ISSN: 1646-9895

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Outubro 16 • October 16



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Nº E8

risti
Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Edição / Edition
Nº. E8, 10/2016

ISSN: 1646-9895

Indexação / Indexing
Academic Journals Database, CiteFactor, Dialnet, DOAJ, DOI, EBSCO, EI-Compendex, GALE, IndexCopernicus, Index of Information Systems Journals, Latindex, ProQuest, QUALIS, SCImago, SCOPUS, SIS, Ulrich's.

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Editorial

Artificial Intelligence, Computer Vision and Multimedia

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Artificial intelligence in the past year has a strong development, to bring more and more benefits to people. And in the future, machine vision will be the next frontier of artificial intelligence. With the development of this kind of technology, there will be a new type of artificial intelligence driven equipment. Machine vision is a branch of the rapid development of artificial intelligence, designed to give the machine can be comparable to human vision. Machine vision has made great progress in the past few years, with researchers using specialized neural networks to help machine recognition and understanding of real-world images.

Today's computer can do all kinds of things in the visual recognition, from the cat on the network to identify specific faces in many photos. However, the technology still has a long way to go. Thus, the RISTI - Revista Iberica de Sistemas e Tecnologias de Informacao presents actual papers on main topics of journal specialization to address and focus artificial intelligence, Computer Vision and Multimedia and related technology in information technologies. The Vol. 2016, No. E8, has selected 40 extended articles presented at the panel discussion on Artificial Intelligence, Computer Vision and Multimedia in January 2016 in Beijing China, which aims to more deep insights about the development of artificial intelligence.

We gratefully appreciate the authors for their scholarly contributions, and all the included contents were anonymously reviewed by distinguished experts to maintain academic excellence and integrity. We assure our readers that RISTI - Revista Iberica de Sistemas e Tecnologias de Informacao will serve as a key exchange platform for publications in information science & technology field. The authors and readers can count on the journal.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 01/04/2016
Aceitação/Acceptance: 10/07/2016

Design and Implementation of the Large-scale Enterprise Management System based on Data Center Model and the OA System

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Pages: 1–10

Abstract: In this paper, we design and implement the large-scale enterprise management system based on the data center model and the OA system. Management information system can accurately and quickly provide modern enterprises with production and management control required for a variety of effective information, companies can use the management system to improve production efficiency, accurate production planning, Product logistics flow rate, and improve the enterprise's capital utilization, thereby enhancing the operation of the entire enterprise. Visible as the whole, relationship between information technology and the information management is very closely: information technology is the technology of information management system, information technology for information management of each link to provide comprehensive support, and, in turn, the demand of information management is also pointed out the direction for the development of general information technology. This paper provides the basis for the systematic design and related further implementation that is meaningful.

Keywords: OA System, Data Center Model, Large-scale System, Enterprise Management System, Design and Implementation

1. Introduction

Management information system is mainly people-oriented, through the computer hardware facilities, software network communications equipment and other office equipment, a series of information collection, transmission, processing, storage, update and the maintenance process (Ates, 2013; Bruneo, 2014). Management information system is a social system, but also a social and technical integration of the system (Dogar, 2014). The management information system is composed of human and computer information technology and enterprise management. The application of information management system can improve the accuracy of management decisions, but also can strengthen the prediction which can be generally reflected from the listed aspects. (1) Information management system has changed the way people work, so that a more rational management system (Gafiyatullina, 2015). Managers can directly through the information system to collect data directly, reducing the unnecessary time spent and the

core information provided by the information system to ensure quality and quantity, and enhance the decision-making ability of decision-makers. (2) Information system can meet the requirements of enterprise for information processing, can make the enterprise managers from the tedious, repetitive things, to engage in the information analysis judgment and decision the real information processing work, the result will be to improve the quality of the managers at all levels and management levels. (3) The application of information management system can save time cost, time cost is the concept of information age. Save time and money can speed up the turnover of the funds, information systems can greatly reduce the time and space of business units and the market that can improve the yield benefit (Jain, 2014; Michalik, 2014).



Figure 1 – The General Components of the Enterprise Management System

As reflected from the figure one, the EMS is a complex system that needs the basic implementation of the related tools. In the later sections, we will propose our unique architecture with the real-world implementation test.

2. The Fundamental Analysis of the Cloud Computing and the Java as the Implementation Tool

Served as the primary and fundamental tools of system, Java and cloud computing paly the essential roles, which cannot be taken place. Java technology to change the way to build and deploy applications, and provides a new means for the network management (Onyiorah, 2014; Pereira, 2015). All classes in Java, it must be loaded into the JVM to run, the loading work is done by the class loader in the JVM, class loader work essence is the class files from the hard disk read into the memory. For the Java, the core feature is the three layer architecture, in the 3-tier network management system, user interface is based on the form of web pages and independent operation of the Java Application, the user through the window or the Web page to monitor the management network status; storage layer to relational database management information, of the basic information, network performance data; the middle layer is the core of the entire network management model is management function and main Java technology layer. In the figure two, we show the flowchart.

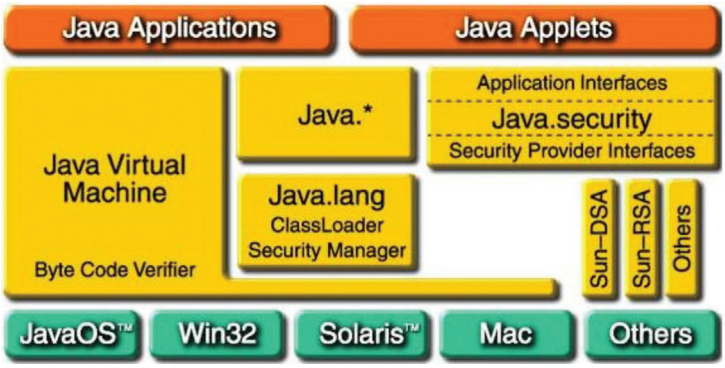


Figure 2 – The Java Architecture and the Related Features

To run the Java application in a large scale, the storage plays the crucial role. Under this condition, the cloud computing technique should be taken into consideration which holds the listed advantages. 1) easy to deploy and convenient, and can be accessed through the Internet user; 2) scalability expression of cloud computing can be expanded to a large cluster, and even contain the thousands of nodes; 3) represents the high availability of cloud computing nodes can tolerate errors, and even a large part of node failure will not affect the correct operation of the program; 4) reduce expenses; 5) limited resources sharing; 6) all the management and well maintenance by professional providers to ensure that cloud computing platform.

To enhance the robustness of the proposed system, we should optimize traditional architecture of the cloud computing from the perspectives of safety and efficiency. Cloud computing model has the following factors.

1. Cloud computing environment, the service provider providing the dynamic storage space, makes the traditional physical and logical security domain to provide the data by dividing the practice of isolation and protection.
2. Cloud computing model, all the business processing to complete the server, server needs to be more robust design with small number of server attacks that may lead to a large number of users cannot run the application.
3. User data is stored in the cloud, the user lose the right to manage data of the absolute. At the same time, the cloud computing service provider's authority is too large, user data is illegal access and leakage hidden trouble.

For solving the bug, we propose the following countermeasures.

1. In order to ensure the master server and the entire system security, the need to strengthen the network's defensive measures to protect it from viruses, Trojan horses and denial of the service attacks from the network. Should be on the Hadoop server set up access control, the operating system security configuration install firewall and antivirus software, timely patch security vulnerabilities and start intrusion detection real-time monitoring server TCP connection and data traffic.
2. In the cloud data center using encryption algorithm to protect the data, and through the key management, algorithm parameter management, strong

authentication and some other cryptographic techniques to ensure that the resources used by special users only by their own management.

While considering the efficiency issues, we can describe the question based on the listed perspectives. Cloud computing system with task scheduling process can be described as: rate of random arrival of different types of tasks in different systems, the scheduler is depending on the type of task, task arrival time, all the computers in the current system of execution status information such as mapping the tasks in a reasonable manner and the final schedule (Qi, 2013). We can mathematically defines the mentioned procedures as the formula 1~2.

$$E\left(\rho_j\right)=\sum_{i=1}^{m} p_{ij}\times\rho_{ij} \tag{1}$$

$$E\left(TIME\_\rho_j\right)=\sum_{i=1}^{m}\frac{\lambda_i}{\lambda}\times E\left(T_i\right) \tag{2}$$

Where the $E\left(\rho_j\right)$ and the $E\left(TIME\_\rho_j\right)$ represent the time consumed. Therefore, cloud computing system of the energy consumption optimization problem can be described as: according to the task to achieve timing and type, computer type and the execution status, to reasonable scheduling of tasks, that tasks are completed from entering the cloud computing system to get execute, in guarantee under the condition of load balancing, the expectations of the minimum energy consumption. In the later design, we will adopt this basic feature.

3. The Theoretical Methodology of the Proposed Approach

3.1. The Data Center Technique

About the data center so far is not an authoritative definition, the traditional data center generally refers to the store as the center, through the core network and the application architecture of basic host system, storage system and software system integration provides a unified application, security and management service data service center (Rouhani,2012; Ramasamy, 2013). The traditional Internet to control logic and data forwarding tight coupling in network equipment, resulting in network control plane management complexity, but also makes the network control level of new technology updates and development is difficult to deploy directly to existing networks, flexibility and scalability It is difficult to adapt to the rapid development of the network(Spangler, 2014). Network control and forwarding separation architecture proposed by proprietary equipment to deploy high-level strategy, network equipment under the guidance of high-level data forwarding, reducing network equipment bearing many complex functions, improve the network of new technologies and the flexibility and operability of the new protocol implementation and deployment. When considering building up the data center, we should firstly think of the listed aspects.

1. Virtualization. As a primary means to improve the utilization ratio of the equipment resources, virtualization become the standard of green data center for granted that can say no virtualization, there would be no new generation of data center.

2. Green energy saving. By using green materials, low energy consumption equipment, intelligent power management technology and virtualization technology can reduce the data center energy consumption, energy saving, environmental protection and low emission of general green standards for enterprises to save information operation and the maintenance costs and improve information performance level.
3. Intelligent security. Green data center should have the visual, controllable, manageable features that can achieve rapid recovery of data center failure or the data dynamic migration.

For the systematic consideration, we choose to use the OpenFlow as the core and primary components that can be shown in the figure 3.



Figure 3 – The General Demonstration of the Data Center Technique

OpenFlow initially as the prototype of the SDN proposed, mainly by the OpenFlow switch. OpenFlow switch controller is composed of two parts according to the flow table to forward the data packet, while representing the data forwarding plane; the controller through the whole network view to realize the control function, and the control logic control plane (Soni, 2014). In OpenFlow based NOX network, NOX is the control core, OpenFlow switch is the operating entity. From the perspective of the features of NOX controller to complete, NOX implements network basic control function, provides a generic API OpenFlow network based control platform, but is not much advantage in performance, failed to provide sufficient reliability and flexibility to meet needs of extensible. However, NOX in the controller design implementation first, now as the basis of OpenFlow network controller platform implementation and the general templates.

3.2. The OA System

With the rapid development of network, network OA system gradually obtains the attention. Some large enterprise groups are working to achieve high-level network of office automation, which will save them a lot of human resources, save a lot of office expenses as a substantial increase in office efficiency. As the state-of-the-art designing methodology, SOA serve as the essential role. SOA allows an enterprise to focus on the business processes in its application development process without focusing on integration or application-level implementation issues. Compared with the traditional

development methods, the SOA has standardized, loose coupling, shared services and the coarse-grained features, and the OA system for the actual performance of the specific performance of the following four points.

1. As long as the relevant standards, regardless of when the development of the components can be combined in a good structure of the SOA system.
2. Because in the aspect of reusable SOA, the new software in the design, development, testing, and deployment time can make full use of existing services, it can significantly shorten the development cycle.
3. Through the adoption of the SOA architecture, the cost of the secondary development of a sharp reduction. At the same time, because the system has loosely coupled features, maintenance costs are greatly reduced.
4. Under the premise of the existing system is not modified, SOA can quickly convert existing systems and applications to services. The application layer of the service interface can be provided to access the legacy system, so the existing system architecture cannot be modified.

For the further implementation of OA system, the methodology can be separated into the following parts. (1) Process definition can advance modeling, also can be free flow. Free flow operation are defined by the user, generally done by the design view controller, namely view controller to record the user's operation process, with the analysis of operating results, generate the corresponding process definition. (2) A processor of the input and output conversion logic is abstracted as a standard activity, generally corresponding to the first and last of the active set, respectively, and the corresponding one or a set of rules. (3) A processor is corresponding to a process definition as process defined by the workflow engine is responsible for the interpretation and execution, the processor execution tracking monitoring by the workflow engine. (4) Activators and the wrappers are abstracted into a standard process definition. Generally, the input logic of the activator is set to null and the output logic of the wrapper is left empty.

In the standardization of OA system construction process, the establishment of the industry and even the regional scope of the process meta model specification, the entire OA standardization construction process is extremely important work. At present, the development of office automation platform and technology develops very fast. Due to the requirement and the running environment for OA difference is very big and it is not a perfect solution. Under this condition, based on groupware system will be the primary selection. The advantage of this kind of development platform is that it has the perfect communication means and that the strong non structure data support ability, and the good system scalability and expansibility. And the system provides a strong security and general permissions and workflow management mechanism as well as the development cycle is short, stable and reliable. The figure 4 reflects the features.

4. The Designed System Demonstration

Enterprise management system is the enterprise system of production and business activities for the management of the object, by many factors of production, the production, management and the external environment together, and the organic whole with specific functions. It is essentially a comprehensive system of planning, organizing,

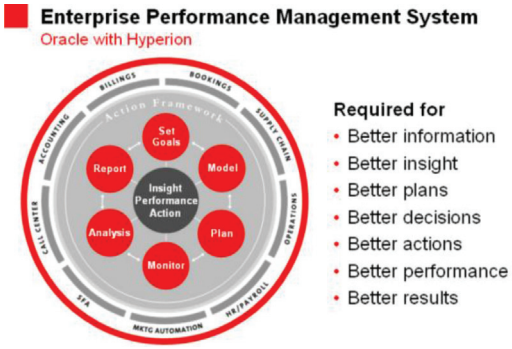


Figure 4 – The OA System and the Reflected Characteristics

directing, coordinating and controlling the operation of the enterprise system. Through the enterprise management system to master system elements of the rational flow of guarantee the efficiency of the enterprise system, coordination of enterprise internal and external economic relations, achieve continuous loop of the operation mechanism of enterprise, gain good economic benefits.

Enterprise management system generally includes business plan system, operation management system, financial management system, operation control system, organization and general management system and the corresponding management information system. In the enterprise system management, we should focus on the enterprise as a system to consider, so the enterprise system management personnel should deeply understand and master following system management principles.

1. Decomposition and the coordination principle. Enterprise system has the characteristics of general complex structure. Therefore, when the system is optimized, it can be broken down into simpler, interrelated subsystems.
2. Growth principle. In order to extend the life of the enterprise system, the enterprise system itself should be flexible and adaptable, but also must have the ability to change its function with the times, and the possibility of the future replacement can be carried out smoothly.
3. The optimum principle. It is one of system management, the pursuit of the goal of optimal system makes the enterprise becomes a general rather than local optimum system, the overall optimal nor sacrifices to meet the local optimum system.

For the implementation, we use the STRUTS to serve as the fundamental unit. The Struts is based on MVC framework, Sun J2EE platform provides the underlying support for development of the MVC system. Struts on the Model, View and Controller provides the realization of the corresponding component, so the Struts and MVC controller is used to separate model and view, to achieve the effect of a kind of loose coupling. For our system, we organize the parts and modes as the follows and we show the final architecture in the figure 5.

1. System administration. System management is core system administrator users use part, and only have permission to use the system administrator. System

administrators can add and remove users, and awarded the level and adjust the system administrator user rights.

2. Customer information management. This system supports the user to import and export customer information in the form of Excel, and not in the system by new entry, and import the Excel specification format can be downloaded in this system.
3. Customer service management. The customer service module is used to manage the service provided by the core customer. Each user manages the customer service through the new edit and deletes the customer service record.
4. Customer pays a return visit management. The customer pays a return visit to manage the customer pays a return visit the situation. Users through the new edit and delete the customer return records for the management of customer return visit.
5. Organizational management module. Knit organization management module includes department management module, mainly for company's manage what department, each department can create child division, and department of add, delete, edit, search and other operations.
6. Inventory management module. Purchase and warehousing in add batch procurement, procurement code automatically generated the information in the supplier management module for the customer the customer list, and let the user choose in the form of a pop-up layer has input suppliers.

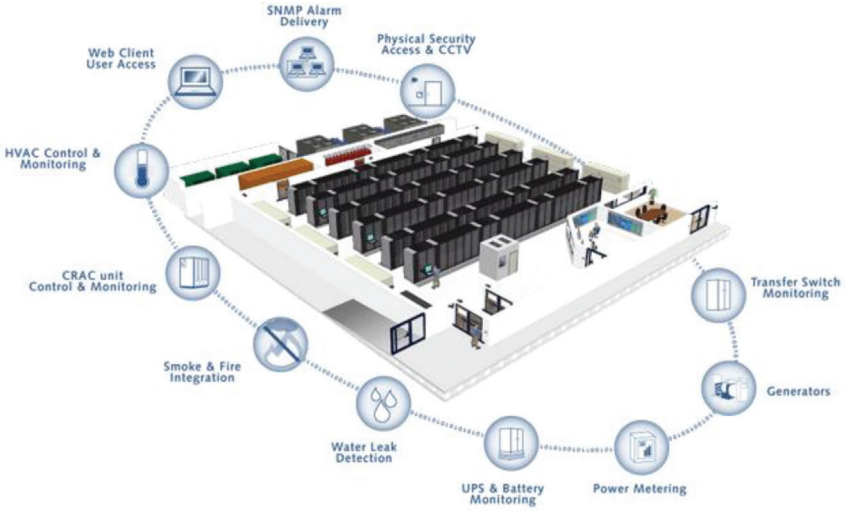


Figure 5 – The Eventual Architecture of the Proposed System

5. Conclusion

In this paper, we design and implement the large-scale enterprise management system based on data center model and the OA system. Enterprises through the management information system to provide the data analysis to improve customer service quality and

efficiency, increased customer satisfaction, the enterprise has won more praise and the tourists. Management information system to provide for enterprises in the supply of products necessary and effective customer service, staff can quickly and easily access to the required information to better serve customers. Enterprises must recognize the importance of the internal network management system for enterprise management and development, functional requirements of scientific analysis and demonstration base, strict construction quality management is in line with the characteristics of enterprises as the key, customized management system software is the key to establish the internal network management system, and through the practical application of the modern management advantage. This paper provides the novel reference for the large-scale enterprise management system which is helpful for the development of the modern management system.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 10/04/2016
Aceitação/Acceptance: 01/07/2016

A Dynamic Programming Model of the Optimal Investment Based on Liquid Asset, Uncertainty and Asset Portfolio Selection

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Pages: 11–24

Abstract: In this paper, a discrete-time variance minimizing problem is considered by incorporating the risk of liquid asset. By using the Lagrange multipliers and the dynamic programming approach, the optimal investment strategy and the minimum investment risk (variance) are obtained. And it's found that liquid asset has a significant impact on optimal strategy and minimum investment risk. In addition, the investment value of risk asset is also analyzed; the numerical analysis shows the impacts of the liquid asset on the minimum variance of the dynamic portfolio selection problem.

Keywords: Liquid asset, investment decision, minimum variance, dynamic programming

1. Introduction

Since Makowitz (1952) proposed the groundbreaking mean-variance model, the quantitative analysis method has laid the theoretical foundation of modern financial economics. The static asset portfolio selection model proposed by Markowitz is to concern about two key indicators: future average income of asset portfolio (mean) and the faced risk of getting returns (variance), the investors hope to have the minimum investment risks under the given expected returns, or the maximum expected returns under given risk tolerance. Merton (1969) further extended the study of the static asset portfolio selection to dynamic intertemporal asset portfolio selection under expected utility. Due to the application convenience of the stochastic optimal control method and the availability of optimal investment strategies under expected utility, the study of dynamic asset portfolio selection under expected utility has been the mainstream of modern finance in the past five decades. Cvitanic and Karatzas (1996) solved optimal investment problem with transaction costs by using martingale method. Shreve and Soner (1994) introduced the transaction costs into the study of the optimal investment and consumption problem. However, regardless of individual investors or institutional investors, it's impossible to make a clear explanation to the meaning represented by expected utility function, and it's also difficult to determine the utility function form

and risk aversion factor in the actual investment operations. Therefore, mean-variance utility is widely used in the investment practice due to its simplified computing program and intuitive economic interpretation. But the inseparability of dynamic mean-variance utility determines that it's impossible to directly use dynamic programming approach to solve the dynamic mean-variance asset portfolio selection. Until the year 2000, Li and Ng (2000), Zhou and Li (2000) used the embedding method and dynamic programming approach to solve dynamic mean-variance asset portfolio selection. Then in the last ten years, the study of dynamic asset portfolio selection under mean-variance utility has been in rapid and vigorous development. Zhu et al. (2004) used embedding method and Chebyshev inequality to solve optimal asset portfolio selection of mean-variance when there's the bankruptcy risk control. Leippold et al. (2004) used the geometric decomposition and the embedding method to study the optimal asset portfolio selection of a multi-stage mean-variance when there's debt. Guo Wenjing and Hu Qiying (2006) considered the optimal asset portfolio selection of dynamic mean-variance when the time for investors to withdraw from market when time is uncertain. Cakmak and Ozekici studied optimal asset portfolio selection of multi-stage mean-variance under Markov mechanism switch market under optimal problem. Xu Yunhui and Li Zhongfei (2008) analyzed the impact of correlation of asset return series on optimal mean-variance strategy. Basak and Chabakauri (2012) further studied the time consistency strategy of dynamic mean-variance asset portfolio selection.

In the study of dynamic mean-variance asset portfolio selection mentioned above, corresponding transaction strategies are assumed to be self-financing, which means that there's no inflow and outflow of funds in the investment process. However, in the investment activity of the financial markets, whether it is for individual investors or institutional investors, their investment process is always with the capital inflows or outflows. For example, the fund managers will inevitably encounter buy or redeem funds in their investment decision-making process, and consumption habits of individual investors have certain inertia, they are less concerned about the utility brought about by the individual consumption. As long as the level of consumption can ensure the basic living needs, the individual investors generally use the remaining funds as the investment of the next phase in order to obtain a better investment return in the future. In other words, investors in investment process are likely to face the inflow and outflow of funds, rather than self-financing. So the consideration of asset portfolio selection under the liquid asset situation is more realistic. Bao Minghua and Ni Xiaoning (2009) pointed out that there's the narrow sense and broad sense of the liquid asset, the narrow sense of liquid asset represents the currency (fund), the liquid asset referred to here is the flow funds. Browne (1995) made use of Brownian motion with drift to characterize the dynamic process of liquid assets, and studied the insurer's optimal investment under the expected utility. Changhao and Rong Ximin (2011) took into the comprehensive account of the optimal portfolio optimization of the quadratic utility function under the random flow funds and the uncertain parameters. The above-mentioned literature is to study the impact of liquid asset on continuous time optimal asset portfolio selection under the expected utility. However, the discrete-time model is more in line with actual investment of financial markets, and the realization of continuous time model usually requires discrete means, so this paper studies the minimum variance portfolio selection when there's the liquid asset in the discrete-time financial market. When the liquid asset value is positive, it's regarded as the inflow of assets, it's seen as the outflow of assets when the liquid asset value is negative.

Part of the structures of this paper is as follows: Section 2 gives the model design, constructing the minimum variance portfolio selection model; Section 3 uses Lagrange multipliers and dynamic programming principle to obtain the minimum variance and optimal investment strategy; Section 4 is to analyze the investment value; Section 5 gives the relevant numerical analysis; and Section 6 concludes the paper.

2. The building of model

Investors enter the market with the initial wealth w at time 0, and plan to carry out the investment activities for a period of N phases, and the planned end time of the investment is N , including the n stage refers to the time interval $[n-1,n), n=1,2,\cdots,N.$ There are J kinds of risk assets (stocks) and a risk-free asset, risk-free rate of return is determined, and the total rate of return of each asset risk is random. At time 0 , investors allocate the initial wealth w to the J kind of risk assets (stocks) and the risk-free asset, in a subsequent $N-1$ stage, investors can re-adjust their portfolios at the start of each stage. Asset transactions always occur at discrete time points of $1,2,\cdots,N$, and there's no transaction in the time interval of $[n-1,n)$.

In the n stage, the yield of the risk-free assets is determined, which is denoted as r_n ; the yield of j kind of risk assets is r_n^j , $j=1,2,\cdots,J$. It is denoted that $R_n=[r_n^1-r_n,r_n^2-r_n,\cdots,r_n^J-r_n]^{'}$, and $[\bullet]^{'}$ represents the vector transposition. We assume R_n is independent and identically distributed, expectation is $E(R_n)=[E(r_n^1)-r_n,E(r_n^2)-r_n,\cdots,E(r_n^J)-r_n]^{'}$, and the covariance matrix is

$$Cov(R_n)=\begin{bmatrix}\sigma_t^{11} & \sigma_t^{12}\cdots\sigma_t^{1J}\\ \vdots & \ddots \quad \vdots\\ \sigma_t^{1J} & \sigma_t^{2J}\cdots\sigma_t^{JJ}\end{bmatrix}$$

Assuming the $W_{n+1}=r_n\left(W_n-\sum_{j=1}^{J}u_n^j\right)+\sum_{j=1}^{J}u_n^jr_n^j+S_n=r_nW_n+S_n+R_n^{'}U_n.$ risk assets are non-degenerated, and then $E[R_nR_n^{'}]=Cov(R_n)+E[R_n]E[R_n^{'}]$ is positive definite. $1-E[R_n^{'}]E^{-1}[R_nR_n^{'}]E[R_n]>0$ is available according to Li and Ng (2000), $n=1,2,\cdots,N.$ Let's make W_n represent the investor wealth at the beginning of n stage, S_n represents the new added liquid assets at the time n , $u_n^j(j=1,2,\cdots,J)$ represents the investors' assets on j stock, then $W_n-\sum_{j=1}^{J}u_n^j$ is the assets invested

to the risk-free asset. Let's denote $U_n = [u_n^1, u_n^2, \cdots, u_n^J]^{'}, n = 1, 2, \cdots, N$, then $U = \{U_n, n = 1, 2, \cdots, N\}$ is the corresponding investment strategy, at this time, the investor wealth at each moment satisfies the following recursion equation

$$W_{n+1} = r_n\left(W_n - \sum_{j=1}^{J} u_n^j\right) + \sum_{j=1}^{J} u_n^j r_n^j + S_n = r_n W_n + S_n + R_n^{'} U_n. \tag{1}$$

We consider S_n is with generality herely, let's set an example to explain the meaning of S_n. If each stage has the fund I_n to rejoin the investment activities, the wealth equation at this time is

$$W_{n+1} = r_n\left(W_n + I_n - \sum_{j=1}^{J} u_n^j\right) + \sum_{j=1}^{J} u_n^j r_n^j = r_n\left(W_n - \sum_{j=1}^{J} u_n^j\right) + r_n I_n + R_n^{'} U_n \tag{2}$$

If we make $S_n = r_n I_n$, and then (2) is degenerated to the form of (1). If investors pull funds C_n out regularly to maintain the basic consumption, then the wealth equation is

$$W_{n+1} = r_n\left(W_n - C_n - \sum_{j=1}^{J} u_n^j\right) + \sum_{j=1}^{J} u_n^j r_n^j = r_n\left(W_n - \sum_{j=1}^{J} u_n^j\right) - r_n C_n + R_n^{'} U_n \tag{3}$$

If we make $S_n = -r_n C_n$, and then (3) is degenerated to the form of (1).

When investors make the investment at time 0, they usually set an expected revenue targets. Under the expected investment target d, the investors hope to find the optimal portfolio strategy U, so as to make the investment risk minimized (measured by variance). That is the optimal strategy used to find the following optimized problem

$$P_{mv} \begin{cases} \min\limits_{U} \ E[(W_N - d)^2] \\ s.t. \quad E[W_N] = d, \\ \qquad W_{n+1} = r_n W_n + S_n + R_n^{'} U_n. \end{cases}$$

3. The solving of model

In problem P_{mv}, the constraints $E[W_N]=d$ is equivalent to $E[W_N-d]=0$, the constraints $E[W_N]=d$ can be solved by using the Lagrange multipliers. After introducing Lagrange multiplier 2φ, there's the optimization problem as follows

$$D_{mv}\quad\begin{cases}\min\limits_{U} & E[(W_N-d)^2]+2\varphi E[W_N-d]\\ s.t. & W_{n+1}=r_nW_n+S_n+R_n^{'}U_n.\end{cases}$$

Let's make $J(w,\varphi)$ represents the optimal objective function of problem D_{mv}, $U_n=g(W_n,\varphi)$ represents the optimal investment strategy. Suppose φ^* is the maximum point of the function $J(w,\varphi)$, according to the Lagrangian duality principle, $J(w,\varphi^*)$ is the optimal value function of the problem P_{mv}, $U_n^*=g(W_n,\varphi^*)$ is the optimal strategy of problem P_{mv}. Since

$$E[(W_N-d)^2]+2\varphi E[W_N-d]=E[(W_N-\gamma)^2]-(d-\gamma)^2 \tag{4}$$

Wherein $\gamma=d-\varphi$. Since φ and d are constants, the optimized problem D_{mv} is equivalent to

$$D_{mv}\quad\begin{cases}\min\limits_{U} & E[(W_N-\gamma)^2]\\ s.t. & W_{n+1}=r_nW_n+S_n+R_n^{'}U_n\end{cases}$$

Let's make $f_n^*(\gamma,W_n)=\min\limits_{U_n,U_{n+1},\cdots,U_{N-1}} E\left[(W_N-\gamma)^2\mid W_n\right]$ indicates the optimal value function of problem $\widehat{D}_{mv}$ by starting from the initial wealth W_n at the time n, and then $f_0^*(d-\varphi,w)-\varphi^2$ is the optimal objective function of proble m D_{mv}. According to Bellman principle, there is

$$f_n^*(\gamma,W_n)=\min_{U_n} E\left[f_{n+1}^*(\gamma,W_{n+1})\mid W_n\right] \tag{5}$$

and the boundary condition $f_N^*(\gamma, W_N) = (W_N - \gamma)^2$. the optimal value function of problem $\widehat{D}_{mv}$ is obtained by using the dynamic programming approach as shown in the following theorem.

Theorem1. For any $n = 0,1,\cdots,N-1$, the optimal objective function of the problem $\widehat{D}_{mv}$ is

$$f_n^*(\gamma, W_n) = \left(\prod_{k=n}^{N-1}(1-B_k)\right)\left[\left(\prod_{k=n}^{N-1} r_k\right)W_n - \left(\gamma - \sum_{k=n}^{N-1}\left(\prod_{t=k+1}^{N-1} r_t\right)S_k\right)\right]^2, \tag{6}$$

Wherein, $B_n = E[R_n^{'}]E^{-1}[R_n R_n^{'}]E[R_n]$.

According to Lagrangian duality principle, the optimal objective function of the optimal investment problem P_{mv} that is minimum variance $Var(W_N) = E[(W_N - d)^2]$ is just maximum value about φ of the optimal value function $f_0^*(d-\varphi, w) - \varphi^2$ for optimized problem, namely

$$Var(W_N) = \max_{\varphi}\ (\tau_1 - 1)\varphi^2 + 2\tau_1\varphi(\tau_2 - d) + \tau_1(\tau_2 - d)^2, \tag{7}$$

Wherein $\tau_1 = \prod_{n=0}^{N-1}(1-B_n), \tau_2 = \left(\prod_{n=0}^{N-1} r_n\right)w + \sum_{n=0}^{N-1}\left(\prod_{k=n+1}^{N-1} r_k\right)S_n$. Since $0 < B_n < 1$, and then $0 < \tau_1 < 1$, so there's the maximum value in equation (7). According to first-order optimality conditions, making (7) take maximum value φ as $\varphi^* = \frac{\tau_1}{1-\tau_1}(\tau_2 - d)$. $\varphi^* = \frac{\tau_1}{1-\tau_1}(\tau_2 - d)$ is put into (7) to obtain the minimum investment risk (variance) $Var(W_N) = \frac{\tau_1}{1-\tau_1}(d - \tau_2)^2$ of the optimal asset portfolio selection problem P_{mv}.Thus the effective boundary and optimal investment strategy of problem P_{mv} is given by the following theorem.

Theorem 2. The effective boundary of the optimal asset portfolio selection problem P_{mv} at the time 0 is

$$Var(W_N) = \frac{\tau_1}{1-\tau_1}\left[E(W_N) - \tau_2\right]^2, E(W_N) > \tau_2. \tag{8}$$

The optimal investment strategy at any time $n = 0,1,\cdots,N-1$ is

$$U_n^* = E^{-1}[R_n R_n^{'}]E[R_n]\left[\frac{d - \tau_1\tau_2}{1-\tau_1}\left(\prod_{k=n+1}^{N-1}\frac{1}{r_k}\right) - \left(r_n W_n + \sum_{k=n}^{N-1}\left(\prod_{t=n}^{k}\frac{1}{r_t}\right)S_k\right)\right]. \tag{9}$$

According to (8), the efficient frontier of the problem P_{mv} depends on the parameters τ_1 and τ_2, while τ_1 and τ_2 depend on financial asset returns and liquid asset, Therefore, the liquid asset has a significant impact on the efficient frontier of the problem P_{mv}. Herewith, $1-\tau_1$ is only related to financial asset returns, which is the indicator of measuring investment value. The larger $1-\tau_1$ indicates the greater investment value of the financial assets, the smaller the corresponding investment risk.

In variance -mean plane, the efficient boundary (8) is the upper half of the parabola above variance –mean plane. If variance is replaced by standard deviation in measuring risk, equation (8) becomes

$$\sigma(W_N)=\sqrt{\frac{\tau_1}{1-\tau_1}}\left[E(W_N)-\tau_2\right], \tag{10}$$

Wherein $\sigma(W_N)=\sqrt{Var(W_N)}$, (10) is a ray by starting from the point $(0,\tau_2)$ on the variance-mean plane with the slope of $\sqrt{\frac{\tau_1}{1-\tau_1}}$. Herely $\sqrt{\frac{\tau_1}{1-\tau_1}}$ is the risk price.

Obviously, the smaller τ_1 value, the greater the investment value $1-\tau_1$, the investment risk under the constraint of the same investment returns will be smaller, the smaller the risk price $\sqrt{\frac{\tau_1}{1-\tau_1}}$.

4. Analysis of investment value

4.1. Support vedtor modhine

Let's set $\tau_1^n=\prod_{k=n}^{N-1}(1-B_k)$, then $1-\tau_1^n$ represents the investment value from the time n to time $N-1$. The following is to analyze the case of only one risk asset. First, since $B_n=E[R_n^{'}]E^{-1}[R_nR_n^{'}]E[R_n]$ is related to the excess returns of risk assets, τ_1^n is determined by the excess returns of the risk asset from the time n to time N. When there's only one risk asset, $B_k=\frac{E^2[R_k]}{E[R_k]^2}$, so $1-B_k=1-\frac{E^2[R_k]}{E[R_k]^2}=\frac{Var[R_k]}{E[R_k]^2}$, then

$$\tau_1^n=\prod_{k=n}^{N-1}(1-B_k)=\prod_{k=n}^{N-1}\frac{Var[R_k]}{E[R_k]^2}=\prod_{k=n}^{N-1}\frac{Var[R_k]}{Var[R_k]+E^2[R_k]}.$$

So $1-\tau_1^n=1-\prod_{k=n}^{N-1}\frac{Var[R_k]}{Var[R_k]+E^2[R_k]}$ is the reduction function of investment risk $Var[R_k]$, and it is the increase function of investment expected return $\left|E[R_k]\right|$,

$1-\tau_1^n$ meets the characters of measuring the investment value indicators, so $1-\tau_1^n$ can be seen as the indicator used to measure stock investment value. According to the efficient frontier (8), at a given target of return on investment, the greater $1-\tau_1$ value, in other words, the larger the stock investment value, and the smaller the corresponding investment risk, the efficient boundary is also conducive to investors.

In addition, since there is only one risk asset, the dynamic Sharpe ratio can be defined accordingly. Let's make $Sharpe(0,T)=\frac{E(W_N)-\tau_2}{\sigma(W_N)}$, indicating the dynamic Sharpe ratio of the problem P_{mv}, the following can be obtained according to (10)

$$Sharpe(0,T)=\frac{E(W_N)-\tau_2}{\sigma(W_N)}=\sqrt{\frac{1-\tau_1}{\tau_1}} \tag{11}$$

Since $\frac{d[Sharpe(0,T)]}{d(1-\tau_1)}=\frac{1}{2}\sqrt{\frac{1}{\tau_1^3(1-\tau_1)}}>0$, namely $1-\tau_1$ and $Sharpe(0,T)$ is one to one, so $1-\tau_1$ is the same to the dynamic Sharpe ratio, and it can reflect the investment value of the stock, which can be used as the indicator of measuring the investment value.

5. Numerical Analysis

Let's assume the initial wealth $w=1$, considering an investment activity of a pension fund plan for the period of T = 6. There's a risk-free asset on the financial markets, the annual rate of return is 6%, and there are three risk assets, respectively, S&P 500 (SP), and the emerging markets index (EM) and small-cap stocks index (MS). According to the data of Elton et al (2007), we can obtain annualized expected rate of return, variance and correlation coefficient of the three indices as follows

	SP	**EM**	**MS**
expected returns	14%	16%	17%
variance	18.5%	30%	24%

Table 1 – The annualized expected rate of return and variance of the three indices

	SP	**EM**	**MS**
SP	1	0.64	0.79
EM	0.64	1	0.75
MS	0.79	0.75	1

Table 2 – Correlation coefficient of the three indices

Correspondingly

$$E[R_n]=\begin{bmatrix}0.09\\0.11\\0.12\end{bmatrix},\quad Cov[R_n]=\begin{bmatrix}0.0342 & 0.0355 & 0.0351\\0.0355 & 0.0900 & 0.0540\\0.0351 & 0.0540 & 0.0576\end{bmatrix},$$

$$E[R_n R_n^{'}]=\begin{bmatrix}0.0423 & 0.0454 & 0.0459\\0.0454 & 0.1021 & 0.0672\\0.0459 & 0.0672 & 0.0720\end{bmatrix}$$

5.1. Fixed liquid assets

If there's the liquid asset S_n with a fixed ratio is added to investment activity at the beginning of each stage. When the liquid assets at each stage is respectively $S_n=-0.1$, $S_n=0.1$, $S_n=0.2$, then the efficient frontier of investors at the time can be obtained as shown in Figure 1, wherein, $S_n=0$ represents there's no liquid asset at each stage, namely the self-financing situation.

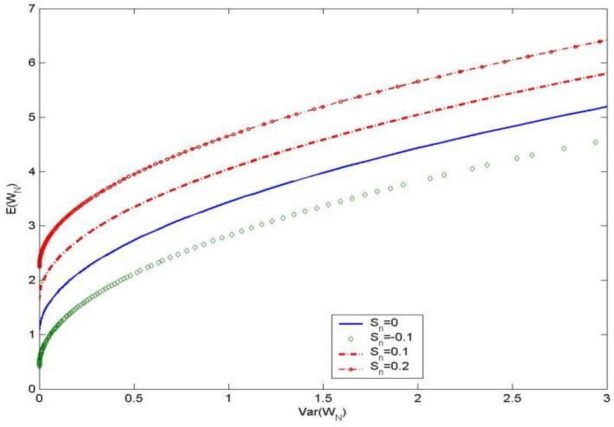


Figure 1 – Efficient frontier of mean-variance when existing liquid assets with a fixed ratio

Figure 1 shows that when investors pull funds out at each stage ($S_n=-0.1$), the return on investment $E(W_N)$ obtained in the same investment risk $Var(W_N)$ is smaller compared to the self-financing situation ($S_n=0$). If there are new funds added to the investment activities at each stage ($S_n=0.1, S_n=0.2$), and then the return on investment $E(W_N)$ obtained in the same investment risk $Var(W_N)$ is larger compared to self-financing situation $S_n=0$.

In particular, when the investment objective previously set by the investor is d = 1.5, the liquid assets are respectively $S_n = -0.1$, $S_n = 0.1$, and $S_n = 0.2$,then the investment risks are respectively $Var(W_N) = 0.2019$, $Var(W_N) = 0.0034$ and $Var(W_N) = 0.0977$. At the time the corresponding investment risk under self-financing strategy is $Var(W_N) = 0.03815$. This means that when there is outflow of assets, there's the highest investment risk; the investment risk is lower than that under the case of self-financing when the proportion of liquid asset is 0.1; and when the liquid asset ratio is increasing to reach 0.2, the investment risk is increased, and it is greater than the investment under the case of self-financing. This indicates that the outflow of assets will result in the increasing investment risk of investors when reaching the investment objective at the end of the investment, an appropriate increase in liquid assets at each stage will be conducive to reducing investment risks. However, it does not mean the more increased liquid assets the better; the more liquid asset the investment risk may become larger.

5.2. Unsteady liquid asset

If the liquid asset S_n re-added to the investment activities at the beginning of each stage is uncertain, investors need to set the amount of the new invested liquid asset according to the fund condition of the time. When the liquid asset at each stage is respectively

$$S^1 = (S_1, S_2, S_3, S_4, S_5, S_6) = (0.2, 0.1, 0, 0, -0.1, 0),$$

$$S^2 = (S_1, S_2, S_3, S_4, S_5, S_6) = (0.1, 0.2, -0.1, 0, -0.1, 0.2),$$

$S^3 = (S_1, S_2, S_3, S_4, S_5, S_6) = (0.1, 0.1, 0.2, 0.15, 0, 0.3)$, the efficient frontier of investors is as shown in Figure 2, wherein S^0 represents the case of self-financing.

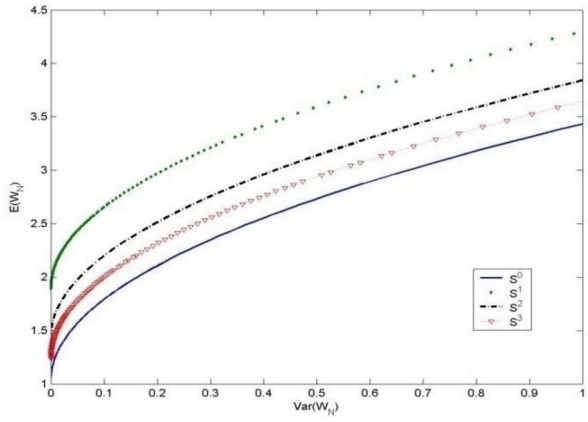


Figure 2 – Efficient frontier of mean-variance when various stages of liquid asset proportion in each stage changes randomly

It can be found in Figure 2 that when there's liquid asset (either inflows or outflows), the efficient frontier of the investors are superior to the efficient frontier in the case of self-financing. In other words, although there's fund inflows and outflows during the investment, for investors with the same expected return on investment $E(W_N)$, the investment risk (variance $Var(W_N)$) when there's the liquid asset is significantly less than the investment risk (variance) in the case of self-financing.

6. Conclusion

This paper introduces liquid asset into the study of the optimal asset portfolio selection in a financial market with one risk-free asset and multiple risk assets, thus to build the minimum variance asset portfolio selection model with the liquid asset. By using the dynamic programming approach and Lagrange multipliers, the optimal investment strategy and minimal investment risk (variance) are obtained. And it's found that liquid asset has a significant impact on optimal strategy and minimal investment risk. In addition, we constructed an indicator measuring the investment value. Finally, the results of numerical analysis showed that liquid asset has a significant impact on the efficient boundary.

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Appendix

Prove Theorem 1:

The mathematical induction is used to prove the theorem. According to the boundary condition $f_N^*(\gamma, W_N) = (W_N - \gamma)^2$ and Bellman equation (5), there's the following

$$\begin{aligned} f_{N-1}^*(\gamma, W_{N-1}) &= \min_{U_{N-1}} E\left[f_N^*(\gamma, W_N) \mid W_{N-1} \right] \\ &= \min_{U_{N-1}} (r_{N-1} W_{N-1} + S_{N-1})^2 + 2(r_{N-1} W_{N-1} + S_{N-1}) E(R_{N-1}^{'}) U_{N-1} \\ &\quad + U_{N-1}^{'} E(R_{N-1} R_{N-1}^{'}) U_{N-1} - 2\gamma [r_{N-1} W_{N-1} + S_{N-1} + E(R_{N-1}^{'}) U_{N-1}] + \gamma^2 \end{aligned}$$

Since $E(R_{N-1} R_{N-1}^{'})$ is positive definite, the optimal strategy can be obtained according to an order optimality conditions as follows

$$U_{N-1}^* = E^{-1}(R_{N-1} R_{N-1}^{'}) E(R_{N-1}) [\gamma - (r_{N-1} W_{N-1} + S_{N-1})] .$$

Put U_{N-1}^* into $f_{N-1}^*(\gamma, W_{N-1})$ and obtain:

$$f_{N-1}^*(\gamma, W_{N-1}) = (1 - B_{N-1}) [r_{N-1} W_{N-1} - (\gamma - S_{N-1})]^2$$

Suppose (6) establishes for $n+1$, namely

$$f_{n+1}^*(\gamma, W_n) = \left(\prod_{k=n+1}^{N-1} (1 - B_k) \right) \left[\left(\prod_{k=n+1}^{N-1} r_k \right) W_{n+1} - \left(\gamma - \sum_{k=n+1}^{N-1} \left(\prod_{t=k+1}^{N-1} r_t \right) S_k \right) \right]^2 ,$$

Then

$$\begin{aligned} & f_n^*(\gamma, W_n) \\ &= \min_{U_n} E\left[f_{n+1}^*(\gamma, W_{n+1}) \mid W_n \right] \\ &= \min_{U_n} \left(\prod_{k=n+1}^{N-1} (1 - B_k) \right) \left[\begin{array}{l} \left(\prod_{k=n+1}^{N-1} r_k \right)^2 [(r_n W_n + S_n)^2 + 2(r_n W_n + S_n) E(R_n^{'}) U_n + U_n^{'} E(R_n R_n^{'}) U_n] \\ -2 \left(\gamma - \sum_{k=n+1}^{N-1} \left(\prod_{t=k+1}^{N-1} r_t \right) S_k \right) \left(\prod_{k=n+1}^{N-1} r_k \right) [r_n W_n + S_n + E(R_n^{'}) U_n] \\ + \left(\gamma - \sum_{k=n+1}^{N-1} \left(\prod_{t=k+1}^{N-1} r_t \right) S_k \right)^2 \end{array} \right] \end{aligned}$$

Since $E(R_n R_n^{'})$ is positive definite, the optimal strategy can be obtained according to an order optimality conditions as follows

$$U_n^* = E^{-1}(R_n R_n^{'})E(R_n)\left[\frac{\gamma - \sum_{k=n+1}^{N-1}\left(\prod_{t=k+1}^{N-1} r_t\right)S_k}{\prod_{t=n+1}^{N-1} r_t} - (r_n W_n + S_n)\right]$$

Put U_n^* into $f_n^*(\gamma, W_n)$ and obtain

$$f_n^*(\gamma, W_n) = \left(\prod_{k=n}^{N-1}(1-B_k)\right)\left[\left(\prod_{k=n}^{N-1} r_k\right)W_n - \left(\gamma - \sum_{k=n}^{N-1}\left(\prod_{t=k+1}^{N-1} r_t\right)S_k\right)\right]^2,$$

According to mathematical induction, (6) is established for all $n = 0, 1, \cdots, N-1$. That's all about the proof.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 02/04/2016
Aceitação/Acceptance: 09/07/2016

Bending Moment Capacities of Mortise and Tenon Joints Made by Formosan Alder (*Alnus Formosana*) Wood

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Pages: 25–38

Abstract: The object of this study is to find out the strength of T-shape and L-shaped rectangular mortise and tenon joints made by Formosan alder under compression loads with two-factor experiment. Tests were conducted to determine the bending moment capacity of 80 T-shaped and 60 L-shaped rectangular mortise and tenon joints. Specimens were assembled with 30% solid content polyvinyl acetate adhesive. Two experiment factors (i.e., tenon width and tenon shoulder width for T-shaped joints, tenon width and distance from top wall of mortise to top face of post for L-shaped joints), each at four or three levels, were carried out. The results of ANOVA and Duncan's Test revealed that the optimal T-shaped joint is 30mm in tenon width and 15mm in tenon shoulder width, the optimal L-shaped joint is 30mm in tenon width and 15mm in distance from top wall of mortise to top face of post.

Keywords: Bending Moment Capacities, Mortise and Tenon Joints, Formosan Alder (*Alnus Formosana*) Wood

1. Introduction

Alnus is a genus in the family *Betulaceae* and Alnus genus is composed of about forty species native to Asia, Africa, Europe and America, and seven species are native to China (CASFRPSE, 1979). Formosan alder (*Alnus Formosana*) shows an expansive distribution from plains to mountains in Taiwan, i.e., original place. Since Formosan alder has been introduced into Sichuan province of People's Republic of China on a large scale as early as 1999, Formosan alder reached the same height and diameter compared with that grows in original place(Wang,J., Wang, S.,2003). It was reported that Formosan alder have been used for different purposes such as building, appliances, box board, furniture, paper, etc. Although Formosan alder has been a subject of some studies, most of them are anatomical, ecological, botanical, planting technological reports. Besides the research on correlativity between site condition and properties of Formosan alder introduced into Sichuan and comparative study on wood properties of *Alnus cremastogyne* and *Alnus formosana* (Yang, Y., 2009; Wang, J., 2008), there was few detailed and original research papers on important physical and mechanical properties of Formosan alder(Chen, M. *et al.*,2004a; Chen, M. *et al.*,2004b).

Mortise and tenons joint geometry has a significant effect on the strength of those particular joints (Tankut and Tankut,2005). It is reported that the optimum results of simple and haunched mortise and tenon furniture joints under tension and compression loads were obtained with joints constructed with 10 thick tenons that were 37.5 wide by 30 mm long. And tenon width was found to have a much smaller effect than tenon length on joint capacity (Oktaee *et al.*,2014).

This study was undertaken to investigate and compare the bending moment capacities of several configurations of rectangular mortise and tenon joints made by Formosan alder wood. One objective of the tests was to fill the gap in the research field and to promote the utilization rate of industrialization of Formosan alder. Another objective was to determine the effect of rectangular tenon and mortise geometry on the bending moment capacity of Formosan alder joints constructed with both T-Shaped and L-Shaped mortise and tenon joints.

2. Experiment

2.1. Materials and Methods

Formosan alder wood, which are widely used in furniture construction, were selected for the tests, and Formosan alder lumbers were harvested from Suji Town, Leshan City, Sichuan Province, PRC. All samples were conditioned and maintained at 9.5% moisture content approximately, and subsequently machined to 200 mm in length by 40 mm in height by 30mm in thickness for post part and 165 mm in length by 45.6 mm in height by 30mm in thickness for rail part, respectively. All components were sequentially numbered. The rail and post for each specimen were then randomly selected from the resulting material pool. Sufficient material was obtained to manufacture 140 Formosan alder specimens.

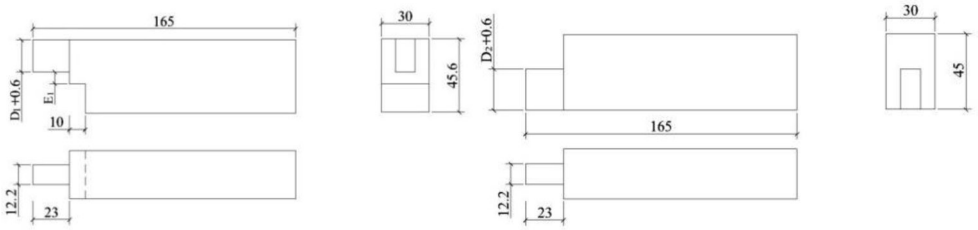


Figure 1 – Rail dimensions in mm; overall dimensions of rail (165 mm×45.6 mm ×30mm); left rail sample used in T-shaped joints, right rail sample used in L-shaped joints.

Tenons, 23 mm long by (D1+0.6) mm/(D2+0.6) mm wide by 12.2 mm thick, were cut with a tenoning machine. Mortises, 25 mm deep by D1 mm/ D2 mm high by 12 mm wide, were cut with a router. D1 and D2 are 15mm, 20mm, 25mm, 30mm for T-shaped joints and L-shaped joints, respectively. E1 represents tenon shoulders, which were 0mm, 5mm, 10mm, 15mm for T-shaped joints. E2 represents distance from top wall of mortise to top face of post, which were 5mm, 10mm, 15mm for L-shaped joints. Tolerances were such that a tenon could be inserted 2/3 of its length into a mortise without using under force. The faces of the tenon and the walls of the mortise were coated with a 30% solid content polyvinyl acetate (PVA) adhesive (Henkel China, Shanghai, PRC), and the full length of the tenon was inserted into the mortise and clamped in place.

Specimens remained clamped for 24 h, and they were stored in a conditioning room at 9.5% moisture content. 7 days elapsed before specimens were tested.

2.2. Test Procedure

All tests were conducted on an Reger universal testing machine (Shenzhen Reger Instrument Co., Ltd. Shenzhen, PRC) as shown in Figure 2. The rate of loading was 10 mm/min. The moment arm was 100 mm. Loading continued until a non-recoverable drop-off in load occurred as shown in Figure 3 (Erdil *et al.*, 2005).

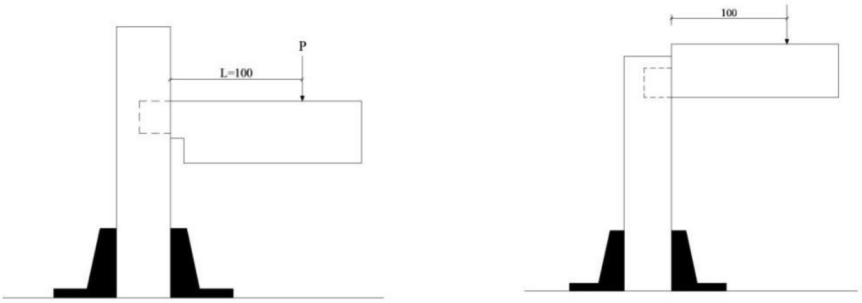


Figure 2 – Test set-up ; left set-up used in T-shaped joints test, right set-up used in L-shaped joints test.

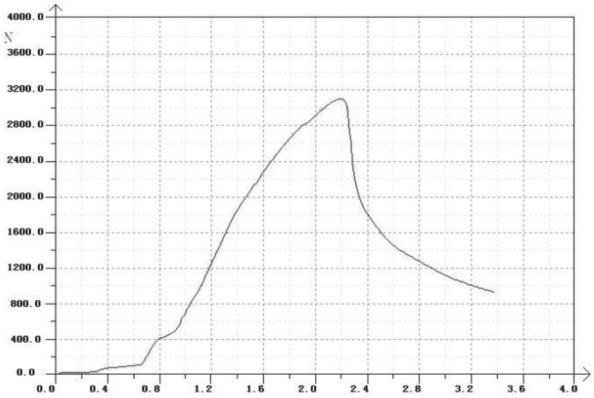


Figure 3 – Displacement-loading curves.

3. Results and Discussion

3.1. Material Properties

The physical and mechanical properties of the materials, as determined according to the procedures described in GB/T 1936.2-2009, GB/T 1936.1-2009, GB/T 1935-2009, GB/T 1938-2009, GB/T 1933-2009 and GB/T1931-2009 respectively, are given in Table 1.

Wood species	MOE *	MOR*	Tension strength	Compression strength	Density	MC*
Formosan Alder	8102.429	80.429	81.542	41.575	0.43	14.154

* MOE: Modulus of elasticity; MOR: Modulus of rupture; MC: Moisture content

Table 1 – Physical and Mechanical Properties of Formosan Alder Wood Used in the Study

3.2. Failure Modes

A rapid drop in the applied load occurred when the ultimate value was reached in T-shaped joints test. In general, joints with tenons 15 mm in width and without tenon shoulder failed as a result of fracture of the tenon, whereas joints with tenons 15 mm in width and with tenon shoulder failed as a result of glue-line fractures, splitting of the tenon and indentation of mortise.

Joints with tenons 20, 25 and 30 mm in width failed as a result of pulling out of the tenon in different extent. For those joints without tenon shoulder failed as a result of glue-line fractures and deformation of tenon, whereas joints with tenon shoulder failed as a result of deformation of tenon and indentation of mortise. Warping and cracking occurs at the edge of mortise for the joints with tenons 30 mm in width in particular.(Figure 4 a, b, and c)



a. b. c.

Figure 4 – Failure modes of the specimens in T-shaped joints including the fracture of the tenon (a), pulling out of the tenon (b), and indentation of mortise (c).

A rapid drop in the applied load occurred when the ultimate value was reached in L-shaped joints test. More than half of joints with distance from top wall of mortise to top face of post 5 mm failed as a result of fracture of the tenon when assembling, whereas joints with distance from top wall of mortise to top face of post 10 mm or longer, such phenomenon would not appear.

Joints with tenons 15mm in width failed as a result of pulling out of the tenon or fracture of the tenon. For those joints 20mm or 25mm in width failed as a result of pulling out of the tenon slightly with deformation when E2 were longer than 5mm and fracture of the tenon when E2 were exact 5mm, whereas joints with tenons 30mm in width failed as a



a. b. c.

Figure 5 – Failure modes of the specimens in L-shaped joints including the fracture of the tenon (a), pulling out of the tenon (b), and tearing the mortise part parallel to grain (c).

result of fracture of the tenon on end face or tearing the mortise part parallel to grain. (Figure 5 a, b, and c)

3.3. Results

Machine loads were converted into bending moments by means of the following expressions:

$$M = P \times L \quad (1)$$

Here, M refers to the bending moment capacity (Nm), P refers to the machine load (N), L refers to the distance between the line of action of the machine load to the point of intersection of the right surface of post (100 mm). Statistical values of ultimate bending moments obtained from the tests are given in Table 2 and 3.

Bending Types* (TD1-E1)	Mean	Maximum	Minimum	Standard Deviation
T15-0	38.86	42.44	33.67	1.49
T15-5	47.03	51.31	43.17	2.92
T15-10	49.45	52.47	45.16	1.782
T15-15	62.64	71.53	54.59	5.112
T20-0	41.93	46.89	35.44	4.052
T20-5	55.69	66.82	48.74	6.93
T20-10	71.51	82.97	65.44	6.58
T20-15	80.09	89.56	71.29	6.52
T25-0	59.88	64.43	48.16	6.64
T25-5	73.31	79.45	67.08	4.60
T25-10	83.96	93.67	77.04	3.85
T25-15	90.58	99.42	78.86	6.88

Bending Types* (TD1-E1)	Mean	Maximum	Minimum	Standard Deviation
T30-0	79.69	83.83	72.89	4.18
T30-5	93.30	100.41	85.57	5.34
T30-10	112.65	128.15	94.39	12.70
T30-15	122.14	134.63	103.46	11.32

* T represents T-shaped joint, D1 value represents tenon width, E1 represents tenon shoulder width.

Table 2 – Statistical Values of Breaking Bending Moment in T-shaped Joints Test

Bending Types* (LD1-E1)	Mean	Maximum	Minimum	Standard Deviation
L15-10	35.84	39.03	33.67	2.348
L15-15	34.19	42.58	40.34	3.029
L20-5	45.23	48.73	52.21	3.236
L20-10	56.47	62.36	49.25	3.831
L20-15	59.24	70.18	52.99	6.648
L25-5	58.37	61.65	62.27	3.007
L25-10	66.29	69.01	62.73	2.948
L25-15	65.25	68.02	60.00	1.947
L30-5	66.89	70.52	63.57	3.788
L30-10	70.27	75.42	68.51	4.134
L30-15	72.23	75.36	77.04	2.238

* L represents L-shaped joint, D2 value represents tenon width, E2 represents distance from top wall of mortise to top face of post.

Table 3 – Statistical Values of Breaking Bending Moment in L-shaped Joints Test

Standard analysis of variance (ANOVA) methods were applied to bending moment capacities data of T-Shaped joints. The 2 geometric tenon factors considered (tenon width and tenon shoulder) had highly significant effects on the bending moment capacity of the joints; however, their interaction effects had less effects on breaking bending moment in tests with 0.034 P value (Tables 4). Duncan's multiple range test was applied to determine whether there was a significant difference among groups. The homogeneous groups emerging at the end of the test are given in Tables 6and 7.

Standard analysis of variance (ANOVA) methods were also applied to bending moment capacities data of L-Shaped joints. The 2 geometric tenon factors considered (tenon width and distance from top wall of mortise to top face of post) had highly significant effects on the bending moment capacity of the joints; however, their interaction effects have no effect on breaking bending moment in tests with 0.150 P value (Tables 5). Duncan's multiple range test was applied to determine whether there was a significant difference among groups. The homogeneous groups emerging at the end of the test are given in Tables 8and 9.

Dependent Variable: Breaking Bending Moment

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	44315.741a	15	2954.383	56.959	.000
Intercept	422467.045	1	422467.045	8144.976	.000
TenonWidth	30395.144	3	10131.715	195.335	.000
TenonShoulder	12899.683	3	4299.894	82.900	.000
*TenonWidth * TenonShoulder*	1020.914	9	113.435	2.187	.034
Error	3319.579	64	51.868		
Total	470102.365	80			
Corrected Total	47635.320	79			

a. R Squared = .930 (Adjusted R Squared = .914)

Table 4 – ANOVA Results for Bending Moment Capacities of T-Shaped Joints

Dependent Variable: Breaking Bending Moment

Source	Type III Sum of Squares	df	Mean Square	F	Sig
Corrected Model	8043.430a	10	804.343	49.845	.000
Intercept	168382.627	1	168382.627	10434.667	.000
TenonWidth	7869.182	3	2623.061	162.551	.000
Distance from Mortise Upside to The Top of Post	681.405	2	340.703	21.113	.000
*Tenon Width * Distance from Mortise Upside to The Top of Post*	138.828	5	27.766	1.721	.150
Error	710.021	44	16.137		
Total	191517.212	55			
Corrected Total	8753.451	54			

a. R Squared = .919 (Adjusted R Squared = .900)

Table 5 – ANOVA Results for Bending Moment Capacities of L-Shaped Joints

	Tenon Width	N	Subset			
			1	2	3	4
Duncan[a,b]	15	20	49.4935			
	20	20		62.3070		
	25	20			76.9315	
	30	20				101.9455
	Sig.		1.000	1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.
Based on observed means.
The error term is Mean Square(Error) = 51.868.

a. Uses Harmonic Mean Sample Size = 20.000.
b. Alpha = .05.

Table 6 – Results of Duncan's Test with Respect to The Width of Tenons of T-Shaped Joints

	Shoulder	N	Subset			
			1	2	3	4
Duncan[a,b]	0	20	55.0905			
	5	20		67.3310		
	10	20			79.3915	
	15	20				88.8645
	Sig.		1.000	1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.
Based on observed means.
The error term is Mean Square(Error) = 51.868.

a. Uses Harmonic Mean Sample Size = 20.000.
b. Alpha = .05.

Table 7 – Results of Duncan's Test with Respect to The Width of Tenons Shoulder of T-Shaped Joints

	TenonWidth	N	Subset			
			1	2	3	4
Duncan[a,b,c]	15	10	36.9320			
	20	15		53.6500		
	25	15			63.3020	
	30	15				69.7927
	Sig.		1.000	1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

Based on observed means.

The error term is Mean Square(Error) = 16.137.

a. Uses Harmonic Mean Sample Size = 13.333.
b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.
c. Alpha = .05.

Table 8 – Results of Duncan's Test with Respect to The Width of Tenons of L-Shaped Joints

	Distance from Mortise Upside to The Top of Post	N	Subset
			1
Duncan[a,b,c]	5	15	56.8340
	10	20	57.2105
	15	20	58.6885
	Sig.		.198

Means for groups in homogeneous subsets are displayed.
Based on observed means.
The error term is Mean Square(Error) = 16.137.

a. Uses Harmonic Mean Sample Size = 18.000.
b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.
c. Alpha = .05.

Table 9 – Results of Duncan's Test with Respect to distance from top wall of mortise to top face of post of L-Shaped Joints

3.4. Discussion

For T-Shaped mortise and tenon joints made by Formosan alder wood, considering the width of tenons, the greatest bending moment capacities were obtained with joints that had 30-mm-wide tenons. The capacity of joints with 30-mm-wide tenons was 32.51% greater than joints with 25-mm-wide, 63.62% greater than those with 20-mm-wide tenons and 105.97% greater than those with 15-mm-wide tenons. According to Erdil and Oktaee's research, joints with greater width show more bending strength, which is in agreement with the results of this study (Oktaee, J. *et al.* 2014; Erdil, Y. Z. *et al.*,2005). There are multinomial regression equations among width of tenon and bending moment capacity, respectively, are given in equations (2), (3), (4), and (5). As the joint width increases, the contact area and glued surface of the joints increases, moreover bending moments of the joints strengthens.

Considering the shoulder of tenons in T-Shaped mortise and tenon joints tests, the greatest bending moment capacities were obtained with joints that had 15-mm-wide tenon shoulders in T-shaped joints. The capacity of joints with 15-mm-wide tenon shoulders was 8.42% greater than joints with 10-mm-wide shoulder, 30.91% greater than joints with 5-mm-wide and 53.27% greater than joints without shoulder in 30-mm-wide tenon joints tests. The same conclusion could be obtained in tests of joints that had 15, 20 and 25mm wide tenon joints tests. Bending moments of joints were getting higher with the increasing of tenon shoulder of joints(Figure6.).

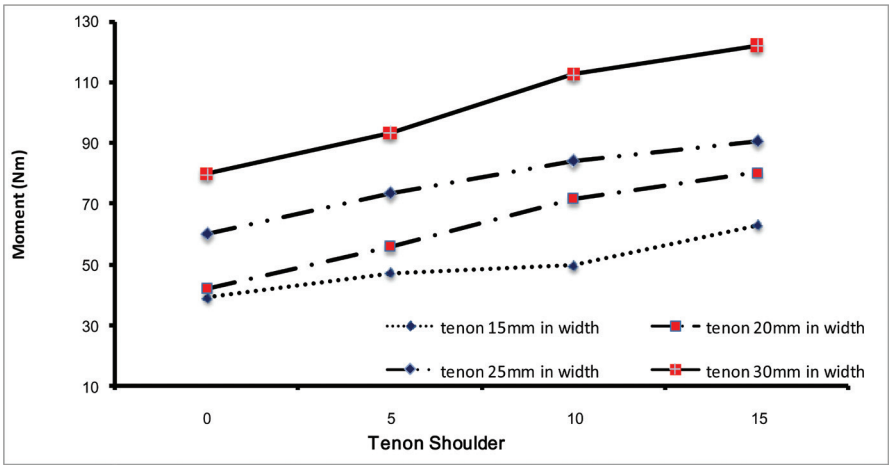


Figure 6 – The relationship between breaking bending moment and tenon shoulder

As shows in Figure 6 and Figure 7, with the increase of tenon width, the capacity of joints increases, accordingly. Likewise, the capacity of joints improves with the increase of tenon shoulder from 0 to 15mm. The empirically derived expressions were developed to predict average ultimate bending moment capacity in different tenon width joints, as follows:

$$y = 1.4749x + 38.432 \quad (2)$$

$$y = 2.6062x + 42.761 \quad (3)$$

$$y = 2.0555x + 61.515 \quad (4)$$

$$y = 2.934x + 79.94 \quad (5)$$

where : (2)tenon 15mm in width,

(3)tenon 20mm in width,

(4)tenon 25mm in width,

(5)tenon 30mm in width,

y- breaking bending moment(NM),

x-tenon shoulder(mm).

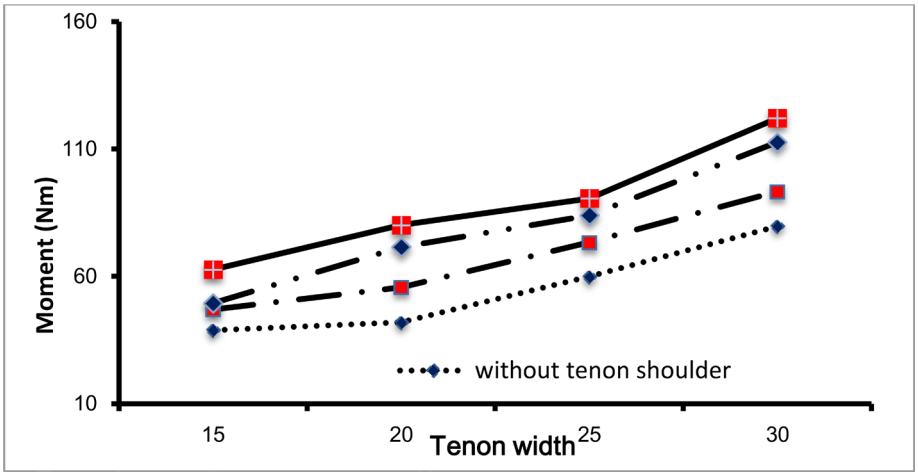


Figure 7 – The relationship between breaking bending moment and tenon width

Likewise, the empirically derived expressions were developed to predict average ultimate bending moment capacity in different tenon shoulder width joints, as follows:

$$y = 0.1674x^2 - 4.7242x + 71.407 \quad (6)$$

$$y = 0.1133x^2 - 1.9699x + 50.757 \quad (7)$$

$$y = 0.0663x^2 + 1.0575x + 19.963 \quad (8)$$

$$y = 0.1411x^2 - 2.5697x + 70.84 \quad (9)$$

where: (6)without tenon shoulder,

(7)tenon shoulder 5 mm in width,

(8)tenon shoulder 10mm in width,

(9)tenon shoulder 15mm in width,

y- breaking bending moment(NM),

x-tenon width(mm).

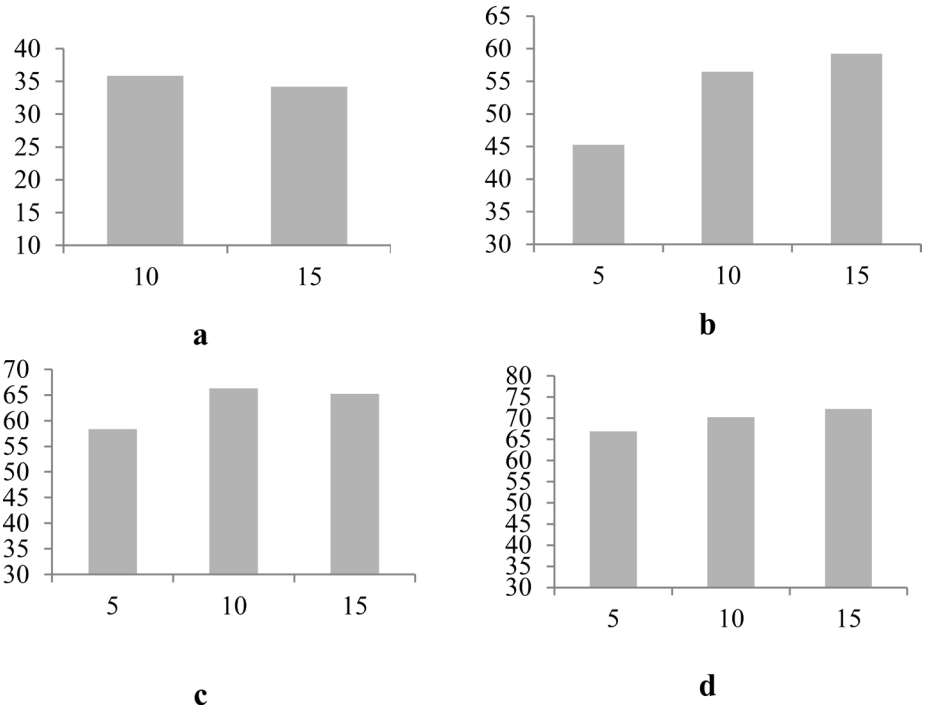


Figure 8 – The relationship between breaking bending moment and distance from top wall of mortise to top face of post of L-Shaped joints including tenon 15mm in width(a), tenon 20mm in width(b), tenon 25mm in width(c) and tenon 30mm in width(d),x-coordinate represents distance from top wall of mortise to top face of post, y-coordinate represents breaking bending moment.

There is no obvious difference in moments between the two distances from the top wall of mortise to top face of post in 15mm -wide tenons(Figure 8a). For 20mm -wide tenons and 30mm -wide tenons, the moments increase smoothly (Figure 8 b and d). Otherwise, the breaking bending moments were increased and then decreased slowly with the increasing of distance from top wall of mortise to top face of post in 25mm -wide tenons(Figure 8c). Analysis of the data for breaking bending moment, in Figure8, indicates that the highest capacities were obtained with 30-mm-wide tenons and 15-mm- distance from top wall of mortise to top face of post. Overall, the joint capacities were improved with the increasing of distance from top wall of mortise to top face

of post for 20mm-wide tenons and 30mm-wide tenons, and a relative significant increase of breaking bending moment from 5mm to 10mm in distance from top wall of mortise to top face of post for 20mm-wide tenons and 25mm-wide tenons. However, there is deceleration of growth, even drop, from 10mm to 15mm in distance from top wall of mortise to top face of post. Likewise, a relative slowest increase occurs in joint capacities of 30-mm-wide tenons. Overall, the breaking bending moments increases and then goes to be flat with the increase of distance from top wall of mortise to top face of post in L-shaped joints, likewise, the moments increases gradually with the increase of width of tenons.

4. Conslusions

1. Results of the tests indicated that the shoulders on tenons significantly increase the bending strength of joints when the shoulders of the tenon fit firmly against the side of the member in which the tenon is inserted (C.Eckelman *et al.* 2004). Results also indicated that mortise and tenon joints becomes greater as either tenon width or tenon shoulder width is increased, furthermore, tenon width has a more significant effect on joint capacity than tenon shoulder width, which is in agreement with the results reported by other researchers(Tankut and Tankut 2005). The presence of a shoulder on the rail member of a mortise and tenon joint substantially contributes to the capacity of the joint by compression on mortise part with tenon shoulder. Because tenon shoulders not only help joints to turn the bending moment into tensile pulling force, but also make mortise part resist bending. The tensile stress and compressive stress vary along the distance from the neutral axis. The bending strength is increased with shifting down of neutral axis when the tenon shoulders increase. Finally, the empirically derived expressions were developed to predict mean ultimate bending moment capacity in T-shaped and L-shaped joints.
2. Experimental results indicated the breaking bending moments were increased with the increasing of distance from top wall of mortise to top face of post in L-shape joints. A greater increase occurs from 5mm to 10mm than 10mm to 15mm of distance from top wall of mortise to top face of post on the breaking bending moments. Overall, the breaking bending moments increases gradually with the increase of width of tenons, but when width of tenons gets bigger, the breaking bending moments increase trend gets slow with the increasing in distance from top wall of mortise to top face of post.

Ackonwledgments

A Project Supported by Scientific Research Fund of Sichuan Provincial Education Department (Grant No. 13ZB0281) and the Open Research Subject of Research Base of Industrial Design Industry Research Center (Grant No. GY-15ZD-01). This research was carried out at the Sichuan Provincial Colleges and Universities Wood Industry and Furniture Engineering Key Laboratory, Sichuan Agricultural University.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 05/04/2016
Aceitação/Acceptance: 04/07/2016

Empirical Analysis on the University-industry Knowledge Chain Conflict Reasons

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Pages: 39–48

Abstract: Innovation is a new combination of productive factors, also is the outcome of knowledge flow. University-industry knowledge chain (UIKC) refers to a knowledge chain structure, which is formed by knowledge flow between university and company, company participating in innovative activity. This paper extracts cause factors of University-Industry Knowledge Chain Conflict that is knowledge, intellectual property, personal characteristics and social capital. Then design, distribute and recycle questionnaire, construct structural equation model, at last using data, verify theory. Result shows there are no direct impact relationship between KF, IP and UIKCC, but they impact it through SC. Therefore SC is more important than other factors in China.

Keywords: university-industry knowledge chain, Conflict, Reason, Structural equation

1. Introduction

In order to remain invincible and get the market share, the company must search the outer knowledge sources, cooperating with university, research institution, supplier, customer and even competitor, by which, the company can improve innovative ability and get the core competence. The cooperation of company and other institution makes the knowledge flow and then form the knowledge chain. Knowledge chain is a knowledge chain structure, which is formed by knowledge flow between different organization participating in innovative activity, in order to share knowledge and create knowledge (Xin, 2008). Company is the main body of this chain. University-industry knowledge chain(UIKC) refers to a knowledge chain structure, which is formed by knowledge flow between university and company, participating in innovative activity, in order to share knowledge and create knowledge, in which process, company is the main body of this chain. For example, UIKC is formed by technology transfer, patent license, cooperative study, incubator and so on. There are many kinds of knowledge chain, but UIKC is a general trend. University is a place which has much fundamental knowledge and theoretical knowledge, also has many scientific workers. With the research and development cycle become shorter and shorter, market competition more and more fierce, even the large company with own research and development team can't finish the task alone, therefore, university becomes the main source of innovation. Since the construction of UIKC, UIKC is accompanied by conflict. Because of difference

of different organization, all kinds of conflicts are unavoidable, which is the outcome of inharmony of this two organization. The manifestation of disharmony are different opinions, negative emotion and behavior fighting (Xin Gu, Wushaobo & Quanli, 2011). Therefore, university-industry knowledge chain conflict (UIKCC) refers to inharmonious state which is led to a certain extent of contradiction that is generated by different behavior, goals and culture between university and company. China's scientific and technological achievements conversion rate is very low, one important reason is conflict of university-industry cooperation. Managing this conflict effectively is a requirement for university-industry knowledge chain running smoothly. UIKCC is produced by conflicts between people and objects of restrictive condition. Therefore, we need find a effective method to manage conflicts led by people or objects.

If we want to resolve and manage UIKCC, we must make clear what the essence of UIKCC is. This paper gets data from questionnaire and then use structural equation to demonstrate the cause factors which lead to UIKCC.

2. Theory analysis

2.1. Knowledge factor

The essence of knowledge flow between organization is realization of effective integration of knowledge resources. Innovation is a new combination of productive factors, also is the outcome of knowledge flow. The target of UIKC construction is realization of knowledge innovation. Therefore, knowledge flow is fundamental and important activity of UIKC. If knowledge don't flow freely, conflict will appear on UIKC. Therefore, knowledge influences knowledge flow, and also led to UIKCC. Knowledge factor includes knowledge type, knowledge transferring channel, knowledge absorption and knowledge transferring ability (Polyani M, 1996).

2.2. Intellectual property factor

Intellectual property refers to right holders have the Proprietary rights to Intelligence work achievement created by him. After the construction of UIKC, controversial issues about intellectual property (main form is patent) become the main conflicts of UIKC. And it also becomes the most time consuming issue during the process of university-industry negotiation. The essence of intellectual property dispute is interest allocation problem of two sides. Intellectual property is made up of rights, mature technology criterion, technology price, on-duty invention and technology secrecy(Geuna A, 2006).

2.3. Personal characteristics

Different personal characteristics will have different personal value, personal targets, and personal roles. These lead to different degree of differentiation of opinions, attitudes and targets. This differentiation leads to UIKCC (Wang, 2004).

2.4. Social capital factor

Social capital depends on social networks or social relations. Personal informal social network is exclusive, is not easy to copy. It is social relation which is constructed by

long time interaction. Cooperation of university and industry which don't have informal social network is easy to produce UIKCC. Social capital contains personal participation, trust, promise and personal experiences (Giuliani E, 2007).

Tacit knowledge of knowledge factor is difficult to communicate, so spillover effect is not big. Just because of this, two sides tend to maintain important tacit knowledge. But this will influence the construction of interpersonal network, there are bad feelings between the person and the person because these things. Because intellectual property problems is not easy to negotiate, and during the negotiation, there are much contradictions, conflicts and misunderstanding. These factors will influence interaction and views between people and people. Therefore, if intellectual property is not processed well, social capital cannot formed effectively.

2.5. University-industry knowledge chain performance evaluation

Because of difference of history, culture, targets and views, the criteria or indicators to define university-industry relation will be different. That means the evaluation of whether UIKC is successful is different. Therefore, this paper uses comprehensive perception "harmony" to evaluate UIKC performance. Harmony is an overall impression and feelings, which reflects two side's respective feelings to targets and performance. Harmony represents no conflicts of UIKC or conflicts have been controlled in a certain range. These conflicts play a constructive role. Disharmony (conflicts) represent there are conflicts on UIKC. These conflicts play a disruptive role.

3. Theoretical hypothesis

Through theory analysis, the cause factors which lead to UIKCC are knowledge, social capital intellectual property and personal characteristics. The empirical analysis model hypothesis of cause factors shows as below:

Hypothesis 1: knowledge factor positively impact on UIKCC.

Hypothesis 2: intellectual property factor impact UIKCC positively.

Hypothesis 3: personal characteristics factor positively impact on UIKCC.

Hypothesis 4: social capital impact UIKCC positively.

Hypothesis 5: knowledge factor impact on social capital factor positively.

Hypothesis 6: intellectual property factor impact on social capital factor positively.

4. Questionnaire Design

The final version of questionnaire consists of 2 parts: basic information and scale. Basic information includes background information of respondent, such as working unit; the scale are made up of 5 dimension which are measured by a few items.

4.1. Variable design and measurement index

This paper analyzes data with structural equation(SE). Therefore, variable set is made by research purpose and unique feature of structural equation.

Latent variable and observed variable

The latent variables of this paper are knowledge, intellectual property, personal characteristics and social capital and university-industry knowledge chain conflicts. The observed variables of this paper are measurement variables of each latent variables, that is scale items of questionnaire. Therefore, scale items are observed variables of structural equation.

The most variables of this paper is not easy to quantified. Even if they could be quantified, the real situation will not be given because of secrecy. Therefore, the measurement method of this paper is subjective fuzzy evaluation method. It is Likert Five-point scale scoring method. Judgment standard 1-5 represent "don't agree with very much, don't agree with, generally, agree and very agree with". Final observed variables index are shown as Table 1.

Latent variables	Observed variables	Questionnaire items	Source	Decision criteria
Knowledge communication	absorptive capacity	Understand knowledge from partner(K1)	Guxin (2008)	Likert Five-point scale scoring method(from don't agree with very much (1 point) to agree with very much (5 point)
		We are encouraged to communicate information and knowledge with external person(K2)	Own design	
	explicit knowledge	Share explicit knowledge in written form(K3)	JO Rhodes (2008)	
	transmission channel	We deliver different knowledge through different suitable channel(K4)	Own design	
	tacit knowledge	Experience are shared through oral communication(K5)	JO Rhodes (2008)	
Intellectual property (I1-I4)	rights	Who own the intellectual property is able to be agreed by two sides(I1)	Chengliang (2012)	
	Mature technology criterion	We have same ideas about whether technology is mature in technology transfer and development(I2)	Chengliang (2012)	
	Technology price	We have same ideas about price(I3)	YiYu (2009)	
	Technology secrecy	We can keep secret about commercial or technical secrets (I4)	Own design	

Latent variables	Observed variables	Questionnaire items	Source	Decision criteria
Personal charaterics (P1-P3)	values	Personal values don't influence cooperation(P1)	Wangqi (2004)	Likert Five-point scale scoring method(from don't agree with very much (1 point) to agree with very much (5 point)
	aims	Personal aims don't influence cooperation(P2)	Wong (1992)	
	roles	Personal roles don't influence cooperation(P3)	Wong (1992)	
Social capital (S1-S5)	Personal participation (1)	We have employees who often maintain relationships with partner(S1)	Carolin Plewa (2008)	
	Personal participation (2)	Times and efforts invested are worth(S2)	Carolin Plewa (2008)	
	Personal experience	We familiar with working requirements and way of partner(S3)	Carolin Plewa (2008)	
	promise	Interpersonal management is effective(S4)	Couchman (2001)	
	trust	We trust partner(S5)	Carolin Plewa (2008)	
UIKCC (Harmony) (C1-C5)	Physical resources	Enough money and equipments are supported(C1)	JO Rhodes (2008)	
	Expected targets	Cooperation relationship meets expected targets(C2)	Carolin Plewa (2008)	
	Long-time cooperation	We have a long-term cooperation with partners(C3)	Carolin Plewa (2008)	
	productive	Cooperation is effective(C4)	JO Rhodes (2008)	
	Harmony feelings	We have harmonious relationship with partner(C5)	Own design	

Table 1 – the design of final latent variables and observed variables

4.2. Questionnaire distribution and recycling

Questionnaire distributed object are university and enterprise staff who have cooperation experiences. In order to get the effective samples, identified questions "whether you have experience of cooperation with university or enterprise" and trap questions are designed. Trap questions are random. Distributed channel is questionnaire star. It is a professional survey site which has strong suitable sample objects. The network site is http://www.sojump.com/. A valid questionnaire is 276.

4.3. Data processing and analysis

Before SE analysis, descriptive statistical analysis, validity analysis and reliability analysis are made. The outcome of the last factor is shown. KMO is 0.783. Bartlett's spherical card value is 881.486. Degree of freedom is 171, P=0.000<0.05, getting 0.05 significant level. The numerical result of KMO and Bartlett shows that this scale is suitable for factor analysis. Cronbachi's Alpha is 0,789. This data shows that the reliability of this scale is very good.

5. SE model of UIKCC

5.1. The model fitting and correction

This paper uses IBM SPSS AMOS 21 software to construct SE model. Exogenous observed variables of personal characteristics, knowledge and intellectual property are P1-P3, K1-K5 and I1-I3. Medium observed variables of social capital is S1-S5. Endogenous observed variables of UIKCC is C1-C5. After validity analysis and reliability analysis, unsuitable items of K5，I4 and C5 are deleted. When model fiting, The correlation coefficient of intellectual property and UIKCC is -0.025，P=0.883>0.05. On the one hand, Parameter estimation is not significant; on the other hand, relation is

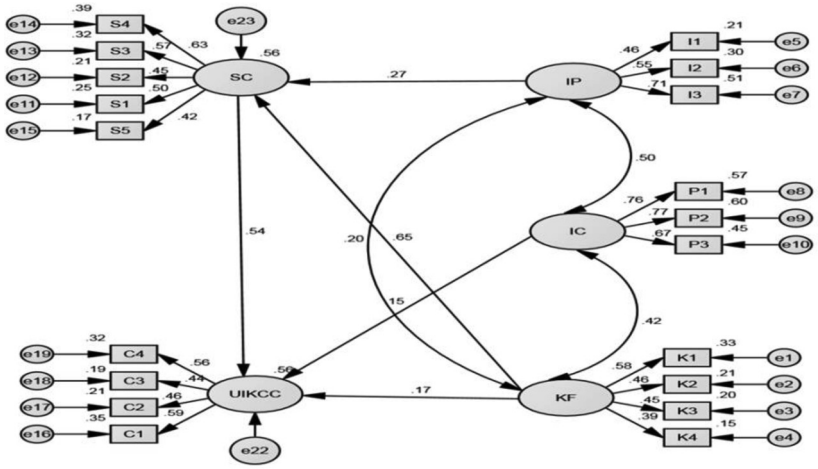


Figure 1 – correction SE route chart and route system standardized estimate

negative correlation. But relation should be positive correlation on theory. So the route between intellectual property and UIKCC is deleted. Correction model and route system standardized estimate is shown as chart 2.

5.2. Model evaluation

According standards of basic fit indicators, the basic fit of this SE model is very good. From the important indexes of table 3, most overall fit indexes meet requirements. From the observed data of table 4, the inner fitting of this paper is acceptable.

Statistical inspection quantity	The adaptation of standards or the critical value	Estimated value	Fitting outcome
χ^2	P>0.05(not significant)	P=0.000， significant	Relatively small
GFI	>0.9	0.916	Conform to the standard
RMR	<0.05	0.022	Conform to the standard
RMSEA	<0.05(very good) <0.08(suitable)	0.049	Conform to the standard
ECVI	ECVI of theoretical model is smaller than independent model and saturated model	1.199 theory) 1.382(saturation) 4.018(independent)	Conform to the standard
CFI	>0.9	0.895	Not conform to the standard
PGFI	>0.5	0.694	Conform to the standard
NC	1<NC<3 suitable NC>5 need to be corrected	1.651	Conform to the standard

Table 2 – Definition for a few styles

			Estimate	S.E.	C.R.	P	Label
SC	<---	(IP)	.262	.101	2.585	.010	par_18
SC	<---	(KF)	.572	.128	4.484	***	par_19
UIKCC	<---	(SC)	.753	.249	3.021	.003	par_20
UIKCC	<---	(KF)	.214	.212	1.007	.314	par_21
UIKC	<---	IC	.104	.066	1.579	.114	par_22
K1	<---	KF	1.000				
K2	<---	KF	.896	.176	5.076	***	par_1
K3	<---	KF	.763	.152	5.018	***	par_2
K4	<---	KF	.761	.167	4.556	***	par_3

			Estimate	S.E.	C.R.	P	Label
I1	<---	IP	1.000				
I2	<---	IP	1.143	.225	5.089	***	par_4
I3	<---	IP	1.785	.346	5.163	***	par_5
P1	<---	IC	1.000				
P2	<---	IC	1.133	.111	10.254	***	par_6
P3	<---	IC	1.056	.111	9.529	***	par_7
S1	<---	SC	1.000				
S2	<---	SC	.920	.175	5.268	***	par_8
S3	<---	SC	1.258	.210	6.003	***	par_9
S4	<---	SC	1.313	.208	6.299	***	par_10
S5	<---	SC	.849	.171	4.959	***	par_11
C1	<---	UIKCC	1.000				
C2	<---	UIKCC	.636	.116	5.467	***	par_12
C3	<---	UIKCC	.606	.115	5.274	***	par_13
C4	<---	UIKCC	.855	.137	6.217	***	par_14

Table 3 – route parameter estimated value of SE model

6. Result

Impact of social capital to UIKCC

The estimated value of path coefficient between SC and UIKCC is 0.735, C.R.=3.021>1.96, significant (0.05). therefore, SC impact on UIKCC positively.

Impact of Personal characteristics to UIKCC

The estimated value of path coefficient between PC and UIKCC is 0.104，C.R.=1.579，P is not significant. Therefore, PC impact on UIKCC negatively.

The impact of knowledge to UIKCC

The estimated value of path coefficient between PC and UIKCC is 0.214, C.R.=1.007, P is not significant. Therefore, knowledge impact on UIKCC negatively.

The impact of knowledge, intellectual property to social capital

The estimated value of path coefficient between KF and SC is 0.572, C.R.=4.484, P is significant. the estimated value of path coefficient between IP and SC is 0.262, C.R.=2.585, P is significant. Therefore, knowledge and intellectual property impact on social capital positively.

SE model inspection is on the base of theory. So while statistical analysis decision, the rationality of theory should be considered. Most of the model fitting indexes reflect analysis technology, not the evidence of theory. The optimization of indexes reflects

the optimization of analysis technology, not theory. Therefore, SE model construction should be supported by theory, specially while modification. Separating from theory, modification is just data oriented analysis, not theory verification construction (Huberty C, 1988).

Before model fitting, each measurement model and SE model have been inspected. Load factor or a one-way path coefficient reached the significant level. When we add 20 more samples, C.R. value is increasing. Therefore, the appearance of not significance of route coefficient may be led by small sample data. 276 sample data don't support some theory. This don't express there are no positive relationship between them. SE model should be oriented by theory, not data.

7. Conclusion

Direct influence relationship between IP, KF and UIKCC is not supported by data. But direct impact relationship between KF, IP and SC is supported by data. And direct influence relationship between SC and UIKCC is supported by data. This illustrates that KF and IP impact UIKCC through SC. This phenomenon is consistent with Chinese real situation. SC is more important than other factors which influence UIKCC. Of course, data verification represent Chinese real situation. Therefore data verification cannot represent there is no relationship between KF, IP and UIKCC. We should respect theory; any route should not be deleted randomly according to data.

Acknowledgments

The work of this paper is supported by The Philosophy and Social Science Fund of Education Department of Jiangsu Province， Conflicts and countermeasures study on cooperation of industry-university-research institution of Jiangsu Province (Grant NO. 2016SJD630117). Project supported by National Natural Science Foundation of China, impact study of synergy innovation of cross boundary tacit knowledge to long-time effect of disruptive innovation (Grant NO. 71471091).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 08/04/2016
Aceitação/Acceptance: 09/07/2016

Analysis of Computer Aided Architecture and Interior Design based on Building Information Modeling

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Pages: 49–58

Abstract: With the rapid development of the global economy, the construction industry has been greatly developed. The scale of the construction project is increasing and the function demand of the building is more complex. Computer aided design is the product of the combination of architectural design science and computer technology. In this paper, the authors analyze the computer aided architecture and interior design based on building information modeling. By using computers to assist in the process of building design, the creation of the building designers will not be weaken; on the contrary, with the help of digital technology, architects will not be bothered by a large amount of repetitive work, so as to focus on the creative and innovative design. At the same time, we study the application of BIM in building construction and put forward some suggestions.

Keywords: Computer aided architecture, Building information modeling, Interior design, 3Dmax, Architectural design

1. Introduction

In the current construction industry, especially in the field of architectural design and management, computer aided design technology has been widely used. However, due to the progress of the society and the development of the times, people's demand for building is also increasing (Denghua, 2005). In addition to the current needs of a successful building to meet the aesthetic requirements and functional aspects, but also needs to satisfy the various needs, human beings on the environment such as thermal insulation, ventilation, lighting, noise and indoor air quality index of buildings (Daiyong,2000; González, 2015). Because of the complexity of the situation, even experienced architects, it is difficult to rely solely on the experience of the design of environmental quality assessment. As mankind enters the information age, the computer plays a more and more important role in people's life (Liangfeng,2006). Throughout the world, the computer starts to change the way the information is produced and used on the day it is produced. Because of the help of computer hardware and software technology, people can not only use the information. In today's society, the computer has been recognized as an important tool for information storage, editing, production, modification, transmission, display and so on (Qiang, 2004; Mora, 2014). For the use of computer aided design of the staff, their work has greatly reduced the intensity, while the way to get a lot of work. There is no need to put a lot of effort and time of the manual

design of the computer aided, and now basically all can use the computer to complete. So now the computer has become an important tool used in many professional fields.

Computer-aided design (CAD) is the product of the combination of architectural design science and computer aided design technology. The use of computers to assist in the process of building design, the creation of the building designers do not have the impact of weakening. On the contrary, with the help of digital technology, architects will not be bothered by a large amount of repetitive work, so as to focus on the creative and innovative design. From this point, the computer aided design technology enables the architect to be better engaged in the architectural creation (Yongdong, 2005; Wang, 2014). The architectural design is the architect through investigation and Research on the architectural design task, to fully consider the functional requirements of the target building, art form, and the environment, climate, geology, investment, structure, equipment, construction and other factors, comprehensive analysis, and the result of creation. Usually the final results of the architectural design are expressed in the form of drawings and documentation. For a long time, the process of architectural design is the architect mainly depends on its various aspects of culture, knowledge, experience, with his head, the hands of the pen and paper on the design object of repeated analysis, design, modification and comprehensive creation process. The architect depends mainly on the human brain to complete such a complex task, the work will inevitably affect the architectural design of the care for this and lose that, quality and efficiency. Traditional architectural design methods, so that many talented architects to a large amount of energy consumed in the complex work of the work, cannot play its ability to create. With the rapid development of the global economy, the construction industry has been greatly developed. The construction project of the increasingly large scale, for the building's functional requirements become more complex, new technology change rapidly for the construction of the new building materials, to emerge in an endless stream, forcing the architectural design must be more scientific and more efficient. The traditional work style of Architects has become increasingly unable to meet the needs of the development of the information age, and need to seek a new tool, new technology and methods to face this new challenge. On the other hand, due to the development of electronic technology, the computing speed of the computer is increasing day by day, the function is becoming stronger and stronger, and the multimedia technology based on the computer system is becoming more and more mature. Faced with the challenge of the architectural design industry, the architecture design and the computer multimedia technology are organically combined together. With the help of multimedia technology, the architectural design of the product can be more efficient production, editing and display. Architects used to take a few days of work, may now use the computer keyboard, mouse, and other digital equipment, such as a few hours can be completed. With the help of simple computer operation, the complexity of the scheme is greatly reduced. This increasingly sophisticated architectural design based on computer aided technology has been highly valued by the architectural design industry.

2. Computer aided architectural design

2.1. Building digital technology

Computer aided design technology is a new technology which was born in the process of computer development. Due to the continuous development of computer technology,

computer aided design of the content is constantly improving and follow up. The construction industry is concerned, in the design of the unit, the traditional drawing table, Slide Show machine has been replaced by computer and plotter; data file has been stored using a computer storage. Building digital technology not only greatly improve the efficiency of the work of the architect, but also slowly but steadily changing the way of thinking and work of the architect. Now, on the one hand the development of the construction of digital technology is very significant, and improves the engineering cost and the development to create a new image from the drawing quality and efficiency of development; on the other hand, to multiple now design of the whole process of the development from the original drawing auxiliary. Architectural digital technology plays a key role in the process of continuous thinking and expression of architects and gradually building design. The use of digital technology in the process of the research and feasibility analysis of major projects can make use of the powerful data processing ability of the computer to improve the scientific and efficiency of the process decision-making. For the planning and design, in the historical heritage protection, renewal and control planning, you can use the GIS technology; research and analysis of body concept design in the construction units and groups, can use Max, 3ds, SketchUp and other software. Computer aided design of engineering drawing and the current project, mainly through 3dsMax and AutoCAD software, some two times the development of software for body shape design, review, special analysis, and construction drawings, documentation, economic estimate. In addition, the architectural design industry is now using computer architecture technology to represent the final results of the structure and appearance of the building, in order to show the auxiliary means of the design of the final version has not yet been finalized.

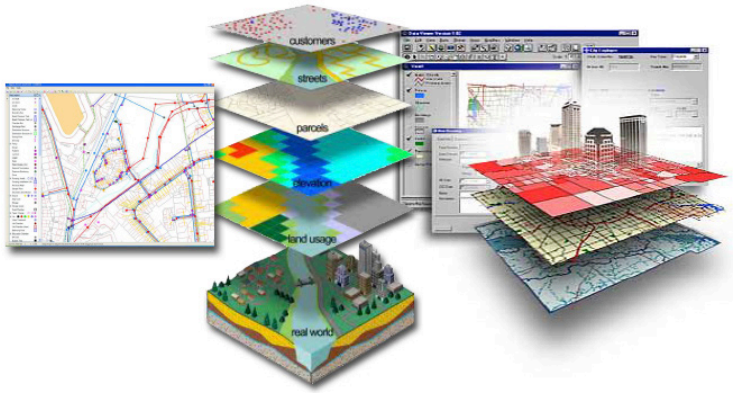


Figure 1 – GIS technology

2.2. Computer-aided Auto CAD

With the progress and development of society, people's demand for aesthetic cultural life continues to improve, the traditional interior design has become more and more popular, and the new generation of interior design came into being. Today, the rapid development of computer graphics, making a lot of people cannot use words and drawings to express the thinking and inspiration have been achieved. In recent years, the technology of computer aided design software is one of the most important technologies in the field of interior design.

Application of computer aided design software technology in the interior design can be very good to people's indoor quality of life as well as the indoor environment atmosphere, style context and other spiritual aspects of the requirements are displayed. For interior design, the commonly used computer aided design software is AutoCAD, 3Dmax, PhotoShop, Vray, PremierePro. 3Dmax has a decisive role is obvious, and CAD 3Ds, Max Auto, Vray and other software also plays an important role. Auto CAD is now the international popular drawing tools, drawing its powerful function obviously; 3Ds Max has made remarkable contributions in the 3D rendering and animation above; Vray is to provide high quality images and animation rendering as excellent 3D modeling software in different fields, as shown in Figure 2.

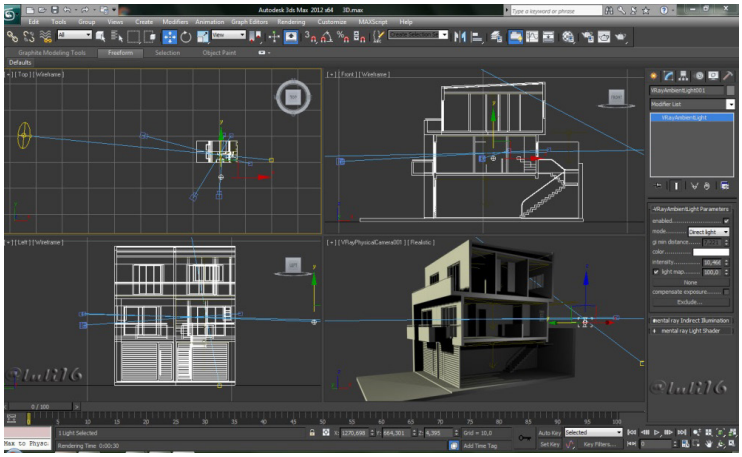


Figure 2 – 3Dmax architectural design

The computer can express the whole of things more vividly by 3D graphics, so that people can understand the design of each position and reduce the error caused by the graphics. The traditional drawing can only be performed by different graphics, it has a high requirement for the ability of drawing knowledge. The computer can make the size more accurate, to a large extent reduces the error, the design of the ideal model will not have too much difference with the physical. Therefore, the computer graphics are more advantageous than the traditional drawing, not because the plot is not accurate and lead to the failure of the works. At the same time, the computer can be observed through changing different viewpoints, give people different visual experience, not artificially exaggerated picture effect, and consistent with the design effect. The application of the computer program is not only convenient for the change, can be more intuitive to understand the relationship between design objects and the overall environment, the coordination of the two convenient (such as lighting, furniture, etc., so that the static landscape) model will not be designed too abrupt, can better integrate into the environment, but also can show the real appearance luster.

Simulation of light objects, better convey light object information and reproduction after the implementation of the program of the object relative to the scene, the rigid on the drawing board and drawing more vivid. Interior design often requires repeated changes, need careful and deliberate, the use of computer to modify a lot of convenience, not only improves the work efficiency, but also solves the disadvantages of traditional drawing modification is not convenient, speed up the replication of extraction time, so that

designers can quickly show the ideal picture. The computer also improves the output efficiency of the design, can also exhibit structural sketches, diagrams and other graphic design, but also can be done at the same time the selection of materials and collocation, greatly saves the time and manpower resources, improve work efficiency. Computers can give people a sense of the scene, to bring people to the visual feast. With the continuous development of society and the progress of computer technology and its application level has been greatly improved, animation design and virtual roaming technology has been applied in interior design, it improves the shortage of all kinds of static painting, owners can make by entering into the three-dimensional space design of virtual space, understand the scene and layout design of the future, shorten the difference the reality and the ideal design. And can be different from the traditional design method to quickly break down the various parts, in order to facilitate the observation of the organizational structure of the various parts, convenient to study. The traditional model design includes drawing, stereotype, cutting boards, bonding, color, green production, lighting and other processes, and the use of computers to reduce the use of personnel and space.

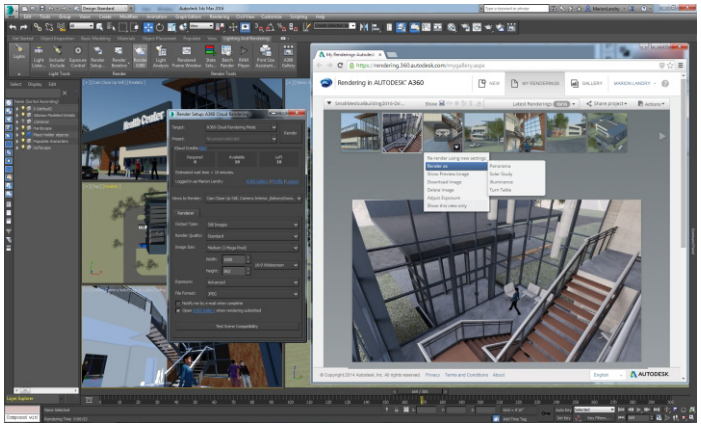


Figure 3 – Computer aided design



Figure 4 – Simulation of interior design

3. Application of BIM in construction management

From the technology of computer aided technology was first used in architectural design and architectural design software has appeared so far, every kind of painting: from the beginning of the gradual implementation of the plan, establish the 3D building model in the computer environment, the development model of 3D effect later and stained drawing from 3D early line box. But these building models lead to the lack of a lot of design information, this is due to a variety of affiliated on the building information not covered in, that is to say these building models can only design the exterior space, facade, shape and amount of scrutiny, and cannot be applied in each process after the completion of the design. In order to ensure the smooth flow of information in the process of digital building design, the information flow to the next phase of the design work, and now widely recognized in the construction design phase of the application of BIM technology.

BIM is a digital representation of the physical and functional characteristics of a building or facility. It is a shared information knowledge base about a building or facility. It can be used as a reliable information base for making decisions in the whole cycle of construction or facilities. Both China and the United States are given the definition of the definition of the technical standards are stressed the "life cycle", that is, the application of the model to cover the whole building life cycle. Building information model is a kind of digital method used in management, construction and design, which can reduce the risk of construction project in the whole process, but also can greatly improve the efficiency of the whole process. In addition, the building information model is a kind of engineering data model, it will be all kinds of construction projects in the integration of information together, it is also based on 3D digital technology, the digital expression of information related to the construction project.



Figure 5 – Building Information Modeling

The following three aspects of architectural design software technology features a simple introduction, this technology is built on the basis of BIM:

1. ***Digital building information model:*** The basic element of this model is a three-dimensional member with relevant information, the model covers all the

information of the building, in addition, users can facilitate data sharing and updating, this is mainly due to the construction of information stored in the database is in a digital form. Create a building information model, not only can easily carry out the effect analysis diagram analysis, volume analysis, spatial analysis, visualization, and analysis of design for non computer professional conduct heat analysis, structure analysis etc.. In the construction phase, the project management software using the data of the building information model, it produced the corresponding engineering project implementation data. In this case, we can get a more perfect model, which is due to the construction of these data into the implementation of the model, it becomes a new model data.

2. ***Consistency of BIM platform design:*** Intelligent interaction and related display can be carried out in a variety of digital construction entities, if the design charts, drawings exist in a digital model of the building, then they are linked together. This feature makes the work quality and efficiency is improved, mainly because when any change in the model database data, the relevant places will be displayed immediately. Architectural design will involve many different kinds of major such as equipment, structure, architecture, etc.. Because BM has the characteristics of carrying all kinds of information, integrated database storage of the entire set of design documents and the entire building of the relevant information, in addition, all the information are interrelated and are digitized. Therefore, to work together in various professional, you can create a platform on the BIM. This not only makes the information in each professional to share, but also to overcome the past professional design software incompatible obstacles.
3. ***Information sharing:*** The information sharing environment is implemented in BIM. Animation display, display, 3D visualization of traditional 2D chart expression and display (mainly refers to the profile, graphics, graph display etc.) supported in BIM design software; analysis and calculation of various (such as energy saving, structure etc.) also support; support IFC (Industry Foundation Classes) standard. When BIM is widely used, BLM technology is produced. This is a kind of new management thought in the construction industry, which is used to assist the construction life cycle management.

4. The application of the construction management

Traditional architectural design defects will bring the progress of management issues. Because the traditional design process is mainly designed to construction drawings, to complete the whole project design, this set of drawings about tens to hundreds of pieces, we can see that the figure of personnel and architects must through the collation of information containing the huge information design drawings, inevitably produce errors. In addition, due to the various professional designs work is completed independently, making each professional design drawings will produce a certain contradiction. If these problems are not found in time, then in the construction stage, these problems will be exposed; will inevitably affect the construction progress of the project. Three dimensional view of 3D building in real life with a two-dimensional flat vertical side view three to express, that is to say, this way of expression and people's habit of dimension is not the same, so the need to understand the two-dimensional drawings will have a

certain degree of difficulty, the need for specialized training, learning can really read drawings. In addition, with the continuous development of people and the architectural design industry for building the appearance of the increasingly high demand, the two-dimensional CAD architecture design cannot meet the needs of the people, it is not effective to highlight the design quality problem, also does not have strong visibility. The use of BIM technology can make up most of the shortcomings of the traditional method of using two-dimensional three views.

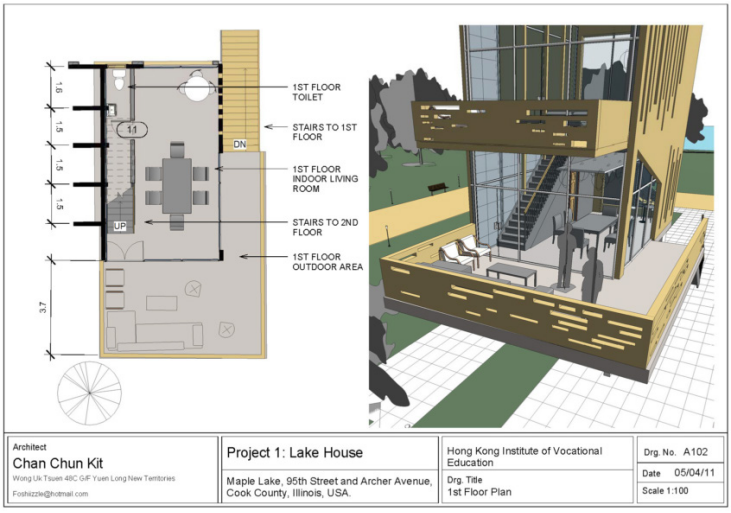


Figure 6 – BIM technology application in construction management

The basic model of BIM not only contains the geometric dimension information of CAD, but also contains more abundant information. And because of the advantages of rich information, BIM technology has the following advantages:

- ***Support designers a natural design interaction model:*** The process of using Revit architecture to create similar digital architectural models and the actual construction of the corresponding, in most cases, users create building models of the digitization process is similar to the challenge and add different building components, such as wall, roof, doors and windows, stairs, the process to build the building itself. From the user and computer interaction, this is similar to the virtual construction of the application model, compared to the traditional graphics based computer graphics system is more vivid, intuitive and vivid.
- ***Engineering data and component model highly integrated:*** The construction of 3D building models largely enhance the design method and the practical application in the project are often two-dimensional drawings and documents, in the BIM model, building components in a different view of the different display content is defined, the model itself actually, the component designer can define: the component in different how to view the performance. Also, the performance attributes can be accessed and is adjusted, such as the

opening direction of the door switch, can open the direction by controlling the switch icon in the view plane to adjust the door, 3D model component will make the corresponding adjustment.

- ***High intelligence and automation:*** The parametric model is the BIM core, the parametric model design model (geometry data) and behavior model (change management) effective integration as a whole, and the whole project file is an integrated database, all the contents are parameterized and interrelated. Compared to the traditional CAD system based on graphics, BIM produces a "coordinated, internally consistent, computing architecture information". BIM uses a parametric model from the implementation layer, and the parameters of real-time model inherent two-way connection and modify and change the overall transfer characteristics, thus the model results of high quality, consistent and reliable.

5. Conclusion

In today's society, with the popularization and development of computer aided technology, computer technology is more and more widely used in the construction industry. At the same time, architectural design technology itself is constantly developing and changing. This paper is based on the combination of architectural design and computer aided design for the research of the main line, the architectural design based on computer aided technology, especially the architectural design based on BIM technology, has been analyzed and studied. The architectural design itself has fuzziness and creativity through the computer design elements will be organized, thought and inspiration to fully explore and inspire designers, can help the designer to design a better and more excellent works. Because in the process of building design, it should not only have the communication between designers and non-designers, but also the exchange between developers, construction workers, users, and they have a requirement for collaborative work. Our further work will be a combination of BIM technology and network collaborative design. In addition to building design quality of building products plays a crucial role, another one of our further work will consider combining with professional design software requirements of architectural design and research of software development based on design, and how to give full play to their professional requirements and design software.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 12/04/2016
Aceitação/Acceptance: 03/07/2016

Research on the Public Relations Course Reform in Suzhou University based on Data mining and Cloud Computing

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Pages: 59–68

Abstract: In recent years, network data shows great influence, is changing people's life and work. Information technology education has a profound impact on teaching content and organization. In this paper, the authors research on the public relations course reform in suzhou university based on data mining and cloud computing. In 2000, suzhou university started the course of public relations, aiming at improving students' comprehensive quality, especially public relations awareness, interpersonal skills and service awareness. In order to make this course to meet the requirements of personnel training, we use intelligent information technology to build an intelligent environment, and make continuous research and practice.

Keywords: Cloud computing, Network data, Curriculum reform, Public relations

1. Introduction

In recent years, network data shows more and more great influence, is changing people's life and work. For information technology education teaching content and teaching organization, teaching and research work of the form and content, schools and social contacts and school living environment has a lasting and profound effect (Chen, 2002). From the perspective of information, there is no target of curriculum reform curriculum embodies the fundamental demand of information society and talents development characteristics, curriculum content cannot highlight the information society the teaching mode and learning mode to innovation of higher requirements, curriculum resources construction and sharing level to support the course information and other issues (Gossling, 2004; Hu, 2008). Therefore, education curriculum reform under the support of "wisdom education" concept, to achieve the depth of integration of information technology and course, through training design diversified teaching mode and scientific and practice teaching system, construct the mechanism of flexible curriculum resources development mode, to adapt to the development of modern education needs the curriculum system(Mora, 2014).

Influence the teaching content and teaching organization mode. Information age is the era of knowledge economy, people's attention to knowledge innovation and

technological progress more than ever before, the core of national competition lies in knowledge and talent (Shi, 1999; Meng, 2007). The knowledge is more and more open, diverse and comprehensive. Therefore, education should emphasize the cultivation of students' innovative quality, and highlight the formation of information acquisition and integration, cooperation and communication ability. Through the study, students not only to achieve the accumulation of knowledge, but also to have the knowledge, learn a multi-level and multi angle understanding, cultivating the innovation and creativity of their own. These characteristics require the course content to achieve integration and cross domain, reflect the openness and flexibility (Wang, 2007; Zhou, 2008). In higher vocational education, education is not only to teach students the knowledge and skills should be ability and methods to teach students to acquire knowledge, cultivate students' soft skills, need to adapt to the changing world of work in the future.

2. Data mining and cloud computing

In recent years, with the rapid development of information technology, the amount of data generated every 18 months now is about the sum of the past few thousand years, and there is a growing trend. So much of the data will undoubtedly bring a vast amount of information, but the need to find a large number of data from the enterprise or the difficulty of personal useful knowledge increased. Cloud computing platform can be dynamic resource scheduling and distribution, with a high degree of virtualization and high availability, and so on, just to meet the needs of efficient data mining. It is a feasible way to combine the cloud computing technology with the existing data mining technology effectively. In the Google App Engine platform presents a parallel data mining model, and the efficiency of system execution than single system high mining cloud computing platform based on the data obtained through experiments, with the increasing amount of data, the efficiency is more obvious. The data mining model proposed in this paper is to provide efficient and convenient data mining services for different enterprises to improve production efficiency and reduce costs.

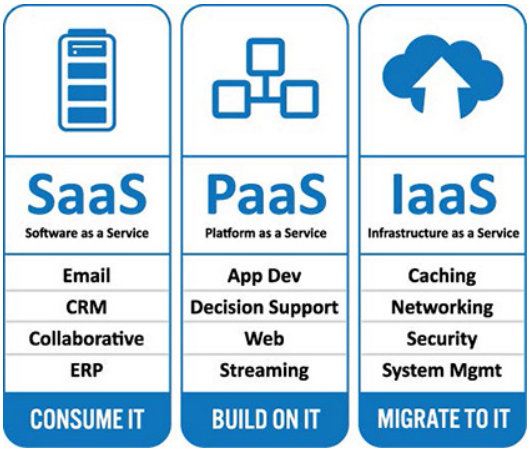


Figure 1 – Cloud computing architecture

From a technical perspective, cloud computing technology has already existed, it is virtualization technology extension, distributed computing technology, the evolution of SOA architecture extension, information resource centralized management and intelligent deployment mechanism is reflected. The difference with the traditional IT technology is, cloud computing brings the concept of innovation. From a business perspective, the core idea of cloud computing is to provide computing resources in the form of service users to purchase and use as needed, can better meet the rapid change of business organization and innovation needs upgrading. Cloud computing, there are three main types of mainstream business model, namely the platform that is the service (PaaS), infrastructure, namely service (IaaS) and software (SaaS). Its basic function logic diagram is shown in figure 1.

Data mining (Mining Data), also known as the database of knowledge discovery process, is the discovery of a novel, effective or may have a potential role in the process of the model can be understood. For enterprises, the ultimate goal is to extract the knowledge from the massive data, and hope that the scale of the data is better, so that the knowledge is more accurate to dig out. Such a high demand for data mining on the development environment and application environment is relatively high requirements. In this case, the cloud based approach is more applicable. Cloud computing data center platform can store huge amounts of data, and can be based on the application of data mining needs dynamic allocation of resources, ensure the scalability of data mining algorithm, and the fault tolerance mechanism to ensure the reliability of data mining application.

1. Cloud based model can be distributed parallel data mining, to achieve efficient real-time mining. At the same time, it can adapt to the different scale organizations, for small and medium-sized enterprises to bring new low cost computing environment, large enterprise cloud computing platform for certain data of the calculation of the large high performance machine dependence will be reduced.
2. The data mining based on cloud computing is easy to develop, and the bottom layer is blocked. For users, there is no need to consider the division of data, data distribution and load to nodes and computing tasks scheduling, etc.

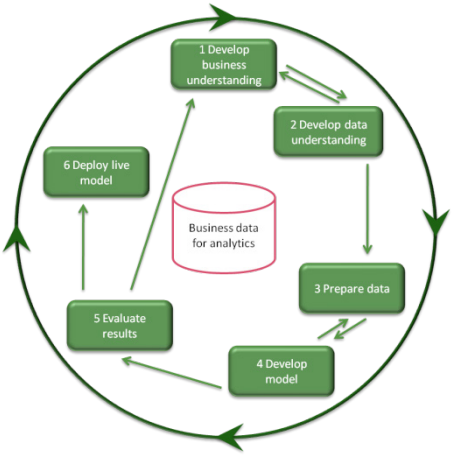


Figure 2 – Data Mining

3. Using the original equipment under the condition of parallelization, it can greatly improve the ability of large scale data processing. It is also more free and convenient in the increase of nodes, and the fault tolerance is improved.
4. Cloud based data mining to ensure the sharing of mining technology, reducing the threshold of the application of data mining, so that the massive data mining needs to be met.

The key of massive data mining is the parallel algorithm of data mining. Because cloud computing is used in MapReduce model calculation model, the need for existing data mining algorithms and parallel strategy transformation to a certain extent, can be directly used in the cloud computing platform for massive data mining tasks. So we need to make more in-depth research on the parallel strategy of data mining algorithm, so that the high efficiency of the parallel massive data mining algorithm can be realized. Parallel mining algorithm including parallel association rules algorithm, parallel classification algorithm and parallel clustering algorithm for massive data classification or prediction model, data summary, data clustering, association rules, sequential patterns, dependency relationship or dependence model, and found abnormal trend etc.. Based on this, according to the characteristics of massive data mining algorithm of the inherent to the existing cloud computing model to optimize and upgrade and expand, for the mining of massive data to obtain the greatest degree increase.

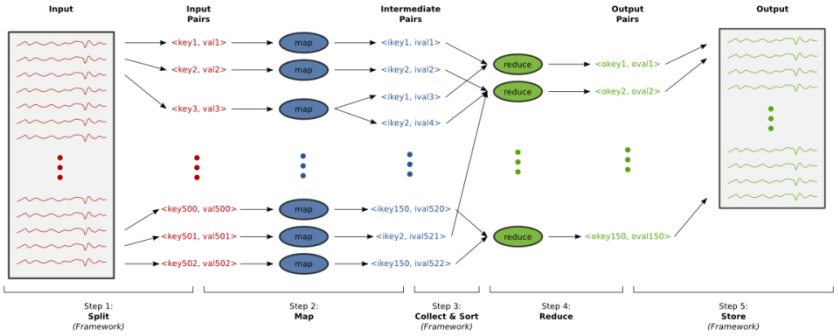


Figure 3 – MapReduce based on Cloud Computing

MapReduce is a distributed parallel programming model or framework proposed by Google lab, which is mainly used for the parallel processing of large scale data. A MapReduce consists of a large number of Map and Reduce task, it will be large-scale data processing operations can be split into a number of independent operation of the Map tasks assigned to different machines, intermediate files generated in a certain format, a plurality of Reduce merger documents between these tasks to get the final output file. GFS, distributed MapReduce and distributed file system, distributed database lock mechanism of Chubby Big Table and Borg cluster management is considered the essence of Google five technology in the field of cloud computing. With the above techniques, cloud computing can provide efficient mass data processing and analysis platform. Specifically, the Internet data is decomposed into data blocks with the same size, and distributed storage in cloud computing for each server in the network, then the data processing by the use of

MapReduce parallel computing model, this magic technology can be said to be Google's great success in the search engine is very important in the application. However, massive data to be calculated by the MapReduce calculation model for parallel computing, must be consistent with the structure, and the calculation is simple. For such a large number of data mining tasks such as data intensive applications, often need to be involved in the approximation of the solution, the program iteration, data dimension reduction and other complex algorithms, it is very difficult to really calculate. Therefore, the massive data mining technology based on cloud computing has been the common concern of academia and industry, and has become one of the hot spots in the current technology.

There may be many uncertain data mining process, the purpose of data mining is to reduce the impact of these unidentified. The uncertainty includes the uncertainty of mining task description, data acquisition and preprocessing will appear ambiguity, data mining methods and the final result of the data mining results are not clear on how to evaluate the data and is not clear.

In view of the above problems, the following work can be started from the following aspects:

1. Infrastructure construction, according to the diversification and personalized needs, and comprehensive consideration of the characteristics of various fields of the industry, to build an exclusive data mining cloud services platform.
2. Virtualization technology provides an important technical support for data mining of cloud services, follow-up should increase research and development of virtualization technology, and promote the wide application of its results, the efficient implementation of independent allocation and scheduling of computing resources.
3. In the research and development of cloud services application products, we should take more consideration of the actual needs of the community, and actively guide the public to actively participate in them, so that it can better meet the needs of personalized data mining.
4. In terms of credibility, the use of the algorithm is best with universal, and can be checked at any time, adjust and view.
5. Data security issues cannot be as direct encryption as the general information security should be based on their needs by the customer, in their own platform on the terminal through the appropriate encryption measures to protect the data.

3. Public relations course reform

In 2000, Suzhou University started the course of public relations, aiming at improving students' comprehensive quality, especially public relations awareness, interpersonal skills and service awareness. Now, "course has gone through 15 years in Suzhou University public relations", in order to make the course to reach the demand of talent in recent years around the nature of the curriculum idea, curriculum and open manner research and practice continuously.

3.1. The change of concept of curriculum: from the elective to compulsory

In 2004, Suzhou University upgraded to undergraduate colleges and universities, has fundamentally changed the nature of and school orientation, by reforming normal colleges of traditional comprehensive undergraduate college, as "local application". Public relations,

like most traditional theoretical courses, face two major problems: to continue to open? How to open? For this, it is the institute through the full discussion and demonstration.

1 “public relations” with the introduction of professional courses training program

“Public relations” is a very novel and practical comprehensive social science training, behavior norms, cultivating students’ good habits, students to further enhance the charm of the workplace, with elegant temperament, is engaged in service work lay a solid foundation in the image; it has the corresponding occupation ability (facial expressions, posture), grasp the necessary service body language, to lay a good foundation for service work. There is no doubt about the course of “public relations” in Colleges and universities. With the practical, normative and operational characteristics of this course, it lays the foundation for this course. Management Engineering College in 2006 when the training program to revise the “public relations” course from the original elective courses to professional courses, it is in the management of the Engineering Institute of all professional to open.

2 “public relations” course with different majors have their own specific

There are many disadvantages in the course of the traditional public relations, though it must be opened, but it is also necessary to reform and innovate. One is the traditional large classes; it is difficult to improve the students’ interest in learning. Points of knowledge cannot be vividly manifested through the teaching of teachers and the description will let the students feel flat and uninteresting to mention, the enthusiasm of the students, the teaching effect is difficult to achieve the desired goals. Two is the traditional teaching method; it is difficult to improve students’ public relations etiquette practice idea. Traditional teaching method of “cramming”, causes the student thinking and learning the passive, do not pay attention to the cultivation of students’ practical ability and practical ability. Three is the traditional case teaching, it is difficult to improve students’ ability of public relations etiquette. The teacher demonstrates etiquette in traditional



Figure 4 – Students show

etiquette teaching, but there is not enough time for students to exercise, cannot correct students' mistakes; through the case teaching, the students' mastery of knowledge still remain at the theoretical level.

To avoid these problems, project management for different students, according to jobs and job needs of students, teaching content should have the ability of students to develop and design of public relations, a single change to the targeted, targeted and effective implementation of the curriculum. The name of the course is also aimed at different professional for "public relations and etiquette", "modern service etiquette", "form etiquette training" and so on.

3.2. The change of nature of curriculum: from theory to practice

The setting of public relation course has double meanings and functions. One is to shape the image of the students, and the two is to cultivate the students' ability to do their job and improve their professional ability. Through the course of teaching, can cultivate students' body shape, elegant posture and good moral character, so public relations curriculum should be based on shape image, enhance the occupation accomplishment, service professional training objectives as the center. In order to improve the teaching effect of "public relations", the Management Engineering College of Suzhou University has adjusted and innovate the nature of the course.

First, the course name is adjusted. "Public relations" to "public relations and etiquette", and by "public relations and etiquette" is divided into "modern service etiquette" and "body etiquette training" two courses. Secondly, the nature of the curriculum has been adjusted. The "public relations" for pure theory teaching, Suzhou University management professional to professional elective courses ";" public relations etiquette "and" theory + practice "course, the nature of the course as" professional courses ";" modern service etiquette "further into" professional basic course "," physical training in etiquette is to "practice course" (compulsory). The importance of the curriculum has not only weakened, but in the training program is more and more significant status. Again, the teaching hours of courses will be adjusted. "Public relations" is 3 hours per week; "public relation and etiquette" 2 theory class 2 training class; "modern service etiquette" 2 hours per week; "form" is the etiquette training for a period of 2 weeks of intensive training, is the "modern service etiquette" the extension of the curriculum.

The course from theory to practice and change, the school stresses consistent Application-oriented Education, training objectives and high-quality compound talents agree without prior without previous consultation. Curriculums set up the goal of knowledge, ability and quality, and realize the training goal of applied talents.

3.3. The way of curriculum changes: from single to comprehensive

In order to improve the effectiveness of the teaching process, the students' learning interest and application ability are promoted, and the reform and innovation of the course are carried out.

1. the reform of teaching mode: the implementation of concentrated teaching, in a period of 2 weeks, to carry out the etiquette behavior norms, make-up skills and

professional image of the training course. Adhere to the students as the teaching, so that each student according to the standard training, until the corresponding.

2. building the teaching team to meet the practical needs of teaching, according to the training content and teachers' personal expertise, established by the makeup trainer, physical training division, etiquette training division of the teaching team, centralized training of student makeup skills, physique, occupation image and etiquette norms, both play teachers' expertise, the relevant teaching effect has provided a guarantee.
3. enable the student teaching assistant: in order to solve the problem of the shortage of teachers and students' training in the centralized practice teaching, we have implemented the teaching assistant. In the high grade students in the college, I apply for examination, select a group of students practice ability, strong sense of responsibility as the assistant, the main training teachers of teaching assistants in strict training, the teaching goal, and grasp the training standard and carry out relevant training for students. Excellent completion of the teaching task of teaching assistants, college to give a certain innovation credits.
4. evaluation methods of reform: at the end of the 2 week training course, all students in the class as a unit to participate in the festival etiquette, training results show, and scoring appraisal in class. These assessment methods to enhance the class honor of each student strengthen the importance of training, enhance the training effect. Ensure the training course after the end of each student's image awareness, etiquette awareness and behavior norms can achieve the teaching requirements.
5. detailed assessment criteria: develop detailed assessment standard, from the appearance (image), the standard of behavior to the link has a clear assessment of creative requirements. The students of every participating initiative and in the standard at the same time, either as a combination of professional exhibition design ideas, or for performing successfully provide logistical services, increase the class cohesion, improve their active consciousness, improve the style and class wind.



Figure 5 – Assessment criteria

In recent years, this course is to promote the development of college education project for all students to develop a civilized and professional quality of the promotion has played a very good role.

4. Conclusion

Under conditions of informatization, the pursuit of cultivating students' innovative ability and innovative consciousness, intellectual development of students is the essence of education, the use of intelligent information technology, build the intelligent environment for education, in order to provide intelligent teachers and students with learning methods and skills, teaching activities and students' learning behaviour to improve teachers the full penetration of cultivating students' good value orientation, strong humanistic quality, high quality of thinking and strong ability to act, the development of students' innovative ability and innovative quality, promote the all-round development of students to achieve wisdom. At the same time, teachers in the implementation of the wisdom of the curriculum is to achieve self-development and beyond. Information technology and curriculum integration is the essence of curriculum information; curriculum reform mainly includes two aspects, namely, information technology curriculum and curriculum information, so as to achieve the integration of the two. From this point of view, the most important is the use of information technology for education curriculum reform and innovation, to realize the course information.

Acknowledgments

Ling WU is corresponding author. The work of this paper is supported by Anhui provincial education department Quality engineering Project: Key teaching research project of Anhui Provincial Department of Education (No. 2013jyxm237); Anhui Province revitalization plan project "property management new professional construction" (No.2015zytz067); Teaching team of Management (Grant No. 2014jxtd042); Teacher studio (Grant No. 2014msgzs165); Anhui province major teaching reform research projects: Management class specialized practice teaching mode of the local applied universities (Grant No. 2014ZDJY135).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 15/04/2016
Aceitação/Acceptance: 01/07/2016

Study on Strategy of Tourism Exploitation of Scenic Area with Forested Wetlands based on Geographic Information System

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Pages: 69–79

Abstract: Geographical information system, also called the land resources information system, is a product of the combination of geography and computer technology to solve global problems such as resources and environment. In this paper, the author study on strategy of tourism exploitation of scenic area with forested wetlands based on geographic information system. Forested wetland is one of the important types among diverse wetlands. The tourism exploitation has the significance role as agricultural transition and promotion of industrial convergence. By taking example of the water forests in xinghua, lizhong region, we analyze the characteristics of scenic area resources, and cons and pros of tourism exploitation, and then put forward relevant policy suggestions

Keywords: Geographic information system, Big data, Forested wetlands, Tourism exploitation

1. Introduction

Big data in the past two years has been concerned about. Because of all kinds of sensors is increasingly popular, high-speed development of communication technology leap and network infrastructure. More and more fields such as finance, business, medical, biological, and advertising/logistics began to consciously collect and accumulate a lot of data mining (Draper, 2000). Geographic information system, which is the whole earth or part of the region's resources, the environment in the computer microcosm, strictly speaking, it is a reflection of the survival of the people of the real world all kinds of spatial data updating and change of spatial data and attribute description of these features, in support of the computer software and hardware, the technology system of the format of the input, storage, retrieval, display and analysis applications (Wang, 2014; Ma, 2015). It's a special and important space information system, the collection, storage, management, analysis and description of all or part of the earth's surface and spatial data spatial and geographic distribution of the state information system. Wetlands are widely distributed all over the world, and their definitions and classifications are different in different countries (Mora, 2014; Wang, 2014). International multilateral environmental conventions international wetland definition is more accepted from have greater influence on the current Convention on Wetlands of international importance especially as Waterfowl Habitat, refers to whether natural or

artificial, permanent or the swamp, temporary wet, raw peat land or water areas, or with a stationary or mobile, or fresh, brackish or salt, including at a depth of less than six meters of water (Wang, 2013). Keep water and wetland in resisting flood, pollution control, climate regulation, plays an important role in maintaining biological diversity, known as the "kidney of the earth", and the forest, oceans are called three global ecosystem. There are many types of wetlands, generally divided into five categories according to the distribution area and origin: coastal and coastal wetland, river wetland, Lake Wetland, wetland, pond (Zhang, 2011). A forest belongs to the marsh wetland, its characteristic is obviously higher than 6 meters, the main canopy more than 0.2 woody plant communities of Swamp Forest Wetland, forest and wetland has two ecological systems, has become one of the most attractive tourist resources in china.

Abundant animal and plant resources of Forest Wetland Tourism Attraction from the forest, water, which can be carried out and contains a variety of highly participatory tourism activities and air places. The forest is the biological community to trees as the main body, according to scientific research, a variety of plants in the forest, such as pine, fir, eucalyptus, poplar, oak, juniper can secrete monoterpenes, sesquiterpenes with aromatic and diterpene gas, can kill pathogenic bacteria in the air of the forest is rich in the human body; health is extremely beneficial to determination of negative ion, negative ion content, the forest is the interior of the city 200 times, the negative ion can promote the body to breathe smoothly, The new supersedes the old., decreased blood pressure and vigorous spirit, improve body immunity(Zhang, 2012). Water is the essential condition of life, and it is an important part of the natural geographical environment. The water storage in the Forest Wetland culvert shape posture charming, rich and quiet as a mirror, crystal Bitou, reflecting the scenery, taogongliulu, Xi Yin Zhaohui, colorful, majestic and grand, become the important tourism resources to attract tourists to the garden. Forest Wetland has the characteristics of forest and wetland, and it also contains a very rich resources of animals and plants. Conclusion "Ramsar Convention" the original intention is "taking into account the basic ecological functions of wetlands is as a regulator of hydrological condition, is a unique flora and animal fauna, especially waterfowl survival environment; that is a kind of wetland resources are of great economic, cultural, scientific and entertainment value, once the loss is irreparable." The forest provides fruit, seeds, roots, tubers, mushrooms and other food raw material resources, and rely on forest biological resources and environmental conditions, feeding habitat, survival and reproduction of animal species, including reptiles, amphibians, mammals, birds, insects and protozoa, forest animal populations, distribution range wide, high economic value, has become one of the most unique tourism resources. In the international wetland protection focuses on the protection of migratory birds and waterfowl, and our use of forests, water, land and other resources shoal, carry out a variety of breeding, the animal and plant resources of Forest Wetland more abundant. Jiangsu is rich in wetland resources, as a Typical Forest Wetland of Jiangsu Xinghua forest is the eastern plain area of China rare forest wetland landscape, after years of efforts, the tourism development has been achieved, a set of forest tourism and leisure entertainment experience, water birds ecological science and health resort and other functions of the state AAAA level scenic spots, the experience of other parts of the National Forest Wetland economic transformation and upgrading, the development of industrial integration, has a certain significance.

2. Geographic information system and forest resource management

2.1. Geographic Information System

The emergence of information processing system based on computer technology has become one of the main symbols of the science and technology revolution after the Second World War. In many types of information, information and space related information is particularly important, and a large amount of data. We humans live earth is a three-dimensional space, which all is closely related to the spatial location information, how to use computer to handle the relevant space is the original power generation and development of geographic information system. Geographic information system, also known as the land resource information system, first started in the field of geography, is to solve the problems of resources and environment development of global issues, is a product of the combination of computer technology and geography. The definition of the geographic information system is divided into the following two parts: first, the geographic information system theory and method of description, storage, analysis and output of spatial information, is a cross discipline; two, the geographic information system is based on geo spatial database using geographic model analysis method, to provide spatial and dynamic geography information, provide services for geographic research and decision-making, is a kind of computer system. Geographic information system is an interdisciplinary subject of multiple disciplines, but its core is computer science, the basic function is to analyze the database, terrain visualization and spatial geographic data; GIS is the input, output, management, query, analysis and computer aided decision system. It is a technical system for the management and study of spatial data, computer hardware and software support, through the comprehensive analysis of many factors, it can quickly meet the needs of the application of information extraction, and by map, graph or data are expressed as the end result of treatment.

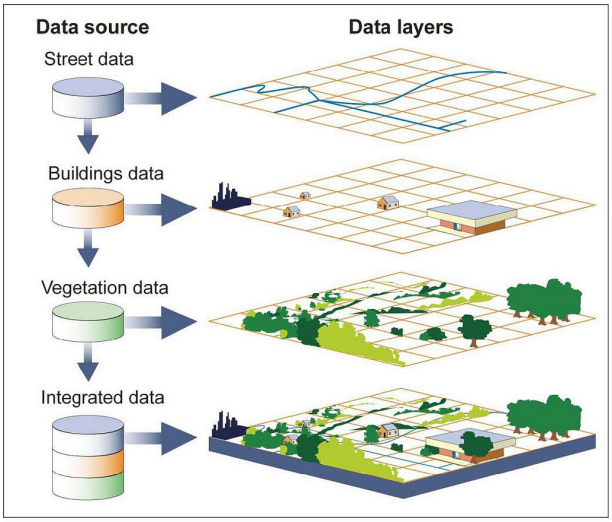


Figure 1 – Geographic Information System

GIS main function, respectively is: (1) Data entry, storage. GIS data sources mainly include artificial vector data, scan data, remote sensing images and GPS data, as well as a variety of geographic objects related information. (2) Data processing and updating. GIS management objects in the space and time are constantly changing and development, in order to ensure the real-time and accuracy of the data, the data should be updated in a timely manner. (3) Geographical analysis. Including spatial analysis, terrain analysis, statistical analysis, field of vision analysis, etc.. The establishment and analysis of three-dimensional model can be carried out by establishing the model of DEM and DTM. (4) The outcome of the output. GIS can output a variety of ways such as achievement, report output, output, data output and spreadsheet document output, improve the performance of information ability.

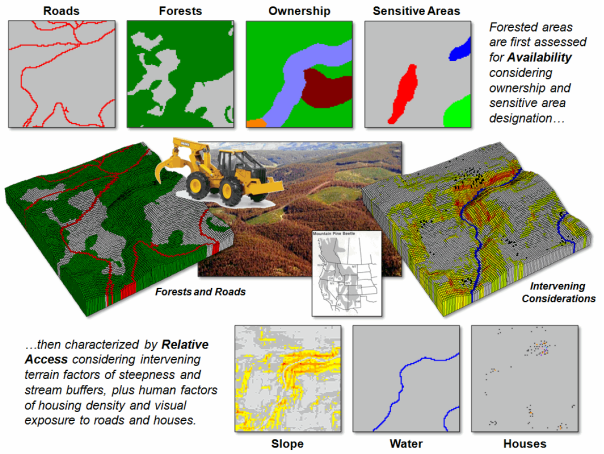


Figure 2 – GIS and forest resources management

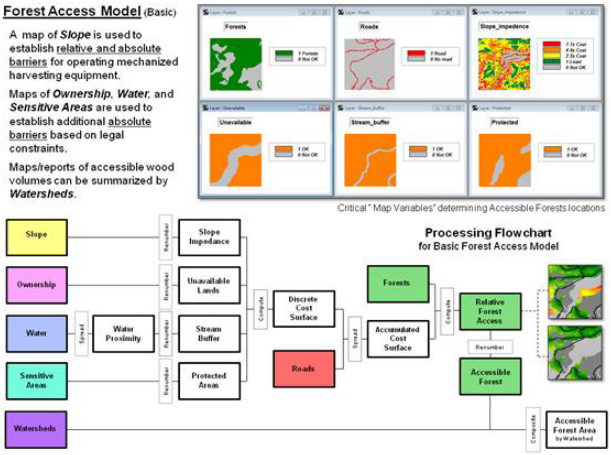


Figure 3 – Flowchart of the basic model

In recent years, with the rapid development of computer software and hardware technology and the market demand of all walks of life, the rapid development of geographic information system. This is mainly manifested in the continuous maturity of GIS technology and the increasingly widespread application in the field of application. The development trend of GIS technology is mainly reflected in two aspects, one is the integration of Technology (Integration), two is the differentiation of software technology.

1. Integration: GIS technology, mainly reflected in the combination of GIS and other information technology, we often say "3S", or GIS, RS and GPS integration is the embodiment of technology integration. However, now GIS has gone far beyond these, it has been with CAD, multimedia, communication, Internet, office automation, virtual reality and other technologies combined to form a comprehensive information technology. This point has been valued by many companies engaged in different business. Synthesis is an important direction for the development and application of GIS technology.
2. Fractionation: the development of GIS software has experienced from the early functional processing module, to the development of components GIS and WEBGIS process. At present, the components of the G S and WEBGIS have become the development direction of many large GIS company products. The biggest advantage of the component GIS is that it can make the GIS function embedded in other software, or other software functions into the GIS. Intergraph said the company has entered the era of the component GIS, its Jupiter program, is to transplant and develop a variety of components GIS. ESRI in the component GIS also made a new exploration, launched a new generation of GIS as the representative of the MaPobjects. MapInfo is not a sign of weakness, invested heavily in the development of MapX, has good prospects for development. In software development, component GIS is an important development direction, it will form a great impact on software package. Compared with the traditional GIS, the component GIS has many advantages.

2.2. The GIS application prospect

- The management of natural resources including natural resources distribution, natural resources, natural resources statistics query, resource evaluation, prediction and decision analysis, rational development and utilization of resources, resources dynamic monitoring etc..
- Land Management: including cadastral investigation and management, land use planning, land use investigation and management, land evaluation, land carrying capacity calculation and analysis, land classification, evaluation and management of real estate, land information, land potential analysis, analysis of the relationship between human and land use prediction and decision analysis.
- Forest resources management: including the distribution of forest resources and the distribution of resources, the distribution of species, the status of forest productivity, forest disaster investigation and protection, the rational development and utilization of forest. With the contradiction between the development of forest resources and the protection of human living environment, the research and application of GIS has become more and more extensive in the forestry system.

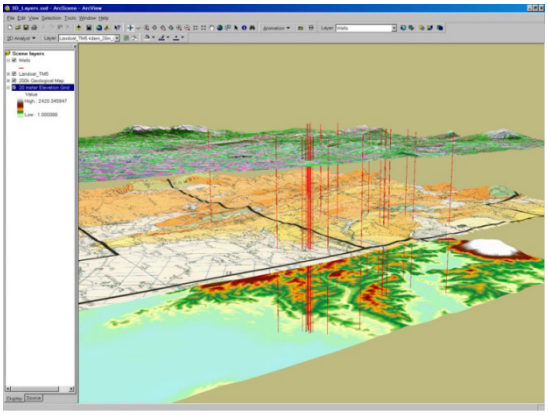


Figure 4 – Spatial analysis function of GIS

MIS first appeared in the last century in 70s, it is a use of computer hardware and software, manual work, analysis, planning, control and decision-making model. After years of development, the management information system of environment, goal, function, support level, composition, and connotation has changed a lot.

3. Forest wetland development

3.1. Analysis on the disadvantages and advantages of Forest Wetland Development

Weaknesses as:

- **The more remote location:** location often becomes an important factor affecting the sightseeing tourists travel. He from the forest area of dense population, tourist resource rich city is far away from the surrounding the most economically developed city of Shanghai, Nanjing, Suzhou, Wuxi, Hangzhou, Hefei and other places 220-410 kilometers, the city is the main scenic tourist potential target customer groups, if the organization is a day or two days tour may, because of distance, long drive and influence tourists' willingness to travel.
- **Infrastructure is lagging behind:** most of the forest wetlands in less developed areas, the original transport, accommodation and other infrastructure are relatively weak. Tourists can quickly arrived in the area nearby, but the area perimeter 20 km relay traffic, limited to dense river network, the road is narrow, traffic jams often appear in the peak travel. The need for forest and water protection, temporarily unable to large-scale new tourist roads and parking lot and other facilities, as a tourist vessel internal traffic tool matching is insufficient, which may affect the scenic tourist reception capacity and feeling.
- **The threat of natural disasters:** many wetlands are hydrostatic wetland, water from rainfall and water, probably due to the pond dried up without other water drought, waterlogging may be caused by poor drainage flooding, some wetlands or traditional flood. The forest in history he River area has repeatedly suffered natural disasters, the new China after the founding of the party and

the state invested heavily in the restoration efforts, through canals and sluices, draining water, the natural disaster is reduced. However, in the recent 20 years, in the region is still many times for the flood Shanghai and South of Jiangsu area. Many other National Forest Wetland is still in the state of nature or in the initial stage of development, more vulnerable to the threat of natural disasters, which may lead to the tourism development of huge investment, long development cycle, lower returns, thereby affecting the willingness to invest.

- **The lack of Tourism Talents:** Forest Wetland has rich tourism resources, but with vision and understanding of business, management of tourism talents, especially its own local talents are seriously lacking, resulting in the management and tourism service cannot meet the needs of tourists. Forest Wetland Tourism Practitioners mainly refers to the local tourism business management personnel, including the farmhouse (fishing village) hotels, restaurants, attractions, agricultural and sideline products processing enterprises, production manager and the person in charge of planning, sales and management personnel, and personnel active in the first line of the tourism reception, directly for the majority of visitors to provide services, including scenic area and tour guide personnel, conductor, accommodation and catering enterprises staff, tourist shops salesperson, tourism personnel training work without delay.

Advantage analysis as:

- **The unique landscape resources, the high value:** a type of wetland scenic forest of artificial ecological forest in Jiangsu province is the largest, the "Duo Lin Gou fish" three-dimensional landscape model, unique. Duotian ups and downs, dotted, towering trees, birds gather, ditches, fish jump, water reflects the harmony and unity of man and nature, has certain influence at home and abroad. Forest mainly to the pool of Chinese fir, the pool of Chinese fir is a deciduous tree, up to 25 - 20 meters, the trunk base are inflated, crown conical or cylindrical. Native to North America, was born in the pond wetland because often called Taxodium or cedar bog. Acidic soil Taxodium hi hot and humid climate and deep and loose, moisture resistance is extremely strong, narrow crown, strong wind resistance, is the ideal tree windbreaks, plain area of wave break. Wood texture straight, fine structure, with wire rope gloss, Alice indehiscent, process performance is good, is a good raw material for shipbuilding, construction, timber, furniture, vehicles.
- **The government attaches great importance to the joint development efforts:** after the founding of new China, the governance of the lower river region has been an important work of the government of Jiangsu province. After 40 years of continuous improvement and development, to improve the standard of embankment, renovation and development of shipping and irrigation canals, comprehensive measures, as well as the construction of electric power irrigation and drainage system, formed a relatively complete system of water conservancy project, effectively control the flood, drought and alkali tide disaster, become Huaihe basin's largest rice and cotton yield at the same time, the base; the canal has become an important channel of South to North Water Diversion Project, get the great support of the government. The passage of time, just to catch up with the development of a new era of green ecological agriculture, vigorously develop the tourism industry, focus on sustainable development, this treasure is at all levels of leadership and the

community's concern and support. Forest area ten years ago from the tour started, to today's AAAA scenic spot, the rapid progress of construction.

- **The radiation area of economic development, the leisure tourism market:** forest scenic spots around Shanghai, Jiangsu, Zhejiang, is China's most developed economy, the highest population density of tourist number, strong economic strength, strong willingness to travel, travel frequency is high, the tourism market has great potential. The scenic tourists every year about 300 thousand people, from the larger growth space is the best reception amount; tourists from Shanghai, Nanjing, Hangzhou, Suzhou province and outside the city, there are a small number of international tourists, most of them are just 1-2 days sightseeing tourists. In fact, the Forest Wetland is more suitable for carrying out the long retention time and high repeatability of the leisure tourism, can make people temporarily leave the busy and crowded, tense, haze shrouded the city, enjoy the relaxed, comfortable, quiet, fresh country life, can let the tourists relieve the pressure, adjust the mood, energy, back into the busy work. He is more and more attention to the development of forest leisure tourism around the market, is gradually transforming the resources superiority to the more popular tourist products.

3.2. Principles of Forest Wetland Development

- ***Principles of sustainable development:*** Forest wetland development should adhere to sustainable development, the development scale and the tourists travel reception amount is controlled in the range of allowable bearing capacity, the slow regeneration of tourism resources such as water resources, forest vegetation, wild animal resources, should increase the protection, avoid short-term behavior and quick success, to achieve sustainable development.
- ***Principles of ecological environmental protection:*** beautiful ecological natural scenery forest characteristics is the lifeline of scenic spots, so pay special attention to environmental protection in the process of tourism development, make the product design and ecological protection coordination. To fully respect the natural state of forest wetlands, rational use of natural resources, the protection of wetland biodiversity, tourism development on the impact of the environment to minimize.
- ***Principles of ecological and cultural integration:*** Culture is the inexhaustible source of the development of tourism, is the soul of tourism and vitality. Agricultural environment, agricultural landscape and its cultural connotation is the core attraction of rural tourism, the cultural, economic and cultural integration of rural tourism has become a new trend and new trend of international tourism development.
- ***Industry linkage comprehensive and efficient principle:*** First of all, we should cooperate and coordinate with each other in the tourism industry, and explore the potential of each subsystem. For forest area, should make reasonable allocation of accommodation, travel, shopping and entertainment of the six elements; in the premise to ensure the natural landscape and cultural resources protection, priority service facilities catering, accommodation, shopping and so on, make the limited investment maximize economic benefits. Secondly, the tourism industry needs to cooperate closely with the support of other industries, make the deal with the tourism and ecological environment

protection, tourism and aquaculture, tourism and indigenous residents daily life relationship, promoting the agriculture by tourism, tourism agriculture, agriculture and tourism, promote local economic development, realize the comprehensive benefit maximization.

- ***Respect for nature and the pursuit of harmony:*** Forest Wetland Eco tourism emphasizes the harmony between man and nature of the artistic conception in the process of tourism development, to achieve the layout, attractions and scenic spots construction and reserve match; the original authenticity and construction of scenic spots to protect resources, should be in harmony with the natural background of the original construction, avoid excessive protection of permanent buildings in the scenic area; in addition to the necessary road, pavilion, ecological toilets and other facilities, other services and entertainment facilities should be comprehensive tourist service area on the road outside the area; scientific design, reasonable and simple, try to use the original path, to make use of natural materials, reduce the impact on the natural environment.

4. Development orientation and functional zoning of Forest Wetland

4.1. The development of positioning

The various needs of Forest Wetland can satisfy the tourists, such as temporary leave downtown city, close to nature; get rid of chores, relax mood; breathing essence, Runfei health; aerobic exercise, physical health; fish identification of plants, increase scientific knowledge; the natural taste of delicacy, enjoy the wild village. After many discussions, he established the forest scenic tourism development orientation of the ecological health of heaven. In the forest on water, thousands of birds contend, bird fish play, mutual Taxodium Genyi and other natural landscape based on ecological characteristics of the human outstanding forest oxygen bar, rivers and lakes, Heron cuckoo song, mutual leisure tourists to; to be able to meet the various needs of Forest Wetland Tourism Development as the basis, to create a set of wetland forest tourism and leisure entertainment experience, water birds ecological science and health resort functions as one of the “national well-known, Jiangsu class AAAA level scenic spots. Put forward a slogan: “Su group in Jiuzhaigou, East China bird paradise”, “mist forest, natural oxygen”, “swim on the forest products, natural fish and crab”, “water heaven, forest and bird fun”.

4.2. Function partition

Used a three-dimensional culture model of Forest Scenic duo Lin Gou fish, set a successful example for wetland development and utilization of the transformation of people, has a certain market value. According to the characteristics of the natural ecological environment, the scenic spots are divided into six functional areas. See Figure 5 and table 1.

5. Future perspective

At present, the problems of Forest Wetland Tourism development are the most common problems. Tourism products do all day scenic attractions in essence, mainly to meet the basic needs of a tour “or” two days tour of tourists. But with the increasing number of tourists visit and participate in self awareness, its disadvantages are also increasingly

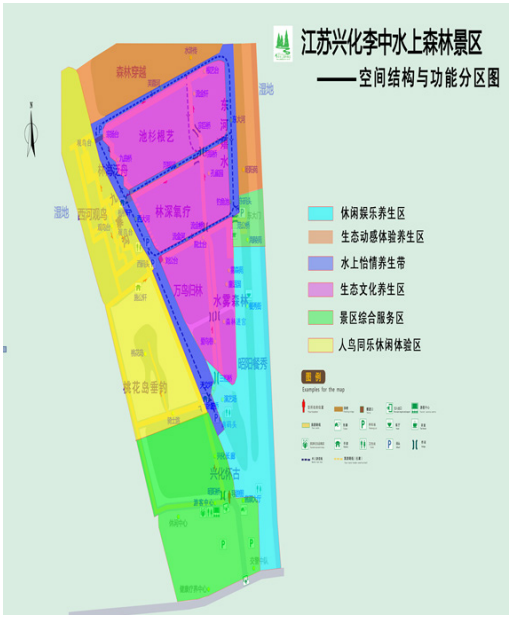


Figure 5 – Lee water forest scenic spot functional partition map

Functional area name	Theme
Scenic area comprehensive service area	Parking and visitor service
Leisure and entertainment district	Aquatic forest fish feast, buy ecological goods
Ecological culture area	Somewhere deep in the woods, the birds love bar
Ecological dynamic experience zone	Mizumori meets Lake wild fishing and hunting
The bird fun leisure area	Taohua Island river water fishing, birdwatching, forest domesticated birds, bird interactive fun
Water for health belt	Linhai Rafting Tours Genyi mid, birds'twitter and fragrance of flowers

Table 1 – Water forest scenic area and the theme

apparent, one is the product characteristic is not obvious, the line simply will fly and see the attractions in series, lively, crowded fatigue experience difference; two are the same, not for different market segments, the introduction of different tourism products, tourist hybrid, sightseeing, leisure, activities, etc. the delicacy theme is not outstanding, all kinds of needs are met; three is the amount of the tourists is limited, as a result of excessive accumulation of the core area of tourists have to compress reception number, on the other hand, a lot of space have not been fully utilized and idle resources; four is the facilities are not in place, failed to give full play to resource advantage. In view of the existing problems, the development of forest wetland tourism products should highlight the theme of tourism products, leisure products, special products and refined.

Tourism products include natural sightseeing, tourism, cultural and ecological tourism products; ecological leisure products including air products, forest products in sanatorium and ecological culture landscape convalescence nursing products, health products, bird coexistence for ecological dynamism in health products; special products include Linhai boating, forest crossing, ecological bird photography, Taxodium Shangjian, Genyi fishing and hunting. On the basis of product optimization, we can launch a rich variety of tourism products for different regions, different ages and different needs, and obtain good social benefits and economic benefits.

Acknowledgments

This study is supported by the 2014 university philosophy social science research funded projects: "Study on the legal regulation of government purchase of public services" (2014JB288); Key project of Jiangsu Institute of Commerce: "Practical teaching strategies for tourism major" (3042141223046); key project On Countermeasures of Practical Teaching in Tourism Management of Jiangsu Vocational Institute of Commerce. (HU Qiang) (No.3042141223046).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 03/04/2016
Aceitação/Acceptance: 09/07/2016

Study on Intelligent Stadiums System and Development Trend based on the Internet of Things

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Pages: 80–92

Abstract: With the development of information technology, the intelligent system combines the structure, system, service and management in stadium, and makes the function becomes more reasonable. In this paper, the author study on intelligent stadiums system and development trend based on the internet of things. Modern smart stadium is becoming more and more safe, efficient, comfortable and convenient; it reflects the characteristics of the information society. The intelligent construction of gymnasium not only meets the needs of sports teaching and sports activities, but also can meet the needs of sports meeting, assembly and other large-scale activities.

Keywords: Intelligent stadiums system, Office automation system, RFID recognition, Sports activities

1. Introduction

Rapid advance of science and technology, especially the rapid development of modern electronic technology, computer communication and control technology based on microelectronics, which has a history of several thousand years in the construction industry is experiencing a historic change hitherto unknown (Crespo, 2015). These techniques allow the building by a warm haven, shake the body into a set of upgrading the feeling, response, information, judgment and decision is one that can adapt to various changes in a safe, efficient, comfortable living and working environment (Dai, 2012; Hu, 2012). Only by relying on the continuous development of science and technology, these systems can be safe, reliable operation, to meet the various requirements of people. The meaning of intelligent building follows the advance of science and technology and constantly excavates and adds new functions (Jian-hua, 2012; Huang, 2013). All of these provide a solid foundation for the development of the modern smart stadium, which plays an irreplaceable role in the promotion and development of the modern comprehensive physical exercise and entertainment. The intelligent system will be the combination optimization relationship between structure, system, service and management of the stadium and the four basic elements, which make the stadium function become more reasonable, the construction environment is becoming more and more safe, efficient, comfortable and convenient (Kim, 2014). It reflects the characteristics of the era of information society, will greatly promote the reform of the sports industry and the diversification of people's living standards.

The application of high-tech system intelligent system of stadium is electronic technology, information technology and microelectronics; they are working under low voltage environment, also known as the weak current system. Now an important part of the intelligent system has become a modern stadium, it has distinctive characteristics of the times, the construction contents of the gymnasium and the extension, greatly promoted the transformation of traditional industries to upgrade and improvement of people's living standard (Sigala, 2012; Krstev, 2014). The stadium is the place of professional sports training, sports and physical exercise, plays an important role in the development of sports industry. In recent years, with the rapid development of information technology, in-depth study of the intelligent building, intelligent stadium get much development. Networking technology as a new generation of information and communication technology, has a broad application prospect in many industries, has been promoted to the level of strategic planning of national development (Zhang, 2011). The technology and concept based on the Internet of things, a system of intelligent stadium, stadium analysis the intelligent development trend, theoretical research and practical work to serve the stadium intelligent. With the development of science and technology, has brought the world's advanced intelligent system for domestic stadium construction, people feel the intelligent system to bring the entire sports facilities, to bring the safe, comfortable and efficient environment. As the carrier of the development of the times, in order to maintain their leading position of its own technology, strengthen the intelligent packaging of their stadium, the one hand to meet the physical education and sports activities in their own schools, on the other hand can also satisfy the social games, rally and other large activities. Intelligent system has gradually become a symbol of modern university gymnasium. The establishment of economic and practical, safe and reliable, convenient and comfortable, strong expansion and beautiful campus intelligent stadium is an important opportunity, but also an important aspect of the development of China's intelligent sports arena.

2. Internet of things and intelligent Stadium

2.1. Internet of things

The Internet of things, is "simply connected things" network, it refers to "everywhere will be the terminal equipment and facilities, through a variety of communication networks to achieve interoperability and application integration and cloud based software operating mode in the network, network and / or under the Internet environment, the information security protection mechanism appropriate, provide safe and controllable personalized real-time management and service functions, to achieve the" things "and" high efficiency and energy saving, safety and environmental protection "and" management and control, including the "camp" integration. The connotation of technology of Internet of things: the perception layer technology, such as RFID, sensor network, remote sensing, bar code technology transport layer; technology, such as M2M communication network, the Internet, LAN, wireless network technology; application layer technology, such as pervasive computing, cloud computing, knowledge discovery, intelligent technology.

The Internet is referred to as a new generation of information technology to the application demand, the realization of "barter" exchange of information of the target. In the early stage of development, it has wide application prospect. The Ministry of industry and information issued by the "Internet of things" 12th Five-Year "development plan" pointed

out that "things are an important part of strategic emerging industries, plays a promoting role in accelerating the transformation of economic development. At present, the study of things related to application of the main intelligent industry, intelligent agriculture, intelligent logistics, intelligent transportation, smart environment, smart grid, smart security, smart healthcare, and smart Home Furnishing nine key application fields. Building and intelligent information fields have gained great progress. Research results of intelligent security, intelligent building, intelligent information, intelligent Stadium With reference to the development in sports and related fields, the networking research is still in its infancy, used for networking technology in the field of one or some technology in the field of sports, such as wireless sensor networks, knowledge discovery and so on.



Figure 1 – Internet of things

2.2. Smart Stadium

Intelligent stadium is one of the important signs of modern sports venues, stadiums are automation, digital and information development reflects the intelligent stadium, not a unified definition. But its content is growing with the development of intelligent technology, and increasingly rich. With the development of modern science and technology as the base, intelligent sports venues or stadiums in electronic sports venues, automation, digital and network on the basis of the further extension of the idea. Every time the progress of information technology and management idea of progress, will give smart stadium new meaning, so as to enhance the intelligent level of sports venues and management.

Generally, intelligent sports venues are "by the intelligent monitoring system, communication system, network system, application of special venue information system, integrated wiring system". At this stage, a smart sports venue is a complex system engineering a set of intelligent building system and intelligent system for sports. Networking technology used for smart, the stadium "intelligent" level to further improve.

Intelligent building refers to the building as a platform, including building automation equipment BA, OA office automation and communication network system CA, set optimization combination structure, system, service and management and between them,

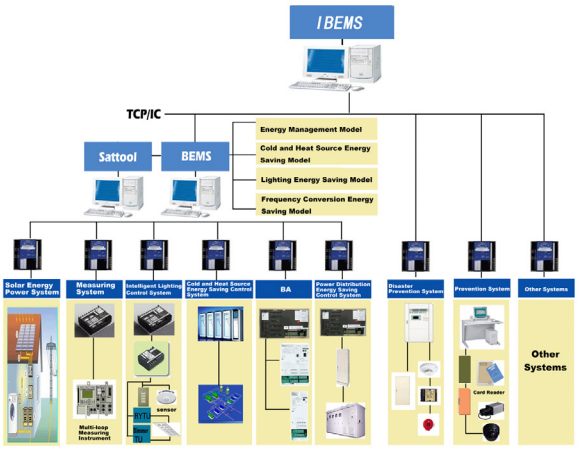


Figure 2 – Intelligent building systems

to provide people with a safe, efficient, comfortable and convenient building environment. Intelligent building can be called 5AS the construction of office automation system, including OAS (Office Automation System), CAS (Communication Automation System communication automation system), BAS building automation system (Building Automation System), FAS fire automation system (Fire Automation System), SAS security automation system (Safety Automation System). The intelligent building is the product of a large set of modern science and technology the technology base is mainly composed of modern construction technology, modern communication technology and modern control technology. The stadium itself is a building, intelligent building is the material base for realizing stadiums intelligent. Intelligent building networking technology include building equipment monitoring system, automatic fire alarm system, security automation system and automatic temperature control system, lighting control system, and communication network system "based on. Based on the intelligent building nature of networking technology and traditional intelligent building there is no difference, but the use of a new generation of things related to technology to enhance the intelligent level of intelligent building, the building system in the traditional automation, digital and network on the basis of the transition to a real sense of intelligence.

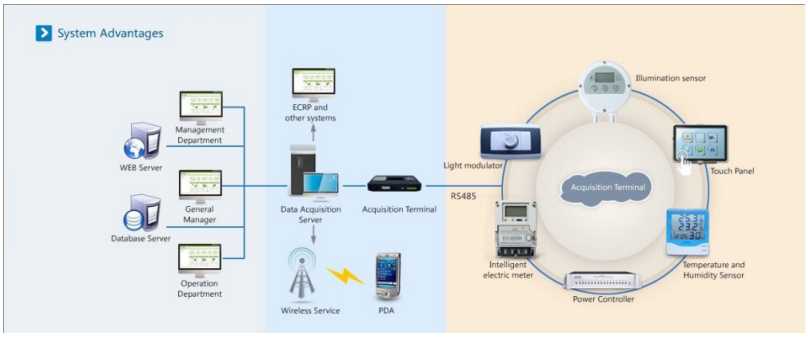


Figure 3 – Automation System

- ***Intelligent security system:*** anti-theft, fire prevention, disaster prevention is an important part of the life and property safety related to sports management work. The effectiveness and timeliness of the security event for the application of networking technology can effectively improve the stadium security system processing. Such as the National Stadium, the network sensing technology, the anchor and other sensors on the venue is an important location, collecting all kinds of safety information data, through the expert system of LAN and the Internet sent to the server, analysis, processing and feedback using cloud computing technology. The difference between intelligent security system of networking technology and traditional security automation system is based on the ability to enhance the self treatment, from sensory extends to sensory liberation. Video surveillance as an example, the traditional video surveillance is only the extension of the function of the eyes, the liberation of the limited staff and legs. Based on the original video surveillance the technology on implanted sensing technology, the original video analysis into high performance computing and knowledge discovery technology, which can effectively enhance the video monitoring system of self processing ability. Intelligent fire control system using a variety of sensors, has the control function of inductor, the linkage with the fire alarm, power control, building control, fire smoke and other systems can be. In or before the disaster occurred at the beginning, to make timely emergency response, disaster prevention or minimize disaster Loss. Intelligent access control system, integrated use of RFID, sensor technology and video analysis technology, to achieve the effective certification and control of venues and personnel.
- ***The environmental system of intelligent venues:*** the use of networking technology can also effectively improve the stadium and the surrounding environment, including venues, venue temperature, humidity control, traffic control and other venues surrounding environment. Venues lighting, temperature and humidity control facilities, the brightness, sound, temperature and humidity sensors, data acquisition and transmission, and control system, and the environment for system interconnection, lighting conditions, suitable internal security venues for temperature and humidity, reduce unnecessary waste of energy; and security monitoring system interconnection, lighting circuit operation situation, the timely processing of potential security risks. For example, the Jinan Olympic Sports Center will be interconnected GSHP system with temperature and humidity sensing system on the one hand, stadium lighting, intelligent control facility environment, on the one hand, make full use of geothermal resources, and meet the lighting, temperature and humidity Control of the energy demand. Venues surrounding traffic environment control technology based on RFID and identification card can automatically identify the vehicle, auxiliary staff to implement vehicle and dock scheduling, to achieve targeted, humanization and convenience of traffic supervision, to prevent vehicle congestion venues around the phenomenon.
- ***Intelligent communication system:*** information communication system of Internet transmission venues can achieve all kinds of information flow in the internal and external transmission network based on communication between inside and outside the construction of intelligent high-speed processing various images, text, voice and data, information processing and information to meet user needs. The mutual communication, public broadcasting communication

office can be stadiums the effective implementation of the venues in the information communication platform system. But the Internet communication system based on communication facilities is only to realize the communication between people, communication of intelligent communication system based on IOT technology to realize the human itself, including the "object" and "object". Its precondition is unique identification and enable features of "object", "object" is intelligent, has enabled the "object" has become the subject of the communication for example, The use of RFID recognition technology and sensor technology, sports equipment, sports stadium grandstand seating facilities enable, which has the ID authentication and information communication ability. So the sports equipment, facilities and other items into the sports venues management network, realize the management and the "object", "object" and "object" the information and communication. This will greatly enhance the sports venues, facilities and equipment such as save, update, and management efficiency.

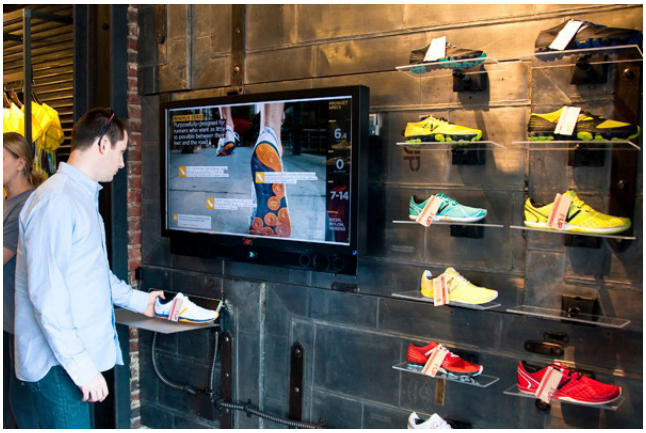


Figure 4 – RFID Recognition technology

3. Gymnasium intelligent system

3.1. The development trend of intelligent system in Gymnasium

Although our country stadium system intelligent research started relatively late, but in the intelligent building in our country and the large-scale games driven, still appeared to "catch up" trend. However, at present in China after foreign development at the same time, but also ignored the many problems, such as the blind pursuit of the various venues system, blind investment lead to high operation cost, make ends meet; rely on foreign products, the lack of independent innovation; advanced value system, neglect the training of management personnel; regulate the development of slow market chaos. With the rapid development of computer technology, communication technology and network technology support, the stadium intelligent system is still in constant reform, sustainable development, more perfect. Its development trend is mainly reflected in the following aspects:

1. Integration and linkage: Integration and linkage is the best way to realize the whole stadium intelligent system of comprehensive, flexible, avant-garde. On the basis of product integration to realize the integration of the whole system, information integration, function integration.
2. Digital: Digital facilities for good, not only can effectively meet the competition requirements, create a good communication environment, but also expand the fitness service market, effectively enhance the sports industry image, guarantee the development of the sports industry sustained and healthy. Digital venues is using digital means, with the help of the information superhighway, maximize the utilization of information resources, change the traditional management mode to achieve venues, venue internal business process automation and intelligent facility management and humanized service of the new stadium facilities.
3. Business virtualization: Virtual operation is relative to the operating entity is concerned, he can through the integration of the supply chain, to meet the needs of changing and competitive environment, to achieve "win-win" stadium has a great role in promoting. Business virtualization is conducive to the establishment of a dynamic cooperative network of intelligent sports stadiums and their cooperative units, to achieve the complementary and optimization of sports resources enhance the economic and social benefits of the stadium.
4. Green energy saving: Intelligent and green stadium is an organic whole concept. In the realization of intelligent and stadium, should pay attention to the surrounding environment and harmonious, comprehensive consideration of the flow of air, the use of the sun and landscape environment, to provide excellent space at the same time, also has a long-term positive impact on the surrounding environment.



Figure 5 – Digital stadium

3.2. Security technology protection system

The security system consists of video security monitoring system, access control system, intrusion alarm system, electronic patrol system, parking lot management system, security communication system and security information management system. For special high security level of the entity protection system, explosion-proof safety inspection system,

warehouse security system, etc., should be set according to the special needs. Security technology protection system should ensure the smooth progress of teaching, training and other activities, and to adapt to the daily management needs of the stadium. Video surveillance system is the most important part of the security system; it mainly realizes the stadium security management personnel to master the real-time scene area, inside and outside the museum entrance of the state, the implementation of global monitoring and management of important parts. In the setting of monitoring points related to safety performance, from the overall planning of the entire stadium, but not to the audience a negative psychological impact, combined with these two considerations, monitoring points located in the stadium entrance, public areas, hall and elevator hall, elevator, main channel and other key positions, to to achieve safety information to the stadium for the purpose of real-time monitoring.

The transmission of video monitoring signal is composed of three parts to transmit video signals and control signals and power supply. The image information need to be transmitted to control center cameras, and control signals and power supply wiring from the control center to be transmitted to the corresponding camera. The system uses coaxial cable SYV75-5 transmission video signal, RVV2*1.5 cable transmission power signal, RVVP2*1.0 shielded cable transmission control signal. Special video cable for elevator used to reach the demand of its tensile strength. All cameras are used in the AC24V room - weak electricity centralized power supply, so that the system can ensure the stability of the power supply and power synchronization, as far as possible to avoid the matrix switch when the image jitter.

3.3. Integrated wiring system

As the intelligent stadium system information transmission platform, integrated wiring system in general by the work area subsystem and vertical sub horizontal subsystem and system management subsystem, equipment room subsystem consists of five subsystems. Outdoor pipeline and route it sinks in the total system of voice and data line and connected with the computer center, so that the integrated wiring system of the gymnasium of integrated wiring system composed of a modular, systematic, high flexibility. It can support voice, data and image information, and give full consideration to the future network structure change, expansion and the need for the development of new technology to achieve the smooth transition of the feasibility. A fully integrated wiring system capable of fully integrated with other application systems, which is necessary for the intelligent gymnasium. The reliability and flexibility of the integrated wiring system is mainly reflected in the aspects of whether it can meet the functional requirements of the stadium and the daily management of the stadium after the match. To this end, the generic cabling system is generally used in the high flexibility of the star topology wiring mode. This wiring mode can be used to carry out the subsystem wiring separately, so that each subsystem is independent of the unit group, and the changes of any subsystem will not affect the other subsystems. In the new integration requirements, you cannot need to re layout of the level of wiring and the appearance of the construction of the impact of the United States.

In the gymnasium, according to the function of each function area room function, area and the use demand is not the same, adopts the fixed information point, the wireless network node to cover, in order to prepare the emergency. In the regional competition

area, the audience area and management area, athletes, according to different sports and related needs to set up voice and data point; in the news media zone in the speech and data points, is also equipped with a universal single-phase power supply socket, and set aside the temporary go enough line in the TV channel; also equipped with cable TV broadcast additional interface; in the office, conference room, lounge and other general workplace according to the 2 /10 square meters to set up voice and data points. For all voice and data points, the level of the six types of wiring systems, can provide more than 250MHz bandwidth, each information point can be flexible application, while taking into account the development of the network link bandwidth requirements.

3.4. Information network system

Information network system is the foundation of the operation of the information system of the intellectual games venues. In the overall design of the process, from the technical measures, system structure, system applications, equipment selection, technical services and implementation, and other aspects of comprehensive consideration. With high efficiency, safety and stability of network products, combined with high performance routing and switching infrastructure and enhance the safety and reliability characteristics, stadium network information system to build a safe, reliable, easy access, easy expansion, easy to manage. Building efficient, safe and stable information network system to meet the needs of the intelligent facility information system to run stably and facilitate access to the Internet. The backbone network of the information network system of the gymnasium uses the Gigabit Ethernet switch technology to construct the star network structure, realize the Gigabit to the desktop, and establish a unified, efficient, stable and scalable network platform. Among them, in the -4.500 standard high-rise fire control room set 1 Ruijie Gigabit multilayer Ethernet switch RG-S5750-24SFP/12GT as the core switch venues, and RG-S5750-24SFP/12GT Ethernet switch through the multimode fiber access at the southwest corner of No. 1 weak between the implementation of the core data platform of Intranet and the extranet high-speed exchange; access switch two other nodes according to the number of the regional data of the different point of the RG-S2924G or Ruijie RG-S2328G the corresponding switch stack, RG-S2924G, RG-S2328G by multimode fiber access module on the Gigabit Ethernet switch configuration corresponding to the core layer.

In the wired network system also designs a high-speed and reliable wireless WLAN access system as a temporary access to user data access; according to the distribution of stadium construction engineering plane drawings and corresponding room, gymnasium consists of wireless AP access system provides 18 sets of the entire venue WLAN access. Due to the large number of wireless AP system, from the management effectiveness, convenience, security and maintenance of multiple point of view, take the wireless switch + AP WLAN deployment mode, operation management through the wireless network management system can realize real-time monitoring of wireless network.

3.5. Information display and control system

Information display and control system is an important system of intelligent gymnasium. In sports activities, information display and control system is indispensable. In the control, to be concise, accurate and timely, strong, and can support a number of sports

activities to show the demand, in accordance with a number of sports rules, but also to facilitate maintenance, upgrade. The core of the whole system is “console”, “the console” is set in the control room of the northeast corner of the 7.400 standard, the control and display control operation of all competitions in the game. From the control room to the LED display circuit using metal wire slot along the grid. The system includes two LED display, two play control console, which is operated by the staff to operate the broadcast control console, control two big screen broadcast content. In addition, the system can be introduced in the game when the “referee Taiwan”, “have access control equipment set up at the venue by the referee Taiwan area” inside the mouth, connected through the embedded line and the control room, can perfect the operating personnel and the separation of functions, the referee may all score, timing and other operations in the independent system, all the content score is immediately displayed on the big screen, at the same time, the stadium managers can control the display of the broadcast content, such as a screen display than another screen display, animation and so on.



Figure 6 – Full color LED electronic display screen

Full color LED electronic display, mainly used to play on the field of wonderful scenes in the game scene, or slow motion replay live wonderful close-up, or the use of 3D animation mode and a sports tournament. Two electronic display screen can be used as a timing and scoring display, they can be connected with the timing and scoring system, through the display of text or text and animation graphics to the audience to show the current player’s related message. In general, the information display and control system compatibility, to achieve the integration of computer, game, the referee, referee, stadium News Center, formed a systematic information resource sharing and network facilities, various activities and competitions can efficiently serve the entire stadium.

4. The characteristics of the intelligent system in Gymnasium

Through the analysis of the intelligent system of the gymnasium, it can be seen that the intelligent system of the high gymnasium should be based on the practice teaching and

the fitness movement of the general population. On the basis of this, we should have a strong scalability to meet the needs of the national movement. Therefore, the University Gymnasium intelligent system cannot be translated into the ordinary Intelligent Building intelligent system, but also cannot be separated from the needs of sports activities and other expansion activities for intelligent and intelligent. University Gymnasium intelligent system has been integrated into a highly integrated, collaborative work of the organic whole, it has a multi media full power, intelligent integration, expansion and compatibility, innovative applications and other advantages.

1. Professional

In addition to the need for competition and training, the University Gymnasium also needs to carry out practical teaching and functional diversification. Its special function determines its unique professional compared with other common building intelligent systems. Intelligent system design should focus on various training and competition needs to be designed, the game features and rules based on the needs of the various needs of the decision must conform to the coaches and athletes, referees, journalists, and other guests, the audience. Secondly, the demand for practical teaching and the use of multi functional, but also makes it intelligent system must have a strong flexibility and flexibility to meet the needs of the broad masses of people. Compared to other intelligent buildings, its strict requirements of professional and flexibility are not common.

2. Focus

In the design and implementation of the general intelligent building, building automation system as an important point to evaluate the energy saving and convenience of an intelligent building, in the intelligent system, a large proportion of. In the intelligent system of University Gymnasium, its outstanding system into a comprehensive wiring system, information display and control system, lighting and control system and timing and field performance processing system, match statistics system, television and live commentary system is directly related with sports. In the aspect of outstanding construction, building related equipment management is generally focused on the Intelligent Building, and University Gymnasium intelligent system emphasizes the system is associated with the competition and training of sports activities. University Gymnasium intelligent system should be tightly in compliance with demand, sports activities focused, concise and to the point is the basic principle, the design not overdo sth..

3. Technology is complex

University Gymnasium intelligent system generally consists of more than and 20 subsystems, and also by professional sports, computer application, electronic control, optical principle, acoustics principle, network information transmission is composed of professional, technological content of their complex technology and high has become the difficulties and characteristics of the construction of the stadium intelligent system. A successful College Gymnasium intelligent system is the result of the cooperation, joint efforts and development of these professional staff. The intelligent system in the gymnasium is both independent and interdependent. When the design needs of all intelligent stadium of the system considering the configuration between combination and linkage between each other, to guarantee the unity, at the same time, but also to ensure its advanced design, advance.

4. The pipeline is complicated

The sign of the intelligent system of the University Gymnasium is the support system of sports activities. These systems are independent of each other, but they are interrelated, therefore, in the design of the time, the need for a variety of pre buried pipeline, the need to consider adequate reserve space. The various types of sports activities lead to a lot of sports support system need temporary adjustment, increase the demand for system flexibility, but also increased the demand for flexibility of the pipeline. At the same time, due to the arrangement of the intelligent system in the venue, only around the intelligent layout system in the stadium, resulting in long distance communication between the various systems, to ensure the reliability of multi site communication is a big problem.

5. Conclusion

Intelligent system of stadium mostly borrowed from the design at home and abroad venues, from a system point of view to the overall planning of the whole university gymnasium intelligent system, strengthen the system integration and linkage, make it better for the sports teaching, training and competition of sports leisure service, is the key point of the research and development of intelligent system of stadium. Generally speaking, the intelligent construction of the gymnasium in our country is still in the primary stage, and there is still much room for development. In the design process, the design of the content is not clear, the design basis is complete, construction drawings and other relevant documents lack of content, the blind pursuit of "leading", "high technology", and did not pay attention to the applicability and practical problems; we should ensure the synchronous design and design of the gymnasium in intelligent system. In the design, the use of intelligent system integration of advanced technology, mature and practical; the intelligent system of stadium management and unified monitoring; using the standard and open the system equipment, which has enough flexibility and scalability. The system design should be functional and practical, advanced technology, mature, reasonable economy, safety and reliability, convenient construction and maintenance, environmental protection, energy saving and sustainable development.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 11/04/2016
Aceitação/Acceptance: 14/07/2016

Evaluation of Water Resources Carrying Capacity based on Data Mining and AHP Method

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Pages: 93–105

Abstract: With the development of information technology, large data network has been widely used in various fields of social economy. In this paper, the authors make evaluation of water resources carrying capacity based on data mining and AHP method. With the rapid development of social economy, the demand for water resources is increasing. Target of Water resources carrying capacity is to find out the optimal scale of development and utilization of water resources. Through the empirical analysis, we constructed the comprehensive evaluation index of water resources carrying capacity. The index system includes water resources condition, water environment development and utilization, water resource management, water environment condition. On the basis of this, we put forward some relevant suggestions.

Keywords: Water resources, Data Mining, Analytic hierarchy process, Indicator system, Bearing capacity

1. Introduction

Water is the source of human life, water resources of the whole area accounts for about 71% of the total area, but in the coverage area, there are about 98% of the water resources is the human cannot drink water (Bing, 2015). From this point of view, there are at least nearly one billion and four hundred million people do not have enough water resources can be used. With the rapid development of social economy, the number of the world's population continues to rise; the demand for water resources is increasing (Hui, 2014; Kesang, 2015). China's water consumption reached 681 billion 400 million cubic meters, of which the Yangtze River Basin's water consumption is the largest, with second in the Yellow River Basin; the third is the Pearl River basin (Li, 2014; Mora, 2014). In recent years, with the influence of climate change and human activities, the quantity of water resources in China has been declining, and the demand of water resources with the economic development of our country is increasing, which exacerbated the contradiction between supply and demand of water resources, and restricts the healthy development of national economy (Salvatore, 2015; Sun,2015). In this situation, how to use water

resources reasonably is the most important one, so the concept of water resources carrying capacity is appeared, which is the natural combination of the bearing capacity concept and the water resources field. Now, the water resources carrying capacity is not very clear, many researchers have made different interpretation of water resources carrying capacity because of the different research objectives.

The analytic hierarchy process is a very practical method for multi project or multi objective decision making. The most prominent feature of this method is that it is a reasonable decision between the qualitative and quantitative decision skillfully integrates, referring to the thought and psychological law on the decision level and the number of partitions (Wang, 2014). Main problems of water resources are less total water resources, rainfall is not the average, with the water more and the upper reaches of the river to bring the less, have a lot of exploitation of groundwater and groundwater are serious water quality problems, the current situation is one disaster after another (Wang, 2013; Zhang, 2013). In the process of development of water resources for a long time, we carried out a number of water conservancy project, the project was originally established, in order to protect water resources, water resources, protect the environment better, improve the bearing capacity of water resources, the initial implementation of these projects results are satisfactory, but with the rapid development of the natural environment the change and the economy, the original planning pattern cannot well adapt to the social changes. This study discussed the carrying capacity of water resources in Zhengzhou city, according to the principle of establishing the evaluation index system and the basic situation of Zhengzhou City, and set up a suitable evaluation index system of water resources carrying capacity in Zhengzhou city. Based on the fuzzy analytic hierarchy process and water resources carrying capacity evaluation index system, the present situation of water resources carrying capacity in Zhengzhou is evaluated. According to the current situation of water resources carrying capacity can be better planning, development and conservation of water resources, has a certain practical significance.

2. Water resources carrying capacity

2.1. The basic concept

In the world, the definition of water energy carrying capacity is not consistent. To explore the concept of analytic most experts issued a statement, generally divided into three categories, the first category is the water energy to maximize the support of the whole society economy healthy and harmonious development of the competence theory, most experts agree that this concept, although they have recognized the water energy capacity is to limit the number of the population as the basis, but they the average overall efficiency level is also in favor of residents and population size are corresponding to each other, in other words, to the healthy and harmonious development as the foundation, the so-called “maximum” refers to the best state of development. Generally agree with the above point of view. In a limited time of use water energy exploitation, maintaining the ecological development at the same time, also can ensure that the best economic model for future development; second is the theory about water resource acquisition development scale, the scale of development theory refers to the current domestic social and economic development and water resources total quantity as the basis, the distribution of the appropriate means, and get to the formal channels of the development of water resources for a large number of developers use to get the maximum area.

Normally, we use the amount of water resources can be collected as water resources. In the beginning of the use of the first to maintain the basic needs of the social ecology, and secondly to maintain the balance of the people's water. In a range of technical and economic level and social development, water can within the scope of supply to the industrial and agricultural production, power group people normal life and ecological environment maintenance etc., known as the largest mining area water resources; the third is water energy to withstand the most human number theory. In a limited range of developed economy, science and technology, the water can be fixed in the social and economic development, maintain a good social development, and also the largest range of supply to the residents, the maximum capacity of residents.

By many experts are described in this paper is defined on the carrying capacity of water resources is in the specific area of water energy in the specific historical period of development, with the advance of science and technology, to understand the social and economic development level as the basis, establish the sustainable development rules, to maintain the good ecological environment as a prerequisite for the development. The appropriate allocation of use to the regional economic development can bring the best support.

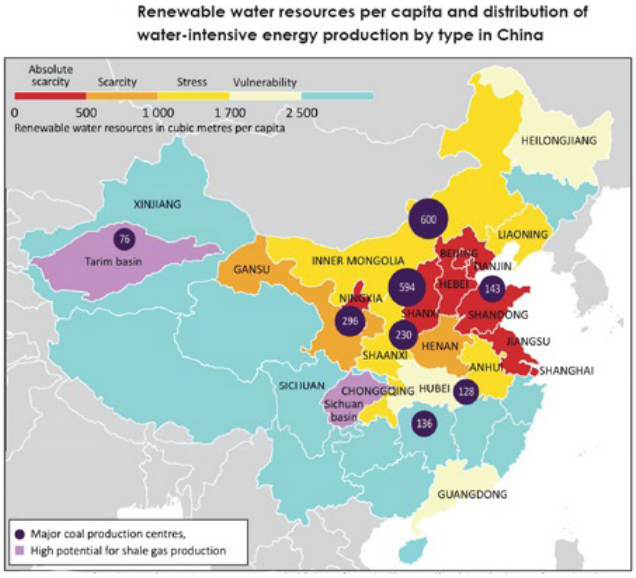


Figure 1 – Current situation of water resources in China

2.2. Main components of water resources carrying capacity

1. ***Ingredients:*** social and economic development of social and economic development capacity of water energy under fixed component field reflected in the following aspects, the first is associated with the principle of economic development of the whole society, and residents' consumption habits and consumption levels linked to the final is the use of population quantity and the corresponding social and economic development level and living standards to

match. The purpose of social and economic development is not the same, reflects the ability to bear is not the same. Followed by the field of water resources under the power of the expected, economic and technological standards is a basis for development. The expected level of science and technology refers to the level of water resources in the use and control of water, the level of water resources in the field of. Finally the water energy capacity is obtained by proper distribution. However, such allocation is a kind of symbolic social and economic development.

2. ***Sustainable development:*** Research on the sustainable development of water resources in the field of sustainable development. The basic requirements of energy control of water bearing capacity is "good progress" to maintain the social environment, the number of residents and the development of regulations supporting method of social and economic development as a "continuous support", all show the ability of sustainable internal water energy bearing area.
3. ***Spatial and temporal development of components:*** for regional water energy is concerned, a larger advantage is the development of space and time. The first is the problem in the field of exploration, the need for exploration in the field, should not have the influx of fresh water from the outside, just need the local water energy; second is how much water energy should be the same, different areas of water resources should be adjusted according to the water quality capacity of culture, terrain, weather and other conditions.

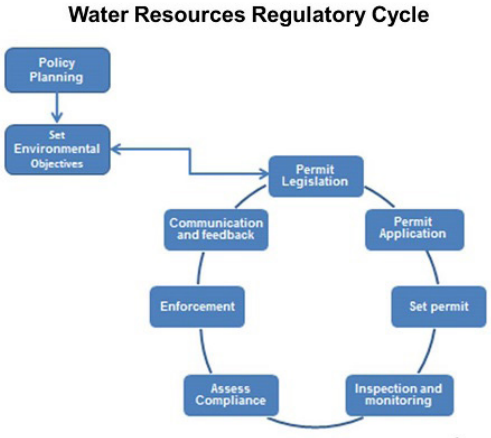


Figure 2 – Water cycle process

2.3. Characteristics of regional water resources carrying capacity

- ***Limited:*** although the earth, water resources can be through the atmospheric circulation, rainfall and other means in the sky, land, ocean between the circular motion, the theory is never exhausted. But in a certain area, the total amount of water resources is not changed, there is a limit on the amount of the above conditions. In a short period of time, no large-scale increase or decrease, so in a region, water resources have a limited bearing capacity.

- ***Change:*** with the development of time, the carrying capacity of water resources will change. As in some of the more precipitation period, the area will increase the amount of water, then its bearing capacity will be enhanced; and in some of the time period of precipitation, the region's water decreased, the carrying capacity of the weak. The very important point of its carrying capacity is that it has a variety of changes.
- ***Can be strengthened:*** Science and technology in the development of human society has played a great role in the past, is now, the future is also. In the future society, management and technology will continue to move forward, there is something more advanced, then the utilization rate of water resources will be further improved, and some cannot use the previous water resources like deep groundwater can be developed, so the capacity will continue to strengthen.
- ***With the upper limit:*** in a certain period of time, all aspects of human society will not happen too much change in the use of water resources, there will not be much progress. Also because the water is limited, so it can withstand the maximum value will not change, we cannot exceed this value, once exceeded, it will break the balance of the whole system, bringing irreparable loss.
- ***Not only:*** as the world now is a socialist country, a capitalist country, as well as the feudal state, social development in various countries is not the same way, showing diversified characteristics. With the development of the Internet and the world trade, the relations between countries have become closer, which leads to the situation of the social development of all countries become more complex. It is because of this reason, the use of water resources, there are many ways, not the only.

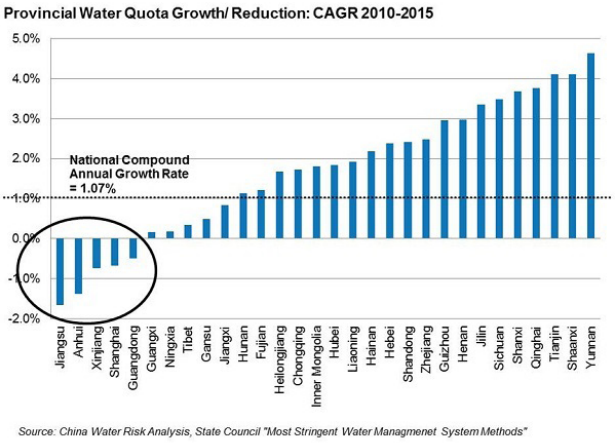


Figure 3 – Status of water resources in the provinces 2010-2015

3. Research method

Data mining (DM), also known as knowledge discovery in databases (KDD), is a non-trivial process to extract valid, novel, potentially useful and ultimately understandable patterns from large amounts of data in the. It combines database system, artificial

intelligence, statistics, machine learning, information science, etc., is a new interdisciplinary field of application.

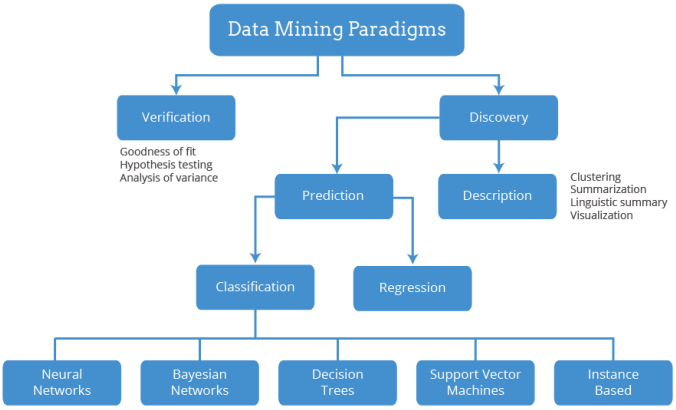


Figure 4 – Data mining

AHP method is a combination of qualitative and quantitative decision analysis technology; it is a complex problem to be identified into a number of levels. This is establishment of hierarchical structure model. In-depth analysis of the practical problems to be solved, the related factors from upper to lower layer (target to standards or indicators to plan or object), and the factors affected the lower factors, and each factor layer basically not affected, relatively independent. On the different structure of the judgment matrix to calculate the maximum eigenvalue and the vector value, it is through a series of indicators to determine the consistency of the matrix test. If the test is passed, then the feature vector as the weight vector; if it is detected, then need to re construct the matrix. Test by using the consistency ratio of the total sort. If you can, you can make decisions according to the results of the total ranking weight vector representation, otherwise you will need to reconsider the model or to re construct the larger pair wise comparison matrix of the consistency ratio CR.

Assuming that there are n needs of decision indicators, the decision maker through the analysis of the relative importance of these indicators to determine the indicators, construct a 22 comparison of the judgment matrix.

$$A = \left(\alpha_{ij}\right)_{n\times n} \tag{1}$$

Compared with the positive reciprocal judgment matrix, decision makers of i, j comparison, its important results for a_{ij}, we have the following relationship established:

$$a_{ij} = \frac{1}{a_{ji}} \tag{2}$$

$$a_{ii} = 1 \tag{3}$$

We all know that the matrix only through the test, through the calculation, in order to get the value of the weight. Therefore, the judgment matrix A in order to get the value of the weight, it is necessary to carry out the consistency test. When the detection of A is not passed, it is to re estimate the matrix, to re modify the parameters, to make appropriate adjustments. This process may need to run several times until qualified.

At present, there are two methods of testing:

1 Reciprocal judgment

If A meet:

$$\alpha_{ij} = \frac{\alpha_{ik}}{\alpha_{kj}} \left(\forall i,k,k = 1,2\ldots,n \right) \tag{4}$$

Call the consistency matrix. However, for the mutual matrix lmax³n anyway, so you can make full use of (lmax-n) to test A.

$$CI = \frac{\lambda_{\max} - n}{n-1} \tag{5}$$

If the consistency of the matrix is poor, then the CI value will be great. Therefore, RI is introduced. The consistency ratio is defined as follows:

$$C.R. = \frac{C.I.}{R.I.} \tag{6}$$

CI / RI is called the consistency ratio, which is the result of a parameter of the consistency check of the expression matrix. When the CR£0.1, we say that the matrix consistency inspection has the front process through several rounds of revision, until the consistency inspection.

2 Fuzzy complementary judgment

Compatibility index must be proposed in this method. This index usually has important reference value for fuzzy complementary judgment. Compatibility index solution is a complex process, but Xu Zeshui has been derived practical solution formula. The solution is as follows:

$$w_i = \frac{\sum_{j=1}^{n} \alpha_{ij} + \frac{n}{2} - 1}{n(n-1)} \tag{7}$$

Therefore, we detect the following order: first, the corresponding transformation formula between the intuitionistic fuzzy judgment matrix and the fuzzy judgment matrix:

$$r = \frac{u}{u+v} \tag{8}$$

Secondly, the consistency of the transformed matrix is tested. If the test is qualified, it can be considered that the original matrix is in conformity with the consistency. Finally, use the consistency test formula mentioned above to test the weight formula and judge whether it is reasonable or not. If B, A are all fuzzy judgment matrix, then there are:

$$I(A,B) = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}\left|a_{ij} + b_{ij} - 1\right|}{n^2} \tag{9}$$

$$A^{*} = \left(w_{ij}\right)_{n\times n} \tag{10}$$

The A after the first request this feature vector and the maximum value of lmax. If the matrix is consistent with the consistency, the corresponding weight vector W is bound to be obtained after the normalization of the column. The calculation of Max according to the following formula:

$$\lambda_{\max} = \sum_{i=1}^{n}\frac{(Aw)_i}{nw_i} \tag{11}$$

If the value of the property for the reliable alternative is known, then it is easy to solve. As long as these options are selected according to a fixed index to be arranged, and the best program can be selected. However, if the attribute chosen we want to know the value is difficult to quantify, or cannot be quantified, it can only choose a stupid and complete method: 22 comparison of each program attributes, than the weight of the size, and then through the comprehensive calculation, the comprehensive results of each chosen, finally the pros and cons order. However, the theory is the theory, when in the application; we will be based on the decision of the impact of more factors.

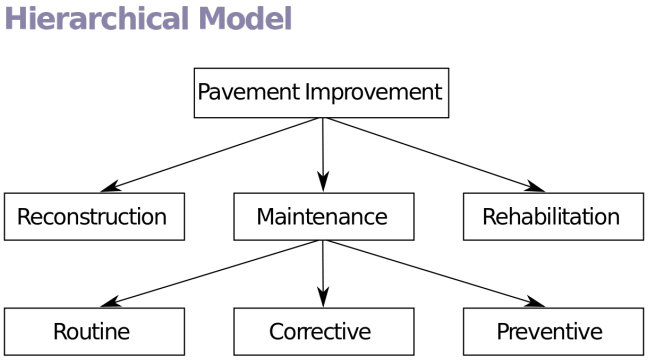


Figure 5 – Hierarchy model

4. Evaluation of water resources carrying capacity

4.1. The indicator system

The index system of water resources carrying capacity is not only the basis of the evaluation of water resources carrying capacity, but also a decision-making tool. Therefore, the choice of indicators should follow the following principles: first, to the regional evaluation of the main body of comprehensive evaluation. The evaluation, both natural and human factors, current situation and development prospect, water quantity and water quality, objective conditions and utilization management level; secondly, to index decision variables; thirdly, population and economy is the most directly reflects the water resources carrying capacity size; finally, because change of character factors of water. Resources carrying capacity evaluation index system must be dynamic; the index should be with the social and economic development and change. According to the classification value table, combined with the specific data of water resources, and then calculate the weight of the index elements, you can get the Zhengzhou water resources carrying capacity rating.

Criterion layer B	Index layer C	V1	V2	V3
B1	*Per capita water resources*	>1600	1600~500	<500
	Water availability	>500	500~300	<5300
	Fine rate of water quality	>75	75~40	<540
B2	*Water resources development rate*	<35	35~80	>80
	Groundwater exploitation rate	<35	35~75	>75
	Water supply modulus	<15	15~65	>65
	Modulus of water demand	<15	15~65	>65
B3	*Water conservancy investment coefficient*	>1	1~0.1	<50.1
	Integrity rate of water conservancy project	>90	90~80	<80
	Water price	>4	4~2	<2
B4	*Sewage runoff ratio*	<2	2~10	>10
	Water rate of ecological environment	>5	5~2	<2
	Sewage treatment rate	>60	70~45	<45

Table 1 – Comprehensive evaluation index

4.2. Calculate weight

The establishment of intuitionistic fuzzy hierarchy analysis method of water resources in Zhengzhou city carrying capacity evaluation model based on the first to build a hierarchical structure, hierarchical structure is divided into three layers, the first layer is the target layer refers to the evaluation of water resources carrying capacity in Zhengzhou City, the second layer rule layer refers to an index of water resource conditions, development and utilization of water environment the management of water resources, water ecological environment. The third layer index layer is two indicators, per capita water resources per capita, the amount of available water resources, water quality rate, the rate of development and utilization of water resources, groundwater exploitation rate, water supply modulus, modulus of water demand, water conservancy investment coefficient, water pollution, water conservancy project intact rate, diameter ratio, ecological and environmental water use rate, sewage treatment rate. Based on the comparison of the 22 methods, the relationship between the same layer and the upper layer is compared, and the intuitionistic fuzzy complementary judgment matrix is established. The second layer of the matrix is expressed as follows:

$$A=\begin{pmatrix} 0.5 & (0.6,0.3) & (0.9,0.1) & (0.7,0.2) \\ (0.3,0.6) & 0.5 & (0.6,0.3) & (0.8,0.1) \\ (0.1,0.9) & (0.3,0.6) & 0.5 & (0.6,0.3) \\ (0.2,0.7) & (0.1,0.8) & (0.3,0.6) & 0.5 \end{pmatrix}$$

Can get third layers of matrix representation:

$$B_1=\begin{pmatrix} 0.5 & (0.9,0.1) & (0.6,0.3) \\ (0.1,0.9) & 0.5 & (0.7,0.2) \\ (0.3,0.6) & (0.2,0.7) & 0.5 \end{pmatrix}$$

$$B_2=\begin{pmatrix} 0.5 & (0.7,0.2) & (0.9,0.1) & (0.8,0.2) \\ (0.2,0.7) & 0.5 & (0.6,0.2) & (0.5,0.4) \\ (0.1,0.9) & (0.3,0.6) & 0.5 & (0.8,0.1) \\ (0.2,0.8) & (0.4,0.5) & (0.1,0.8) & 0.5 \end{pmatrix}$$

$$B_3=\begin{pmatrix} 0.5 & (0.7,0.3) & (0.6,0.4) \\ (0.3,0.7) & 0.5 & (0.9,0.1) \\ (0.4,0.6) & (0.1,0.9) & 0.5 \end{pmatrix}$$

$$B_4=\begin{pmatrix} 0.5 & (0.8,0.2) & (0.4,0.3) \\ (0.2,0.8) & 0.5 & (0.1,0.8) \\ (0.6,0.4) & (0.8,0.1) & 0.5 \end{pmatrix}$$

A fuzzy analytic hierarchy process is used to get the first rank weights:

$$W(1) =(0.5324, 0.2657,0.0647,0.0793$$

Table 1 the classification value table according to the membership degree of the comprehensive evaluation index of each evaluation index statistical value:

Criterion layer B	Index layer C	2010	2015
B1	*Per capita water resources*	158.1	165.3
	Water availability	196.2	203.7
	Fine rate of water quality	27	33
B2	*Water resources development rate*	82. 4	81.5
	Groundwater exploitation rate	86.6	85.8
	Water supply modulus	15.3	20.1
	Modulus of water demand	23.2	25.7
B3	*Water conservancy investment coefficient*	0.12	0.16
	Integrity rate of water conservancy project	74	83
	Water price	2.4	4.1
B4	*Sewage runoff ratio*	7	8
	Water rate of ecological environment	0.09	0.12
	Sewage treatment rate	48.7	65.4

Table 2 – Statistical value of each evaluation index

In order to objectively understand the evaluation results of water resources carrying capacity of water resources, here are the scores shown in Table 3, according to the evaluation results, compared with the above three methods, it can be found that the water resources carrying capacity evaluation index itself is in a fuzzy environment, so AHP will be more accurate and objective result. However, although the results are not the same, but the above data show that in 2014 the development and utilization of water resources have reached a considerable scale. Two indicators of V3 membership that the existing technology of social economy, the local water resources is relatively small, has been seriously over exploitation of groundwater, rivers and lakes water quality deteriorated, the further development and utilization of water resources potential is very small. Later, with the development of city economy, industrial water growing, watershed water gradually reduced, the total water supply increased year by year, water supply has been difficult to bear the social development demand for water resources, water resources carrying capacity will be decreased year by year.

Year	V1	V2	V3	score
2010	0.2468	0.2311	0.5837	0.1238
2015	0.1230	0.0476	0.2491	0.0614

Table 3 – Water resources carrying capacity based on AHP

5. Conclusion

In this paper, the evaluation model of water resources carrying capacity was constructed based on the direct analysis method and the evaluation index system of water resources carrying capacity, and the water resources carrying capacity of Zhengzhou city was evaluated and the improvement measures were put forward. Adequate water conservancy project is an effective method to adjust the uneven temporal and spatial distribution of regional water resources. As the population of Zhengzhou City, the economy has long been in the stage of rapid growth, the construction of water supply projects cannot meet the needs of people's lives and social economy and the ecological environment of water. Therefore, we should strengthen the river basin and the basin outside the two ways to increase the number of regional water resources in the basin, increase refers to the construction of reservoirs and other water conservancy facilities, improve the basin refers to the inter basin water transfer, here special guide to North Water Diversion project. The construction of these projects should co-ordinate arrangements in the premise of reasonable arrangement of population, water resources, social economy and ecological environment coordinated development, and increase the water supply project funds, in order to maintain the local social economy continue to rapid development.

Acknowledgments

This study is supported by the Ministry of water resources public welfare industry special fund project (201501008): Management model of groundwater resources protection and restoration in Haihe River basin; Henan province university science and technology innovation talent support plan: Study on the organic pollution and health risk assessment of groundwater in Henan province (13HASTIT035).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 12/04/2016
Aceitação/Acceptance: 02/07/2016

Research on the Influencing Factors of Rural Financial Development based on Data Mining Technology

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Pages: 106–116

Abstract: With the rapid development of Internet and computer technology, data showed explosive growth; data mining can extract valuable information from these massive, heterogeneous and random data, and discover patterns of user interest. In this paper, the author research on the influencing factors of rural financial development based on data mining technology. Through empirical analysis, the results show that the regional development difference of rural finance in China is expanding. The result of dynamic panel model shows that the development level of rural finance has a significant hysteresis characteristic. Therefore, the government should strengthen macro-control, and promote the sustainable development of rural finance.

Keywords: Data Mining, Rural finance, Development difference, Influencing factors

1. Introduction

In recent years, the Internet and the rapid development of computer technology, which produces around us data showed explosive growth, especially after the rise of the intelligent mobile phone as the representative of the mobile Internet technology is more obvious (Clark, 2006). Faced with such a large scale of data, data analysis and processing has become a huge problem, which gives the opportunity to develop the data mining (Chen, 2007; Levine,2000). Data mining can extract the valuable information from the massive, heterogeneous and random data, and find the model of user's interest. Data mining is a process of knowledge discovery, specifically refers to the massive data analysis and summary, get useful information. Traditional data mining technology in the processing of massive data is often too long, the emergence of cloud computing for data mining has brought the way to solve this problem(Chen,2009). Cloud computing physics is often based on large clusters or large-scale data centers, through the scale of the advantages of cloud computing can provide a powerful and inexpensive computing power, cheap storage network. Moreover, the public cloud also allows a large number of users to obtain their required computing resources at the same time.

China is a developing country with a large population and regional differences, regional development is not balanced has become an important issue facing China's current economic development. Especially since the reform and opening up, with the rapid growth

of the total economy, but the economic development gap between regions was gradually increased, economic and social problems caused by gradually emerge, the imbalance of regional economic development has become an important obstacle of coordinated economic and social development in our country (González, 2015). Early scholars found that China's regional financial development and economic development has a significant correlation, the level of financial development, to maintain rapid and stable economic growth cannot be ignored. With the rapid development of modern agriculture, farmers and rural small and medium-sized enterprises and various forms of cooperation management the main demand of development funds is also growing, the development of the rural finance service carrying more social responsibility of agricultural development(Li,2007). Under this background, the laws of the market demand supply decisions based on the Keynes doctrine, rural finance has also made rapid development in recent years, the balance of agricultural development is related to China's economic and social development of fast and stable (Townsend, 2006). The imbalance of rural finance's regional development will bring certain influence to our country's economic and social development. First, the imbalance of regional development of rural finance will aggravate the imbalance of economic development in rural areas, resulting in the coexistence of modern agriculture and agriculture. Second, moderate rural financial differences in regional development is conducive to the promotion of capital flows, but excessive regional development differences may affect the stability of the financial market, the formation of rural financial market polarization.

2. Data mining based on Cloud Computing

2.1. Cloud Computing

Cloud computing, massive data information and powerful computing and data processing ability has provided strong support for data mining, the system has many previous data mining systems do not have the advantage of cloud based data mining, enterprises and individual users of the data mining task provides a good solution. The use of cloud computing has incomparable advantages of common network, such as resource sharing, data security, powerful performance, cost reduction and so on.

- Resource sharing: cloud computing can be connected to all the computer and other hardware devices and software, data information and other resources to conduct a unified scheduling management. For users, the cloud can be considered unlimited, you can always use the resources required to use the cloud, and by the use of the amount paid. Users can also have their own hardware and software resources sharing to the cloud, become a part of the shared resources, and the authority of effective management strategies can allow users to share their resources with the specified user safely, will not cause information leakage.
- Data security: the user will own the information into the cloud, data security and reliability will be greatly enhanced. Professional team will be on the cloud data information maintenance and management, users do not have to worry about data corruption, virus and other issues.
- Powerful performance: through the network connection of the computer and various hardware devices to form a super server performance, can provide powerful computing and data processing abilities for users, it is difficult to stand on a personal computer.



Figure 1 – Cloud computing

- Low cost: the enterprise does not need to buy expensive hardware equipment, hire the cloud equipment to be able to build their own information platform.
- Service excellence: cloud computing to provide users with excellent service, users can easily build their own platform for data storage or sharing. At the same time, it is very convenient to use, users only need to accurately grasp their true intentions, other can be handed over to the computer or other terminal to complete.

Cloud computing can provide users with a variety of excellent services, according to the level of service provided by the different we can be divided into three categories: infrastructure layer services, platform layer services, application layer services. Infrastructure layer services mainly refer to the network of computers and a variety of hardware resources. Platform level of service is the system platform or development environment as a service provider to the user. Application layer service mainly refers to

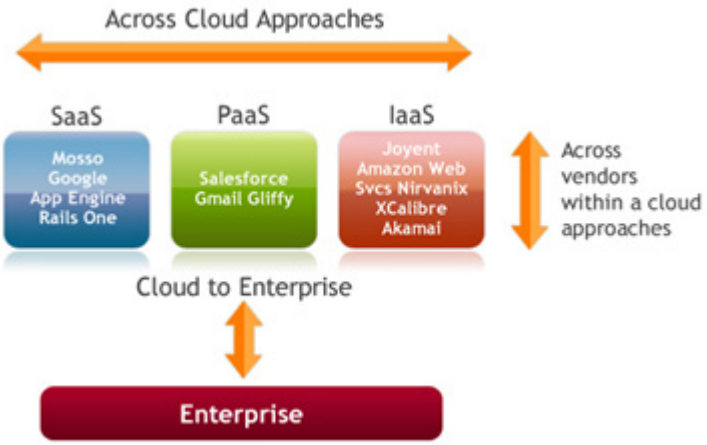


Figure 2 – Cloud computing framework

all kinds of application software, for users, instead of buying all kinds of software, can use the software provided by the network provider, and you don't have to maintain the software provider, this is the thing to do. In addition to the application software, the data itself can become a service, you can provide the original data or processed data to the user, the user simply by the use of pay.

2.2. Data mining algorithm

Algorithm is the soul of the data mining, only the most effective data mining algorithm to better complete the data mining tasks, so that the goal is meaningful. But there are many kinds of data mining algorithms, which is the most effective is to be based on the specific circumstances. Because there are many kinds of data types, mining of different types of data is not the same algorithm, there is no algorithm can be used in all types of data. The same applies to some type of data mining algorithm, the results are not the same. The data for a single type of mining often exists only in the experiment, is the ideal state, in reality we usually need for various types of data mining at the same time, it is more complex, so in practice, according to the data types and algorithms are considered. In order to find the appropriate mining algorithm is very important. In general, we will use a variety of algorithms for data mining, and may even improve the existing algorithms or create new algorithms to achieve better results. Starting from the type of data mining, we can divide the data mining algorithm into the following categories:

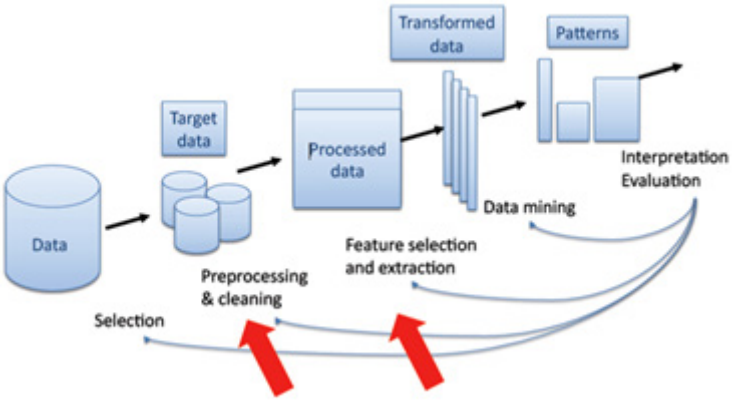


Figure 3 – Data mining process

Classification algorithm: the main purpose of a classification algorithm is based on the existing data mining to find other types of data, and analysis of existing data sets and new data, and then find the principle of data classification. This principle can be used to classify the data after the accession. The classification algorithm is mainly applied to the relational data which is composed of the tuple.

Cluster analysis: the main purpose of clustering analysis is from the underlying data found in the meaningful data distribution pattern of new and existing data process is not specified in advance grouping rules, according to the data characteristics are divided into different groups to mining. Cluster analysis is mainly used for relational data composed of tuple.

Association Rules: the main purpose of the association rules is to find interesting association or correlation relationships among a large set of data items. The data types of association rules are relatively large, which are mainly applicable to transaction type, transaction type and relational data. The most suitable variable types of association rules are Boolean and numerical values.

Similarity search model based on this algorithm is applied to text type and time of two kinds of data used in the text data is mainly used in text similarity search; time data, is mainly embodied by mining time series database to find the time series of knowledge.

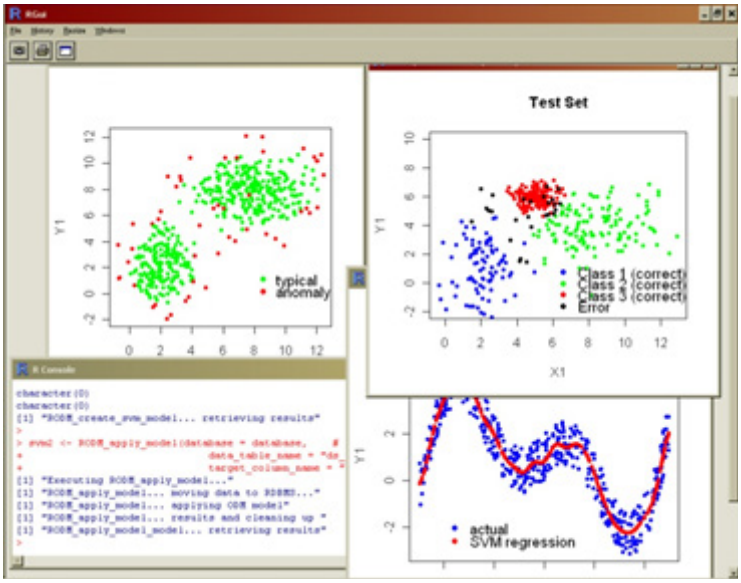


Figure 4 – Data mining software analysis

Cloud computing platform based on data mining is a perfect combination of cloud computing and data mining, which has all the advantages of cloud computing, but also has powerful data mining capabilities, provide strong support for cloud computing, data mining, data mining and data computing makes cloud computing management ability has been greatly improved, cloud computing and data mining should complement each other. The data mining platform based on cloud computing is a complex and rich content service system. Mainly consists of four subsystems, a server group and a database. Cloud computing platform based on data mining and give full play to the service model of cloud computing, data mining can provide better services only on the whole, and any subsystem of the system can also provide individual service to users.

3. Rural financial regional development differences

3.1. Index analysis

The research of this paper is to study on the differences of regional development in rural finance, and convergence, the differences of regional development in rural finance future

trends do not make too much research, and this measure therefore only as auxiliary to understand the difference of regional financial development in rural areas, because of the exclusion method to construct complex econometric model; in in this paper the inequality index as a measure of the Theil index. Theil index method as a measure of individual or regional differences between the indicators cited by many scholars, its biggest advantage is the difference of regional development can be decomposed, helps measure gap gap within the groups and between groups to the total gap contribution to help us understand the difference of regional development, this paper uses Theil index method to measure the differences of regional development in rural finance, will help us have a more clear understanding of the differences between regions, China's rural financial regional differences as well as the two contribution to total variance. The basic form of the index is set as follows:

$$TL = \sum_i \left(\frac{CD_i}{CD} \ln \frac{CD_i / CD}{AGDP_i / AGDP} \right)$$

Where TL is the Theil index, CD for the rural loan and the data from the provinces and cities and agricultural businesses, rural credit cooperatives, agricultural bank, Agricultural Development Bank of China in agricultural loans and to measure the AGDP, GDP for the agricultural regions, taking into account the existing township enterprises more cross-border business and the main business and agriculture mostly irrelevant, so using only the total output value of animal husbandry and fishery around as a measure of agricultural GDP. The value of the index value is composed of the difference in the area and the difference in the region, among which the regional difference is expressed:

$$TL_{BE} = \frac{CD_E}{CD} \ln \frac{CD_E / CD}{AGDP_E / AGDP} + \frac{CD_C}{CD} \ln \frac{CD_C / CD}{AGDP_C / AGDP} + \frac{CD_W}{CD} \ln \frac{CD_W / CD}{AGDP_W / AGDP}$$

Regional difference is:

$$TL_{IN} = \frac{CD_E}{CD} \frac{TL_E}{TL} + \frac{CD_C}{CD} \frac{TL_C}{TL} + \frac{CD_W}{CD} \frac{TL_W}{TL}$$

The Theil index value is:

$$TL = TL_{BE} + TL_{IN}$$

The entropy is based on entropy, which can effectively reflect the differences between individuals. The greater the value of the index, the more obvious is the difference among the individuals.

3.2. Data results

On the whole, the Theil index overall difference values were higher than 0.314, and differences in the degree of regional development in rural finance than the financial

industry to a high degree of difference. It can be seen that the contribution of the regional differences in the overall differences accounted for the vast majority, the overall trend of decline in volatility; regional differences have been maintained at a relatively low level, and there is a slight downward trend. China's overall regional differences in rural financial development in the eastern region than the Midwest higher and more stable; there is an upward trend in differences in the development of the central region, to 2011 has been close to the different level of the eastern region; development of the western region rural financial development is slow, the development of little difference and the difference level of a downward trend. Overall, the development level of the difference between the three regions is more balanced in the rural finance, except the western region because of differences in development level due to low degree of development between the eastern introverted, little difference in the development of China's rural finance regional differences. This shows that the overall domestic regional financial development differences exists between the East and the central and western regions, not for the different regions show different results; in addition the regional imbalance shows a smaller range imbalance is more obvious, suggesting that the regional development of China's rural financial imbalance has become a problem worthy of attention.

Year	Eastern region	Central region	Western region	Overall difference
2006	0.079	0.051	0.055	0.368
2007	0.086	0.054	0.063	0.374
2008	0.114	0.065	0.123	0.375
2009	0.086	0.076	0.054	0.315
2010	0.074	0.085	0.054	0.323
2011	0.085	0.072	0.078	0.342
2012	0.087	0.067	0.035	0.341
2013	0.085	0.064	0.041	0.368
2014	0.089	0.076	0.032	0.335
2015	0.095	0.085	0.022	0.315

Table 1 – The regional rural financial development difference between 2006 - 2015 years

4. Empirical analysis

4.1. Descriptive statistics

The use of Stata statistical software for data analysis, selection of China's provinces, municipalities and autonomous regions during 2006-2015 of various statistical data, calculated by analyzing the required variables in the calculation process, the variables of the units are using the standards of National Bureau of statistics units were normalized. Descriptive statistics for each variable are shown in table 2. In order to verify the existence of multiple linear problems, this paper calculated the Pearson correlation coefficient of each variable, and found that the correlation coefficient of each variable was lower.

Variable	Classification	Average value	Standard deviation	Minimum value	Maximum value
FIR	*WH*	2.687196	1.121862	0.315967	6.795419
	BE		1.056843	0.545755	4.515982
	IN		0.457891	0.545486	4.535749
Edu	*WH*	8.234641	0.678452	5.14867	9.145623
	BE		0.665286	5.628332	8.445287
	IN		0.347881	6.264826	8.630423
Inft	*WH*	1562.246	1014.145	200.521	6255.87
	BE		724.4852	681.4562	3256.254
	IN		709.5862	433.458	4152.451
Pgdp	*WH*	7142.928	4255.583	1350.91	27562.8
	BE		2256.154	2452.838	13584.52
	IN		3124.181	423.1524	12503.07
Pexp	*WH*	3647.153	3025.475	614.510	11452.8
	BE		2245.456	2358.132	12431.08
	IN		2124.893	2039.02	14465.14
K1	*WH*	0.142045	0.92425	1.24526	3.55342
	BE		0.94285	1.2337	3.415624
	IN		0.133077	0.34253	0.57245
K2	*WH*	1.627149	1.245621	0.117364	8.37406
	BE		0.994522	0.624628	5.042587
	IN		0.825635	3.24528	5.22356

Table 2 – Descriptive statistics

4.2. Estimation results and analysis

Table 3 reports the estimation results of the model. The three models are static regression model, the model 1 and model 2 are fixed effect model and random effect model. The fixed effects model, F test results show that significant fixed effects model is better than the mixed OLS model; random effects model, we use Breusch and Pagan test results show that the random effects are also very significant, significant. Because of the random effects model in this paper requires variables associated with individual effects, and fixed effects model requires the explanatory variables are strictly exogenous, thus constructing a statistics to determine individual effects and explanatory variables related to whether can be used as a screening model for how to select. This paper use Hausman test paper in the domestic and foreign general for the use of the model, test results show that the covariance matrix is not positive, Hausman test results cannot be used as evaluation criteria, this paper also shows the results of the empirical report of fixed and random effect model analysis results, in addition to the difference of K1 coefficient is large, the results of two models the difference is not great, the fixed effect

model and random effect model has certain adaptability. However, due to the choice of this paper is the province of the country, which belongs to the whole sample analysis, in this case, the choice of fixed effect model is more suitable.

Usually, the panel data of possible heteroscedasticity and autocorrelation problem, this paper uses the Wooldridge model test of self related issues, to accept the null hypothesis that the results, since the model and related issues is not obvious. In addition, we use the likelihood ratio test for heteroscedasticity was examined. The results show that the heteroscedasticity problem is more serious, in order to eliminate heteroscedasticity, we use generalized least squares method (FGLS) to estimate the model, to correct for heteroscedasticity. The results showed that the value of the log likelihood and Wald test were significant, indicating better model fitting effect; estimation of the explanatory variables are significant in 1% degree, that the education level of the region, regional commodity trading efficiency, regional informatization level, regional policy support and financial market transaction efficiency has a significant impact on the financial ratio, the economic development of the region the level has a weak reverse effect on financial development, which may be related to the following two factors: one is from weakness of agriculture itself on the economic growth effect is not obvious, according to scholars estimates, China's first industrial contribution rate through since 1990 began to gradually decline, to 2012 has dropped to below 10%, and the first the second industry of the third industry developed area accounted for reduction, slow development, thus leading to the level of economic development in the area of financial factors The development of the reverse effect of the two is the phenomenon of the outflow of funds in rural areas, the development of rural economy to promote the role of rural finance and cannot be reflected. Several other factors of financial development had a significant positive effect on this, we infer that there is a big relationship between location factors, degree and regional financial development economic development factors, political factors and the market, which is also consistent with the expectations of financial development theory.

Fixed effect model				**Random effects model**			
Variable	coefficient	T value	P value	Variable	coefficient	T value	P value
Edu	0.2566	2.18	0.025	Edu	0.3151	2.89	0.004
Inft	4.12E-05	1.23	0.257	Inft	0.0001	2.25	0.028
Pgdp	-5.05E-05	-4.11	0.000	Pgdp	-9.5E-05	-6.47	0.000
Pexp	0.0001	4.62	0.000	Pexp	0.0002	7.13	0.000
K1	-0.123	-0.58	0.458	K1	0.2142	3.20	0.003
K2	0.1561	4.26	0.000	K2	0.1566	5.17	0.000
Constant	-0.514	-0.57	0.426	Constant	-0.863	-1.12	0.178
R2-overall	0.3564	R2-overall	0.7219				
F value	9.15	F value	123.12				

Table 3 – Static model estimation results

Model 3 and model 4 use the dynamic panel data model to estimate the dynamic adjustment model, and the results are shown in table 4. Because of the financial development has a lagged effect, the financial ratio of first order lag explanatory variables into the equation of lag coefficient reflects the influence degree of the existing rural financial development level of rural financial development level of the next period. For the dynamic panel model, meet the needs of the residuals cannot exist assuming two order serial correlation, so this paper uses the Arellano and Bond test of two order serial correlation test, the results show that the two models are tested, there is no two order sequence.

DID-GMM				**SYS-GMM**			
Variable	coefficient	T value	P value	Variable	coefficient	T value	P value
FIR	0.1347	1.51	0.182	FIR	0.2783	5.22	0.000
Edu	0.6123	2.12	0.014	Edu	0.6547	4.05	0.000
Inft	2.41E-05	0.38	0.532	Inft	5.12E-05	1.02	0.254
Pgdp	-1.7E-05	-1.12	0.314	Pgdp	-5.4E-05	-2.35	0.024
Pexp	2.56E-05	1.24	0.272	Pexp	4.21E-05	2.47	0.000
K1	-0.244	-0.62	0.420	K1	0.4562	3.68	0.000
K2	0.3162	3.54	0.000	K2	0.2560	4.23	0.000
Constant	-2.583	-1.72	0.070	Constant	-4.15	-3.42	0. 000
Hansen	0.8643	Hansen	0.8812				
AR(2)-Z	0.5012	AR(2)-Z	0.6547				
Wald	31.42	Wald	142.15				

Table 4 – Dynamic model estimation results

Because of the financial development has certain influence on the issue of inertia, the degree of financial development on the stage of financial development is generally positive, affected by the financial development scale, financial development efficiency, the higher the degree of financial development of the regional financial development faster, so the regression coefficient lag should be positive. The influence of the rural financial development on the rural financial development in the last period is very significant, which is consistent with the expectations of financial development theory. At the same time, it also shows that the regional disparity of rural financial development may appear more and more, in order to avoid this phenomenon, the need to pay attention to the construction of strength increase rural financial development in backward areas, this has important policy implications on China's regulation of rural financial development. In addition, in this model, the level of regional information is not significant to explain the variables, the current stage of view, the level of information technology in rural areas to improve and cannot significantly improve the level of rural financial development.

5. Conclusion

The phenomenon of regional differences in the development of rural finance in China and there is more serious, the analysis from three angles of finance, financial deepening

and financial structure, rural financial regional development difference is expanding, the development level of rural finance in eastern region is much higher than the central and western regions; analysis of the Theil index based on the differences in the level of three major areas appear to run the law to expand with the fluctuations; from the difference decomposition of the situation, the regional differences are far less than the regional differences, regional differences determine the overall difference in certain extent. Dynamic panel model results show that the effect of rural financial development level on the issue of rural financial development in this period is very significant, which indicates that the rural financial development area gap may appear more and more countries should carry out macro-control phenomenon, through the development of appropriate policies on this phenomenon, to prevent the expansion of the difference. Another area in the dynamic model of informatization level display cannot promote the development of rural finance area, and the degree of informatization level in rural areas is low, practice shows that when the level of information to a certain stage of development, to promote financial only.

Acknowledgments

The work of this paper is supported by The Henan provincial government tender subject of 2016: Problems and Countermeasures of Scientific and Technological Innovation of Henan Province Financial Support under the New Normal (2016B151); The Henan provincial soft science research project of 2016: Agricultural Science and Technology Innovation of Henan Province and Coordinated Development of Agricultural Modernization (162400410486).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 14/04/2016
Aceitação/Acceptance: 03/07/2016

How Does the Corporate Philanthropy Develop in China? Ideas, Focuses and Implications under the Background of Internet Big Data

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Pages: 117–130

Abstract: Although there is always some dispute surrounding corporate philanthropy, developments in philanthropic practice have proved that corporate philanthropy has an irresistible historical trend. Theories originate from examination of reality, while real developments inevitably induce further exploration of theory. Although the theoretical system underpinning corporate philanthropy is not unified and is still incomplete, its ideas and content have been continuously enriched by almost half a century of development. Today, corporate philanthropy has become a research focus of a multitude of disciplines. This paper summarizes the different motivations for corporate philanthropy and then analyzes the major factors influencing corporate philanthropy from several points of view. These include individual, corporate, and environmental perspectives. Moreover, the mechanism by which corporate philanthropy influences organizational performance is also discussed. Based on this, it is proposed that slack resources and corporate political connections will become the foci of future research on corporate philanthropy in the transitional system of economy in China. At the same time, a decision model for corporate philanthropy is proposed by referring to a resource–strategy framework. Further research directions are also given consideration.

Keywords: Internet Big Data, Philanthropy, Organizational effect, Slack resource, Corporate political connection

1. Introduction

Since the late 20th century, when the theoretical basis of corporate philanthropy was founded by the studies of Hunt (1986), Wood (1990), and Logsdon (1990), etc., the motivation, approaches, effects, and decisions involved in corporate philanthropy have been paid a great deal of attention. With the introduction of pertinent empirical methods of analysis and new theoretical ideas (including strategic corporate philanthropy and public benefit–brand strategy), the ideas and content of corporate philanthropy have been continuously enriched and have expanded into fields such as corporate strategy, social capital, etc. With a background of fierce competition and a complex and variable environment, formulating and implementing philanthropic strategies so as to improve organizational performance has an important theoretical and practical significance with regard to strengthening the comprehensive competitiveness of a corporation. Thus, this

has become an important part of the field of corporate strategy. In recent years, with the rapid development of the Internet, networking, cloud computing, network convergence and IT communication technology, the rapid growth of data has become a serious challenge faced by many industries and precious opportunities, so the information society has entered the era of big data.



Figure 1 – The big data and cloud computing

The emergence of big data not only changes people's life and work way, enterprise's operation mode, and even causes the change of the model of scientific research. In this work, by referring to previous research, the system of philanthropy is systematically integrated based on a logical chain: philanthropic motivation → influencing factors → organizational performance. Then, our research focuses on slack resources and corporate political connections (CPCs) to find new foci for philanthropy in China according to a classic theoretical resource–strategy framework. Thus, we are able to explore the mechanism of decision in corporate philanthropy in the transitional economy of China. Compared with research progress abroad, research on corporate philanthropy in China is generally in its initial stages and achievements are rare. On the one hand, the development of Chinese corporations in an internationally competitive environment and active corporate philanthropy bring challenges and impose requirements on the translation of research achievements to other countries. On the other hand, these facets provide rich material for discussion of the relationship between corporate philanthropy and corporate competition and reasonable philanthropic decision making. Therefore, theoretical research on corporate philanthropy is significant for guiding the implementation of corporate philanthropy strategy in China, enhancing the competition of corporations, and promoting sustainable and harmonious development of the whole society. The theoretical research in this work will surely become one of the important research directions in corporate competition strategy and has a wide scope for innovation in the field.

2. The research idea: philanthropic motivation, influence factors and organizational performance

A general survey of the development of theoretical research on corporate philanthropy shows that the theoretical exploration followed a logical framework for recognizing a

problem. That is, why does such a problem occur, what are its characteristics, and what its effects are. For corporate philanthropy, the initial stage of analysis of the motivation is to find the foundational reasons for the evolution of corporate philanthropy. Afterwards, the multitude of factors of influence can be explored to discuss the characteristics of the corporate philanthropy. Finally, corporate philanthropy can be revealed as the reason underlying significant performance differences between companies and relevant mechanisms explored (see Fig. 2).

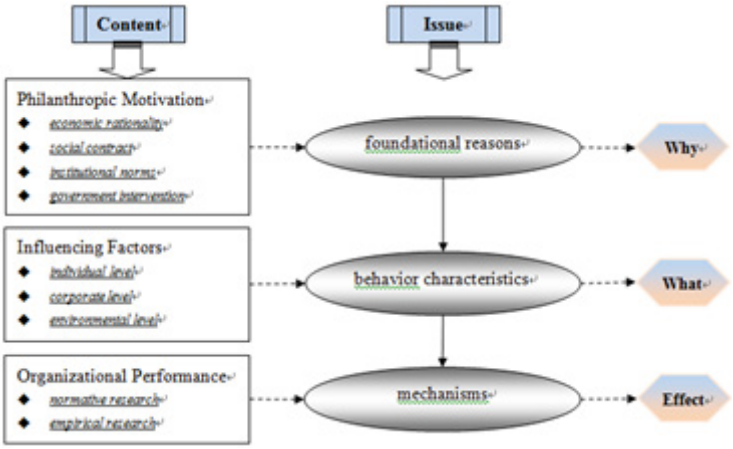


Figure 2 – The development of corporate philanthropy theory

2.1. Philanthropic Motivation

Early corporate philanthropy was actually nothing more than the compassionate acts of entrepreneurs influenced by religious doctrine. However, nowadays it refers to several voluntary corporate acts, e.g. donating cash, material, labor, and technical expertise so as to achieve a 'win–win' situation consisting of self and social benefit. Corporate philanthropy in modern times is different from the ideas in the early stages (i.e. altruism and universal love). As time has changed, corporate philanthropy has played a significant role and there are now various motivations (Zhao, 2012). Although there is much dispute concerning the motivations of corporate philanthropy (from different perspectives), research in the field never stops. Some important points are listed below.

1. The relationship between corporate philanthropy and economic rationality.

Whether or not corporations should undertake social responsibility has been debated for a long time. During this time, the economic rationality of corporate philanthropy has been established. Many scholars have attempted to prove that companies can benefit from philanthropy and refute the idea that a corporation should not cost resource philanthropy. Branco discussed the relationship between corporate philanthropy and competitive advantage (Branco, 2006). Porter and Kotler proposed strategic philanthropy and philanthropic marketing successively to guide corporate philanthropy and create higher economic benefit (Porter, 2002). By conducting empirical analyses,

the Chinese scholar Li Zheng (2006) proved that long-term philanthropy did not reduce corporate value. The research carried out by Zhou Yanfeng et al. (2007) also revealed that a companies' performance in respect of social responsibility (including donations) can improve consumers' purchasing intentions and perception of product quality.

2. Association between corporate philanthropy and social contract.

Morality and ethics, as well as social values, can promote corporate philanthropy. Steiner (2002) pointed out that society entrusted a right of reasonable behavior to enterprises. In return, an enterprise's behavior should meet the requirements of social ethics. Donaldson (2001) believed that there is a contract between corporations and society and the core of corporate philanthropy is social responsibility based on business ethics. Chinese scholars Chen Honghui and Jia Shenghua (2003) proposed that when a comprehensive social contract is formed (including dominance ones and implicit ones), the requirements of the interest of stakeholders has to be considered so as to actively undertake proper social responsibility.

3. Relationship between corporate philanthropy and institutional norms.

From the perspective of embeddedness, a company's universal participation in philanthropy is not a result of benefit demands and moral requests. Corporate philanthropy shows significant differences according to specific social relationships. In this respect, organizational sociological research provides a more persuasive theoretical point of view. Useem (1988) considered that system pressure is an important motivation for corporate philanthropy. The attention of the surrounding environment on corporate philanthropy improves the consistency of the behavior of corporations and therefore promotes philanthropy levels. Campbell also put forth that corporate philanthropy is largely adjusted by institutional conditions including regulations imposed by public and private organizations, supervision of non-profit organizations, connections among companies, etc (Campbell, 2007). Based on research on Haier and Procter&Gamble, Chinese scholars Tian Zhilong et al. (2005) proposed that the non-marketing behavior of corporations is conducive to improvement in the operational legitimacy of a corporation and promotes legitimate behavior (including donations and community services) and is a significant approach for promoting operational legitimacy of corporations.

4. Relationship between corporate philanthropy and government intervention.

In the current economic background of China, companies' donations (as an important method for performing social responsibility) are influenced by authoritative government (departments). For many philanthropic acts, the government is the major driver. Under such motivation, corporate philanthropy is not voluntary. Rather, it is forced by the pressure of mandatory fundraising. The research carried out by Day and Devlin (Day, 2004) indicated that the time allocated to fundraising shows a positive correlation with donation amount: the greater the fundraising time, the larger the donation amount. Li Sihai, Lu Qirui, and Song Xian Li, 2012)pointed out that losing enterprises performed philanthropic acts due to the influence of government allowances — the larger the governmental allowance, the more willing was the private losing enterprise to donate and the greater the donation level. Donation in order to obtain a government allowance is a reasonable choice of a private losing enterprise based on reciprocal exchange. An empirical analysis performed by Guo Jianhua (2012) proved that the nature of an enterprise's donations is of different types: donations from state-owned enterprises

(on request) involve more government intervention; those from private enterprises are motivated more by the market and are voluntary acts.

2.2 Influencing Factors

1. Influencing factors at the individual level

In considering the factors that influence corporate philanthropy on an individual level, the relationships between the individual characteristics of the chief executive officer (CEO) and senior leaders of the company and corporate philanthropy were mainly investigated. The following literature is of importance and should be noted here: In terms of leadership characteristics, Choi and Wang (2007) believed that kindhearted and just leaders participated more in donation activity in order to balance the benefits of different stakeholders. Lan Wenqiao (2012) found that the value a leader attached to a private enterprise directly influenced the intention, patterns, and fields of corporate philanthropy. Considering professional backgrounds, the research of Slater and Fowler (2008) indicated that an enterprise whose leaders had experience working in other countries demonstrated more philanthropy. Additionally, the output functional background of a leader positively affected the influence of the leader's foreign work experience on social performance. As for social relevance of the leaders, Bin and Edwards (2009) discovered that among 463 enterprises that donated to a flood-disaster fund in North Carolina, USA, the social capital obtained by participation from public citizens was positively correlated with the corporate donation.

2. Influencing factors at a corporate level

The influencing factors at the corporate level mainly include the scale, debt ratio, advertisement expenses, board composition, and nature of the ownership of the enterprise. Donation is closely related to scale: big companies have large visibility, and are therefore scrutinized more by the public. Because of this, larger companies donate larger amounts compared with the smaller ones. Many studies have found that donation amount is positively correlated with enterprise scale (Mello, 2008; Xu, 2013). The greater the debt ratio, the lower the probability of donation (Zhang, 2010), empirical research indicates that advertisement expense is positively correlated with the donation probability and donation amount (Brammer and Millington, 2005). Consistent conclusions have been obtained concerning a positive correlation between board size and donation amount (Helland and Smith, 2003). In considering the independent director size and donation amount of enterprises, Lv Fangfang (2010) and Wei Xueqiang, Yun Xiao, and Yu Yang (2010) surmised that these factors are positively and negatively correlated, respectively. The association between donation and ownership was discussed in different works from the aspect of dissimilarity. Shan Liwei, Gan Li, and Zheng Tao (2008), and Wei Xueqiang, Yun Xiao, and Yu Yang (2010) found that non-state-owned holding companies showed a higher donation level. However, while Cao Hongbin (2006) and Fang Jingyi (2010) reached the opposite conclusion. That is, state-owned enterprises donated more. Li Xiaoling, Ren Yu, and Liu Zhongyan (2012) are of the opinion that the nature of the ownership highly influences donation level, namely, private enterprises have higher donation levels than those of state-owned enterprises.

3. Influencing factors at an environmental level

Industrial background greatly affects corporate donations. Direct-to-consumer enterprises donate more and the enterprises that do not donate are mainly indirect-to-

consumer ones (Brammer and Millington, 2005). The enterprises whose products are directly forwarded to consumers present larger donations compared to other kinds of enterprises (Shan Liwei, Gan Li, and Zheng Tao, 2008; Shi Lei, 2010). Previous research has proved that government expenditure and philanthropy are complementary, rather than substitutional in nature. Zhang Qilin and Huang Xiaorui (2013) proved that corporate donation amounts show the same variational trend as the income tax rate of the enterprise. This conclusion is consistent with those drawn by foreign scholars. The local economic development level, policy, and corporate network also affect the amounts donated by enterprises. By analyzing enterprises' donation data after the Wenchuan Earthquake (Wenchuan, China), Zhao Xiaoqin and Wan Difang (2011) discovered that apart from the influence of local economic development level and policy, the amount donated by enterprises in a certain province is closely associated with those of enterprises in adjacent provinces. Afterwards, Zhao Xiaoqin and Wan Difang (2012) proved that the donation level of enterprises is significantly positively correlated with the density of the corporate network in each province in China. It is noteworthy that Nan first analyzed differences in local donation levels and their variation. They found that there were differences apparent among the donation levels of eastern, central, and western China and that the donation levels in the three areas displayed 'U-type' characteristics. There were more obvious differences among different provinces. Furthermore, the differences in the donation levels in different areas and provinces varied according to the same trend.

2.3. Organizational Performance

Theorists are continually trying to explore the reasonableness of corporate philanthropy by analyzing the relationship between philanthropy and effect on the organization. Although no consistent conclusions have been obtained so far, a clear research logic has been formed and more studies have been performed in recent years with mature achievements.

Normative research includes: By donating, a corporation can form a good social image, improve their degree of public recognition and corporate reputation, promote the sale of some products, obtain preferential revenue policies, and reduce transaction costs. Organization of volunteering activities can improve employees' cooperation, enthusiasm, and sense of responsibility. Meanwhile, it can improve the community's environment. By conducting public welfare programs, enterprises can select and target valid consumers, increase sales and market share, reduce operation risks, promote the development of their enterprise, and perfect the competitive environment. The Chinese scholar Zhong Hongwu (2007) considered that philanthropy brings the following corporate benefits: increased income, reduced costs, improved efficiency, and acquisition of market power. Based on an empirical study, Fan Jianfeng and Tian Bowen (2013) explained the effects of different types of corporate philanthropy on a company's reputation with a disaster in the background. Their results show that when a corporation has strong abilities, a charity program based on philanthropic acts displays a more positive effect on corporate reputation. Otherwise, philanthropy based on professional ability is the dominant factor capable of improving corporate reputation.

At the same time, increasingly greater numbers of empirical studies have proved that there is certain causal relationship between corporate philanthropy and organizational performance. Some statistical analyses indicate that philanthropy improves corporate performance and that

the two aspects are significantly positively correlated and influence one another. The research conducted by Li Jingqiang and Liu Fengjun (2010) shows that the accumulated abnormal rates of return of enterprises donated during the Wenchuan earthquake are positively correlated with the amounts they donated. Based on donation data from listed companies in China during 2002–8, Wang Duanxu and Pan Qi (2011) found that the greater the degree of satisfaction of their stakeholders, the more obvious is the corporate value promoted by the donation. The empirical studies performed by Tian Xueying (2010, 2012) reveal that enterprises construct and enhance social capital through philanthropic acts. A combination based on social capital transforms intangible resources, e.g. internal and external knowledge, information, and trust to core advantage, so as to promote the performance of the organization. The survey of Lu (2012) indicates that the donation amount can significantly increase sales growth rate. Also, the donations of enterprises whose products are directly forwarded to consumers show a significantly more positive correlation with sales growth. According to the nature of the actual controller, Guo Jianhua (2012) verified that donation promotes a win–win situation consisting of economic benefit of the corporation and social benefit. The donations of direct-listed private enterprises show a more obvious promotion effect on performance than those of state-owned enterprises. By introducing the degree of public attention, Yi Bingna and Han Qinglan (2013) found that corporate donations are significantly positively correlated with financial performance, while adjustments due to degree of public attention were not apparent. Furthermore, some studies have obtained different conclusions. Examples include: donations inhibit the financial performance of enterprises (Friedman, 1970), there is no significant interdependent relationship between donation and corporation performance (Sharman et al., 1988), and donation and corporate performance display 'U-type' (Brammer & Millington, 2008) and reversed 'U-type' relationships (Wang, H et al., 2008).

The above studies suggest that most scholars consider that corporate donations can promote organizational performance and, in particular, long-term performance. As the pattern of economic development and the structure of social interdependence change, public social welfare will play a constraint role in actual production of enterprises and more significant role in the creation of corporate values.

3. Research focus on China's economic transition

Philanthropy is not only a manifestation of an enterprise's social responsibility and method of promoting a charitable culture, but can also relax social contradictions and maintain social stability. As such, it is an essential requirement for harmonious development of society. However, the development of philanthropy in China lags far behind that actually required to promote harmonious development of society and faces several problems: low efficiency, lack of management, enterprises which cannot operate normally ('losing' enterprises) donate generously while enterprises generating excessive profits do not donate, etc. Previous research fails to explain the underlying causes of these problems. That is to say, the donation problems which are specific to Chinese philanthropy have not been solv ed. Therefore, introducing theories which include slack resources and corporate political connection (CPCs) is conducive to overcoming the problem that philanthropy in China's transitional economic system has not been sufficiently studied (as most attention has been paid to western-style economic systems).

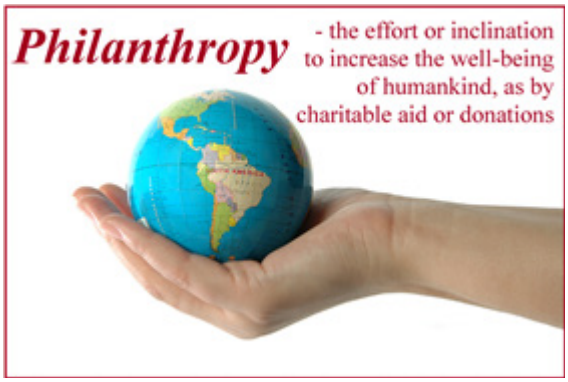


Figure 3 – The Philanthropy

3.1. Relationship between Slack Resources and Corporate Philanthropy

Slack resources, often regarded as kinds of excessive and freely available resources (Bourgeois, 1981), are actual or potential resources that can help cope with environmental changes. They enable an organization to successfully handle the pressure caused by internal adjustment and external policy changes and implement strategic variations to cope with the external environment. In previous work, slack resources have usually been utilized to explain a variety of organizational phenomena including goal conflicts, power struggles, efficiency, and innovation. At present, the positive effects of slack resources have been most studied. Slack resources generally exist in enterprises and enable them to adjust their strategic choices so as to improve their performance. Based on this, slack resources are regarded as 'buffers' with respect to environmental change.

Philanthropy aimed at establishing social capital, improving corporate reputation, and obtaining competitive advantage has become one of the important strategic decisions of enterprises. Compared with enterprises in other countries, corporate philanthropy in China has had a late start and lacks strategic operation and effective management. Thus, a large amount of scattered and blind philanthropic acts have resulted. Therefore, a way to examine and utilize internal slack resources to meet sustainable expectations or requirements of different stakeholders is urgently required so as to maximize the philanthropic effect. Currently, the relationship between slack resources and corporate philanthropy has been rarely studied and there is almost no research of relevance in China. At the same time, the existing research in the field from overseas is outdated. Although there is a lack of work to reference, such research has good scope for extension in future research, especially with regard to the relationship between slack resources and corporate philanthropy in China.

Exploration of the relationship between slack resources and corporate philanthropy dates from the philanthropic acts of enterprises in the United States. In the US, cash can be directly donated to the benefiting party or cash donations realized by philanthropic foundations supported by the enterprise. Instead of donating large amounts of cash at regular intervals, enterprises in the US mostly donate when they have more surplus cash. This indicates that financial slack influences the cash donations of enterprises. By measuring slack resources using an accounting rate of return, Buchholtz, Amason, and

Rutherford (1999) discovered the relationship between the perception of an enterprise's CEO of its slack resources and corporate philanthropy. Their results indicate that the CEO's perception of the slack recourses has a significantly positive relationship with philanthropic expenditure. Additionally, managerial discretion has an absolute adjustment effect on the positive influence while the executive's values display only a partial adjustment effect.

Meanwhile, non-cash donations of enterprises include the products of the enterprise (or other enterprises), technical training and services, equipment, voluntary services of employees (Tian, 2011). So, non-cash slack resources, such as extra stock, labor, inactive machines, sites, and cash can be donated as non-cash donations. Brammer and Millington (2002) found that the availability of labor and stock of enterprises in the UK that participate in community activities is related to the non-cash donations of the enterprises. St. Clair and Tschirhart (2002) declared that the perception of employers and employees towards slack human resources in the US affects the voluntary activities of the employees of the enterprises. The above studies verify that non-cash slack resources affect non-cash donations. Furthermore, Nohria and Gulati (1996), as well as Sharma (2000), discussed the relationship between slack resources and absence of philanthropy.

3.2. CPCs and Corporate Philanthropy

With the continuous promotion of global economic integration, and the integration of politics and economy, enterprises need to compete more vigorously. Establishing and maintaining a good relationship with government in order to obtain key resources has become a major source of an enterprise's competitive advantage. A 'CPC' refers to when an enterprise tries to participate in a political activity, through public or implicit methods, so as to affect the public policy of the government. Using its CPCs, senior leaders of an enterprise can obtain unique comparative advantages by influencing governmental departments. This is done by learning the operation regulations and policy trends of the government departments and communicating effectively with governmental officials (Zhao Feng and Ma Guangming, 2011). CPCs exist widely in the world, particularly in countries with emerging markets where CPCs, as an informal institution, play a more important role and, therefore, have been focused upon by researchers.

In the current transitional economy of China, the government holds the distribution rights for resources which determine the existing and sustainable development of enterprises. Therefore, constructing relationships with the government is an essential activity for enterprises if they are to obtain resources. To increase the trust of government towards enterprises and maintain the connections between the enterprise and government, donations have been widely used. This is because they comply with public values, can establish an enterprise's social responsibility, and display the citizenship of the enterprise. Clearly, CPCs are closely associated with corporate philanthropy. A discussion of this association enlightens intensive studies in relevant fields as well. Therefore, the relationship between CPCs and corporate philanthropy has become a research focus in the institutional environment specific to China. However, both qualitative and quantitative analyses are in their initial stages.

Meng Zhao suggested that enterprises with weak political connections are likely to improve their reputation, establish images, and obtain legitimacy and scarce resources through donations. Muller (2009) found that when a serious disaster happens, enterprises are

likely to actively assist the government in handling the pubic crisis via donations, as this increases trust and safeguards the connection with government. Jia Ming and Zhang Zhe considered that listed companies that have political connections are more likely to donate at higher levels in after an earthquake. Meanwhile, the higher the status of the political connection of senior leaders, the greater the probability a company will participate philanthropy and the larger the donation amount. Li Sihai et al. (2012) conducted empirical analyses and discovered that whether or not an executive had a political background (and the type of political background) significantly affected donations by enterprises. In the few studies exploring the relationship between CPCs of private enterprises and philanthropy, the conclusions are highly consistent. Moreover, the CPCs of private enterprises as well as the social status, political background, and political participation of private entrepreneurs display a significantly positive effect on an enterprise's donation level. Compared with enterprises that do not take part in philanthropy, private enterprises having CPCs, obtain more bank loans privileges in revenue, and property right protection after making donations. Protection benefits improve the performance of enterprises, particularly in areas with poorer institutional environments.

The research of Zhang Min, Ma Lijun, and Zhang Wen (2013) reveals that philanthropy is an important approach for strengthening the connection between enterprises and government. Furthermore, in view of the bonding effect of a donation between an enterprise and government, they also suggested that state-owned enterprises show a more pronounced effect compared to private ones. Also, the lower the degree of marketization of a province, the more significant the enterprise's bonding effect in the province. Zhang Jianjun classified CPCs into prior government connections and achieved political status. It was also pointed out that the prior government connections of the executive of a state-owned enterprise can improve corporate philanthropy. Furthermore, the achieved political status of the executives of private enterprises is positively correlated with corporate donations. Jia Ming and Zhang Zhe (2012) proposed that senior leaders with political status promoted their enterprises to actively react to natural disasters, driven by the need to highlight their sacrifice and spirit of dedication.

4. Conclusions and implications

In a background of globalization, exploring corporate philanthropy with Chinese characteristics is interesting and challengeable. Therefore, before drawing our conclusions, we consider several important issues so as to further strengthen related research undertaken in the future.

4.1. Comprehensive Explanation of Philanthropic Motivation in Multiple Dimensions

Corporate philanthropy is a result of complex behavior and is related to a multitude of factors including the economy, management, ethics, society, and politics. The development of philanthropy is, alternatively or jointly, also influenced by domestic demand and external pressure. Therefore, by merely examining the motivation for philanthropy from one particular aspect does not allow the formation and changing characteristics of corporate philanthropy to be comprehensively described.

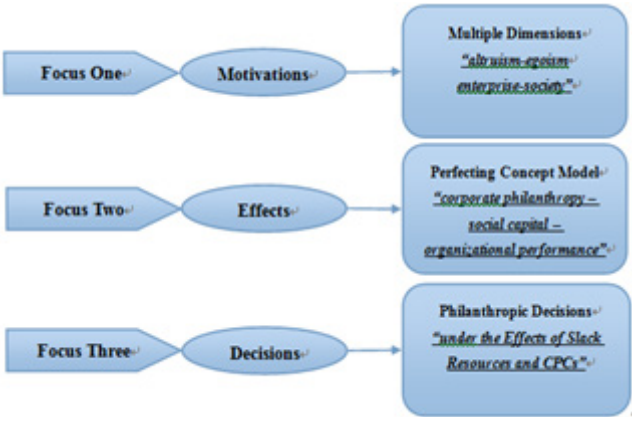


Figure 4 – Future research on corporate philanthropy in China

In order to achieve this, a more comprehensive research framework and critical theoretical work is needed to analyze the motivation for corporate philanthropy. To be comprehensive, multiple dimensions must be invoked. In the future, to explore this motivation, the internal motivations and basic starting point for corporate donations need to be studied using a continuum of dimensions involving altruism and egoism. At the same time, social embeddedness features of the corporate-system can be considered, so as to summarize an institution's features and the evolution of corporate philanthropy in China and other countries. This should reveal the foundational factors for the continuous development of corporate philanthropy and the reasons causing local differences. Furthermore, motivation-based variation and evolution can be adopted to explore the matching patterns between philanthropy motivation and philanthropy operation. Although studying the motivation for foundation of corporate philanthropy in multiple dimensions is conducive to comprehensively understanding the connotations of philanthropy motivation, whether or not this kind of study is suitable for the practice of corporate philanthropy in China still needs to be tested in the future.

4.2. Perfecting the Conceptual Model for Corporate Philanthropy's Effects on an Organization's Performance

There are various studies on the influence of corporate philanthropy on organizational performance, which, unfortunately, do not go into too much depth. Previous research on this topic lacks the use of an integrated model and merely considers the direct effects of corporate philanthropy on organizational performance. Therefore, previous studies fail to reveal the foundational reasons for the significant differences in corporate performance induced by corporate philanthropy.

The social capital of an enterprise, as a valuable resource, plays an important role in the mechanism underlying such influence and it connects corporate philanthropy and organizational performance. That is, compared with other enterprises, whether or not an enterprise takes part in philanthropic acts, and how it participates, affects the acquisition of scarce resources (e.g. external information, techniques, and knowledge),

thus contributing to performance differences between enterprises. Therefore, the social capital of the enterprises can be applied as a mediator to reconstruct a theoretical model for the influencing factors (philanthropy – social capital – organizational performance), so as to explain the theoretical mechanism by which philanthropy influences organizational performance via the transfer of social capital. By describing philanthropy (and the basic mechanism of influence of social capital on organizational performance) from the perspective of social capital, the research will present not only favorable practical guidance but also theoretical innovation.

4.3. Philanthropic Decisions under the Effects of Slack Resources and CPCs

Existing studies on the relationship between slack resources and corporate philanthropy are outdated and insufficient. In most studies, social responsibility is considered as a whole and philanthropy is not investigated independently to study its role in social responsibility. Studies on the matching patterns between slack resources and corporate philanthropy are rare. An abundance of slack resources is not obviously correlated with the level of corporate donations in practice. However, it is the major reason for scattered, blind, and invalid corporate philanthropic acts. Therefore, finding different types of philanthropy theoretically (by matching the abundance of slack resources with the level of philanthropic responsibility) is significant for selecting and evaluating corporate philanthropy patterns.

In the transitional economy of China, with its imperfect market adjustment mechanism and fierce resource competition, corporate philanthropic acts should be reasonable behavior. They satisfy consumers' demands and guarantee the survival and development of the enterprises themselves. Therefore, enterprises with abundant slack resources are more likely to take part in philanthropy and are more capable of affording the resource consumption involved in these philanthropic acts. Besides this, this kind of enterprise can obtain other resources to contribute to the operation of philanthropic acts from the market (e.g. they are capable of searching and selecting better non-profit organizations and recruiting talent for planning and managing the acts). The discussion above indicates that a sufficient application of slack resources provides more contingent choice for implementation of corporate philanthropic strategies.

Although the consistent conclusion that CPCs increase corporate philanthropy is obtained in most studies, Zhang Jianjun (2013) proposed a new perspective. That is, because of CPCs, enterprises will donate in order to perform their social responsibility. They are also capable of resisting or avoiding certain external demands because of CPCs and can thus avoid some requests for donations. According to this idea, the influence of CPCs on the donation level of a corporation varies with the establishment goals and values generated from the CPCs. So, adopting philanthropy as an approach to constructing CPCs and studying their relationship according to the research idea of objectives (behavior) gives results that are of greater significance in the future. In addition, different institutional environments may motivate or inhibit corporate behavior and financial performance.

Furthermore, different degrees of motivation and inhibition influence the selection of corporate strategies. In China, development, degree of openness, state of perfection of the market adjustment mechanism, and legal environment are very different in different areas. Whether these factors can moderate the effect of CPCs on philanthropy with

respect to donation levels and contingency effects is seldom reported. Furthermore, the variation of philanthropic strategy with CPCs as a function of the institutional environment and time is rarely studied. The institutional environment can be introduced into the theoretical model in the future to design longitudinal study. This is conducive to testing the variation and consequences of the effects of CPCs on corporate philanthropy.

Measurement of slack resources is an internal requirement for enterprises to perform philanthropy responsibly. To study whether enterprises can reasonably and effectively formulate decisions and rationally implement philanthropic acts, the externally sourced CPCs need to be included in the analysis framework as part of the comprehensive study as well. Future studies should pay attention to the correlation between the internal and external factors in order to construct a philanthropic decision model according to the paradigm of resource–strategy. This will facilitate a comprehensive learning process for corporate philanthropy. Based on this, dynamic game and simulation analysis of the philanthropic decision model can be conducted by adjusting and controlling the relevant variables (including slack resources, CPCs, corporate governance, and institutional environment) to provide a basis for the design and management of philanthropic strategies of the enterprises.

Acknowledgments

This work was supported in part by a grant from National Natural Science Foundation of China (Number: 71002017). This work was supported in part by a grant from Philosophical and Social Science Foundation of University in Jiangsu Province (Number: 2014SJB548). This work was supported in part by a grant from "333" Projects Foundation of Jiangsu Province. (Number: BRA2015417).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 12/04/2016
Aceitação/Acceptance: 06/07/2016

Quality Evaluation of Provincial Urban Open Space System - A Case Study from Henan Province, China

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Pages: 131–141

Abstract: Urban open space system has played a very important role in social-economic development of provincial region. This paper establishes a quality evaluation system of provincial urban open space system. In this system, the general level is divided into two parts as the secondary level, gray open space and green open space, and also includes eight indexes as the tertiary level. Henan province is the first large province of people in China. According to the construction data of 18 cities in Henan Province from the past six years, we use entropy weight method to determine the weight of each index in the system of each year. We find the weight of green open space has a rising trend, but also the weight of gray open space has a downward trend. In the tertiary level, the weight of density of park in built district grew the fastest, and the weight of road surface area rate in built district fell the fastest. This shows that the construction of park does not keep up with the speed of construction of road in the last eight years of rapid urbanization of Henan China. We use ArcGIS and Geoda to analyze the quality of Henan province urban open space system of spatial classification, spatial differentiation characteristics and spatial correlation. The results show that the characteristic of being temporal and spatial in Henan; besides, a big difference exists between North and South in the space area. There is close relationship between provincial urban open space construction and economic factors. Some suggestions are put forward to promote the urban open space system construction based on the evaluation results.

Keywords: Open space system, Entropy weight, ArcGIS, Provincial evaluation

1. Introduction

The space outside the building is open space in a city, and it can be viewed as a system. Because the urban open space embraces the functions of social revitalization. Urban open space provides a number of valuable services to urban population, including recreational opportunities, aesthetic enjoyment, environmental functions, and may also be associated with existence values (Brander. 2011). According to the basic functions of the system, the main elements of the system are divided into two categories: green open space which includes green space, gardens, parks, etc and gray open space including roads, squares,

etc (Wang et al. 2012). Good open space can guarantee the quality of people's life (Friggens et al. 2015). It is widely purported that urban parks and open space can improve the urban environment by cleansing air and reducing noise (Lam et al. 2005), and the roads and squares can improve urban operating efficiency. More and more countries in the world begin to pay more attention to open space. Urban open spaces have already take a huge part in people's daily life. More and more planners find that increase and improve open space would be a more practical and economic way than increasing building (Wu. 2013).

Scholars in different subjects do researches on open space system with various concerns and methods. For example, most of the researches discuss the design method of open space from the perspective of planning and design personnel (Lee. 2014). Some studies have involved such as visitor information in open space (Aikoh. 2012), use condition (Kim. 2012), reorganized institution (Kim. 2011), economic valuation (Jiao. 2010), family biotic index (Ali. 2010), open space plots and land uses around houses (Poudyal et al. 2009), the walking tour planning in urban open space by its functional, social and perceptual (Salama et al. 2015), etc. There are also some kinds of open space economic valuation methods: conventional market approaches, stated preference method and revealed preference method (Wu et al. 2010). In recent years, some researchers use remote-assessment approach that makes use of Google Earth Pro to provide rapid and inexpensive measurement of the quality of public open space (Taylor et al, 2011). However, in-depth discourse and research on the quality evaluation of urban open space system has been limited so far. In particular, it is lack of papers which could analyze and evaluate the quality of different urban open space systems in a region.

At present, China is still in the rapid urbanization. Chinese cities will be confronted with a grave challenge, including open space system. So the study of the open space system in China is very typical (Wang. 2005). To illustrate the complexity involved, we will focus on one region, namely Henan, a province in Central China, with 18 cities. As one of the main crop production regions in China, it has a total area of 160000 km2 and a population of 100 million.

The 18 cities in Henan province have their spatial characteristics, and the development is not balanced. Traditional data only show that the capital city of Henan- Zhengzhou and the second largest city-Luoyang are the economy center of this region, and grain output in the south region is greater than in the north, and the urbanization level is just the opposite. We want to know whether there is a correlation in the good quality cities or the bad quality cities, and the relationship between gray open space and green open space in this region. The aim with this paper is to find more distribution regular of open space system and evaluate them.

Next, we describe the data and methodology used in more details.

2. Materials and methods

We establish a quality evaluation system of urban open space system in Henan can be seen in Table 1. The General level index is the quality level of the urban open space system of cities, which represents the horizontal comparison of the urban open space system in the region of the year. It is divided into two parts as the secondary level, the quality of gray open space and the quality of green open space. There are eight indexes in the tertiary level. They all choose the average index or rate because the different cities have different sizes and population.

General level	Secondary level	Tertiary level
A The quality of urban open space system	B1 The quality of gray open space	C11 Road surface area per capita (m2)
		C12 Road surface area rate in built district (%)
		C13 The road with street lamp rate(%)
		C14 Road density(km/km2)
	B2 The quality of green open space	C21 Public recreational green space per capita(m2)
		C22 Green coverage rate of built district(%)
		C23 Green space rate of built district(%)
		C24 Density of park in built district(%)

Table 1 – The quality evaluation system of urban open space system in Henan Province, China

The General level is the quality level of each city in one year

The data available is taken from China Urban Construction Statistical Yearbook(2008-2013), which is compiled by Ministry of Housing and Urban-Rural Development, P. R. China , including level of urban service facilities, urban population and construction land, urban roads and bridges, urban landscaping, etc. These data have very strong complexity, fuzziness. In order to avoid the deviation of the weight of the subjective analysis (Qin et al. 2011), we choose entropy method which could consider data objectivity and classification subjectivity to evaluate the data.

Step 1: Construct standardized data matrix, to ensure the establishment of conditions ($Y_{ij} \leq 1$):

$$Y_{ij} = \frac{X_{ij}}{\max(X_j)} \tag{1}$$

Step 2: Normalized the standard data to get the new matrix:

$$Z_{ij} = (Y_{ij} / \sum_{i=1}^{m} Y_{ij})_{m \times n} \tag{2}$$

Step 3: Calculate the entropy of the j index:

$$E_j = -\frac{1}{\ln m} \sum_{i=1}^{m} Z_{ij} \ln Z_{ij} \tag{3}$$

Step 4: Calculate the weight of the j index:

$$W_j = (1 - E_j) / \sum_{j=1}^{n} (1 - E_j) \quad (4)$$

Step 5: Calculate the urban open space quality value of each city:

$$G_i = \sum_{j=1}^{n} (W_j \times Y_{ij}) \quad (5)$$

From step 1 to step 4, we can calculate the weight of each of the tertiary level in the annual. The bigger the entropy is, the bigger the weight is. This is a good reflection of the differences between various indexes. We can find the trend according to the change of the weight of different years, and the result is shown in Table 2.

Secondary level weight			**Tertiary level weight**		
Year	2008	2013	Year	2008	2013
B1	0.36880	0.32884	C11	0.14673	0.13741
			C12	0.07897	0.03583
			C13	0.07400	0.07648
			C14	0.06910	0.07912
B2	0.63120	0.67116	C21	0.11906	0.10459
			C22	0.01191	0.01459
			C23	0.012538	0.00906
			C24	0.48769	0.54292

Table 2 – The indexes weight of different years by entropy weight method

The Results five effective numbers were reserved

As Table 2, We find that the weight of the gray open space has a downward trend, and the weight of the green open space has a rising trend. This shows that in the last six years in Henan Province, the difference of the urban green open space is widening, and the difference of the gray open space is narrowing in the process of urbanization. In tertiary level, C24 (density of park in built district) and C12 (Road surface area rate in built district) have the biggest change. It also shows that road surface area rate becomes more similar in different Henan cities, and the density of parks in built district is the obvious difference between the cities. We can understand that road construction speed is always faster than green space and parks in the process of rapid urbanization.

By step 5, we can calculate the quality value of urban open system of each city in the 2008 and 2013. We got a relative assessment of urban open space system, the greater the value is, the more advanced the level of the hierarchy will be. With this result, we can use ArcGIS and other software to analyze the spatial distribution of the urban open space system in a provincial area. And we can explore the spatial classification and spatial correlation characteristics of these data which are calculated by the evaluation system.

Year	2008			2013		
Level / City	Value of General level	Value of Gray open space	Value of Green open space	Value of General level	Value of Gray open space	Value of Green open space
Zhengzhou	0.62349	0.17465	0.44885	0.73642	0.17143	0.56498
Kaifeng	0.56404	0.19557	0.36848	0.64771	0.22379	0.42393
Luoyang	0.36336	0.18236	0.18099	0.38301	0.18095	0.20206
Pingdingshan	0.77367	0.21958	0.55409	0.45593	0.21008	0.24585
Anyang	0.48050	0.24853	0.23197	0.54972	0.23573	0.31399
Hebi	0.41617	0.23502	0.18115	0.52449	0.24179	0.28270
Xinxiang	0.76841	0.23206	0.53635	0.67152	0.21523	0.45630
Jiaozuo	0.68096	0.23819	0.44277	0.72767	0.23035	0.49732
Puyang	0.80651	0.22657	0.57995	0.52996	0.23771	0.29224
Xuchang	0.45298	0.20049	0.25249	0.44849	0.19678	0.25172
Luohe	0.75461	0.28406	0.47055	0.74389	0.23763	0.50626
Sanmenxia	0.77990	0.15423	0.62567	0.85700	0.20186	0.65514
Nanyang	0.38524	0.19931	0.18593	0.37765	0.21245	0.16520
Shangqiu	0.32033	0.18187	0.13846	0.55044	0.20737	0.34307
Xinyang	0.39775	0.27938	0.11837	0.41670	0.24583	0.17087
Zhoukou	0.46285	0.31367	0.14917	0.48541	0.27215	0.21327
Zhumadian	0.60999	0.30558	0.30441	0.39657	0.24405	0.15253
Jiyuan	0.87852	0.32439	0.55413	0.88925	0.27239	0.61685

Table 3 – Quality value of urban open space system of 18 cities in Henan Province, China (2008, 2013)

The Results five effective numbers were reserved

3. Results analysis

3.1. patial classification analysis

We took the data of Table 3 into the ArcGIS. With Jenks best classification method, the region is divided into four categories: High-Hign level area, Low-Hign level area, Hign-Low level area and Low-Low level area, and we analyzed its spatial pattern characteristics. Fig. 1, Fig. 2 and Fig. 3 show these result.

From Fig. 1, in 2008, there is no regularity in cities which have different quality levels in the geographical space. But, the spatial differentiation is very obvious in 2013. In the overall pattern, the quality of the urban open space system in the northern part of the Henan Province is greater than that of the southern region. Jiyuan and Sanmenxia become the best areas of urban open space. Xinxiang, Jiaozuo, Zhengzhou, Kaifeng are in the Low-High level area, and geography is connected. The cities which are in Hign-Low level and the Low-Low level area also connected geographically.

From Fig. 2, for gray open space, we can find clearly that their differences are narrowing in 18 cities. The number of cities in the High-High level area and the Low-Low level area is reduced. This shows that the difference of urban gray open space is reducing in the urbanization. Two most developed cities of Henan (Zhengzhou and Luoyang) are in the Low-Low level area of gray open space, for the indexes are more than the per capita or proportion of indicators. This also reflects the population pressure of these two cities. The cities in the southeast of Henan are in the High-High level area, it can be said that their construction pace of the city ahead of the pace of the urbanization development.

From Fig. 3, for green open space, it performs the spatial differentiation trend. In 2008, there is also no regularity in the cites which have different quality levels in the geographical space. In 2013, Zhengzhou, Jiyuan and Sanmenxia are in the area of High-High level. The level of Southern regions cities are low, the level of the northern region is relatively high.

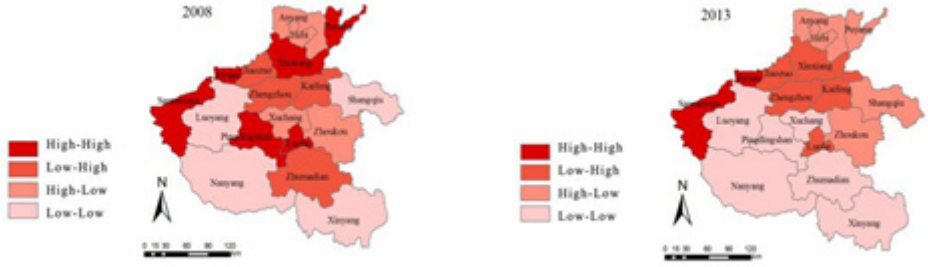


Figure 1 – The quality of urban open space system of 18 cites in Henan (2008, 2013)

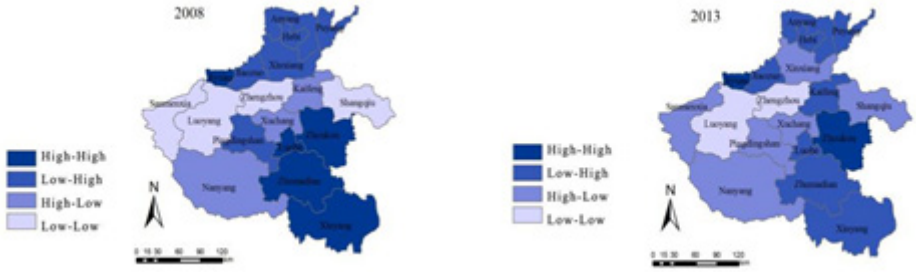


Figure 2 – The quality of gray open space system of 18 cites in Henan (2008, 2013)

The level of economy and urbanization of southern cities is relatively low. This may be one of the reasons that their open space quality is behind the other areas. The exception is Luoyang with its level of economy and urbanization all are leading in the province, but its various indexes level on open space are relatively backward. The reason may be its size and urban terrain constraints.

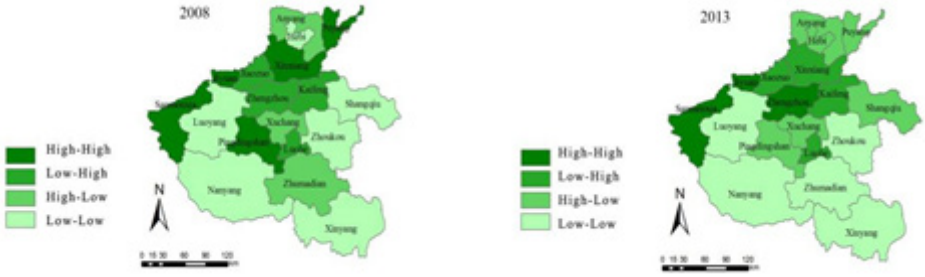


Figure 3 – The quality of urban open space system of 18 cites in Henan (2008, 2013)

We can also find that there is some kind of game relationship between the green open space and the gray open space in most cities. The total amount of urban open space is fixed. If the investment on gray open space is increasing, it will develop lag on green open space. If they both develop very well, the quality of urban open space system must be the best in the region, such as Jiyuan.

We suggest that the southern cities of Henan province and Luoyang should strengthen the construction of green open space. They must increase the number of parks and green areas. In view of increasing city areas, Zhengzhou and Luoyang also have to raise the level of gray open space. Rapid urbanization can lead to traffic congestion and low efficiency. They should integrate the resource of gray open space, and raise the road density and square area.

3.2. Spatial correlation analysis

We took the data into the ArcGIS and Geoda, then analyzed their spatial autocorrelation. Spatial autocorrelation is characterized by a correlation in a signal among nearby locations in space (Li. 2007). According to the SHP file generated by ArcGIS , the software Geoda can calculate the Moran's I and generate moran scatter plot. Moran's I is a measure of spatial autocorrelation developed (Moran. 1950). And moran scatter plot can intuitively reflect the spatial unit of space aggregation.

This is apparent from Fig. 4, which shows each absolute value of Moran's I is very low. This indicates that their spatial association is very small. In contrast, gray open space exhibit a little positive spatial autocorrelation. General level and green open space shows very small negative spatial autocorrelation. Especially the green open space in 2013(Fig. 4, f), its space distribution approximate random state, the role of location factors is not very impossible in provincial urban open space construction.

Then, we add the economic data in the SHP file, and calculate the Bivariate Moran's I of the evaluation value and Real GDP per capita in current year. The results are significantly different. From Fig. 5, it shows relatively significant spatial autocorrelation. Gray open space exhibit negative spatial autocorrelation, general level of urban open space and green open space shows significant positive spatial autocorrelation. There is close relationship between provincial urban open space construction and economic factors. Green open space is more easily affected by economic factors. From the chart, we can see

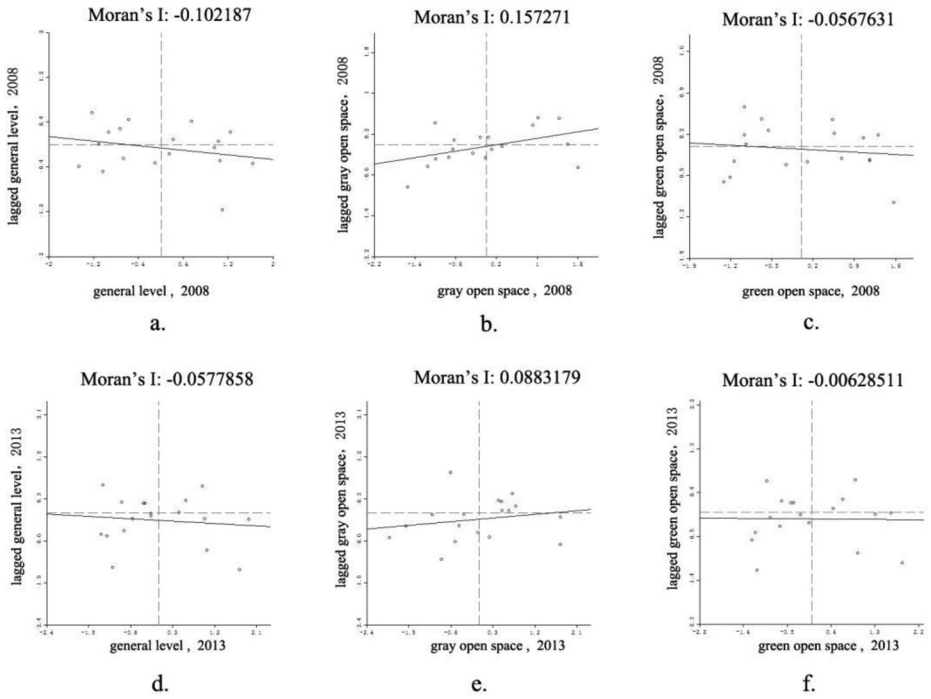


Figure 4 – The Univariate Moran's I and Moran Scatter Plot of the Evaluate Result (2008, 2013)

that the gray open space and green open space exist opposite spatial correlation effect. This also confirms our previous conjecture that there is some kind of game relationship between the green open space and the gray open space in most cities.

4. Conclusion

This paper shows that provincial urban open space system could determine the weight by entropy weight method. The weight of Henan urban green open space change big trend in past six years. The result is not said that the green open space is more important than the gray open space. It is said that the difference on green open space is much more easily becoming bigger in fast urbanization. This is also the key to improve the quality of regional urban open space at present.

We analyze the spatial pattern of urban open space system in Henan province at different times by ArcGIS. We found that, in the late period of rapid urbanization, spatial differentiation is more obvious. For Henan Province, it show "North-High, South-low" pattern. Economic center cities are not the best quality of open space city in the region, even in some respects is still poor. We also analyze the spatial correlation of provincial urban open space system. We found that, the role of location factors is not very impossible in provincial urban open space construction, and there is close relationship between provincial urban open space construction and economic factors.

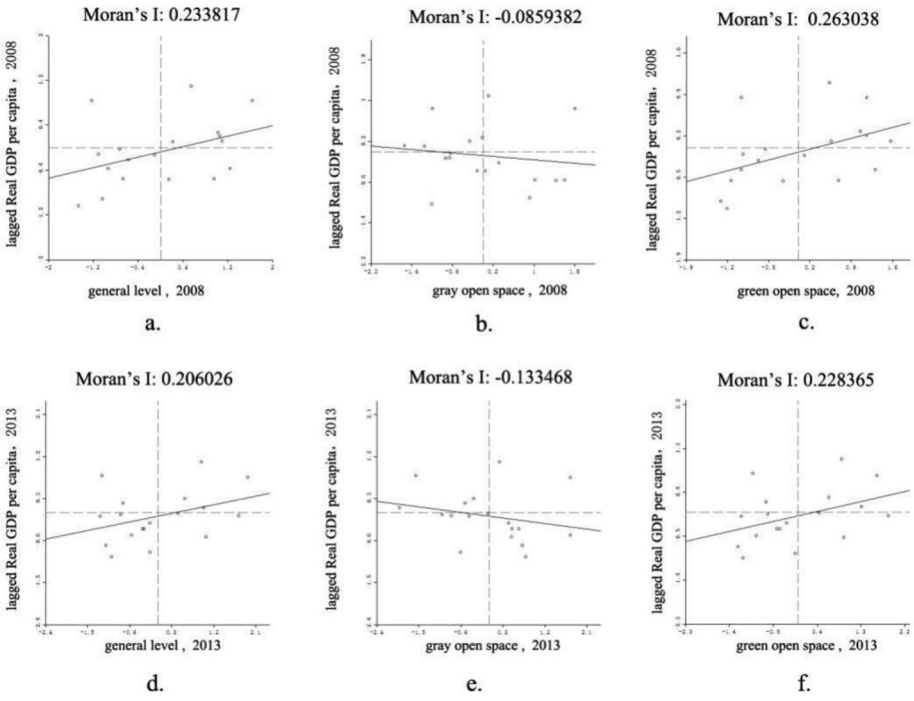


Figure 5 – The Bivariate Moran's I and Moran Scatter Plot of the Evaluate Result and Local Real GDP per capita, (2008, 2013)

Quality evaluation of provincial urban open space system needs to be improved. It is also a reference case to other regions. We expect that more and more scholars continuously devoted themselves to the work of bringing more preceding thoughts and advanced technology to the field of urban open space in order to improve the quality of urban construction.

Acknowledgments

This work is supported by the National Natural Science Foundation of China (No.40771065), the Natural Science Foundation of Henan, China (No.411095), the Soft Science Project of Henan Province, China (No.092400410002), and Henan University Innovation of Scientific Research Project for Graduate Student, China (No. Y1426001).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 10/04/2016
Aceitação/Acceptance: 07/07/2016

Computer-aided Data Mining and Impact of Technological Innovation on Regional Agricultural Economy: An Industry Convergence Perspective

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Pages: 142–152

Abstract: At present, the Internet industry has become the development trend of agricultural modernization. Agricultural Internet will promote the modernization of the agricultural industry chain, broaden the marketing channels and improve social services in rural finance. In this paper, by using the computer-aided data mining technology, the authors study on the impact of technological innovation on regional agricultural economy from the industry convergence perspective. The empirical results show that technological progress is an important factor of promoting agricultural economic growth, at the same time, regional agricultural development shows obvious difference, the traditional agricultural mode with a larger share. On the basis of this, we put forward some relevant suggestions.

Keywords: Data mining, Technological progress, Agricultural Internet, Agricultural industry integration

1. Introduction

At present, the Internet has become the development trend of agricultural modernization (Clark, 2006). Modernization of Agricultural Internet helps the agricultural industry chain, promote the standardization of production of agriculture, agricultural products to broaden the sales channels and improve the social service of rural finance (Chen, 2007; Dara, 2012). The agricultural industrial cluster based on the Agricultural Internet has optimized the agricultural industry chain(Levine,2000). Therefore, we should grasp the spiritual connotation of Agricultural Internet and virtual industrial cluster scientifically, and actively promote the docking of the Internet and agricultural industry (González, 2015). Since twenty-first Century, the Internet has penetrated into all fields of production, life and consumption, is the direction of development and integration with the industry. Such as the German academia and industry, should make full use of the virtual information system through the physical system of information communication technology and network space by means of a combination of manufacturing led the fourth industrial revolution in intelligence. Visible, the "Internet +" industry has become a major trend in the development of the industry. In the field of agriculture, information technology is constantly being used in agricultural production and operation of the field, the Agricultural Internet emerging industries are emerging (Townsend, 2006; Li, 2007). In the Internet industry perspective,

China's agricultural industry should be how to docking with the Internet, the Internet plays what role in China's agricultural industry chain optimization process, has become a key problem of agricultural development and transformation (Pereira, 2015).

In today's development of science and technology change rapidly, agricultural science and technology has penetrated into all aspects of agricultural production, improve agricultural production conditions, optimize the industrial structure of agriculture, alleviate the pressure of agricultural ecological environment, improving agricultural productivity, reduce agricultural production to play an increasingly important role, the increase in agricultural production, promote agricultural economy growth (Chen, 2009). The progress of agricultural science and technology has become the main driving force and decisive factor of the agricultural economic growth. Study on the mechanism of agricultural scientific and technological progress in agriculture and agricultural economic growth, in-depth study of influence on agricultural economic growth in agricultural science and technology progress and its causes, understanding in different regions of China Agricultural Development and agricultural science and technology progress from the overall level, for the development of agricultural science and technology development planning and agricultural economic development strategy, promoting agriculture the progress of science and technology, improve the level of agricultural production, has very important theoretical value and practical significance to promote the sustainable development of agricultural economy.

2. Industrial Internet and data mining

2.1. The new era of the Internet industry

The second half of the twentieth Century is the rapid rise of the internet. Currently, mobile Internet, big data, cloud computing and intelligent terminals and other technologies continue to cooperate with the industry and industry chain integration, enhance the overall competitiveness of the industry. Internet has penetrated into all industries, the various industries and the internet. The production characteristics of the Internet in the industrial development in this period have become increasingly prominent. Premier Li Keqiang first proposed the "Internet + action" in the 2015 government work report, to promote the



Figure 1 – Large data network

combination of Internet technology and all walks of life, to promote e-commerce, Internet industry and Internet banking and other emerging industry development, promote the integration of the Internet and the depth of the industry. The Internet is no longer just a tool of communication; it is a kind of productivity. We are moving to the office - consumer - production of the three spiral Internet era. Internet developed so far, offices, consumption, production of these three aspects are not independent of each other, but contains each other, is the result of its own endogenous development. The Internet is the premise and basis of consumption and production of the Internet the Internet, but the Internet is a virtual consumer consumption behavior in the process of the virtual network space, and the production of the Internet is a virtual enterprise behavior generated by the virtual process of enterprise and Internet in cyberspace and virtual objects, that is the former is a product of virtual human, which is the product of virtual organization and the. Thus, at this stage we began from the office of the Internet era, the era of consumer Internet into the era of the production of the Internet: the Internet era of industry.

2.2. New model of industrial Internet

The birth of the industrial Internet marks the upgrading of the industrial chain and the value of the industry. In the age of the Internet industry, the traditional enterprises will need to use the Internet industry thinking center to transform the enterprise organizational structure, establishing a flat organizational structure, network reformation of development strategy, to meet consumer demand as from the center to the consumer "cooperation" products R & D and manufacturing service. The industrial pattern in the industry under the Internet thinking is mainly based on the use of modern information technology and network technology, the diversified market subjects (enterprises, intermediate users, middlemen, consumers) and other actors (government agencies, universities, research institutions, financial institutions, etc.) to the production and operation process and products, components and services as the center, a new virtual industry cluster in the

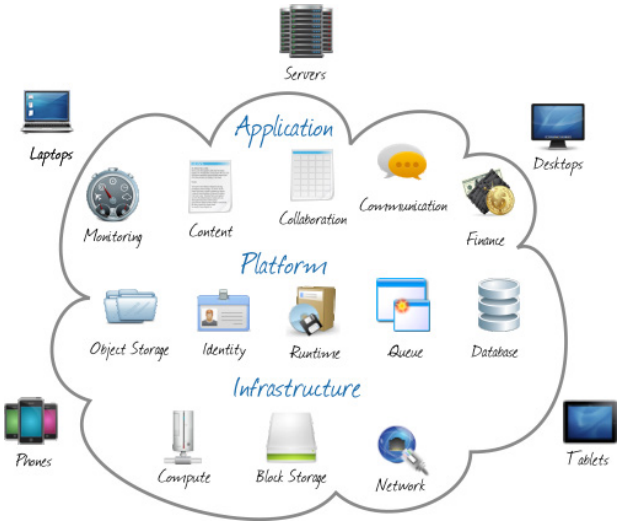


Figure 2 – Internet platform

virtual network space differentiation of composition, breaking the geographical restrictions and single industry value chain limited. Virtual industry clusters, although early in thinking of the Internet industry, but it is still from the mechanism analysis from its definition of virtual industry clusters are reflected in the thinking of the Internet industry organization, but also a concrete manifestation of the Internet industry. The Internet industry is around the development of an industry, the use of computer network and communication tools, to break the geographical restrictions, will have the ability, government, enterprise, University and Research on willingness to participate in industrial product development are connected together, strengthen the cooperation between institutions, dynamic network system software and hardware, human resources, benefit sharing and the formation of. The virtual industry cluster is the performance of this network.

2.3. Data mining

Cloud computing platform based on data mining is a perfect combination of cloud computing and data mining, which has all the advantages of cloud computing, but also has powerful data mining capabilities, provide strong support for cloud computing, data mining, data mining and data computing makes cloud computing management ability has been greatly improved, cloud computing and data mining should complement each other. The data mining platform based on cloud computing is a complex and rich content service system. Data mining subsystem is the core of the whole platform, the main function is to find useful information and knowledge by mining the data provided by the user. Data mining subsystem can be divided into six functional modules: one stop service, data acquisition, preprocessing, data mining, the results of evaluation and help. One stop service, refers to the user can not have data mining related knowledge can be submitted to the data and mining purposes to the platform, by a professional team to complete the data mining, and then the mining report to the user. Data acquisition, the main work is to obtain data from the system internal or external data sources for data mining use, and the external data sources to be stored in the platform database. Pretreatment, the main task is to complete the preparatory work before data mining, to provide data to meet the requirements of data mining, including data cleaning, data integration, data selection and data transformation of four functions. Data mining, through a variety of pre processed data mining algorithm to find useful information. In order to better achieve the purpose of data mining, users can also provide a custom data mining algorithm. The results of the evaluation, mainly including three aspects: model evaluation, results show, the results of comparison. Pattern evaluation is to evaluate the performance of the mining model, such as reliability and reliability. The results show that the mining results in a variety of forms to show to the user. The results of the comparison are the same mining task for many times to dig or use different algorithms for mining, the results of multiple mining for comparison, for the user's reference. Help is mainly about the introduction of the platform, operating methods.

BP learning algorithm is the essence of the minimum value problem solving error function, because it uses the steepest descent method in nonlinear programming, modifying the weights according to the direction of the negative gradient of the error function, which usually have low learning efficiency, slow convergence and easy to fall into local minimum state of shortage. In order to reduce the errors caused by these shortcomings, many improved methods of BP neural network have been put forward. Learning algorithm is the method of regulating the network weight, that is:

$$w_{new} = w_{old} + \Delta w \tag{1}$$

Then, target output error can express as:

$$e_k(t) = \begin{cases} d_k(t) - y_k(t) & k \in T(t) \\ 0, & otherwise \end{cases} \tag{2}$$

The performance function of the network can be expressed as:

$$J(t) = \frac{1}{2}\sum_{k=1}^{n}\left[e_k(t)\right]^2 \tag{3}$$

The total performance function of the network is:

$$J(t_o, t_1) = \sum_{\tau=t_o+1}^{t_1} J(\tau) \tag{4}$$

The RTRL algorithm, the definition of "active" information:

$$P_{ij}^k(t) = \frac{\partial y_k(t)}{\partial w_{ij}} \tag{5}$$

The activity information of the network is transmitted:

$$P_{ij}^k(t) = f'\left(s_k(t)\right) \times \left(\sum_{l \in U} w_{kl} P_{ij}^l(t-1) + z(t-1)\right) \tag{6}$$

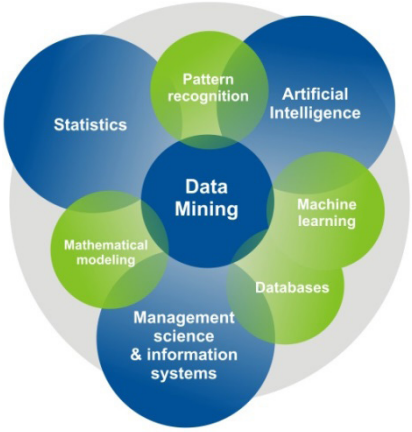


Figure 3 – Data mining

3. Agricultural industry integration

3.1. The data source

The data selected in this study have the added value of agriculture, forestry, animal husbandry and fishery, fixed assets investment in agriculture, forestry, animal husbandry and fishery, the number of people engaged in agriculture, forestry, animal husbandry and fishery, the crop sowing area, and the price index of agricultural production materials. In order to avoid because of the changes caused by the unbalanced panel data on the effect of parameter estimation, according to the "Chinese statistical norms" Statistical Yearbook, the country is divided into North and Northeast (HB) (DB), East China (HD), Southern China (HN), Southwest (XN), Northwest (XB) six areas. Panel data samples taken from six regions 2000 - 2015 annual data, all raw data are derived from the relevant statistical data. At present, there are many methods to measure the contribution rate of agricultural science and technology progress to the growth of agricultural economy. In many ways, the theoretical foundation is based on the C-D production function equation. The general form of C-D production function based on value added as explanatory variables in animal husbandry and fishery, animal husbandry and fishery in the capital stock, animal husbandry and fishery, the number of crop planting area as explanatory variables, establish panel data model to analyze the stationary test and co-integration test for each variable in the model based on the solution of the model, and the regional agricultural scientific and technological progress in agriculture's contribution to economic growth.

3.2. Model design

In order to measure the contribution rate of agricultural scientific and technological progress to agricultural economic growth, the author established the following analysis model based on C-D production function:

$$Y_t = AK_t^a L_t^\beta M_t^\gamma$$

In order to facilitate the analysis of the research, the two ends of the nonlinear equation are taken into a linear equation:

$$LnY_t = \ln A + \alpha \ln K_t + \beta \ln L_t + \gamma \ln M_t$$

Calculation method of capital stock Kt is the perpetual inventory method, calculation of animal husbandry and fishery areas according to the constant price of capital stock. The formula for calculating the capital stock:

$$K_t = I_t + (1-\delta)K_{t-1}$$

3.3. Integration of agricultural industry and optimization of its industrial chain

Actively integrate the Internet into the development of agricultural industry, promote the network and information construction of agricultural industry, enhance the comprehensive competitiveness of agricultural industry, the development of agricultural industry has the significance of the times. As the agricultural development in China is influenced by thousands of years of traditional ideas, the agricultural business model is stuck in the traditional form. This traditional agricultural management mode no longer meet the needs of China's social and economic development. The urgent need to break the traditional thinking frame of the industry concentrated in the first industry; expand agricultural production related to the two or three industry, the formation of the integration of agricultural industry structure in the new industrial chain, to provide protection for the development of agricultural industry. The development of information technology, breaking the boundaries between industries, cross-border integration between the industries has brought an opportunity. The agricultural virtual industry cluster is based on the Internet, the Internet thinking based on agriculture, the agricultural production of prenatal and postpartum seamless docking, and different areas of agricultural organization together formed by information technology. Agricultural Virtual Industry Clusters to achieve data sharing of resources as the goal, the Agricultural Internet industry, promote agricultural products online trading and online settlement, order agriculture and a series of activities to enhance the management of agricultural information, agricultural production capacity. Agricultural Virtual industrial cluster is a new model of agricultural integration in the industrial Internet era, which has its own unique organizational framework, operational mechanism and management model.

At present, the sales of agricultural products through the Internet platform can effectively expand the agricultural products sales channels; widen the channel of agricultural products spread. The Internet has gradually become an important tool for agricultural sales. Such as online community support Farmigo enterprises as the representative of the agricultural project is a link to farmers and consumers online platform, Farmigo advocate in the local food, providing green agricultural products for consumers around the nearby farm community. Farmigo is not only the direct purchase of agricultural products from farmers in the hands of the online market; it is also a farmer online management of agricultural production, sales and distribution system. In China, there are a number of Internet based agricultural products business platform, such as the Alibaba of rural electricity supplier strategy, logistics and channel the last kilometer of implementation, solves the difficult problem of sales of agricultural products, agricultural products sales channel widening. Agricultural Virtual Industrial Cluster integrated management platform, under the integrated service platform, financial management platform and commodity trading platform. The integrated service platform mainly provides industry related products and prices of bulk raw material price quotations and enquiries to the members; the use of networking technology, products and devices for remote control of the production process, and establish the information industry big data platform, in a timely manner to the members to push the dynamic development of the new industry. Financial management platform is a service platform to provide investment and financing services to members. Financial management platform in addition to providing financial services to members,

but also rely on the financial database, through the members of the commodity trading platform for the members of the transaction data to provide a credit report. Commodity trading platform is a real-time and efficient ordering, shipping, receiving management, providing safe online payment, convenient and timely information query.

4. Empirical analysis

4.1. Stability test

LnYt, lnKt, lnLt, lnMt and other panel data variables to carry out ADF test. All test results show that the above variables are variables, at the same time the relationship between Johansen panel co-integration test to the data variables, test results (Table 1) show the added value of the number of employees in animal husbandry and fishery Agriculture Forestry Animal Husbandry and fishery and animal husbandry and fishery, capital stock, co-integration, panel data between the variables of the crop planting area animal husbandry and Fishery: increase the value of the number of employees in animal husbandry and fishery and agricultural capital stock, and there is a long-term equilibrium relationship between the variables of crop planting area. The results show that the linear regression estimation of the panel data is not due to the instability of the variable sequence.

Variable	ADF test value	10% critical value	Result
lnYt	-0.9146	-3.1488	Non-stable
d.lnYt	-1.2745	-3.1488	Non-stable
lnKt	-6.4212	-3.1488	stable
d.lnKt	7.0531	-3.2245	Non-stable
lnLt	1.2681	-3.3643	Non-stable
d.lnLt	-5.6445	-3.3643	stable
lnMt	-2.6780	-3.2574	Non-stable
d.lnMt	-4.5429	-3.3130	stable

Table 1 – ADF test

Hypothesis	Characteristic value	Trace statistic	1% critical value
none	0.8439	46.209	35.128
At most one	0.4152*	10.154	19.657
At most two	0.0087	0.1466	6.4289
At most three	0. 0545	2.1645	7.0342

Table 2 – Cointegration test

4.2. Estimate model

The panel model consists of 3 different forms: the variable parameter model, variable intercept model and constant parameter model. When the panel model is estimated, the sample data is used to contain the information in the three directions of the section, the period and the

variable. If the model is not properly set, the estimated results will be far from the economic reality to be simulated. Therefore, the first step in establishing a panel model is to test whether the sample data is in compliance with the above panel model, so as to avoid the deviation of the model and improve the validity of the parameter estimation. According to the test, the regression analysis should be carried out in the form of fixed effect variable parameter model.

The parameters of fixed effect model in the form of equations) of the regression analysis, results from regression estimation (Table 3), the coefficient of determination is higher, better model fitting effect; the variable parameters have passed significant test; the elastic coefficient is greater than zero, indicating the strong ability to explain economic model. In addition, regression estimation results also show that China's agricultural system is currently in the stage of increasing returns to scale, the increased yield is greater than the proportion of production factors increases the proportion of the full compliance with China's system of agriculture from traditional agriculture to modern.

Variable	Parameter	Standard error	T statistics	Probability
C	-17. 6566	0. 4253	-31. 7206	0. 0000
lnK_HB	0. 7536	0. 0069	114. 9011	0. 0000
lnK_DB	0. 3307	0. 0185	21. 7517	0. 0000
lnK_HD	0. 6420	0. 0052	122. 1726	0. 0010
lnK_HN	0. 5357	0. 0073	91.2390	0. 0000
lnK_XN	0. 3756	0. 0116	32. 1438	0. 0000
lnK_XB	0. 4898	0. 0094	54. 6520	0. 0000
lnL_HB	1. 2604	0. 1049	12. 5833	0. 0010
lnL_DB	0. 8397	0. 1318	14. 9488	0. 0000
lnL_HD	0. 6524	0. 0717 3	4. 3538	0. 0000
lnL_HN	0. 3271	0. 0624	12. 0424	0. 0000
lnL_XN	0. 6915	0. 0317	17. 7394	0. 0000
lnL_XB	1. 4822	0. 0739	32. 6116	0. 0000

Table 3 – Regression estimation results

The primary stage of agricultural transformation indicates that the promoting effect of agricultural science and technology progress on agricultural economic growth is gradually increasing. Therefore, in order to achieve the sustainable growth of agricultural economy, the only feasible way is to rely on scientific and technological progress in agriculture, improve the utilization of agricultural resources, enhance the resources, environment and ecological carrying capacity of economic growth, and achieve a higher growth rate with less investment.

4.3. Factor contribution rate calculation

According to the results of regression analysis and related sequence Variables panel data lnKt, lnYt, lnLt, lnMt, respectively, the contribution rate of each factor is calculated as follows:

$$C_{TFP} = \frac{LnA}{LnY_t}$$

$$C_K = \alpha \frac{LnK}{LnY_t}$$

$$C_L = \beta \frac{LnL}{LnY_t}$$

Because lnA, a, b, g is a fixed value in the estimation section members, and the corresponding time series variables lnYt, lnKt, lnLt, lnMt after the operation, the contribution rate of elements CTFP, CK, CL, CM may deviate from unity, therefore, to be re normalized, then calculate the mean factor contribution rate of sequence.

Factor	HB	DB	HD	HN	XN	XB
TFP	0. 07	0. 15	0. 11	0. 14	0. 12	0. 02
K	0. 32	0. 24	0. 25	0. 29	0. 26	0. 27
L	0. 26	0. 33	0. 22	0. 26	0. 25	0. 35
M	0. 31	0. 22	0. 32	0. 32	0. 35	0. 36

Table 4 – Contribution rate of agricultural production factors

Can be seen from table 4 in the agricultural production factors, regional differences in TFP contribution rate is large, the contribution rate and contribution rate of labour land area difference of regional difference of capital contribution rate is relatively small, show that the area of agricultural science and technology development level and labour education level is not balanced, there is a big difference and agriculture the area's natural resource endowment, directly affects the TFP, regional differences in labour force contribution rate and contribution rate of cultivated land. Look at the TFP contribution rate is generally low in general, higher rate of contribution of labour contribution rate and the contribution rate of capital, land; show the progress of agricultural science and technology in the Chinese agriculture in the process of economic growth is still small, agricultural production factors present low allocation efficiency, makes the agricultural economic growth in all regions of a large number of investment mainly rely on production factors. Although more than 30 years with the growth of the agricultural economy of our country reforming and opening, but the extensive economic growth depends on the traditional high input, high consumption, low output, low efficiency of the growth mode has not changed fundamentally.

5. Conclusion

An empirical study on the influence of regional agricultural economic growth in China's agricultural science and technology results, show that the fixed effect panel based variable parameter model is reasonable in structure model, the design of data structure is scientific, in the estimation of the model parameters are effective, to reflect on the

progress of agricultural science and technology effect of regional agricultural economic growth in China, can reasonably explain the regional differences of agricultural science and technology progress contribution rate in china. Based on the above empirical research, we can draw the following conclusions. There is an obvious regional difference of agricultural science and technology progress contribution rate of China, agricultural scientific and technological progress has played in China's agriculture in the process of economic growth is still small, extensive agricultural economic growth in China relies on the traditional high input, high consumption, low output, low efficiency of the growth mode has not changed fundamentally.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 15/04/2016
Aceitação/Acceptance: 06/07/2016

Distributed Energy System Optimization – an Application in Shenzhen

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Pages: 153–160

Abstract: The low carbon economy is proposed in China, and the national supportive policy for low carbon industrial park is also provided. Distributed energy system applies cascade utilization of energy technique with very high primary energy utilization efficiency. This system can meet users' requirements immediately. Therefore, distributed energy system has become an important technical method to achieve energy conservation, emission reduction and efficiency improvement due to these advantages. In this paper, the power (cool, heat, electricity) load characteristics in a promoter region of low carbon industrial park in Shenzhen are predicted and analyzed. Then the generating set configuration is optimized. The comprehensive energy efficiency of the whole energy system takes priority over others. Finally the generating set form of a distributed energy system is determined.

Keywords: distributed energy system, comprehensive energy efficiency, combined cooling, heating and power system(CCHP)

1. Introduction

Industrial park characterized by industry cluster has become an important form and the main force of economic development in China (Andreas, 2006). However, the development model is excessively dependent on the input of energy, resource and material. This extensive development model focusing on enlarging scale needs to be changed (Claudio, 2000; Freixo, 2014). Therefore, it is urgent to develop low carbon parks. In order to plan and design low carbon parks, the consumption, pollution and emission in the park should be controlled (Mercourios, 2000). At the same time, ecological sustainable construction and development including environmental protection and harmony with nature should be emphasized from the aspects of energy, water, landscape, traffic, etc. It should be in accordance with the principles of being easy for practice, implementation and evaluation. To maximize the efficiency of the energy system in the park, the demand should be lowered and the efficiency should be improved (Kari, 2006; Thomas, 2012). Non-renewable resources should be replaced by renewable resources by cascade utilization of energy technique. A clear development goal will be obtained. Eighty pilot national low carbon

industrial parks with distinctive characteristic and strong demonstration significance will be created before 2015. In addition, a batch of low carbon enterprises which master low carbon core technology and have advanced management experience on low carbon will be built. Then a group of industrial parks with low carbon development model can be formed. The low carbon economy is proposed in China, and the national supportive policy for low carbon industrial park is also provided (Sá, 2012). Distributed energy system applies cascade utilization of energy technique with very high primary energy utilization efficiency. This system can meet users' requirements immediately. Therefore, distributed energy system has become an important technical method to achieve energy conservation, emission reduction and efficiency improvement due to these advantages. Natural gas distributed energy system is a heat and power cogeneration system. For this system, natural gas is used as the main fuel. It can drive the power generation equipment such as gas turbine or gas engine. Electricity produced by the electric power can meet the demands of internal users. The waste heat generated by the system can be used to supply heat and cool for terminal users through recycling equipment. Its main advantage is that the power can be produced and used onsite. The energy efficiency per unit can reach more than 70%. And it has dual peak cutting effect on the power grid and natural gas pipe network. Distributed energy system will be popularized in cities above national scale by 2020, and the installed capacity is fifty million kilowatts. The "gas utilization policy" and "energy development in the Twelfth Five-Year Plan" promulgated in 2012 and 2013 by the national development and reform commission and state council explicitly encourage the development of natural gas distributed energy. In addition, supportive policies of encouraging the development of natural gas distributed energy have been issued recently in Beijing, Shanghai, Guangzhou and other places. The file of "gas distributed energy system development supportive measures for air conditioning in Shanghai" was issued in Shanghai in 2008. The equipment investment subsidies can be offered for the company using distributed power system and gas air conditioning. Natural gas will be supplied for priority. Among them, the distributed power system has 1000 yuan/KW subsidies, and gas air conditioning has 100 yuan/KW subsidies per refrigeration capacity. The file "development plan of cogeneration and distributed energy station in Guangzhou" published in 2012 also puts forward that 16 area type distributed energy stations, 33 commerce and building distributed energy stations will be constructed in the future in Guangzhou city. And about 10 distributed energy demonstration stations will be built during the "Twelfth Five-Year".

2. General situation of the project

This project is located in Shenzhen city with the planning area of about 53 square kilometers. Among them, the promoter region, including public buildings such as office buildings, shopping malls, school buildings and libraries, covers an area of about 1.3 square kilometers. The total construction area is about 2 million square meters. The project is aimed for the international first-class low carbon industrial park with its integrated energy efficiency more than 70%. By predicting and analyzing power (cool, heat, electricity) load characteristic in the promoter region, configuration of generating set is optimized. The comprehensive energy efficiency of the whole energy system has priority over other things. Finally the generating set form of a distributed energy system is determined. This will be a model for other cities.

3. Power load analysis in park

3.1. Electric load prediction and analysis

Shenzhen belongs to the region with hot summer and warm winter. The power load in this area is given priority to cooling load of air conditioning, and time of supplying cool may be up to 6-8 months. Electricity is mostly used in architectural lighting, refrigeration by air conditioning and other office auxiliary equipment in promoter region. Electricity consumption by refrigeration with air conditioning is consisted of cold source side (chiller, pumps, cooling towers, etc.) electricity consumption and end side (fan coil units, air cooling tank, etc.) electricity consumption. Only the electric load at the end of the air conditioning system needs to be considered, because heat and power cogeneration distributed energy system is adopted in this project.

This project is mainly about power load in office. The electric load with time (hour) is closely related to the use frequency of construction and personnel schedule. Therefore, the analysis of electric load is carried out on design day including working days and rest days. And the results are shown in Figure 1 respectively.

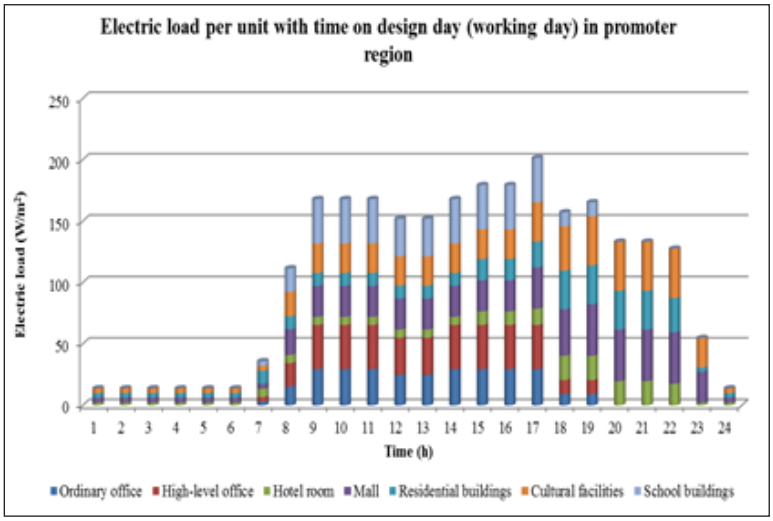


Figure 1 – Electric load per unit with time on design day (working day) in promoter region

3.2. Cooling load prediction and analysis

In order to grasp the characteristics of cooling load changes throughout the year of air conditioning more accurately in the promoter region, and provide basis for the cooling capacity selection and cold water pipe diameter design in subsequent regions, the following steps should be followed. According to files “civil building heating ventilation and air conditioning design specification”, “public building energy efficiency design standards”, “energy efficiency design standards of residential building in area with hot summer and warm winter” and other relevant local energy-saving design standards, air conditioning load simulation calculation software (Energyplus, E +) should be used for

air conditioning load simulation analysis hourly throughout the year. And the simulation results are shown in Figure2.

3.3. Hot water load prediction and analysis

Living hot water load is associated with the required temperature, the tap water temperature and the supplying living hot water temperature. The hot water temperature is 60 °C forall users in this plan. According to the existing planning data combined with the size and position distribution characteristics of hotels and residential buildings in the promoter region, a population of 1.5×104 who use hot water is determined in the promoter region. When considering the population flow factor, population number is multiplied by the coefficient of 0.95 for calculating hot water load. It is estimated that the supplied hot water (60 °C) is 1710 t/d in winter, 570 t/d in summer, and 1140 t/d in spring and autumn in average in the promoter region. And the hot water load of each season in promoter region is shown in Table 1.

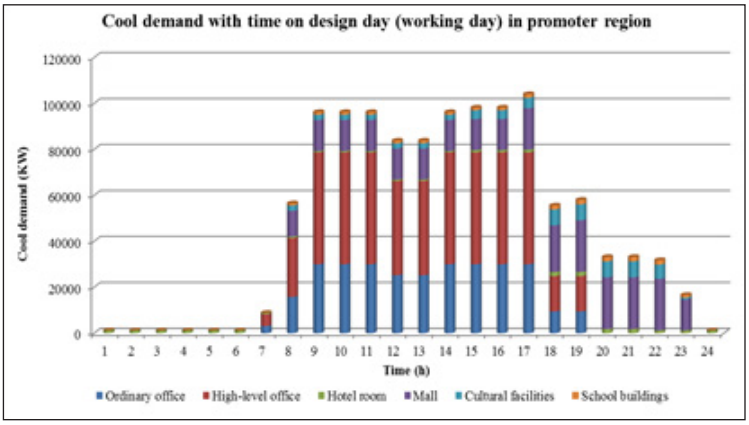


Figure 2 – Cool demand with time on design day (working day) in promoter region

Season		Spring	Summer	Autumn	Winter
Month	3-4	5-9	10-11	12-2	
Population that hot water supplied for (1.5×10⁴)	Hot water demand per day(t)	1140	570	1140	1710
	Load generated by hot water (t/h)	71.3	35.7	71.3	106.8

Table 1 – Load generated by hot water demand in promoter region of each season

4. Selected schemes of generating set configuration and analysis for a distributed energy system

According to electricity generated at end and cooling load curves, different generating setsand configuration methods can be chosen. The selected schemes are shown as Figure 3 - Figure5.

Selected scheme one: Generator capacity can satisfy the electric demand, without needing to buy electricity on the network (Figure3).

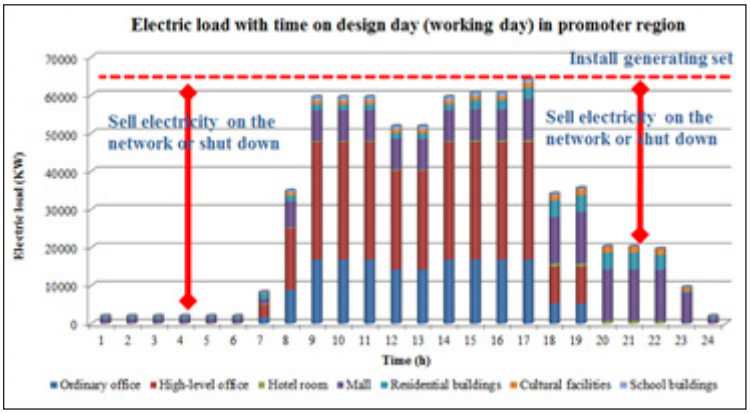


Figure 3 – Selected scheme one: installed capacity of each generating set

In this scheme, installed capacity of generating set is defined by the maximum electric load in this region, and the waste heat is not used for refrigeration. Electivity generated by energy station can meet the demand of electricity in the whole region. In the rest time beyond the peak period, electricity should be sold on the network or shutdown. Since the waste heat is not used for refrigeration, system efficiency of 70% is difficult to achieve as the national development and reform commission requires. So scheme one is not recommended.

Selected scheme two: Waste heat generated by generating set is used for refrigeration. Part of electricity at end can be shared (Figure4).In scheme two, generating waste heat refrigeration technique is applied. The electric demand for air conditioning cold source at the end is reduced, and installed capacity of generating set is also reduced. At the same time, the time of generating electricity is effectively extended, and the time of selling electricity or shutdown is reduced. The system efficiency is less than 70% without using waste heat for refrigeration.

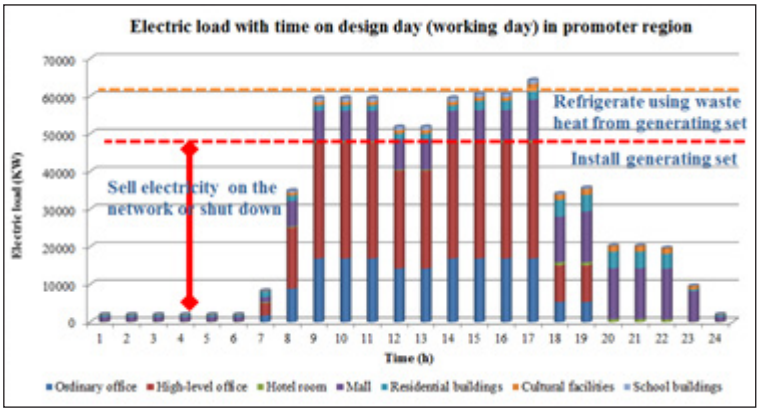


Figure 4 – Selected scheme two: installed capacity of each generating set

Selected scheme three: In addition to generating heat refrigeration technique, ice storage technique is also used in cool rush hour to further reduce electricity demand of the cold source at end (Figure 5).

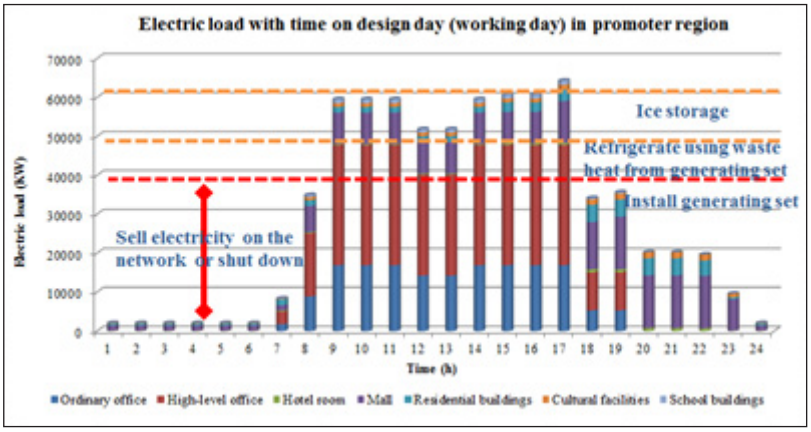


Figure 5 – Selected scheme three: installed capacity of each generating set

Through the ice storage technique, which is refrigeration using low electricity at night and cancellation the cooling load peak during the day, the generator installed capacity can be further compressed, and the time of selling electricity on the network or shutdown is more reduced. However, in the period without refrigeration using waste heat, the system efficiency of 70% is still can't be obtained.

5. Comparison and determination of schemes

As it is discussed above, selected scheme four is used for the selection of equipment type. According to different types of airborne generator, the following two kinds of schemes are proposed and analyzed in detail respectively.

Power generator systems: gas-steam combined cycle units: one 41.63MW gas turbine and gas engine, five 4.3MW gas engines.

Gas turbine is chosen to share airborne electric supply (lighting inside the region, electricity used by equipment). Then gas engine is chosen to share peak electric supply and refrigerate using flue gas. Gas-steam combined cycle units can supply domestic hot water using waste heat with running mode of 12 h/d.

Cooling supply systems in the region: A series model of the absorption chiller and electric refrigeration units is used with part of ice storage. Electricity generated by heat and power cogeneration system is used during the day, while low net electricity is used at night.

Domestic hot water is heated by using waste heat of boiler flue gas. The hot water is heated to 65 °C via extracting a moderate amount of salt-free water from waste heat

boiler. Then the hot water is transported to the end user through the network. The user owns hot water storage facilities.

Gas turbine combined cycle power generation system based on airborne units can supply sufficient electricity to be used during 8:00-20:00 (12 h) on working days. When the quantity of electric load is less than that of the system capacity, the electricity generated by the system needs to be sold on the network. When the quantity of electric load is more than that of the system capacity, the skimpy electricity can be complemented by gas engine + waste heat utilization system or the network. During 20:00-8:00, electricity demand per unit of the buildings in promoter region is reduced, and electricity can be bought directly from the network for application.

Gas engine + waste heat usage system includes gas engine and gas steam absorption refrigeration machine. They can supplement electricity shortage as the gas turbine on working days, and generate power on rest days with refrigeration based on this system.

6. Conclusions

In this paper, the power (cool, heat, electricity) load characteristics in a promoter region of low carbon industrial park in Shenzhen are predicted and analyzed. Then the generating set configuration is optimized. The comprehensive energy efficiency of the whole energy system has priority over other things. Finally the generating set form of a distributed energy system is determined.

Acknowledgements

This study is sponsored by the Youth Science Fund of National Natural Science Foundation of China (No.51108185), the funding of State Key Laboratory of Subtropical Building Science (No.2013KB24) and the Fundamental Research Funds for the Central Universities “researches on high-efficiency urban energy planning and its optimization methods”.

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Iberian Journal of Information Systems and Technologies

Recebido/Submission: 11/04/2016
Aceitação/Acceptance: 15/07/2016

Cloud Computing and Data Mining Application in Enterprise Profitability Analysis Based on the Perspective of Cash Flow

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Pages: 161–172

Abstract: With the development of network technology, data mining based on cloud computing has become a key technology to explore effective data. In this paper, the author research on the cloud computing and data mining application in enterprise profitability based on the perspective of cash flow. Based on the data in the cash flow statement, we detect and maintain the cash flow indicators, and can accurately assess the profitability of the enterprise. According to the enterprise data from 2007-2015, we analyze the level of corporate profits, we identify the various problems existing in the growth of enterprises, and find out the solutions.

Keywords: Cloud computing, Enterprise profitability, Data mining, Cash flow

1. Introduction

Data mining is a necessary part of knowledge discovery in database, and database knowledge discovery is useful information for converting the raw information. The development process of data mining draws on the results of many other fields, including artificial intelligence, machine learning (Cao, 2015; Gu, 2015; Ferreira, et al. 2015). The rapid expansion of the amount of data makes the demand for massive data mining increase day by day. Traditional data mining often takes a lot of time to deal with massive data mining, and the cloud computing provides an effective way to solve this problem (Gao, 2015; Fan,2015). The computational task of massive data mining is very complex, which requires high computing power, and the cloud computing can provide this kind of computing power, and it can effectively organize the storage of massive data.

Profit is the main objective of modern enterprise management and promote enterprise long-term business growth and material basis, a corporate earnings level is long-term business performance evaluation index of the enterprise (Zhao, 2015; Zhang, 2015), but also is an important indicator of the long-term business development ability, strong profitability of the enterprise has obvious advantages, it can increase the survival ability of the enterprise and the future development of the ability to have weak profitability

of the enterprises, the enterprises are at a disadvantage in the future long-term development(Mora, 2014; Shen, 2015). Therefore, the analysis of the profitability of the financial analysis is a point, so, how to correctly and accurately assess the profitability is essential. Stakeholder makes the corresponding financial decisions, in order to achieve the accuracy and practicality of decision-making, profitability analysis can be used as an important basis for decision-making (Zhang,2016).

In this paper, detailed and accurate information to specific enterprises listed after nearly nine years of public data sample, in 2007 to 2015 the enterprise accurate data based method using data statistics and induction, the enterprise nearly nine years of data are calculated by six on the profitability ratio calculation of enterprises the profit level in detail, and the influencing factors analysis of enterprise annual profit level, in the final conclusion that the enterprise based on the existing problems, and puts forward some feasible measures to solve business problems, to avoid risks in a timely manner, to make a solution to, for the long-term stability in the State Development in the future.

2. Data mining based on cloud computing

2.1. Cloud computing

Cloud computing is the one provided by the network defined by the economic boundary distributed system, system according to the external needs of users from an abstract, virtual, dynamic resource pool to provide users with computing power, storage, network and other services. Cloud computing is a special distributed computing system, the system with the traditional system is different: it is scalable and extensible; cloud is encapsulated in an abstract entity, and provides different levels of service to the user. Its computational boundary is determined by economic principles rather than technical constraints; services can be configured and provided as required. In the context of the Internet era, the government, research institutions and industry giants have quickly began to use cloud computing to solve the growing problem of computing and storage.

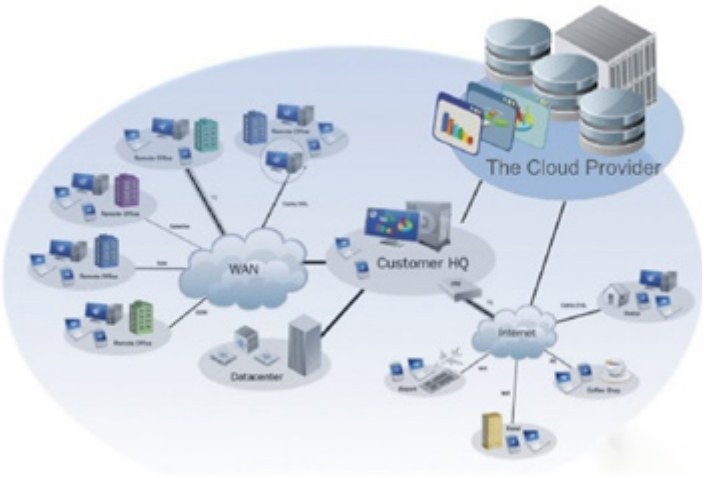


Figure 1 – Cloud computing

There are three main reasons for the emergence and development of cloud computing: 1) Rapidly reduce the hardware cost, increase the computing power and storage capacity of the emergence and development of multi-core architecture and composed of thousands of tens of thousands of computing units of modern supercomputers. 2) Scientific field processing and Simulation of the operation of the data, the Internet field release and collection of data, are showing an exponential growth. 3) The rise of Web2.0 technology as the core of the software services.

Cloud computing applications in the description of the application of the Internet is the use of access to the. Cloud applications using massive data centers and powerful network servers to run network programs and network services. Any one user can access such a cloud computing application via the Internet and browser. From these we can see that on the one hand, cloud computing is equivalent to infrastructure, which can be used to construct the application; on the other hand, it can also describe the application of cloud computing based on these. Cloud computing provides users with a super high computing power and storage access to large companies, and users usually access these resources through Web services. One of the goals of cloud computing is to hide the complexity of the management of the computer infrastructure. At the same time, the cloud platform to provide high reliability, high performance, high scalability, and to be able to configure their own services, and these services are much cheaper than their own to buy hardware.

2.2. Data mining

Artificial neural network is composed of basic components of a large number of simple interconnected neurons, and Simulation of the human brain information processing, information processing and parallel non - linear transformation of complex network

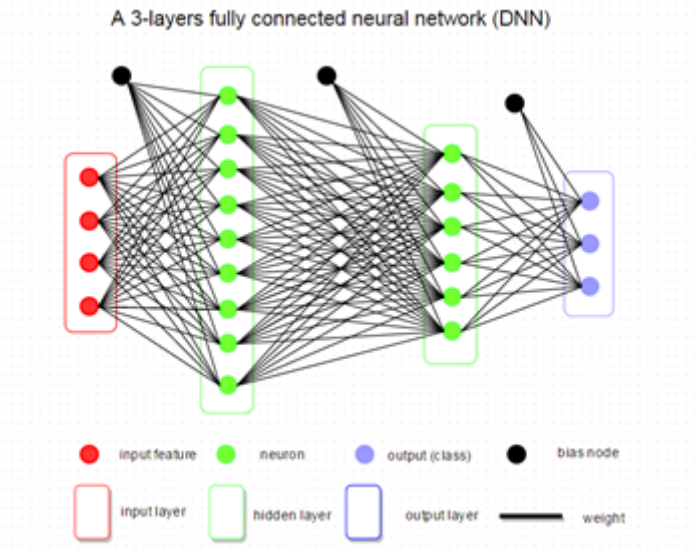


Figure 2 – BP neural network

system of artificial neural network to process information through the information on the neural network training samples, it is the human brain's memory and identification ability. Complete all kinds of information processing function of the artificial neural network has good adaptive self-learning, associative memory, parallel processing and non - linear transformation can

In the case of the defect of the sample and the parameter drift, the stability of the output can be guaranteed. The characteristics of artificial neural network to simulate the human intelligence, attention and extensive academic research, has been successfully applied in many fields, such as data mining, pattern recognition, image processing, virtual reality, intelligent control, optimization calculation etc.. According to the topology and operation mode of the network, a neural network model for feedforward multilayer network model, feedback recursive network model, and random network model. The application of more mature in pattern recognition model is the multilayer feedforward network B type P back propagation model of BP network is a typical multi-layer network is divided into input layer, hidden layer and output layer, with full interconnection between layers.

The application of neural network in data mining is not optimistic, the main reason is that the neural network has the defects of complex structure, can explain the difference, long training time. But the noise data of high capacity and low error rate advantages, as well as a variety of network training algorithm is proposed and the subsequent optimization, especially the extraction the algorithm of various network pruning algorithms and rules are put forward and perfect, the application of neural network in data mining more and more favored by the majority of users. Data preparation is to be defined, data mining and processing, in order to make it adapt to the specific method of data mining. Data preparation is an important first step in the process of data mining, the data mining plays an important role in the process. It mainly includes the following four processes:

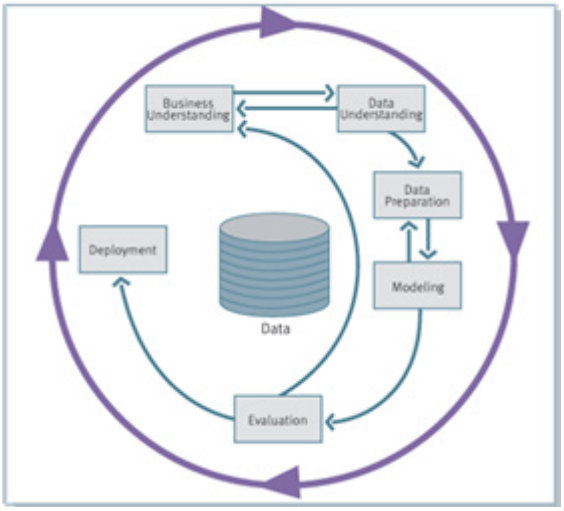


Figure 3 – Data Mining

1. Data cleaning: data cleaning is to fill the vacancy in the data, the elimination of noise data, the data to correct inconsistencies in the data.
2. Data selection: data selection is to select the data columns and rows for the data mining.
3. Data preprocessing: data preprocessing is to enhance the selection of clean data processing.
4. Data representation: data representation is the data after preprocessing the data into a form acceptable algorithm based on neural network and data mining. Can only handle numerical data based on neural network and data mining, so it is necessary to sign data into numerical data.

3. Enterprise profitability analysis

3.1. Profitability indicators and sample selection and overview

Analysis of the income situation, only by the accrual accounting index system is the judgment is not comprehensive, if the enterprises want to truly complete the performance, but also on the basis of profitability analysis. It not only avoids the accrual defects, but also can communicate with other relevant data in the table to communicate and test, more able to respond to the overall profitability of the enterprise.

- Profit cash ratio: this index shows that each unit net profit of net inflows, directly to the enterprise ability to achieve net profit. If the ratio is larger, then the profit situation is better. Cash ratio is equal to 1, is the state of the balance of profitability of the enterprise. So when the profit of cash ratio is greater than 1, the general situation is that the amount of money flowing into the enterprise business activities more, while the net profit is less, then the enterprise has a lot of net profit as the next business. And the profit cash ratio is less than 1, it indicates that the enterprise does not have enough funds as the backing, the next business will have greater difficulties. Even in a state of profit, and occasionally or often have a lack of funds, making the situation is not high profit. Serious cases, but also led to the bankruptcy of enterprises.
- Asset cash return: this index is an objective evaluation of the efficiency of the use of assets, and the speed of the speed of turnover, is the capital of its own funds to produce a kind of evaluation. If the ratio is greater, the proportion of funds recovered from the outflow of funds, the company received more cash, less cash outflow, the loss of the corresponding enterprises will be reduced. If the ratio is lower, then the enterprise losses may be greater, for the enterprise after the development of the business has a negative impact.
- Net assets return on cash: specify the enterprises in the capital level aspects of the situation, if the ratio is higher, enterprise received more cash, cash outflow, corresponding enterprises will reduce the losses, if the ratio is low, then the business losses may be larger, is not conducive to enterprise development.
- Cash gross margin: this index is an effective supplement for sales of zero interest rates, the accrual case can be analyzed and more accurate calculation, found deficiencies, such as artificially inflated phenomenon, can be modified timely.
- Net sales rate: this indicator shows the current situation, the cash recovery phenomenon. Under normal circumstances, the net sales ratio is generally 1.

However, in practical operation, there may be a credit phenomenon, although the sales income is more, but the actual flow of enterprise funds rarely, therefore, the index is less than 1. If the ratio is close to 1, it shows that the rotation of corporate funds faster, less amount of accounts receivable, the more powerful the ability to explain. If the ratio is greater than 1, the enterprise will have a lot of cash vacant, so that more and more difficult to raise funds, the extent of the loss of bad debts is also growing.

- Operating cash ratio: if the ratio is higher, it shows that the level of corporate funds to create a stronger, better financial situation, its solvency and financing capacity is also strong. If the index value is low, it shows that the level of corporate funds to create is weak, the financial situation of enterprises in the more vulnerable, the solvency is weak, it will not conducive to the future development

3.2. Enterprise profitability analysis

The following conclusions can be drawn from the corporate statements. Operating cash flow: net cash flow in 2008 than in 2007 decreased by 383 million 590 thousand yuan, mainly due to the 08 year of the global economic crisis spread and cause service reduced, gradually increase the variety of advertising media and product costs, so that the net enterprises continue to decrease, while the enterprise accounts receivable other receivables, inventory, business taxes and surcharges, selling expenses, administrative expenses, a slight increase of fixed assets is also one of the reasons causing the current net cash flow from operating activities decreased. In 2009 than in 2008 and the rapid growth of 534 million 50 thousand yuan, growth this year is about 1.9 times a year, is a great value in recent years enterprise net cash flow, mainly produce a variety of positive policy in 2009 in response to the economic crisis of the country launched under the action of the effect, such as effects of stimulation of domestic consumption policy. The enterprise in the sale of goods and services in terms of the capital increase, so enterprises in the active policy under the guidance of the level of net profit rose sharply. However, from 2009 to 2012 the company's net decline, and even negative in 2012, is the lowest value in the past few years, the net cash flow in 2012 decreased by 857 million 560 thousand yuan over the previous year. Is mainly due to the support of national

Year	Net cash flow of operating activities	Net profit	Profit cash ratio
2007	98707	53236	185.41%
2008	60348	45911	131.45%
2009	113753	65725	173.07%
2010	88555	59898	147.84%
2011	68289	47352	144.22%
2012	-17467	45948	-38.01%
2013	37370	47996	77.86%
2014	63999	49645	128.91%
2015	124527	56457	221.75%

Table 1 – Enterprise 2007-2015 annual data

policies related to exit, rising oil prices, the reduction in operating income, operating costs increased, it is difficult to improve in the short period of service, so that the current corporate cash inflows than outflows. From 2012 to 2015 the net cash flow of enterprises in the growth phase, and every year was two times the growth trend, mainly due to the increase in the amount of funds received by the enterprise; making the current cash inflow is higher than the amount of outflow.

1. An overview of the profit and cash ratio

From table 1, net profit: 2007 to 2008 net profit fell 73 million 280 thousand yuan, which is mainly due to the impact of the global economic crisis in 2008 led to a decline in net profit. 2009 than in 2008 net profit rose 198 million 140 thousand yuan. This is the result of enterprises to respond to the economic crisis to make a variety of adjustments, but also in the country under the guidance of a variety of positive policies, making a substantial rise in net profit level. But from 2010 to 2011 the enterprise net profit fell 125 million 460 thousand yuan, it is understood that in 2011 the enterprise growth rate is lower than the industry average speed in 2011 is the main exit of government support policies, and the implementation of the policy of the government's negative influence and the enterprise cost and expense increase caused. 2011 to 2014 net profit is up and down in the state, but the volatility is not very large, the net profit for several years to achieve a more stable, not much impact. 2015 net profit increased by 68 million 120 thousand yuan in 2014, which is the largest since 2010 to achieve net profit, but still no large amount of 2009.

2. The analysis of the cash return on corporate assets

Year	Net cash flow of operating activities (10000 yuan)	Total assets (10000 yuan)	Average total assets (10000 yuan)	Cash return on assets%
2007	98707	997217	923202	10.69%
2008	60348	943681	970449	6.22%
2009	113753	911675	927678	12.26%
2010	88555	1000543	956109	9.26%
2011	68289	975642	988092.5	6.91%
2012	-17467	966248	970945	-1.80%
2013	37370	1017387	991817.5	3.77%
2014	63999	1124006	1070697	5.98%
2015	12,527	1470202	1297104	9.60%

Table 2 – All the data in 2007-2015

It can be learned that the average total assets: 2007 to 2015 average net asset volatility is increased, and the annual fluctuation range is not very large, which belongs to the normal operating range of enterprises. Cash return on 2008 was 4.45% lower than last year, 2009 growth of 6.04% over the previous year, 2009 is the maximum value of nearly nine years, the stage of enterprise asset turnover rate is the fastest, has nearly nine years of the best results. From 2009 to 2012 in the decline stage, especially after two years the biggest decline in 2012, asset cash returns have been low to -1.8%, indicating that companies at this stage the total assets cash generating ability is more and more weak, asset turnover slowed down, the reason is that in 2012 the enterprise accounts receivable increased, the assets turnover

rate slow. From 2012 to 2015 the asset cash return rate began to significantly improve, after 2012, the company's capital turnover rate is fast, the impact on the enterprise development.

3. Analysis on the cash recovery rate of enterprise's net assets

year	Net cash flow of operating activities (10000 yuan)	Net assets (10000 yuan)	Average net assets (10000 yuan)	Net assets cash recovery%
2007	98707	453007	392568	25.14%
2008	60348	430492	441749.5	13.66%
2009	113753	537410	483951	23.51%
2010	88555	576815	557112.5	15.90%
2011	68289	546031	561423	12.16%
2012	-17467	595204	570617.5	-3.06%
2013	37370	615167	6051855	0.62%
2014	63999	693848	654507.5	9.78%
2015	124527	913476	803662	15.49%

Table 3 – The data in 2007-2015

Can see that the average net assets increased from 2007 to 2015, the average net assets has been in the stage, in this case that the balance sheet of the total assets and equity in a rising stage in 2015, nearly two times higher than in 2007. 2008 than in 2007 reduced by 11.48%, the main reason is the excessive amount of cash outflow arising from business activities, this phenomenon may be the rise in raw material prices, wages and salaries of workers and a variety of taxes and fees increased. The ratio in 2009 was up 9.85% over the previous year, because of the decrease in the amount of money flowing out. From 2009 to 2012, the ratio of enterprises continued to decline in the stage, even in 2012, the negative -3.06%, the reason is the continuous rise in accounts receivable and management costs, enterprises need to pay more cash, so as to cause the net cash flow reduction. 2012 to 2015 is in a rising stage, the main reason for the rise is to reduce the loss of enterprises to accelerate the rotation of funds, making enterprise receivables reduced. Generally speaking, the ability of the enterprise to obtain cash is more unstable.

4. Corporate cash gross margin analysis

year	Net cash flow of operating activities (10000 yuan)	Cash inflow from operating activities (10000 yuan)	Cash margin%
2007	98707	576370	17.13%
2008	60348	558987	10.80%
2009	113753	434323	26.19%
2010	88555	396591	22.33%
2011	68289	409887	16.66%
2012	-17467	351712	-4.97%
2013	37370	428118	8.73%
2014	63999	412035	15.53%
2015	124527	418145	29.78%

Table 4 – The data in 2007-2015

Cash inflow from operating activities: a gradual decrease from 2010 to 2007. In 2011 this year than last year rose 132 million 960 thousand yuan, than last year in 2012 fell 581 million 750 thousand yuan, in 2013 than last year rose 764 million 60 thousand yuan from 2013 to 2015, the volatility is not big, but on the whole, from 2007 to 2015 operating cash inflow is the decreasing trend that enterprises to provide better service to the young. May also be related to the rate of small enterprise's market share. Cash: 2008 gross margin was 6.33% lower than in 2007, 2008 net operating flow not only declined slightly, even operating cash inflows also decreased in a large range is, the most is mainly due to the global economic crisis in 2008 and continued to rise to reduce the lead to service, and publicity costs and product research expenses in large scale enterprise from capital outflow, so the net operating flow is also reduced, resulting in a sharp decline in the ratio of 2008. 2009 than in 2008 increased by 15.39% in 2009, the operating cash flow of large growth and outflow of a slight decrease, or the expansion of business scale, operating costs due to reduced. 2009 to 2012 continued to reduce, even in 2012 the negative value of -4.97%, the lowest value for the enterprise in the past nine years, is due to the negative value of the net cash flow in 2012 due to. 2012 to 2015 continued substantial growth in 2015 operating cash flow is two times in 2014, is the largest in recent years, with the decrease in operating costs and operating cash outflow has a great relationship.

5. Enterprise sales net cash ratio analysis

year	Net cash flow of operating activities (10000 yuan)	Sales revenue (10000 yuan)	Sales net current rate%
2007	98707	543060	18.18%
2008	60348	488374	12.36%
2009	113753	343400	33.13%
2010	88555	344746	25.69%
2011	68289	278017	24.56%
2012	-17467	291297	-6.00%
2013	37370	299841	12.46%
2014	63999	271903	23.54%
2015	124527	222028	56.09%

Table 5 – The data in 2007-2015

Sales revenue: 2007 to 2015 sales revenue is gradually reduced, may be due to increased competition, leading to the reduction of business services, or inaccurate brand positioning. Sales net cash ratio: in 2008 than in 2007 decreased by 5.82%, which shows the current main business capital rotation is poor. 2009 than in 2008 increased by 20.77%, because in 2009 than in 2008, accounts receivable decreased by nearly two times, which shows the company in 2009 to accelerate the rotation of the capital to get good results, 2010 than the previous year decreased by 7.77%, indicating that the company's accounts receivable increased more, so the slow speed of capital. 2012 than in 2011 decreased by 30.56%, and in 2012 there is a negative value of -6%, the lowest value for the enterprise sales of nearly nine years, the rate of return of funds to achieve

the slowest pace in recent years. From 2013 to 2015 showed a significant upward trend, reflecting the return of funds quickly, a large number of accounts receivable decreased.

4. Conclusion

4.1. The external problems in the analysis of the profitability of the enterprise

1. The impact of other competitors: there are more and more competitors, in order to promote consumption, to achieve greater market share, competitors have to reduce prices and preferential activities.
2. The impact of the Internet on business operations: the rapid development of the Internet economy, the traditional industry has been hit, but also a serious impact on the business model of the original, innovative awareness and management ideas. With the breakthrough of the information technology and the extensive penetration of the Internet, enterprises have suffered from the traditional living space, and must compete for market share. And the company has to be familiar with the knowledge of the management of the Internet is less. The following conclusions can be drawn from the corporate statements. Operating cash flow: net cash flow in 2008 than in 2007 decreased by 383 million 590 thousand yuan, mainly

4.2. Internal problems in the analysis of the profitability of enterprises

1. Enterprise customer service system is not perfect: Although the enterprise has a comprehensive service system, but the customer service system is not perfect, cannot find their own customer service website on the Internet, telephone customer service contact less, to solve the problem of the level is less, no more comprehensive consumer complaints channel. Therefore, it is difficult to meet the requirements of customers, and now more customers would prefer to choose a high price of high quality service.
2. The cost is too high: because of the size of the enterprise keeps growing, the required labour is also more and more, and now the biggest problem is less labour, so labour shortages that labour costs continued to rise, there are various operating and energy costs are rising, so enterprises pay more and more cash, which is not conducive to the rise corporate profits.

4.3. Enterprise research proposal

1. Enterprises should innovate brand management: to strengthen brand management, create brand effect, can effectively maintain the brand and brand reputation degree and beautification degree. Optimization of brand communication, in the traditional channels of communication, it should also be developed and use new media, such as the Internet and other media, publicity and promotion of enterprises, should be more good results.
2. Enterprises should follow the Internet policy: follow the Internet policy, keep up with the pace of Internet business model reform, and create a new cultural consciousness and strengthen the management of ideas, and actively introduce advanced personnel understand the Internet knowledge, for internal staff but also for Internet training, make full use of the convenience of the Internet development.

3. Enterprises should enhance the management efficiency: the development of human resources strategy to business transformation objectives, optimize labor, reduce labor costs, and actively introduce advanced talents, and external recruitment platform communication and cooperation, focus on exploring the internal talent, make enterprise internal personnel loss, pay attention to the cultivation of the quality of existing staff and knowledge, to prepare for the long-term development of the enterprise, the implementation of the personnel system upgrade. And enhance the management level of enterprises is not easy, should be a systemic, long-term, dynamic and continuous problems, so cannot be quick success, impetuous reckless, there should be a complete strategic framework and ideas, and gradually promote firmly distinguish the order of priority.
4. Enterprises should seize the remote market: enterprises should seize the market in a timely manner, and actively carry out publicity and promotion. Generally speaking, if the enterprise occupies a large proportion of the market share, and can correct the market positioning and promotion, the enterprise has a long-term healthy development should not be a problem. Generally speaking, because of a good market share, and to develop a flexible marketing strategy, long-term development of enterprises should not cause any problems.
5. Enterprises should promote the upgrading of Technology: it is very important to improve their innovation ability, innovation ability is the motive force of the development of a long-term survival and vitality of enterprises, enterprises should improve the corresponding technology, can not only stay in the basic development of the blind. The enterprise should take innovation as the main work in the next operation, adhere to stable and not be slow, to seize market opportunities, promote reform and innovation, improve the industrial layout, optimize the allocation of factors, to achieve a good start.

Acknowledgments

The work of this paper is supported by National Natural Science Foundation Youth Project (No. 41601136); The training plan of the special fund for basic scientific research business expenses of the central university: National strategy and management research of national defense science and technology industry (HEUCFZ1607); Project of Natural Science Foundation of Heilongjiang province: Research on the core competence of high end equipment manufacturing enterprises in China (G201405)

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 09/04/2016
Aceitação/Acceptance: 12/07/2016

Data Mining Application and Government Governance from the Perspective of Ecological Civilization Construction

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Pages: 173–186

Abstract: In recent years, data mining has attracted great attention of the information industry, and need to convert these data into useful information and knowledge. Since the reform and opening up, China's economic construction has made great progress, but the economic prosperity is accompanied by excessive consumption of resources, environmental pollution and other serious problems. The Eighteenth National Congress of the CPC Sum up the experience and lessons of economic and social development in the past, make "vigorously promote the construction of ecological civilization" strategic decision-making, for us to depict the magnificent blueprint for the construction of ecological civilization. In order to promote the implementation of the actual work of the construction of ecological civilization, government should play a leading role in the construction of ecological civilization. In order to construct the strategy of ecological civilization, the government should be clear in the duties and tasks of ecological governance, and find a new path of ecological governance.

Keywords: Data Mining, Ecological civilization construction, Government governance, Environmental protection

1. Introduction

The Eighteenth National Congress of the CPC puts ecological civilization into the overall layout of the socialist modernization construction. The connotation of ecological civilization is a new summary and sublimation, and for the first time, the "beautiful China" was regarded as a magnificent goal in the future construction of ecological civilization (Freixo, 2014; Chitresh, 2016). This reflects the deepening of our party's understanding of the overall layout of socialism with Chinese characteristics, while also highlighting the responsible spirit of the Chinese nation for future generations and for the world (Hao, 2015; Jeremy, 2015). The Third Plenary Session of the party's eighteen regards "improve and develop the socialist system with Chinese characteristics, promote the modernization of national governance systems and governance capacity "as China's deepening reform of the overall objectives, which has a profound practical significance

and theory value for our country's construction of ecological civilization and socialist modernization construction (Joachim, 2010; Janis, 2014).

The so-called ecological civilization, is refers to the human transformation of nature at the same time, actively improve and optimize the relationship between man and nature, building a good ecological environment material achievements and spiritual achievements (Lv,2016). Simple, ecological civilization is a harmonious development of human and nature of the civilized state and social form. Government governance is the organic unity of government joint multi force of social and public affairs management cooperation and social constraints on government and public power rules and behavior, its purpose is to maintain social order, promote the public interest, safeguard citizen's freedom and rights. With the construction of ecological civilization, the role of government governance has become increasingly prominent.

1. ***Provide ecological public products:*** Ecological public goods are nonexclusive and noncompetitive in the area of work and life, and are closely related to the nature, material and institutional type of public goods. Natural ecological public products, including fresh air, clean water, soil and forest resources; material type of ecological public products including basic sewage processing, recycling, pollution treatment facilities and other; system of ecological public products including basic ecological protection system, ring environmental laws and regulations, and so on (Paul, 2016). Ecological public goods can be provided directly by the government, but also can be indirectly provided by other social organizations through contract outsourcing. In recent years, the contradiction is becoming more and more obvious between the growing demand of human being and the shortage of government ecological products supply. Some enterprises destroy the ecological environment to pursue the maximization of their profit, which led to regional ecological crisis. Therefore, the government must play its "visible hand" role and prevent the destruction of the ecological environment through the necessary measures, while enhancing its ability to provide ecological public products.
2. ***Undertake Ecological responsibility:*** Ecological responsibility is the awakening of the consequences of the ecological crisis of the human experience for the industrial civilization in the ignorance. It is the sublimation of human self-understanding. Ecological responsibility means that human beings have to act for their own behavior. Ecological responsibility is the government's responsibility to realize the sustainable development of mankind. With the continuous progress of industrial civilization, human material production is becoming more and more abundant and the material needs are growing more and more (Shiyi, 2015). At the same time the consumption of the resources and energy is also increasing and the protection and construction of ecological environment are constantly being challenged. In this context, he Declaration of the United Nations Conference on the environment on the human environment pointed out, the protection and improvement of the human environment are vital to the well-being of the peoples of the world and economic development, but also the people of all the countries in the world are eager to the governments of responsibility. According to this declaration, the construction of ecological civilization has been valued by governments around the world. The government should become the first responsible person of ecological

governance and guide other social subjects to participate in the ecological environment protection, and realize the good development of ecological environment.

3. ***Maintain ecological justice:*** The civilization of a society needs to be just to be reflected by justice. The government can wield the power of the public and has the foundation of legitimacy because of justice. Ecological justice emphasizes the legitimacy of ecological interests and equivalence of the balance of ecological enjoy reasonable maintenance, ecological rights and obligations, utilization and protection of ecological strategic balance and ecological risk bear the fairness allocation and so on. Ecological environment is an organic whole; the environmental protection work is generally linked7. The effective governance of the government can coordinate the economic development and environmental protection, to achieve the basic needs of the development of economy, to meet the growing needs of human beings, and to limit the damage to the environment (Yanliu, 2015). The protection of the ecological environment must be carried out under the guidance of the unified policy, laws and regulations and standards, and must rely on the cooperation of various regions and departments. The government can provide a strong organizational guarantee for the construction of ecological civilization, and organization and coordination, the interests of justice become the government do a good job in the construction of ecological environment, the most important task, especially for those who cross sectoral and inter regional environmental problems, coordination and safeguard the interests of all parties is particularly important.

2. Data mining based on SVM algorithm

2.1. Vector Machine Support

SVM algorithm is widely used in the field of data mining, but also by the scholars more and more attention. Support vector machine is a new machine learning method based on statistical learning theory, in order to find an optimal function f(x ,π0) to approximate the links between the input x and the output y and theory requirements follows the minimization of the expected risk:

$$R(\pi)=\int L(y,f(x,\pi))dF(x,y) \tag{1}$$

Therefore, the expected risk of R (π) to replace the experience of risk:

$$R_{emp}(\pi)=\frac{1}{l}\sum_{i=1}^{l}L(y_i,f(x_i,\pi)) \tag{2}$$

Vapnik after in-depth study put forward the principle of structural risk minimization (SRM), that is:

$$R(\pi)\le R_{emp}(\pi)+\sqrt{\frac{h\ln\left(\frac{2l}{h}\right)-\ln\left(\frac{\eta}{4}\right)}{l}} \tag{3}$$

First, the linear separable problem is analyzed. For linearly separable training sets:

$$T=\{(x_1,y_1),(x_2,y_2),K,(x_n,y_n)\} \tag{4}$$

Hypothesis existence discriminant function:

$$f(x)=\mathrm{sgn}((\omega\cdot x)+b) \tag{5}$$

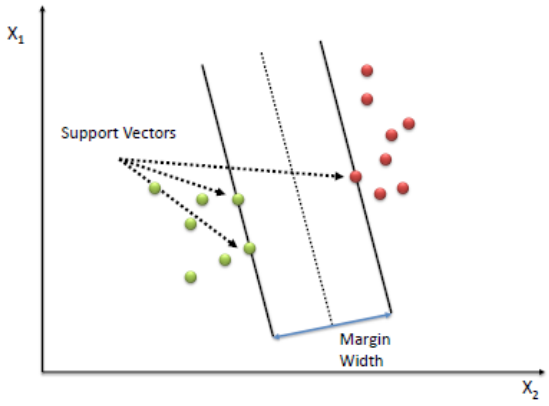


Figure 1 – The optimal separating hyperplane

2.2. Data mining

In recent years, data mining has attracted great attention of the information industry, the main reason is the existence of a large number of data, can be widely used, and the

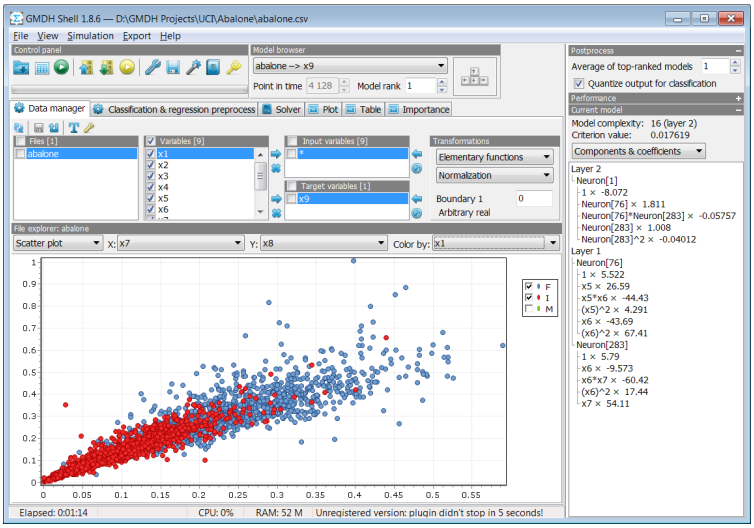


Figure 2 – Data mining

urgent need to convert these data into useful information and knowledge (Gonçalves, 2015). Access to information and knowledge can be widely used in a variety of applications, including business management, production control, market analysis, engineering design and scientific exploration, etc. The use of data mining from the following areas: (1) from the idea of statistical sampling, estimation and hypothesis testing; (2) artificial intelligence, pattern recognition and machine learning algorithm, modeling technology and learning theory. Data mining has also quickly accepted ideas from other fields, including optimization, evolutionary computation, information theory, signal processing, visualization, and information retrieval. Some other areas also play an important supporting role. In particular, database systems are required to provide efficient storage, indexing, and query processing support. Techniques that are derived from high performance computing are often important in dealing with massive data sets. Distributed technology can also help to deal with massive data, and it is more important when the data cannot be concentrated together.

3. The dilemma of Chinese government governance from the perspective of the construction of ecological civilizations

In recent years, Chinese government has made remarkable achievements in the protection of ecological environment and the protection of natural resources, but at the same time, we should also see the difficulties faced by the Chinese government in the construction of ecological civilization

3.1. The idea of government ecological governance needs to be further enhanced

Idea is the guide of action and the idea guides the direction of action. The concept of ecological governance should be melted into the governance of the government to promote the construction of ecological civilization and the government's ecological governance, which is a guide to the government's administrative behavior. Since the reform and opening up, the local government owned the gold and silver mines, first pollution then governance phenomenon is very serious and the ecological management and service consciousness of the government is extremely weak. Some local officials of the ecological concept and the concept of sustainable development have not been translated into a conscious awareness of the protection of the ecological environment and the ideological understanding is not in place. Some officials lack rational understanding in dealing with the relationship between ecological construction and economic development. They pursuit the growth of GDP under the influence of the poor performance concept and lack enough ecological responsibility sense of ecological civilization construction and the power. They appear deviation of role in the ecosystem. Towards environmental issues to They ignored the long-term, the complicated and the arduous of the ecological environment construction that will cause economic one-sided and false prosperity. In addition to the government's concept of governance needs to be improved, the public's awareness of ecological environmental protection needs to be enhanced, and the enthusiasm of participating in the construction of the ecological environment has yet to be further improved.

3.2. Government's ecological governance mechanism needs to be further improved

Ecological civilization construction is a long-term and arduous systematic project, it is impossible to accomplish in one move. Throughout China's reform and opening up the process of ecological civilization construction, the government needs to further improve the institutional mechanisms because of its many departments involved, the wide range of interests, diversification of interests and other reasons. Ecological civilization construction of official accountability system, public participation system and other systems are not perfect, and it appears the serious phenomenon of failure to abide by the government. Accountability is the basic requirement of modern politics. Officials have a sense of responsibility and actively perform public functions only by accountability. And the current power and responsibility of the government does not match, the ecological function is difficult to form a joint force. Our country has already established the accountability system, but this kind of accountability is limited to economic development, social stability and production safety and so on. Although in recent years the government established energy-saving emission reduction responsibility system, the overall strength is not enough. Similarly, although the public participation in the construction of ecological civilization in China has been a large number of, there is a serious form of doctrine and the situation is poor. For example the public participation in the environmental impact assessment of the hearing system, the hearing participants' representation, the hearing participants' opinions on the adoption and response, and the hearing effect are often be questioned. What is more, some local governments not only cannot effectively protect the public environmental rights and interests, but also can safeguard the environmental rights and interests of the behavior to fight and repression f or the public, which are caused by the lack of institutional mechanisms for ecological management.

3.3. The ability of the government's ecological management needs to be further strengthened

The ability of ecological management refers to the integrated use of economic, legal, institutional and other means to promote the development of green and ecological civilization construction capacity. Although the Chinese government will be early environmental issues into focus areas, existing regulatory environment also played a certain effect. Since the beginning of the new century, the government has played a limited role in the environment protection and the construction of the ecological civilization, causing a variety of environmental pollution and ecological damage is still serious.

In recent years, the problem of air pollution in our country has been worsening. Most cities are difficult to achieve the new ambient air quality standards; fog and haze continue to occur. Released by the Chinese Academy of Social Sciences and the China Meteorological Administration, "book of climate change green: tackling climate change report (2013), show that since 2013 national average haze days was 29.9 days, compared with the same period the year partial 10.3 days. Continuous deterioration of the soil, the quality of arable land is worrying, the problem of regional degradation is more serious, accounting for about 10.6% of the total land area. In 2013, China's net reduction of arable land area of 80 thousand and 200 hectares, the total area of 295 million hectares of soil erosion, accounting for 30.7% of the land area. Water pollution has become increasingly serious, surface water is generally mild pollution, some cities reach heavy pollution,

coastal water quality overall showed a downward trend. According to the survey, the Songhua River, Liaohe, the Yellow River, Huaihe, the Haihe River, the Yangtze River, Pearl River seven water systems have different levels of pollution.

This grim environmental situation threated our lives and health, also affected the production and business operation activities. At the same time environmental pollution situation is getting more and more serious due to lacking of the environmental regulation of the local government. The government, as a manager of public affairs and the owner of public power, has not taken effective measures to protect the public from environmental pollution. Some local governments even take a laissez faire attitude to the pollution of the environment and suppress the environmental behavior of the public rights, causing the public to lose credibility. All of these require the government to strengthen its ecological management capacity.

3.4. Government ecological laws and regulations need to be further improved

The rule of law in a society must first be the rule of law in administrative decision-making and administrative enforcement. There is no the rule of law of the whole society if there is no the rule of law of the administrative decision and administrative enforcement. Currently the government decision-making and administrative execution on the ecological construction lack of rigid constraints. Most of the citizens, legal persons and social organizations, and other subjects as the adjustment object lack rigid restraint. Although the ecological legislation of the law and regulation arrangement in our country is fruitful, it still cannot meet the needs of the construction of ecological civilization. The relevant legislation in different periods conflict between one law and the other law in China due to the lack of a complete system of ecological legislation. The legislative process lacks environmental democracy. “Environmental protection law” in 1989 is a law of controlling pollution in our country, but it is very few in the aspect of resource conservation and ecological protection. In addition, the concepts of paying attention to pollution prevention and looking down on ecological protection”, “ thinking highly of city, despising rural area, and so on are widely existed in all kinds of environmental laws and regulations in China. On January 1, 2015 the new “environmental protection law” was been carried out. It made some change in the means of supervision and increased early warning mechanism on public environmental pollution monitoring. The legal status of public participation in environmental right has been improved. But the public in the name of an individual in environmental litigation is not supported.

Strict law enforcement is to strengthen the construction of ecological civilization, to prevent the effective means of environmental pollution, but the current law enforcement and deterrence is inadequate, and some of the laws and regulations not real implementation, the implementation effect is not ideal. In addition, some local governments in China still have some problems in environmental law enforcement. Because the social responsibility of many enterprises is not strong, the entrepreneur’s awareness of the ecological protection is weak. The enterprise management one-sided pursuit economic interests and a large number of enterprises destroy the ecological environment. And many local governments in our country pursuit local economic development goals and d adopt appeasement attitude for enterprise’s environmental violations. Illegal behaviors of destroying a large number

of ecological environments have not been effectively dealt with. What is more, some local governments not only give up the responsibility for environmental pollution enterprises, but prevent and suppress the environmental protection department of law enforcement, resulting in a very bad social impact. This requires that the government must improve the system of ecological laws and regulations in order to better carry out ecological management.

3.5. The evaluation system of government ecological achievements should be further improved

China's environmental problem is not a professional issue, but a political issue. It roots from our distorted view of development. The strengthening effect of the government on economic construction is not only the strong rebound caused by the lack of long-term material, but also the inevitable choice for the government to seek the political legitimacy in the social customs. But the constant satisfaction of material interest demands, in turn, will continue to increase people's expectations of the government's economic growth function. At the same time, power and material interests often to close even zero distance contact undoubtedly also awakened the interest consciousness of the government itself. Government Self-interest motivation is unprecedented evoked. Under the attacking from within and without, local government produced economic supremacy of the concept of political achievements. Economic function will be intentionally or unintentionally intensified. And the other social functions, especially ecological environment protection and ecological industry guidance function were intentionally or unintentionally terrain type and marginalization. Ecological justice distribution of interests is impossible. And under the pressure type political system in our country, officials' performance appraisal system has become an important system to encourage officials' behavior. In this evaluation mechanism, local officials only focus and complete the economic development, social stability and other hard indicators, while ignoring those vague, cannot quantify the soft targets. At the same time, local officials are more likely to get promotion and promotion. Local government officials must pay attention to the local economic development for their own political future. "GDP first", ignoring the environmental protection, and even the environmental pollution behavior of some enterprises advertise feverishly. Therefore, the government must further improve the system of ecological performance evaluation system for the construction of ecological civilization and the correct view of achievements.

4. New path of Chinese government governance

A series of problems in the ecological environment are related to the government. In view of the difficulties in the construction of ecological civilization, the government must find a new path of ecological management.

4.1. Transformation of government ecological governance concept

To carry out ecological governance, governments need to firmly establish the concept of modern ecological governance in the whole society. First of all, the government set up ecological value, which means that the government in paradigm changes the traditional rational economic point of view, upholds the ecological rationality and belief to improve the

effect and quality of economic production and social service as the goal of administration. The current frequent ecological crisis highlights the importance of ecological values; ecological values should be in the basic values to occupy a higher weight. Based on ecological regulation, the government management achieves a balance in the economic benefits, social benefits and ecological benefits. Secondly, the government must take the concept of ecological civilization construction as the main guiding principle of the administration, and cultivate the responsibility culture and the rule of law in the whole society to promote the construction of ecological civilization. Responsible culture requires the government to be responsible to the public and the society, not to the public and the society. The government should be in a state of responsibility for the management of the ecological environment, each department must be clear responsibilities, clear responsibility, environmental management activities and responsibilities. In order to resolutely get rid of that in the past at the expense of environmental costs in exchange for temporary development ideas and practices, firmly establish the environment is the most of scarce resources and ecology is the most valuable wealth, "the concept of ecological civilization, economy, seek development at the same time, there's not a moment to relax to protect environment, protect ecological straitjacket. The rule of law can not only promote the government's sense of responsibility, but also to ensure the effective play of the ecological management function of government, "rule of law culture both restrictions of civil behavior, but also restrain government behavior is the basic requirements of good governance." thus fostering the rule of law culture is conducive to the government to establish the public to comply with environmental protection policies and regulations, is conducive to the government to exercise the functions of ecological management. Again, to increase the propaganda of ecological civilization, the development of green, deeply rooted in the hearts of the people, forming care of the ecological and environmental protection glorious, destruction of ecology, pollution of the environment shameful social atmosphere. And it is necessary to carry out to popularize ecological knowledge and enhance the ecological awareness for the goal of national ecological education, improve ecological civilization consciousness of all citizens that the transformation does not adapt to the ecological civilization values and ways of thinking, reasonable regulation of material transformation between man and nature, ideal for brewing ecological civilization to create the conditions. Ecological civilization education should also establish the concept of the virtuous circle of economic development, improvement of life and ecological protection. The ecological problem is the bad consequence of the blind development of the economy, and the real improvement of people's quality of life includes the improvement of the quality of the ecological environment. To be in the whole society advocate ecological ethics, ecological conscience, ecological obligation, the broad masses of the people's environmental awareness, the concept of environmental protection and ecological protection consciousness enhancement, to awaken the public to the nature and the environment responsibility, so that resource conservation, environmental protection and ecological improvement become everyone's consciousness, consciousness civilization and the basic moral, the ecological management of the implementation of the idea to the people's daily life and action.

4.2. Perfect the mechanism of government ecological civilization

The Third Plenary Session of the eighth put forward: closely around the construction of the beautiful China to deepen the reform of ecological civilization, accelerate the establishment of the system of ecological civilization, improve land space development, resource

conservation, institutional mechanisms for the protection of the ecological environment, promote the formation of human and nature harmonious development of modernization construction of a new pattern. Ecological civilization construction is a systematic project, in the implementation process involves the responsibilities of government departments and various fields of social organizations and public interests, to coordinate the interests of the principal, promote the construction of ecological civilization, need to adapt to changing times sound institutional mechanism of ecological civilization.

First of all, improve the government's responsibility for the construction of ecological civilization, to further implement the accountability system of environmental issues. China's "constitution" twenty-sixth provisions: "national protection and improve the living environment and the ecological environment, prevention and control of pollution and other public hazards", will protect the environment clearly defined as the country's obligations. Secondly, construct the social participation mechanism. Construction of a wide range of social participation mechanism can not only improve the decision-making of government ecological quality and legitimacy, to improve the environment quality, but also to promote mutual understanding and trust among all sectors of the society, together to achieve the ecological management involved in the transformation of ecological management. To reduce the unreasonable restrictions on public and social organizations involved in ecological protection, scientific system to strengthen its participation in the path of ecological environment protection settings, the establishment of communication and cooperation between the government and the community channel. Encourage the public to participate in environmental governance through non-governmental organizations, improve environmental protection public oversight mechanisms and environmental public interest litigation mechanism.

Once again, perfect the construction of ecological civilization, the positive interaction mechanism; realize the multiple subjects of cooperative governance. The government in the process of the ecological management must be society and citizen, social organization of rational cooperation, joint consultation governance ecological problems, government not to make other social subjects do something to play synergistic effect of social organization in the ecological governance. At the same time, it is also to strengthen the enterprise's main body to participate in the construction of ecological civilization. Through the development of all kinds of market rules, for the development of the main players in the market established a good institutional framework, to create a unified, open, fair and orderly market environment, to enable enterprises to undertake to protect the environment and save resources, social responsibility, ecological responsibility transformation for the internal needs of the enterprise, and the promotion of resources comprehensive utilization technology, reduce the pollution rate and promote industrial upgrading and technical work done by the enterprise itself, accelerate the upgrading of enterprise resource products, make the enterprise out of a high technological content, good economic benefit, resource consumption low, less environmental pollution of the new road more effectively assume the social responsibility of the construction of ecological civilization.

4.3. Improve the ability of government ecological management

At present, China's economic development is at a critical period of industrialization and urbanization accelerated the downward pressure on the economy, the situation is grim.

How rational and efficient use of resources, reduce the pollution of water, air and soil, effectively improve the ecological environment, has not only an environmental issue, but also the livelihood of the people, the development of plans. Therefore, the realization of rapid economic development and the balanced development of ecological environment protection, promote each other, the task is very arduous and urgent. We should pay attention to the key points, and effectively enhance the capacity building of ecological management, and constantly improve the level of ecological management, to provide a strong support for sustainable economic and social development.

The ecological management system is the foundation and the foundation of the ecological management ability and the strong ecological management ability must be established on the basis of perfect and perfect ecological management system. However, the perfect and perfect ecological management system is not necessarily able to bring efficient ecological governance capacity, the two of the organic undertake and transformation to a large extent depends on the ecological management of the main body. The basic quality of the ecological governance is high, the ability is strong, and the perfect ecological management system can realize the strong ecological management ability through its. As a result, we should improve the efficiency of ecological governance, not only need to improve the ecological management system, and the need for efficient ecological governance. Therefore, China must vigorously implement the strategy of talent development, and strive to cultivate adapt to the national system of governance and governance capabilities of modern talents, attach importance to universities and research institutions of professional environmental protection and ecological personnel training, create a cultural and spiritual homeland for the construction of ecological civilization. At the same time, the party and government should play a leading role in the national governance system, to speed up the construction of the learning party and the construction of the learning oriented government. To improve the ability of national institutions to perform their duties, the masses of the people to improve according to the management of national affairs, economic and social and cultural affairs, their own affairs, the affairs management system, standardization, program of party, state and society, and constantly improve the use of effective governance of the socialist system with Chinese characteristics in the country. government is to improve ecological management system, enhance the awareness of ecological civilization of the whole society, but also to improve the governance of cultural literacy, technology literacy and practice of quality, firmly establish the concept of governing the country according to law, only in this way can effectively enhance ability to execute the system of ecological civilization, ecological modernization.

4.4. Perfect the laws and regulations of ecological civilization

Law is the highest standard of public political management. The government, social organizations and citizens must act according to law. The direct goal of the rule of law is to regulate the behavior of government, social organizations and citizens, to realize the management of social affairs according to law, to maintain the normal order of social life, and to protect the legal rights of citizens. To do “laws” in the process of construction of ecological civilization, it is necessary to adapt to the changing times, continue to revise and perfect the laws and regulations of ecological civilization, ecological civilization perfect legal laws and regulations system construction, according to the 2020, in key areas and key links of reform achieved a decisive outcome. This decision is proposed to accomplish the task of reform, to form a complete system, scientific and standardized,

the effective operation of the system, all aspects of the system is more mature and more stereotypes, promote ecological management system modernization. Constructing the system of laws and regulations of ecological civilization should be based on the integrity, systematization and coordination of the construction of ecological civilization. At present, China has basically established the legal protection system in the construction of ecological civilization, April 2014 revised and through the environmental protection law in the aspects of legislative idea, technical means, supervision mode, disciplinary efforts is much better than the 1989 "environmental protection law", fully integrated into the concept of ecological civilization, basically can play function of China's ecological civilization system of laws and regulations in the basic law. But with the development of economic and social changes, the new contradictions and conflicts will continue to emerge. Improve the strictest arable land protection system, water resources management system, environmental protection system, build to reflect market supply and demand and the scarcity of resources, reflect ecological values and intergenerational compensation resources paid use system and the ecological compensation system, sound ecological and environmental protection responsibility system and the system of compensation for environmental damage, establish the natural resources property rights system and the use control system delineated ecological protection of the red line. Should also be to strengthen the ecological transformation of the current legal system, especially in accordance with the needs of the construction of ecological civilization of traditional criminal law, civil law, administrative law, economic law department of law transformation, to make it form together as a whole, realize the construction of ecological civilization of the rule of law and special ecological legislation.

4.5. Improve the government ecological performance appraisal mechanism

The Third Plenary Session of the party's eighteen stressed to improve development outcomes assessment system to correct simply to economic growth velocity to assess the performance of the bias, increase resource consumption, environmental damage and ecological benefits, excess capacity, scientific and technological innovation, production safety, new debt index weight. Last year in October, held the 18th session of Fifth Plenary Session proposed development of the concept of the five, the development of green as an important concept in the 13th Five-year and even longer period of economic and social development, become a party on the construction of ecological civilization, socialist modernization construction rule understanding of the latest achievements. Beyond and discard the old mode of development and development, ecological civilization, green development has become the consensus of the people, leading the community to form a new development concept, performance concept and new ways of production and life. Thus, improving the government's ecological responsibility mechanism must reform the performance evaluation system of government officials.

First is to strengthen the binding index, change the government's ruling idea. Governments at all levels should be combined with the actual, in terms of performance appraisal, through effective ecological assessment methods, the implementation of the assessment of green GDP, economic growth and protection of ecological environment of unity, and the monitoring of the form and the cadre performance hooks to hang, to encourage local governments to promote regional economic development through developing ecological economy. Gradually improve the cadre performance evaluation system and evaluation

criteria, gradually the ecological protection laws and regulations, changes in the ecological quality, pollution emission intensity and the public's satisfaction reflect ecological protection and construction effectiveness index into the assessment index system of government and the cadre evaluation system, establishes the science. Also according to the actual situation of our country, consider differences between different regions and different levels, trying to make evaluation content and evaluation criteria of comprehensive, objective, scientific and reasonable, the leading cadres at all levels to establish harmonious coexistence of economic, social and ecological environment view of achievement in one's post, promoting ecological civilization construction. Through perfecting the mechanism of ecological assessment guide local government officials to jump out from the pure pursuit of GDP in a blind, to adhere to the unity of economic and social development and environmental protection, ecological construction, give full play to the leading role of the government for the management of Eco, fulfill government responsibility for the ecological.

Second is to improve the incentive indicators, to enhance the government's ability to govern. To increase the local government to build an ecological civilization city policy support and financial investment, especially in environmental management, the maintenance of ecological balance, ecological and cultural shaping increase evaluation efforts, focusing on whether local governments ecological protection can be incorporated into the national economic and social development and long-term planning and annual plans; and increase investment in ecological protection and improve the ecological compensation mechanism and create conditions for the establishment of special funds for the protection of ecological; whether will improve the living standards of the masses especially enhance ecological and cultural levels are incorporated into government development program and policy.

Acknowledgments

This work is financially supported by the Key projects of National Social Science Fund: study on the system of ecological civilization construction from the perspective of "five in one" (14AKS012); The humanities and Social Sciences Youth Academic backbone project in Harbin Normal University(SGB2009-03); National Natural Science Foundation Youth Project (No. 41601136).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 08/04/2016
Aceitação/Acceptance: 14/07/2016

Research on the Model of Physical Fitness and Community Sports of the Elderly based on Internet of Things

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Pages: 187–197

Abstract: In recent years, Internet of things will become a new technology to change the world outlook after the Internet; it will break the traditional way of fitness. Community elderly health service system is an effective measure to improve the level of physical fitness of the elderly. In this paper, the authors research on the physical fitness and community sports of the elderly based on internet of things. Combined with the development model of community sports and the Internet of things fitness system, we analyze the basis and necessity of the development of the Internet of things. Fitness system is based on intelligent network fitness equipment and information collection terminals, portable monitors and smart phones, residents' physical fitness and health data were uploaded to the database through the digital information processing technology, and then make the digital management of the public health service by using the Internet of things technology.

Keywords: RFID, Internet of things, Elderly sports, Fitness system

1. Introduction

Entered in twenty-first Century, with the advent of the information age, science and technology as the first productive function will be more prominent, people have realized the impact of the Internet on the work, life and learning (Dai, 2012; Abreu et al. 2015; Crespo, 2015). Today, the Internet of things will become another change in the face of the world after the Internet, a new form of technology; it will break the traditional way of fitness, becoming a new "fitness" logo. Combined with the development model of the new type of community sports, Internet of things fitness system is analysis of the basis of the development of the Internet of things and the necessity of fitness system (Hu, 2012; Huang, 2013). The system of fitness and networking organization, analyze the relationship between cohesion and coordination between the various sectors including and mutual, summarizes the existing issues in this process, puts forward some opinions and suggestions (Jian, 2012; Kim, 2014). This will enable the public to understand the Internet of things fitness system, this new model, to experience the benefits of this model, to promote the quality of life of the people, and therefore has an important practical value.

Physical education is an important part of the construction of spiritual civilization in the city. It is very important to strengthen the construction of community sports to promote

the construction of spiritual civilization in the urban community. Community sports as an important part of mass sports (Sigala, 2012). It is comprehensively implement the "Outline" the important content of the national fitness program, it is the effective way to realize the sports and the national economy and the coordinated development of social undertakings, is an important method to improve the overall quality (Krstev, 2014). Social development will promote the development of community sports, pay attention to and actively guide the development of community sports will also contribute to social harmony. With the rapid economic development, people's life pressure is increasing, urban community sports has become an important way of public leisure and decompression. However, according to the national sports site survey results show that: in our country's existing sports venues, the number of community sports facilities. Based on the reality, appeared in the development of city community sports in our country mainly focus on the following aspects: first, the community sports facilities serious lack, shortage of funds. Although the country attaches great importance to the construction of community sports and investment, especially in every corner of the national fitness path throughout the city and the countryside, but the base of our sports population and complex structure cannot meet the needs of the public. Second, the community sports organization and management system is not perfect (Zhang, 2012). City Community Sports Management in our country is mainly undertaken by the Neighborhood Community Association official sports organization of the community, and a large number of regular community sports activities are mainly composed of morning and evening exercises such as spontaneous community sports organizations to complete. However, due to lack of manpower and other neighborhood community association by the subjective and objective factors, yet with numerous small spontaneous community sports organizations to establish normal relations. Third, community sports management, sports instructor team is weak. At present, the number of social sports instructors in our country is only about 700 thousand. Fourth, the participation rate of residents in community sports activities is low. Affected by the natural environment and social environment, in general, China's urban community sports residents only a few. Carrying out community sports activities is an important way to promote the sports life, and it is an important way to realize the national fitness.

2. Basic theory of Internet of things

2.1. Internet of things

General networking refers to the use of bar code and radio frequency identification (RFID), sensors, GPS, laser scanners and other information sensing equipment, according to the agreed protocol, realize people and people and things at any time and place the connection, to exchange information and communication, in order to achieve the huge network system intelligent identification, positioning, tracking, monitoring and management. In 2005, the International Telecommunication Union (ITU) officially called the "Internet of things", now the common understanding is that the Internet is the various information sensing devices such as radio frequency identification (RFID), a huge network device, infrared sensors, GPS, laser scanning device and the Internet all together formed. The types of objects on the device in the electronic tag (RFID), sensor, two-dimensional code after connected with the wireless network interface, thus giving intelligence to the object, can realize people and objects or objects of communication and dialogue between them. The Internet information network technology and RFID technology combination, namely the

use of items encoding global (EPC Electronic, Product Code) as the goods identification, connection automation using RFID "items" and "Internet", without the help of a specific system, can at any time and place, to achieve any recognition and management.

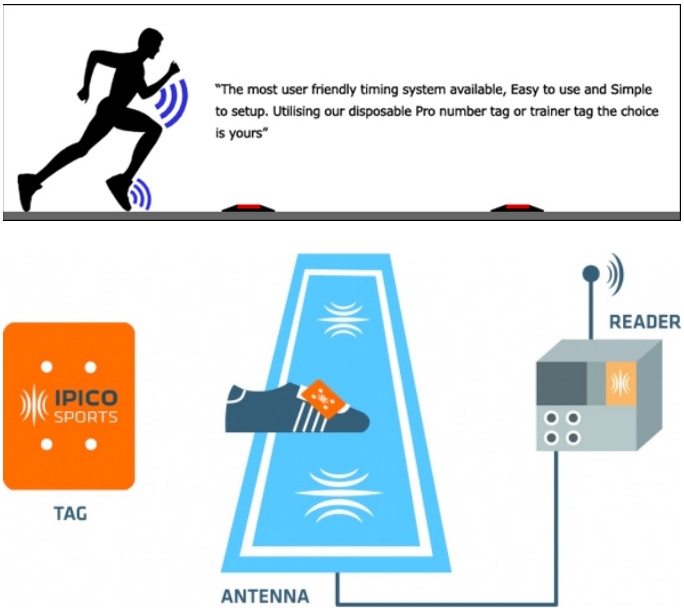


Figure 1 – Radio frequency identification application in running

Compared with the traditional Internet, Internet of things does have its distinct characteristics, can be summarized as three points:

1. Overall perception: the use of RFID, sensors, two-dimensional code, such as the dynamic information can be collected at any time and place. Internet of things deployed a large variety of types of sensors, each sensor is an information source, the information captured by the different categories of sensors to take 5 information format is different. The data obtained by the sensor is real-time, according to a certain frequency of periodic acquisition of environmental information, and constantly update the data.
2. Reliable transmission: the important foundation and core of the Internet of things technology is still the Internet, through a variety of wired and wireless networks and the integration of the Internet, the object of the information in real time to accurately transfer out
3. Intelligent processing: the Internet of things will be a combination of sensors and intelligent processing, the use of cloud computing, pattern recognition and other intelligent technologies to expand its application. To analyze process and deal with the data obtained from the sensor, to meet the different needs of different users, to discover new application fields and application modes. Internet of things using computer technology in a timely manner is to the vast amount of data for information control, to achieve the real people and objects, objects and things.

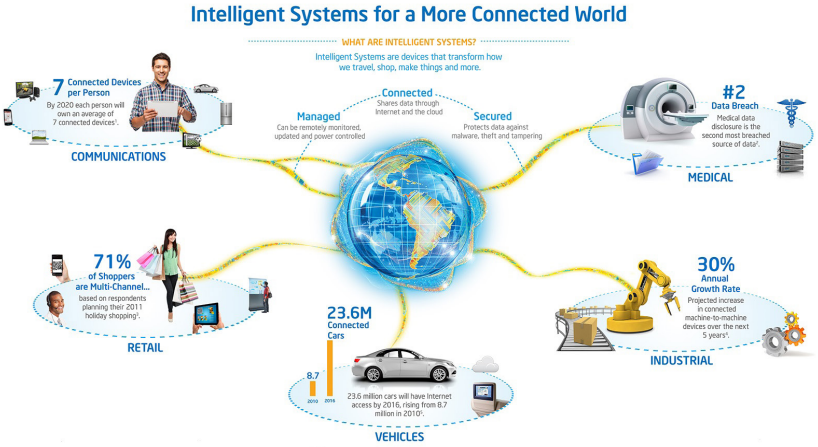


Figure 2 – The Internet of things and intelligent system

2.2. The typical architecture of Internet of things

The Internet of things architecture can be divided into three layers: perception layer, network layer and application layer, and the perception layer includes two parts: coding layer and information collection layer.

- Perception layer: by a variety of sensors, including temperature and humidity sensors, two-dimensional code labels, RFID tags and reader, camera, infrared, GPS and other sensing terminals. The perceptual layer is a source of information collection, object recognition networking, and networking is the core ability to achieve comprehensive perception, is the Internet of things including key technology, standardization, and industrialization breakthrough part. The coding layer is the cornerstone of the Internet of things, and it is the core and key of the transformation of the Internet of things information. The information collection layer refers to the process of obtaining the coding information of the article by means of automatic identification and near field communication technology including bar code, RFID, wireless sensor, Bluetooth, etc.
- The network layer: communication network is the exchange of information, including Internet, cable TV network and network management system and cloud computing platform, is the center of the whole network, responsible for the transmission and processing of information perception layer. Mobile communication network coverage is the infrastructure, networking and network layer networking standard three layers the highest level of industrialization, the strongest and most mature, the key is for Internet application features and improve the formation of cooperative awareness network.
- Application layer: the Internet of things and the user interface, it is combined with industry needs, to achieve intelligent applications of things, including commercial trade, logistics, agriculture, military and other different application systems. The networking application layer can provide rich applications based on the Internet

of things, is the fundamental goal of the development of things, it will demand for networking and information technology and industry combined solution widely used intelligent set, the key lies in industry integration, the development and utilization of information resources, solutions, low cost and high quality information security and effective business model review.

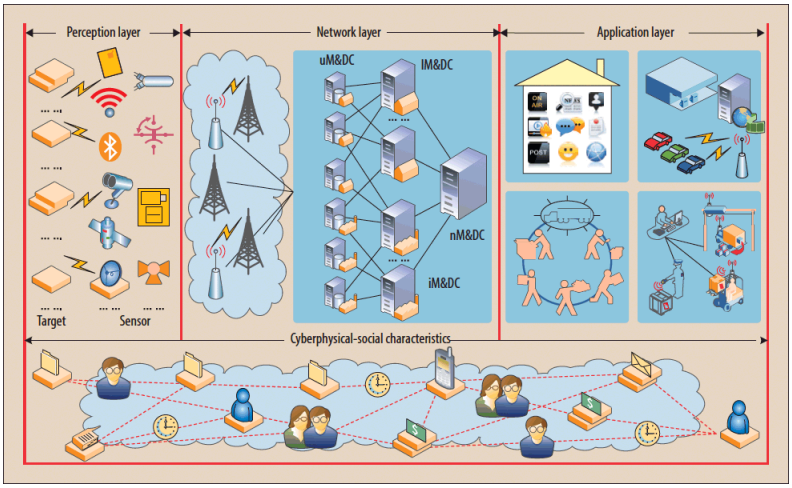


Figure 3 – System architecture of Internet of things

3. Application of Internet of things in community sports

Networking fitness system aims to provide services for the new fitness model of fitness, is installed in the indoor gymnasium in the intelligent network information acquisition terminal, fitness equipment and outdoor sports wear portable energy consumption monitor and data acquisition function of intelligent mobile phone of Internet of things sensing network terminal, the public health status, health data, venues and equipment information through the digital information processing technology and the Internet, mobile communication network, upload to the fitness information management network platform, the use of networking technology to implement the digital management of health services, build a network information platform of Sports Bureau management, enterprise implementation, public participation. The community is indispensable in our life contains a variety of comprehensive services based on the masses, it is to serve as the core, to meet the needs of many convenient life of the surrounding residents shopping, leisure, entertainment, catering, life etc. People in the city live most of the time in the community, so that the application of Internet of things technology health management services came into being. This technical support, people exercise in the sports service center home, indoor gymnasium, or community outdoor fitness path, the daily running fitness activities, and walking exercise, residents' physique data, motion indicator data, food consumption, sports consumption and other information can be collected and transmitted in real time to the health service team, management of related information through the online health management network at the same time,

individual residents and Community Sports Bureau, other services can also be carried out through the website information query and management. Through professional personalized diet and sports guidance services, residents can always understand their own physical condition and guidance.

Community sports service center to improve the physical quality and get rid of sub-health, chronic disease prevention and rehabilitation services for the purpose of providing personalized health guidance services in two aspects of diet and exercise, professional and thoughtful for community residents, and health status of their own real-time feedback query and motion data, in the fitness goal the daily consumption. Secondly, the residents in the home, by sensing household fitness equipment, intelligent mobile phone, digital set-top boxes, instrument, energy consumption intensity table and other types, the daily movement data feedback technique to the background of professional sports health service team through networking, residents according to the personalized guidance plan service team to develop, to intervene healthy diet and exercise, so as to achieve the purpose of health. Finally, the information gathering sensor community outdoor fitness path installation, portable energy consumption monitor and information acquisition function of intelligent mobile phone information sensor, can also exercise and daily activities of residents data provided by the network to the health service team, at the same time, other public service institutions in the community within the auxiliary equipment the sensor node, can also be the daily life of the residents for the collection of information, provide data support for the development of personalized health guidance services, so that the diet and exercise guidance service coverage to the residents in all aspects of daily life, to provide a full range of health guidance services for community residents.



Figure 4 – Running data real-time feedback

Physical fitness instructors is through the members of real-time training data analysis, comparison, evaluation to give one to one guide, to achieve a scientific exercise and adhere to exercise. Analysis of website front view their test report, physical trend can clearly understand their own physical condition, combined with the training goal to actively cooperate with the instructor to complete their physical fitness promotion exercise program, experts can choose their trust through expert customer service online guide service. The expression form of the network supporting layer of the Internet of things is: the Internet, mobile communication, remote control wireless transmission,

the mutual communication between people and objects or objects and objects. Through the integration of information technology for several kinds of communication methods, to achieve two-way communication of long distance, fitness equipment is more than VR digital technology to achieve the transmission of fitness guidance based on prescription, it can automatically identify the individual fitness guidance scheme issued by the tutor, download the fitness guidance prescription, then members of each exercise results upload, ultimately the two-way communication of intelligent. The networking system has the perception layer fitness outdoor path acquisition sensing function information and have the information collection function of intelligent network fitness, service to the community sports, is committed to achieving personalized diet and exercise service, provide the basic data support for the government sports management departments and the whole people's health, scientific and accurate for community residents to provide health services. The networking application is the fitness systems first installed in the indoor gymnasium in have the information collection function of intelligent network fitness equipment for the first performance, it supports members of individual exercise guide download; upload the daily exercise information storage.



Figure 5 – Health management system

4. Community health services for the elderly

From the development of community sports, community sports refers to a certain region in people living together, to the area of the natural environment and sports facilities as the material basis, to all members of the community as the main body, in order to meet members of the community sports needs, enhance physical and mental health of community members, consolidate and develop the community emotion as the main purpose, area mass sports expediently. Community elderly sports fitness service system, is refers to the special management departments unified guidance, soft conditions are composed of a variety of sports fitness services by community organizations and individuals in the community elderly special sports fitness service demand and development and the

hard conditions of the collection system. But under the current situation, the community elderly physical exercise is organized free exercise, participate in organized exercise in the elderly accounted for 37.l% of the total, mainly refers to a variety of counseling sites, elderly activity center, unified organization and guidance of the elderly sports fitness activities; family activities accounted for 17.1% of the total number of couples, mainly refers to the number of free exercise activities; activities accounted for 45.8% of the total, mainly refers to the individual or others and exercise together. Thus, there are 62.9% old people's physical exercise is the free exercise of the organization, it is the main form of community elderly physical exercise. The most common aged people in community sports activities is walking running, 63.3% community elderly people choose to run this with similar results; 57% elderly people choose aerobics, dance class projects; 36.2% of the elderly to choose Wushu, Taiji, qigong project; there are also 18.1% old people choose mountaineering the project, can be seen walking and running is the preferred project in Xiamen, the elderly, and this may be walking, running and low field requirement, second more than the number of items is engaged in aerobics, dance classes, which may be associated in the elderly women. In addition to the two project exercise crowd concentrated thought, other projects scattered temper population, relatively low proportion.

Project	Select number	Percentage	Sort
Take a walk, run	175	63.3%	1
Body building exercise	139	57%	2
Taiji boxing	98	36.2%	3
Fitness equipment	34	11.3%	4
Table tennis	25	8.1%	5
Chess	15	6.3%	6
Other	42	19.5%	7

Table 1 – Sports fitness activities

Community physical fitness activities of the elderly residents to form is still showing spontaneous, loose fitness activities, supplemented by community management in the form of specific community elderly sports fitness organization are as follows: complete folk organization form, which is spontaneous, informal organizations of the masses, no close ties with the government sports department. The talented person as the organizer, and they are the general in the park, the community open space on the morning or evening exercises. Street community and civil official civilian organization form, which is a common phenomenon in our country at present the organization, its activities in addition to the morning and evening exercise, but also to carry out community sports and community sports competition. Change of community sports by the affiliated to the entity type of organization form, which fully rely on and use of relevant policies, laws and regulations, establish the concept of development of the market economy system, the transformation to the management model, the development of sports market, multi-channel fund-raising, and the gradual implementation of independent management organization. Community organization form, which is composed of sports associations and sports clubs, is a relatively mature form of community sports organizations, more common in economically developed areas.



Figure 6 – Community sports fitness for the elderly

At present, most of the community residents' committees in our country have no full-time community sports administrators, but also have no professional community senior sports administrators. At the same time in the community sports administrators, experts rarely, lack of theoretical knowledge to carry out sports activities! Experience and scientific and effective exercise methods, strategic research and lack of community sports activities of the overall planning and community sports activities, something that is basically not, even if the random state. The current situation of sports China elderly nationwide elderly sports organizations, including the official sports organization and folk sports organization survey, main difficulties of sports development for the aged in China showed as follows: the government does not pay enough attention to the elderly sports work. This is mainly reflected in two aspects; first, government financial investment is less, resulting in the elderly sports organizations lack of funds, resulting in elderly venues, and the lack of funds. Second, the government of the elderly sports organizations in the preparation of less, the elderly sports organizations and management institutions are lagging behind.

1. **Community sports organizations:** the traditional community sports activities carried out under the personal, family, neighborhood, street combination in the form of organization, for collective activities especially sports events organizers need according to certain rules, to participate in sports activities in the crowd are orderly organized, ensure the community sports activities can be carried out smoothly. Community events of large scale, wide coverage, will inevitably require the activities of the organization to develop reasonable rules of the game, the players, referees and other organically integrated into a whole. Internet of things fitness is a powerful way to avoid this condition; it does not require the existence of a real organization. The use of networking fitness system simply login to the online game network management task can be completed at a specific time in accordance with the contestants selected game mode, the game after the completion, the system will automatically display candidates.
2. **Community sports activities in time and space:** the traditional community sports activities in time to make full use of the morning and evening, holidays

and other leisure time activities in space, based on the principle of the nearest situ. However, the fierce competition in the current social environment makes people face the dual pressures of life and work, because of the limit of time and space, although aware of the benefits of physical fitness activities, but less participation in sports activities. In contrast, the Internet of things to increase the proportion of groups involved in sports activities have more advantages. Fitness for community residents to participate in sports activities in time and space is not restricted, community residents can exercise at any time, any place. Can choose indoor fitness club, also can choose outdoor open space.

3. **To participate in sports activities groups:** community sports is more professional, systematization, standardization and scale, to some extent limit the extensive participation of community residents, and the sports and fitness show high content, difficult and close to the people to meet the public demand for sports competition, only a small number of a certain level the people in. Networking fitness participation groups covering almost every resident of the community, it is not restricted by the nature of the community sports activities, not affected by individual factors, as long as the fitness needs, you can participate in community sports activities in the past.
4. **Evaluation of community sports activities:** the traditional mode of community residents to participate in community sports activities evaluation results generally take the way of self evaluation, namely according to their degree of fatigue, sweating, heart rate speed feel exercise load, and the contents and methods of their participation in sports activities is not feasible make scientific judgment. The networking system can be collected by the residents of fitness system data, motion indicator data, food consumption, sports consumption and other information, send the information to the background of health service team collected, providing professional and thoughtful health guidance for community residents.

5. Conclusion

The networking system is installed in the interior to fitness sites in the intelligent network information acquisition terminal, fitness equipment and outdoor sports wear portable energy consumption monitor and data acquisition function of intelligent mobile phone of Internet of things sensing network terminal, the residents physical conditions, fitness venues and equipment data, information through the digital information processing technology and the Internet and mobile communication network, upload to the management information network platform, the use of networking technology to implement the digital management of the public health service, to build a network information platform of Sports Bureau management, enterprise implementation, public participation. The elderly in the community in the course of physical fitness to participate in sports enthusiasm is high, but the elderly sports fitness scientific knowledge not much; the concept of sports consumption needs to be improved; they hope to get high quality and rich and colorful sports fitness service in community elderly sports fitness activities; management mainly institutions are inadequate services the problem, lack of management professionals; appears in the service content of the main problem of

inadequate funding, lack of guidance, problems of physical fitness activities of the elderly community less etc.

Acknowledgments

The work of this paper is supported by Humanistic issues in Universities in Jiangxi Province: Research on the development of sports of the aged in Jiangxi province in the process of aging (DB201410093).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 08/04/2016
Aceitação/Acceptance: 11/07/2016

Combining Heuristic Search and Latent Variable Sampling to Infer Dynamic Gene Regulatory Networks

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Pages: 198–211

Abstract: Reconstructing large-scale gene regulatory networks (GRNs) from high-dimensional data is a major problem in many fields such as machine learning and bioinformatics. However, classical Dynamic Bayesian networks (DBNs) are based on the homogeneous Markov assumption and cannot handle non-homogeneous temporal processes. To resolve this problem and reconstruct network structures effectively, we proposed a latent-variable-sampling-based heuristic search algorithm for inferring dynamic GRNs, which predicts structures of a GRN based on time series microarray data. We apply the proposed method to identify the dynamic GRN from synthetic dataset and experimental data in the Escherichia coli. This approach involves selecting variables through ℓ1-norm penalty regularization, which is similar to lasso style methods, and then evaluates network score and identifies an optimal network structure. Both the computational time and accuracy of the network structures estimated by the proposed method are compared with those of LARS, GeneNet, and GLASSO on simulated and real datasets. The results reveal that the proposed method outperforms the other three algorithms in terms of accuracy and efficiency and can infer large-scale GRNs.

Keywords: Learning algorithms, gene expression regulation, network modeling, variable selection, heuristics

1. Introduction

Estimating the true gene regulatory network (GRN), when the number of genes is much greater than the number of samples, it has aroused considerable interest in the computational biology community. Several scientists and researchers have presented different approaches to this difficult problem and have advanced the field. However, many unsolved tasks in this area remain, including identifying high correlated covariates, noisy data, and reasonable prior knowledge necessary to accomplish GRNinferring and model estimation.

1.1. Related Works

The past 30 years has seen several developments concerned the learning structure of GRNs. The complex relationships between such components motivated us to identify a multivariate approach. Inferring gene networks is usually known as the process of identifying gene

interactions from gene expression data through computational analysis. The entire inferring process can be summarized as a task of predicting connectivity among genes. Essentially, it involves learning the structure of a graph. However, in many domains, problems such as the large numbers of variables,small samples sizes, and possible presence of unmeasured causes, remain major impediments to practical applying these developments.

To accomplish this task and infer the structure of GRNs from high throughput microarray data, several techniques have been developed for the mathematical modeling of GRNs from expression data, notably differential equation (Chen, Wang, Tseng, Huang, & Kao, 2005; Zidong Wang, 2009), the vector autoregressive (VAR) model (Zidong Wang et al., 2008), dynamic Bayesian networks (Grzegorczyk & Husmeier, 2011; Li, Li, Krishnan, & Liu, 2011; Nguyen, Chetty, Coppel, & Wangikar, 2012), Boolean networks (Kim, Lee, & Park, 2007), and the information-theoretic method (W. Zhao, Serpedin, & Dougherty, 2006). In addition, other methods based on regression, such as least absolute shrinkage and selection operator(Lasso) (Tibshirani, 1996),or partial least squares (PLS)(Datta, Le-Rademacher, & Datta, 2007) and supervised learning (Bleakley, Biau, & Vert, 2007; Yamanishi, Vert, & Kanehisa, 2005), have shown positive results.

Although standard linear modeling approaches enable analysis of a modeled system, they are not effective in large-scale network discovery. This is because the number of candidate parameters and models is extremely high, and thus searching efficiently and reliably with tight control on many false positives is difficult. By contrast, by using ordinary differential equations to model transcriptional changes in terms of environmental and transcription factor influence, time-series network identification (TSNI)(Bansal, Gatta, & di Bernardo, 2006) constructs a local regulatory network of genes that are affected by an external perturbation. Dynamic regulatory events miner (DREM) (Schulz et al., 2012) uses an Hidden Markov Model (HMM) based algorithm to identify transcription factors that control divergence points in gene expression profiles in order to reconstruct dynamic regulatory networks. Friedman et al. (Friedman, 2004) were among the first to suggest using dynamic Bayesian networks (DBNs) to model regulatory networks that change over time, as such models can capture time-dependent structures such as feedback loops that are impossible to express using traditional probabilistic networks.

A Boolean network is useful for monitoring dynamic behavior in complex systems based on the massive expression profiling data (Kim et al., 2007). However, it has a limitation regarding the complex modeling Boolean function of a gene. Thus, most Boolean network algorithms can be used only with a small number of variables and a lower degree value. In addition, Robinson et al. (Robinson & Hartemink, 2010) developed an Markov chain Monte Carlo (MCMC) sampler to infer non-stationary dynamical Bayesian networks. This has an attractive feature in that the network structure within a temporal phase depends on the structure of the contiguous phases. Liao et al. used network component analysis (NCA) (Liao et al., 2003) to build a series of large-scale transcriptional networks by decomposing a dynamic gene expression matrix to learn transcription factor activities over time.

Wang et al. (Zidong Wang, 2009) proposed the extended Kalman filter (EKF) algorithm to model nonlinear dynamic GRNs from gene time series data. In this method, authors assume that the dynamics of the GRN under investigation is governed by a class of nonlinear stochastic differential equations. Another model for identifying evolving networks is the temporally smoothed ℓ1-regularized logistic regression method, as

described by Kolar et al. (Kolar, Song, Ahmed, & Xing, 2010) andAhmed and Xing (Ahmed & Xing, 2009). These works used dynamic modeling to identify transient co-expression relationships that capture static but temporally related snapshots of a dynamic network.

1.2. Main Content

The main purpose of this study is to developa variable-selection-based ℓ1-norm penalty regularization method for high dimensional data. Our goal is to estimate the true "sparse pattern," that is, the set of covariates with nonzero regression coefficients. We propose a latent- variable-sampling-based heuristic search (LVSHS) algorithm, which is a novel machine learning algorithm for recovering the structure of GRNs from microarray data, thereby extending the capability of inference algorithms. In contrast to existing algorithms, our method can identify various scale GRNs. We note that other search spaces have been proposed, such as the space of network equivalence classes or the space of skeletons. However, these involve fairly complex operators that are computationally expensive and difficult to implement. By contrast, the proposed algorithm is based on searching over the space of the network structure.One novelty of LVSHS when inferring connectivity in GRNs is that it allows inferring causation and considers the period at which this causation occurs.

Through numerous experiments, the applicability and utility of the LVSHS algorithm are demonstrated using both simulated and real data. Our results show that our method outperforms the state-of-the-art methods, both in finding the correct network structure and in computation time. For the E. coli gene expression dataset, we show that LVSHS can obtain a biologically stable GRN.

The remainder of the paper is organized as follows. In Section 2, we provide the mathematical and statistical background on the regressive model. Details of the proposed algorithm, LVSHS, are then provided. Section 3 presents experimental results and analysis and Section 4offers a conclusion and discusses future research.

2. Methods

2.1. Graphical Gaussian models

In this section, we formally define graphical Gaussian models (GGMs) and establish some notation that we use throughout. Consider the problem of estimating a GRN underlying a fixed set of genes. Given an observed data matrix $X = \{X_1, X_2, \cdots, X_p\}$ with N rows (samples) and p columns (variables), assuming satisfies a multivariate normal distribution $N(\mu, \Sigma)$ with a mean vector $\mu = (\mu_1, \cdots, \mu_p)^T$ and positive definite covariance matrix $\Sigma = (\sigma_{ij})$, where $1 \le i, j \le p$. A GGM for X, also known as a covariance selection model, can be represented by an undirected graph $G = (V; E)$, where V contains p nodes corresponding to each of the p variables and the edges in the set E represent the conditional dependence relationship among p variables.

Assuming that covariance matrix Σ is invertible, we can denote the precision matrix by $\Omega = \Sigma^{-1}$ and $\Omega = (\omega_{i,j})$. It is a well-known fact that for GGMs, edges in the graph correspond to non-zero elements in the precision matrix. Although we cannot utilize

the precision matrix to select edges directly, we can estimate the partial correlation coefficients ρ_{ij} between X_i and X_j,

$$\rho_{ij} = sign\left(\beta_j^i\right)\min\left\{1,\sqrt{\beta_j^i\beta_i^j}\right\}, if\ sign\left(\beta_j^i\right) = sign\left(\beta_i^j\right)$$
$$\rho_{ij} = 0, otherwise. \quad (1)$$

As shown in (1), ρ_{ij} will be zero if and only if β_j^i is zero. Consequently, inferring gene network structure is equivalent to evaluating the partial correlation between genes and j conditioned on the values of all other variables. Furthermore, inferring edges of a gene network from ρ_{ij} is equal to that from the non-zero elements β_j^i. Mathematically, the edges of a network will be determined in this study as follows:

$$E = \left\{e_{ij}\left|e_{ij} \in \{1,0,-1\}\right.\right\}, e_{ij} = \begin{cases} 1, if\ \rho_{ij} < -0.1 \\ 0, if\ \left|\rho_{ij}\right| < 0.1 \\ 1, if\ \rho_{ij} > 0.1 \end{cases} \quad (2)$$

2.2. Neighborhood variable selection

Although variable selection is a fundamental tool in analyzing high dimensional data, its abilityto select the important predictor or explanatory variables/models, especially under circumstances in which the number of predictors greatly exceeds that of observations, are often overlooked in computational network analysis. The basic assumption of variable selection is that the available data constitute a random sample from a multivariate distribution belonging to a GGM. In the context of microarray data, the number of variables exceeds the sample size and this precludes traditional structure learning procedures from being applied.

The neighborhood of each gene X_i is the subset of X, which represents the pair-wise interactions between variables, and is conditionally independent of all remaining variables. Lasso, also known as basis pursuit, possessesasparseproperty. The lasso regression coefficients can be used to identify the neighborhood of node X_i in the graph. For gene i, our model can be formulated as follows.

Let X_{-i} be the $p-1$ vector of all variables in the network except i.Here, we manage to solve regression coefficients β_{-i} using a linear regression. To estimate regression coefficients β_{-i}, we adopt the neighborhood selection idea described previously. In addition, we penalize the difference between the correlated variable and within-group variables. More specifically, to recover the structure of a gene network, we propose the following convex optimization problem for estimating networks from high dimensional and correlated data.

$$\hat{\beta}_i = \arg\min_{\beta}\left|X_i - X_{-i}\beta\right|_2^2 + \lambda_i\omega\left|\beta\right|_1$$

$$\hat{\beta}_i = \arg\min_{\beta} \sum_{k=1}^{n} \left(x_{ki} - \sum_{j \neq i, 1 \leq j \leq p} \beta_{ji} x_{kj} \right)^2 + \lambda_i \sum_{j \neq i, 1 \leq j \leq p} \omega_{ji} \left| \beta_{ji} \right| \quad (3)$$

As shown in the two parts of (3) equations above, we mainly consider the inability of lasso to discern the different correlated variables when the pair-wise correlations between them are extremely high. For those variables sharing the same biological "pathway," the correlations between them can be high.

The example of indirect correlation as follows has the same settings as Zhao and Yu (P. Zhao & Yu, 2006). Given a model with p = 6, X_1, X_2, X_3, X_4, X_5, and ε are first generated from the standard normal distribution. X_6, which also derives from the standard normal distribution, is generated for correlation with X_1, X_2, X_3, X_4, and X_5 by:

$$X_6 = \frac{1}{8}X_1 + \frac{1}{4}X_2 + \frac{1}{2}X_3 + \frac{1}{2}X_4 + \frac{1}{2}X_5 + \sigma\varepsilon .$$

The true regression model is:

$$Y = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \varepsilon ,$$

supposing that $\beta_1 < 0, \beta_2 < 0, \beta_3 > 0, \beta_4 > 0, \beta_5 > 0$. Group effect: X_1, X_2, and ε are first generatedfrom the standard normal distributionwith mean 0 and variance 1. Let $X_3 = X_2$.

X_4 is generated to be correlated with X_1, X_2 and X_3 by $X_4 = \frac{2}{3}X_1 + \frac{1}{3}X_2 + \frac{1}{3}X_3 + \frac{1}{3}\varepsilon$, which also has a standard normal distribution. The true linear model is: $Y = -2X_1 + X_2 + X_3 + \varepsilon$ as reported in Zou and Hastie (Zou & Hastie, 2005),

$Y = X\beta + \sigma\varepsilon$, $\varepsilon \sim N(0,1)$, and $\sigma = 15$. We choose, and $p = 40$. The predictors X were generated as

$$X_i = Z_1 + \varepsilon_i, \quad Z_1 \sim N(0,1), \quad i = 1,\ldots,5,$$
$$X_i = Z_2 + \varepsilon_i, \quad Z_2 \sim N(0,1), \quad i = 6,\ldots,10,$$

follows: $X_i = Z_3 + \varepsilon_i, \quad Z_3 \sim N(0,1), \quad i = 11,\ldots,15,$

$$X_i \sim N(0,1), \quad i = 16,\ldots,40,$$
$$\varepsilon_i \sim N(0,0.01), \quad i = 1,\ldots,15.$$

In this model, we have three equally important groups, and within each group five members exist. In addition, 25 pure noise features are present. An ideal method would select only the 15 true features and set the coefficients of the 25 noise features to 0.

2.3. ℓ1-norm regularization regression and penalty parameter λ selection

Our method's goal is to learn a graph model from high dimensional data such that, given an ordered pair of two variables (i, j), it can predict whether i is a regulator of j. Our approach attempts to solve this problem through neighbor selection as in (Meinshausen & Bühlmann, 2006), based on ℓ1-norm penalty least square estimation. In this approach, the neighborhood of each gene ïis estimated independently using a penalized linear regression with a lasso-style (i.e., ℓ_1-norm) regularization over edge weights. The regression goes around every gene in the network, which leads to completing the network. In every neighbor estimation step, gene i is treated as a response variable, all other variables are the covariates, and the weights are the correlations between the other variables and i.

A ℓ1-norm penalty is applied to encourage a sparse solution, as in the lasso in (Tibshirani, 1996). This surprisingly simple method, when applied over i.i.d. nodal samples (e.g., microarray measurements), has extremely hightheoretical guarantees with respect to recovering the correct network structure. It has been shown that under certain variable conditions, obtaining an estimator of the edge set **E** that achieves a property known as sparseness (Meinshausen & Bühlmann, 2006) is possible., Sparseness refers to a case in which a consistent estimator of **E** (i.e., the network structure) can be attained when the true degree (i.e., the number of neighbors) of each node is much smaller than the size of the graph. This is possible even when the sample size is considerably smaller than the number of variables.

We must deal with a much more difficult problem because our samples are no longer i.i.d., and our networks are no longer independent of each other. For this purpose, we must extend the basic neighborhood selection lasso algorithm as shown in the following subsections.

It is known that the elastic net approach, can eliminate co-linearity and improve group effect efficiently. The naive estimate $\hat{\beta}$ is defined as follows:

$$\hat{\beta}(naive) = \arg\min_{\beta} \left\| Y - X\beta \right\|_2^2 + \lambda_2 \left\| \beta \right\|_2^2 + \lambda_1 \left\| \beta \right\|_1 \tag{4}$$

We show that the proposed neighborhood selection scheme is consistent for sparse high-dimensional graphs. Our proposed algorithm for inferring large GGM from the $N \times p - \text{dimensional}$ matrix X consists of the following steps:

Suppose that a dataset has i.i.d. sample matrix X ($N \times p - \text{dimensional}$). Let $X_i = \left(x_{1i}, \ldots, x_{ni}\right)^T$ be the response vector and $X_{\setminus i} = \left(X_1, \ldots, X_j, \ldots, X_p\right)$ where $X_j = \left(x_{1j}, \ldots, x_{nj}\right)^T, \left(1 \le j \le p, j \ne i\right)$ is the matrix consisting of $p-1$ predictors.

We can assume that the response vector derived from the regression model as follows.

$$X_i = \beta_i^T X_{\setminus i} + \varepsilon_i$$

Gaussian noise $\varepsilon \sim N\left(0, \sigma^2\right)$, $\sigma^2 = \text{var}\left(X\right)$ and $\beta_i = \left(\beta_{1i}, \ldots, \beta_{ji}, \ldots, \beta_{pi}\right)$. We perform the following steps:

1. Standardize $X_{\setminus i}$ to be zero mean and unit standard deviation, and X_i to be centered.

2. For any fixed non-negative $\lambda_1 \, and \, \lambda_2$, we consider the penalized least squares criterion:

$$L(\lambda_1, \lambda_2, \beta) = \left| X_i - \beta_i^T X_{\setminus i} \right|_2^2 + \lambda_1 \left| \beta_i \right|_1 + \lambda_2 \sum_{j=1}^{p-1} \omega_{ji} \beta_{ji}^2 \tag{5}$$

$$where \quad \left| \beta_i \right|_1 = \sum_{j=1}^{p-1} \left| \beta_{ji} \right| \quad and$$

$$\left| X_i - \beta_i^T X_{\setminus i} \right|_2^2 = \sum_{j=1}^{p-1} \left(X_i - \beta_{ji}^T X_j \right)^2$$

$$\omega_{ji} = \frac{\sum_{j \neq i, j=1}^{p} \left(\rho_{ji} - \overline{\rho}_i \right)^2}{\sum_{j \neq i, j=1}^{p} \left(\overline{\rho}_i - \overline{\rho}_j \right)^2} \tag{6}$$

$$\overline{\rho}_i = \frac{1}{n} \sum_{k=1}^{n} \rho_{ki}$$

3. The estimation of β_i is $\hat{\beta}_i = \arg\min_{\beta} \left\{ L(\lambda_1, \lambda_2, \beta) \right\}$
4. Let $\alpha = \frac{\lambda_2}{\lambda_1 + \lambda_2}$. We can then formulate the penalized least squares problem as the optimization problem as follows:

$$\hat{\beta}_i = \arg\min_{\beta_i} \left| X_i - \beta_i^T X_{\setminus i} \right|_2^2, \quad subject \; to \; (1-\alpha) \left| \beta_i \right|_1 + \alpha \left| \omega_i^{1/2} \beta_i \right|_2^2 \leq t \;\; for \;\; t \tag{8}$$

5. The penalty $(1-\alpha) \left| \beta_i \right|_1 + \alpha \left| \omega_i^{1/2} \beta_i \right|_2^2$ is a convex combination of the lasso and ridge penalty. When $\alpha = 1$, the aforementioned penalized least squares becomes a simple ridge regression. In this study, we consider only $\alpha < 1$. When $\alpha = 0$, the penalized least squares becomes lasso regression. For all $\alpha > 0$, thus having the characteristics of both lasso and ridge regression.
6. Choose the correct regularization parameter λ in a data-dependent manner by using the standard technique of the Bayesian information criterion (BIC) (Liu, Chen, & Jothi, 2009). The BIC-type criterion is as follows, where RSS denotes the residual sum of squares:

$$\mathrm{BIC}_i(ë) = \log\left(\mathrm{RSS}_i(ë) \right) + \frac{\log(np) + 2\log p}{np} \tag{9}$$

Here, as a result of selecting the penalty parameter λ, (5) can be estimated. We use the modified version of the BIC criterion, because the ordinary BIC criterion tends to include many spurious variables when the complexity of the model space is large. Now, λ is chosen by a minimization:

$$\hat{\lambda} = \underset{\lambda}{\operatorname{argmin}} \sum_{i \in p} \mathrm{BIC}_i(\lambda) \tag{10}$$

In summary, the LVSHS algorithm obtains the penalty parameter by means of the modified BIC criterion previously mentioned, and then calculates the gene regulatory coefficient. Finally, it generates the network. The details of the algorithm are discussed in the section that follows.

Our ongoing theoretical analysis suggests that LVSHS can detect causal relationships in graph evolution. In addition, our method represents an extension of the well-known lasso-style sparse structure recovery technique and is based on a major assumption that temporally adjacent networks are unlikely to be dramatically different from each other in topology and thus are more likely to share common edges than are temporally distant networks.

2.4. Network reconstructing algorithm

To facilitate computing efficiency, we propose algorithm based on aℓ1-norm penalty regularization optimization problem for minimizing the penalty regularization function using a limited-memory quasi-Newton update method. The quasi-Newton method is extremely suitable to learn sparse orparsimonious models especially in a case in whichthe cost of evaluating the objective function isconsiderably high. For instance, structure learning in GGMs or MRFs.

ℓ1-norm regulation can be converted toa constrained optimization problem. Although many conventional algorithms such as gradient descent or the interior point method offer theoretical guarantees, these approaches, which always must solve problems in a large ill-conditioned linear system or consider only function gradient information, are inclined to trap into local optimum and incursubstantial computational cost. In our algorithm, we introduced an efficient limited-memory quasi-Newton method, L-BFGS,to promote efficiency and reduce computational complexity for unconstrained optimization problemswith many variables, which updates with second-order derivativeinformation inferred from observed changes in the gradient.

3. Results and Discussion

In this section, results of experiments with synthetic and real-world datasets are included. We present a numerical comparison with three existing algorithms, including an analysis using E. coli data, and show that our algorithm is much computationally efficient. Although the other three methods provide efficient inference for medium-scale data, they typically cannot fully capture the relational complexity for large-scale datasets. Experiments demonstrate the viability and the effectiveness of our LVSHS algorithm. Furthermore, our LVSHS algorithm occupies a higher position in the accuracy/efficiency trade-off.

3.1. Simulated data experiments

To estimate the accuracy and efficiency of the LVSHS algorithm and compare its performance with three commonly used competing algorithms (i.e., LARS, GeneNet, and GLASSO), we generated synthetic datasets by using SynTReN(Van den Bulcke et al., 2006), which simulates benchmark microarray datasets with the known underlying biological networks for the purpose of developing and testing new network inference algorithms. Through SynTReN, we simulated a biological network with a known topological structure as well as the corresponding time series gene expression data. We retained the default tuning parameters that control the complexity aspects and changed only those that control noise and the size of the dataset in order to generate datasets of different sizes and complexity in the software.

We generated 100 microarray datasets that consist of 200 genes and 100 sample points (noiseσ =0.5). The resulting graphs had approximately 500 connections. For each generated dataset, the network structure that was learned from each method was then compared with the true underlying structure. We ran each experiment at least four times and averaged the results. Receiver operating characteristic (ROC), positive prediction value (PPV),and false discovery rate (FDR) curves of LVSHS in comparison to those of LARS, GeneNet, and GLASSO on simulated datasets are shown in Fig. 1, which shows the performance of the four algorithms averaged over the 100 datasets. Fig. 1 clearly shows that LVSHS outperforms the other three algorithms on the simulated datasets. The ROC curves in Fig. 1 reveal that LVSHS has an advantage over other approaches when the microarray data are "large p, small n."

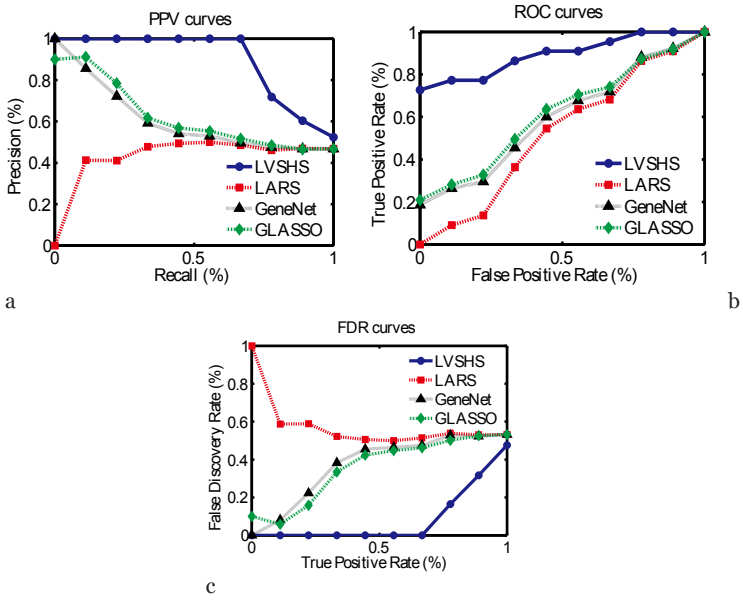


Figure 1 – (a)ROC curves, (b) PPV curves, (c)FDR curves shown as LVSHS versus LARS, GeneNet, and GLASSO on 100 synthetic datasets.

Fig. 2 shows boxplots of the area under curve (AUC) values, based on the aforementioned simulated datasets, to visualize accuracy for all four algorithms under investigation. The boxplots in Fig. 2 show that for all inference methods, the highest AUC value, 0.89, is obtained by LVSHS.

From Fig. 2, we can see that LVSHS results in much higher AUC values than do other algorithms. This figure shows that, statistically, on a sample size 100, LARS with a median AUC of approximately 0.5 is considerably worse than in other methods: GeneNet with a median AUC approximately 0.65, GLASSO with approximately 0.66, and LVSHS with approximately 0.89. It is also worth mentioning that GeneNetis remarkably similar toGLASSO in terms of performance.

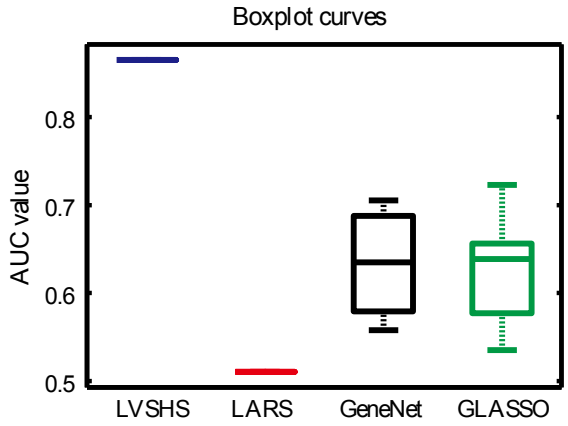


Figure 2 – Boxplots for LVSHS (blue), LARS(red), GeneNet (black), and GLASSO (green). The lines within the box are mean AUC values.

In Tables 1 and 2, we provide additional details of the results over 100 simulated datasets. These tables reveal that LVSHS outperforms the other three methods.

As Table 2 shows, the LVSHS algorithm obtains a comparatively lower false positive rate (FPR) and higher true positive rate (TPR) for more edges than do the other three methods. By contrast, LARS obtains the worst performance among the four algorithms.It should be emphasized that these values show the distinct inference ability of algorithms on the same underlying network.

For our simulations with genes 100, 200, 300, 500, and 1000,in which the sample size is set the same as 100, the time costs of the three algorithms are shown in Table 2. Table 2 shows runtime in minutes of all four methods over 100 simulated datasets. The simulation is repeated 100 times for each algorithm. Table2shows that LVSHS is relatively computationally fast, especially when the number of nodes is high (i.e.,≥300), and is thus superior to the other methods. In addition, LVSHS can infer the network structure for large datasets with 500 genes within a few minutes on an Intel dual 2.93 GHz processor and 4 GB RAM. A comparison of the timing, reported in minutes, among all four methods is given as follows.

Method	Top 100 edges		Top 200 edges		Top 300 edges	
	TPR	FPR	TPR	FPR	TPR	FPR
LVSHS	0.732	0.19	0.784	0.24	0.84	0.27
LARS	0.474	0.20	0.513	0.24	0.561	0.45
GeneNet	0.642	0.23	0.673	0.29	0.694	0.40
GLASSO	0.652	0.21	0.677	0.23	0.701	0.36

Table 1 – Average performance results for LVSHS, LARS, GeneNet, and glasso on 100 simulated datasets

Nodes	LVSHS	LARS	GeneNet	GLASSO
100	0.32	1.37	1.683	0.36
200	0.94	4.91	6.384	1.18
300	1.55	8.73	11.32	2.97
500	3.07	14.85	28.87	5.81
1000	7.95	29.54	54.15	13.02

Table 2 – Average Runtime, in minutes, on 100 datasets for LVSHS, LARS, GeneNet, AND GLASSO

3.2. Real-data experiments

We implemented our LVSHS algorithm to reconstruct a GRN from real-world time course microarray data and compared the performance of our approach with that of the other three methods. To evaluate the performance of the presented algorithm, we utilized the SOS DNA repair network of the Escherichia coli dataset collected by Alon et al. (Friedman, 2004). The SOS network has been well studied and used as the gold standard network in many studies. It is known that the SOS network is a highly conserved system and responsible for repairing the DNA after damage. It is composed of approximately 30 genes, the master regulator being the lexA. Usually, recA acts as a sensor of DNA damage by binding to single-stranded DNA and mediates lexA destruction. The drop in lexA levels causes the activation of SOS genes.

Experimental data can be downloaded from the homepage of Uri Alon et al. (http://www.weizmann.ac.il/mcb/UriAlon/). The dataset comprises four samples associated with two irradiation levels and each sample has 50 evenly spaced time points.

In Fig. 3, expression profiles of eight genes in the SOS dataset are represented. To validate our method using real data, we have plotted expression profiles for all the genes with concise descriptions. The results of the experiments allow us to conclude that our learning technique associated with network inference is able to capture the true patterns of the network.

As depicted in Fig. 4a, the SOS network consists of eight essential genes. Predictions of the gene expression data in the SOS DNA repair network by the LVSHS are plotted in Fig. 4b. The results show that the estimated model has small deviation from measurement, which demonstrates LVSHS's merits.

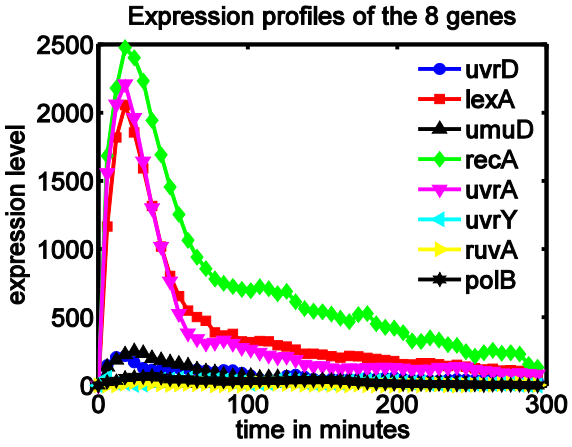
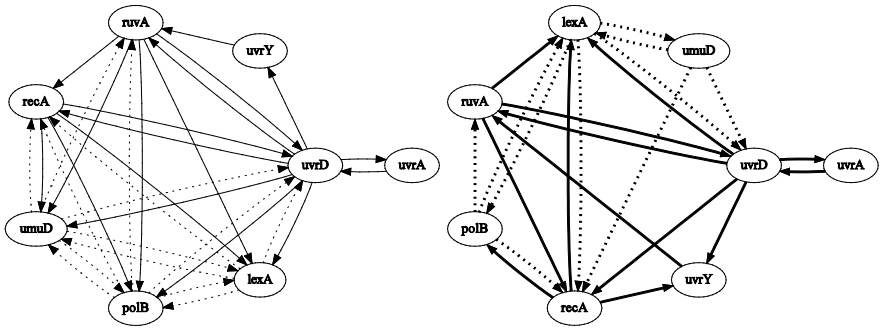


Figure 3 – Expression profiles of the eight genes corresponding to the SOS dataset of Alon et al.



(a) (b)

Figure 4 – (a) Reference structure of the SOS DNA repair network in E. coli with eight main genes. Activations are represented by solid lines and inhibitions by dotted lines.
(b) is LVSHS algorithms for the network structure of Escherichia coli.

4. Conclusion

Determining the relationship and interactions between groups of variables or a set of proteins is of great interest to biologists and computation scientists. In particular, reconstruction of gene and protein association networks from microarray data has been an active and interesting field in bioinformatics in the last few years. Identifying the properties of biological networks is necessary in successfully developing efficient inference techniques.

This study proposed a novel ℓ1–norm regularized sparse correlated graph (LVSHS) reconstruction approach for recovering the structure of networks from microarray data. To examine the consistency of the LVSHS approach and to test its biological applicability, we applied our new method to both synthetic and the SOS DNA repair network datasets.

The new algorithm combines ℓ1-norm penalty parameter learning with Bayesian information criterion controlling to improve the efficiency of computation. Experiments show that the proposed LVSHS method considerably improves computation time and can efficiently infer large-scale GRNs. LVSHS outperforms three existing algorithms both in terms of finding true edges of networks and computational time. With better predictive power, LVSHS could be used in the analysis of genetic networks.

Considerable work remains. Extending the LVSHS approach to non-linear network model would be interesting. Because our model is only a linear approximation of gene regulation systems, care must be given to model validation and extrapolating results. In addition, we will investigate different options for the penalty trade-off parameter λ and improve the computational efficiency of generic solvers.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 06/04/2016
Aceitação/Acceptance: 13/07/2016

Research on the Computer Data Processing Modes under the Big Data Era

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Abstract: In this paper, we conduct research on computer data processing modes under the big data era. Big data is based on platform architecture, data and algorithms are the core of big data, but the actual application is the key to big data. Big data mining process described above, the large data mining goal must be real demand from the application, and only in connection with the specific application data and fit algorithm, the use of effective support and efficient processing platform, and dig into mode or knowledge in practice, in order to provide quantitative, rational, feasible and valuable information. From this perspective, we integrate the CUDA, Hadoop and general parallel computing methodology to construct the new framework for data processing. The effectiveness is proved and verified.

Keywords: Computer Science, Data Mining, Big Data Analysis, Algorithm Development, Hadoop, CUDA GPU

1. Introduction

Cluster makes parallel programs running on all the cluster nodes at the same time, in order to gain higher processing capacity. At the same time improve the system scalability. But with the enlargement of the cluster size, cluster the probability of failure is bigger (Chen,2012; Bennett, 2013). So the fault tolerance is one of the must solve the problem of the parallel computing field. With the increase of the amount of the data, data mining ability to deal with massive amounts of data are questions cannot be ignored (Demchenko, 2013; Dev, 2014). The parallel algorithm is an effective way to solve this essential problem. Classifier in the decision tree algorithm is one of the important methods used in data mining (Mora, 2014; Lupton, 2014; Gonçalves et al. 2015). As for the specific application on the computer architecture concern, we should also be focused on the listed aspects. (1) Replica consistency maintenance, when the basic normal operation of the job and that when an error occurs and copy work normally when the main consideration of consistency maintenance (Swan, 2013), when an error occurs mainly considering that how to shield the mistake (Hu, 2014; Horton, 2015). In the original Primary as the backup agreement, when the Primary node failure, to run the general view change distributed algorithm, and from multiple choose new master copy of a copy of the backup node to provide service to

the system. (2) After the collapse of the node to join. According to the system structure and data copy in the I/O node placement strategy can be known that the system will not be a new file on the crash node, so as long as the change and delete files. When the I/O node is collapsed, the consistency recovery protocol should be run. The consistency recovery of the nodes needs to be consistent with the consistency of the recovery from multiple nodes, rather than by a single node to be responsible for the recovery of the node. (3) Data placement algorithm. Metadata manager is generally determined by the new file in the I/O node placement. The client may select the specified I/O node to store the file. If the specified I/O node is to satisfy the requirements of normal work while if the client specifies that the node has collapsed, the metadata manager stores the client file by selecting the other I/O node based on the placement strategy of the data.

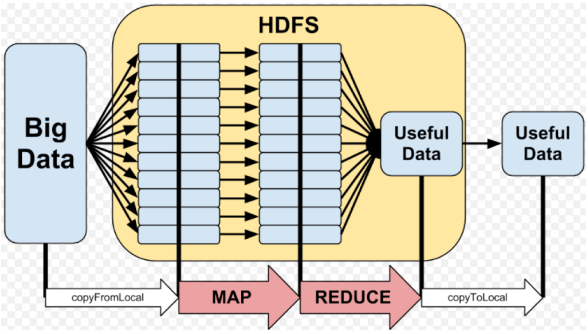


Figure 1 – The Computer Data Processing Modes and Flowcharts

As shown in the figure one, the computer data processing modes and flowcharts are demonstrated systematically. In the later sections, to specifically deal with the mentioned challenge, we conduct research from the perspectives of Hadoop, CUDA and parallel architecture. Experiment will be taken to verify the effectiveness.

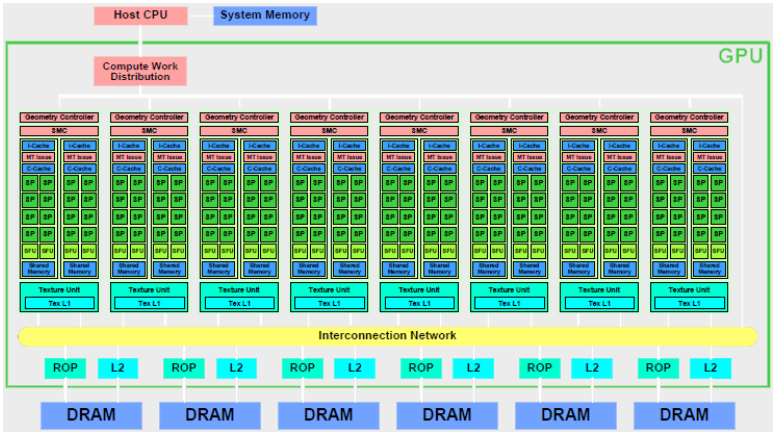


Figure 2 – The Architecture of the Data Processing Systems

2. The Technique Review of the Data Processing Systems

With the rapid development of industry information construction, the enterprise has accumulated a large amount of data, they are the basis of the management, and evaluation, the basis of core competence has become the most units (Marz, 2015; Paten, 2015). In the data processing area, main tool is the ETL tool, such as Kettle, Data-Stage, Informatica, Microsoft DTS, etc., they often provide a graphical operation or the essential scripted definition and management tools to a certain extent improve efficiency of the system development, operation, and some aspects of the commonality (Russell,2014; Rose, 2014). In the following figure one, we show the architecture of traditional data processing system and the features and characteristics are shown as below.

1. **User transparency, high fault tolerance:** Data interaction between the child and the child problems by the graphs organization and management, but according to node distribution characteristics in the process of data processing and data features appropriate modified graphs interface, in order to improve the efficiency of data processing.
2. **Efficiency of the mining algorithms:** In the WAMS platform, when a site failure, the basic algorithm can be used to dig out its impact on the site, to determine the main impact on the site.
3. **Reliable, efficient and scalable:** Graphs can be called the cluster's overall computing resources, largest Hadoop distributed file system can be called the biggest cluster storage resources, and can increase the cluster nodes according to the computing and storage tasks.

Middleware to provide transparent data processing services to users in order to realize the access to huge amounts of data, to effectively manage the data nodes to achieve the high performance parallel processing make full use of the considerable number of server resources in the grid, to provide users with a convenient and fast data services approach is a middleware system structure design of consideration. This paper mainly discusses the I/O intensive large data processing tasks and the essential. Computationally intensive tasks are greatly influenced by the processor real-time running state, and processor provided by hardware and operating system regulating mechanism differences, therefore we do not consider computationally intensive data processing tasks. While as this time, the consumption of the related energy for the system can be modelled as the follows.

$$GeneralCost = \max\{T_i\} \sum p_i \tag{1}$$

As we can see, only use the least amount of nodes perform the task does not ensure that consume the least amount of energy, because the least node is not equal to the total power consumption at least, it doesn't mean that maximum execution time minimum. In addition, in a lot of the cluster is not suitable for using the new data storage strategy. The parameters involved are shown as follows.

Structure of content	Meaning
Began to run	The operation of the log data processing set start time.
Information recorded during execution	Operation of a data processing records of information.
Computational results	The results of data processing set
Environment setting	Record data processing freight lines of the input parameters.

Table 1 – The parameters involved by the data processing system

3. The Proposed Methodology

3.1. Hadoop and data processing

MapReduce framework as a mass data processing is widely used, especially TB-level data processing and PB grade has a natural advantage, more and more are using ETL cleaning process framework MapReduce programming model, the need for that MapReduce operation mechanism, algorithm, performance optimization, programming frameworks and other aspects of the study design customization. For the MapReduce, we can summarize the characteristics as the follows.

1. It has good scalability, greatly improving the efficiency of the development. Through good organizational structure, the use of filters, factory methods, strategies, and the other listener mode, and good xml configuration file, so good scalability.
2. Providing configuration files, use multiple outputs, the results according to certain standards of HDFS assigned to a different directory, to facilitate the establishment hive partition table to do later data analysis or computing.
3. Hadoop as a new distributed storage and computing architecture, due to be deployed on a common platform and scalable, low cost, high efficiency and reliability and other advantages to distributed computing has been widely used, and has been industry and that academia is becoming the de facto standard parallel processing of massive data.

HDFS data management model for the MapReduce job down into task execution laid the foundation for a map task, jobtracker will consider that tasktracker data locality, in the best case, the task is the localization data that is the task to run the slicing of the input node is located. for reduce task, jobtracker simply select from a list of the tasks to be run reduce one to perform, without taking into account the localized data. The figure 2 demonstrates the issue in detail.

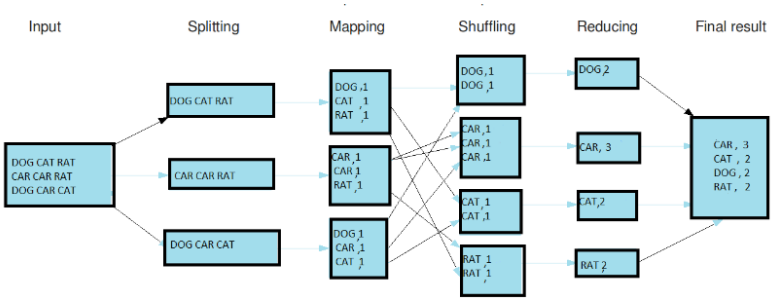


Figure 3 – The Architecture for the Hadoop Processing Core

Hadoop static replication strategy is adopted, namely, when the data enter to create a specified number of the copies. But that is not the case for the static replication strategy based on changes in the environment to make dynamic adjustment, easy to cause the waste of basic resources. Therefore, researchers put forward the dynamic replication strategy that can be based on the user network, storage and demand dynamically create or delete a copy such as: tension in the storage space, delete some copy to save the storage space while when storage resources are rich, for the frequently accessed data increase copy in order to improve the efficiency of the load balancing node. The complexity can be shown as the follows.

$$e_{complexity}(f,t) = \sum\left(d_{im} + f_j\right) / \left(I \times D\right) \tag{2}$$

In a distributed environment, I/O capacity and network bandwidth nodes are the two key factors affecting the performance of the whole cluster. In order to take full advantage of the cluster computing resources, the system may be deployed to the mission all nodes in the cluster, leading to a task it may need to process data is not stored locally. Taking into account the cost of data transmission, the traditional MapReduce cluster system when the job is executed for a map task, the system will try to assign a task to the node processing the data is located, to avoid mobile data bring I/O and communication costs that shown in the figure three.

```
<property>
    <name>browser.rule.AndriodBrowser</name>
    <value>Regex::.*?Mobile.*Safari.*</value>
 </property>

 <property>
    <name>browser.rule.Safari</name>
    <value>Regex::.*?safari\/([\d+\.]*).*</value>
 </property>

<property>
    <name>browser.rule.MQQ</name>
    <value>Index::MQQBrowser</value>
 </property>

 <property>
    <name>browser.rule.MQQ</name>
    <value>Index::MQQBrowser</value>
 </property>

 <!-- mobile model -->
 <property>
    <name>match.mobile.type.names</name>
<value>symbian::symbian,nokia::nokia,juc::juc,zte::zt
e,j2me::j2me,samsung::samsung</value>
 </property>
```

Figure 4 – The Configure Code for the Hadoop System

3.2. CUDA and data processing

CUDA is Nvidia GPU-based computing company launched a parallel platform. CUDA C language syntax is similar to write parallel programs, while adding some access, use GPU hardware features proprietary instructions. The current GPU hardware unified shader and the general purpose computing architecture, this architecture allows the use of CUDA on behalf achieve shader functionality possible because the CUDA general-purpose computing code and the shader code eventually was converted to the same hardware instruction and the same hardware unit on execution. For the processing of the CUDA based architecture, in the host, the CPU is responsible for the task scheduling, human-computer interaction and to get the data from the data stream, and constantly to exchange data subset to the device memory. On GPU equipment, using CUDA kernel program to deal with the data flow, and dynamically update the summary data structure to the device memory. In data flow quantile parallel algorithm, this paper adopts the sliding window model based on basic window as the summary data structure model, support fixed length or period of sliding window. Sliding Windows update, and delete operations based on basic window units and memory on the device out-of-date basic window will be abandoned in the device memory directly as follows.

1. In the field of the real-time data, the high density of the general data and multidimensional attribute constitutes a huge stream data with calculation model has the transition to the nuclear calculation. Because the calculation problem becomes very complex that must find new ways to improve the computing speed. These high-dimensional data stream related processing performance requirements is very big, before making the calculation of the processor performance cannot meet the requirements.
2. The use of GPU image block and pixel mapping technique, the proposed model the general flow of data elements mapped onto threads in parallel processing, and the existing data stream suitable for parallel computing algorithms have a lot of the qualities, the same instruction can be applied different data, the use of parallel processing to accelerate the model.
3. Based on related GPU high-dimensional data stream processing the biggest bottleneck is the host and the device data transmission overhead. The GPU can't handle the core tasks for alone, so must first buffer a certain amount of high-dimensional data, again to the GPU to calculate, to gain high data throughput. In order to meet the real-time demand of that data stream processing, by reducing the buffer and can reduce the delay, but the size of the buffer should guarantee every kernel program processing of a batch of data can make the GPU work at full capacity.

In this study, GPGPU programs at NVIDIA CUDA architecture is developed and run the program, so the compiled code file formats are cuh its extension headers and cu-based. The architecture is shown in the figure four. Dogpu class directly using the GPGPU program Dogpu.cuh and Dogpu.cu, where Dogpu.cu is devoted to memory allocation routines, their memory for configuration and the data transfer functions do not belong to any one class order; and then that Dogpu kernel GPU computing is the core of the program, called directly by Dogpu.cu the program, Dogpu class must be achieved by Dogpu.cu GPGPU purpose of Dogpu_kernel.cu make calls. When the program starts to

calculate, allocate CPU to do the first data on GPU computing, in this process, working on the GPU running called Kernel, Kernel and each work on the GPU is allocated to each of the Grid Therefore let the GPU kernel is a core program operations. A Grid can contain several Block, Block each in turn contains a number Thread.

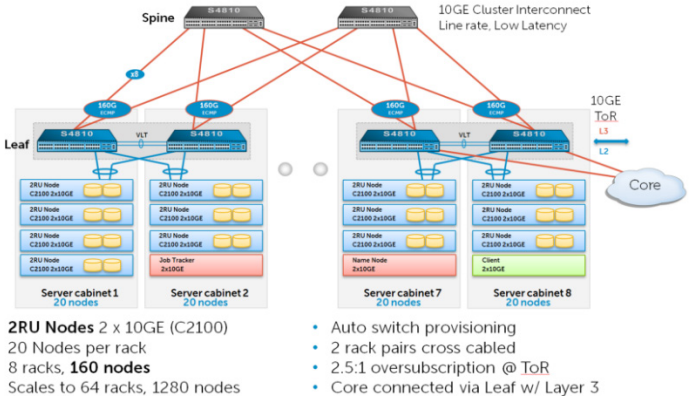


Figure 5 – The CUDA Core and the CPUCPG Connection Pattern

4. The Proposed Methodology and the Experiment

4.1. Parallel data processing paradigm

In parallel and distributed computer systems use the copy technology can improve system performance and availability. In the case of some node failure, the user will still be able to get to access the data. To improve the usability of the system, at the same time the data replication technology can improve the performance of the system. For the construction of the system, we should take into consideration of the listed issues. (1) For some of limited resources parallel storage system, the logical block number from the time and space to the storage node label mapping process consumption is crucial. If the mapping process up too much CPU and the memory space, will lead directly to the system performance degradation. (2) For parallel storage system, the degree of the parallelism is the key to system performance, and data distributed manner will directly affect the degree of parallelism data access. (3) Since zero is invalid mobility in this article are distributed two kinds of design goals, these two kinds of way is not in accordance with the movement of generating invalid weight equalization operation to distribute the data, so these two methods can be completely ineffective zero mobility.

For this concern, we should integrate the clustering algorithm as the whole. Fast K-medoids clustering algorithm to update general cluster centers using local heuristic method, it is possible to obtain more stable clustering results, the algorithm runs with Kmeans similar algorithm is simple, fast advantages. However, due to the algorithm in the selection of the initial cluster centers, and it is possible to make different kinds of clusters initial cluster centers are in the same class clusters, so the effect is not optimal clustering. We use the formula 3 to modify the center.

$$m_{center} = \left\{ x_{ij} \left| \min \left| x_{ij} - \frac{1}{N} \sum x_{ik} \right| \right| \right\} \tag{3}$$

Algorithm thought is that calculate each sample data sets the sample distribution density around; Choose the former sample distribution around the K concentration of sample points as the initial clustering center clustering; Calculation of various kinds of clusters in each sample to the other cluster sample distance, the sum of minimum value choice of the sample as the new clustering center to clustering, until the sum of all the samples to where the cluster center distance remains the same. Extensibility is parallel algorithm and high performance parallel computers design personnel's pursuit of an important goal. The scalability of parallel system reflects the problem size in parallel system with system size. Through scalability analysis, we can understand the degree of match system structure and application algorithm, at the same time can be used to evaluate the performance of the parallel system. For this, we define the similarity function as follows. And the systematic flowchart architecture is shown in the figure 5.

$$Sim\left(x_i, x_j\right) = \frac{1}{1 + \sum w_l \left| x_{il} - x_{jl} \right|} \tag{4}$$

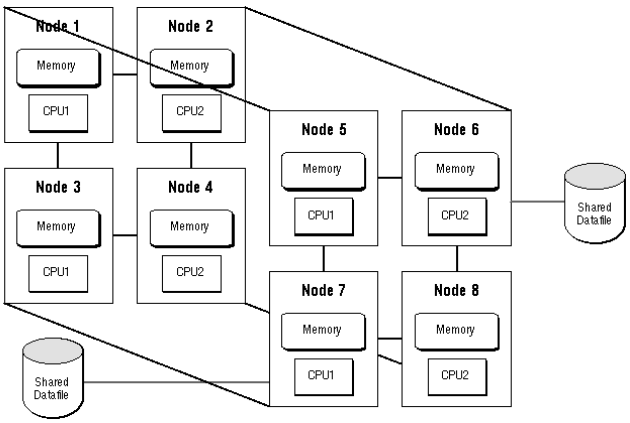


Figure 6 – The Proposed Parallel Data Processing Paradigm

4.2. Experimental analysis

In this part, we conduct experimental analysis on the proposed algorithm. To test the validity of the algorithm in this paper, respectively in the artificial simulation data set and UCI machine learning database to experiment on the standard data sets with the experimental environment of Matlab 9.0 programming environment, Windows 7 operating system. The following experiments are stored in a distribution of the structure of the large-scale parallel computer. Now in two ways to achieve data distribution Gaussian elimination and

to facilitate the analysis, there is not pivoting operation; while using constant efficiency scalable parallel system to analyze scalability. These two are the allocation block cyclic distribution block cyclic distribution columns and rows and columns. The visualized and numerical simulation results are demonstrated in the figure 6 and table 2.

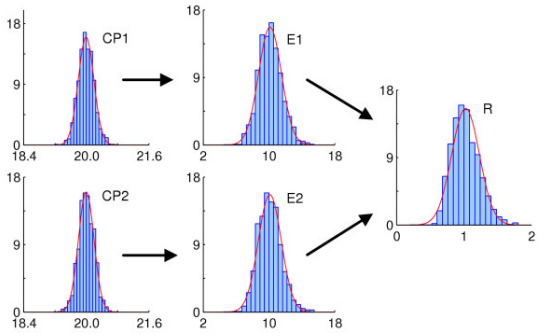


Figure 7 – The data processing procedure simulation result

NO.	Ours	Method1	Method2	Method3	Method4
1	97.86	95.12	96.77	95.66	95.66
2	97.55	95.20	96.85	95.45	95.63
3	97.26	95.22	96.65	95.47	95.69
4	97.53	95.59	96.66	95.45	95.86
5	97.74	95.36	96.30	95.42	95.84
6	97.12	95.33	96.28	95.53	95.75
7	97.55	95.37	96.79	95.26	95.23
8	97.66	95.41	96.56	95.25	95.56
9	97.53	95.15	96.22	95.28	95.33
10	97.58	95.16	96.25	95.89	95.62

Table 2 – The accuracy detection of different methodologies

5. Conclusion and Summary

In this paper, an efficient platform for the large data can effectively support the huge amounts of data integration and data mining algorithms are proposed, and visualization of the steps, and can use the standard data analysis process to ensure the stability of the results. In today's era of big data, massive use of historical data stored in the on-

site production process, from mining the useful knowledge and information, through the intelligent algorithm to multivariable model identification system has become a hot research. Because of the diversity of big data, big data acquisition and integration usually cannot be directly applied to data mining algorithms to preprocess the data, that combined with the information structure of the specific application of data processing, data abstract semantic information, and the need for large numbers obtained according to various properties in select attributes independent culling and application, or the introduction of additional abstract measure etc. This paper provides the new paradigm for the issues that is proved to be efficient from the theoretical and technique layers.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 05/04/2016
Aceitação/Acceptance: 12/07/2016

Research on the Education Management System Optimization Model based on Wavelet Neural Network and Adaptive Weight Analysis

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Pages: 223–233

Abstract: In this paper, we conduct theoretical and real-world application guided research on the novel education management system optimization model based on wavelet neural network and adaptive weight analysis. We analyze the issue from the listed individual perspectives. (1) Security: System can effectively prevent the attack from network, and the internal, for the key information using encryption transmission, the transmission of the data file to provide non-repudiation. (2) Openness: Open system technology, providing system source code, provides the complete operating software, configuration, maintenance, testing, documentation and appropriate secondary development of technical information. (3) The advanced nature: Comprehensive adoption of Web technology and system, we adopted the popular three-tier architecture, realizes the core database, the core business logic and user interface. Through the proper integration of the neural network, we enhance the robustness of the system. The user interface is designed for the better HCI performance.

Keywords: Education Management System, Optimization Model, Wavelet Neural Network, Adaptive Weight Analysis, Systematic Design

1. Introduction

The 21st century is the information age, the information is imminent, especially the education information. Education management information system as an important part of education information, deserve a very good development, but in fact slow development, education management information system software both from the aspects of general quantity, and quality are far cannot satisfy the requirement of many schools (Chung, 2013; Aguilar, 2014, Lino et al. 2016). But the education management information system development and the application not only technical personnel, because it is a social technical system, the success of the development and application of it is related to many factors, these factors often play a decisive role (Gopinathan, 2012; Gikas, 2013). Therefore, building a new and effective graduate education management information system to ensure the normal and orderly conduct of the daily management, strengthen the cultivation process monitoring, and management standardization, scientific and other very important practical significance (Mahony, 2012; Kozhevnikov,

2014).Based on the literature review, traditional forms of setting the framework of the technique for system can be separated into listed aspects.

1. **Using B/S mode**. In the B/S structure, the user interface completely through the WWW browser for access, without additional client software development. B/S structure has been proven that it has better security and better cross-platform, but because the general architecture is an emerging technology, currently the technology is not yet mature part.
2. **Using C/S mode**. C/S is built on the basis of the LAN as is collaboration between the client and server two layers of system platform model. Using the system C/S model has the advantages of the strong interactivity, high efficiency, high speed and good security.
3. **C/S mode combined with B/S mode**. If in high security requirement, interactive, flexible processing of large amount of data, data query and the place fixed small scale using C/S mode, and in the security and interactivity is not high, flexible site wide area within the scope of using B/S mode can make full use of the two modes respectively.

Besides the selection of the technique for developing the software, storage media is also essential for a successful system. The prototype of the cloud computing in the IT market is gradually formed, which provides new opportunities for the IT service provider and has given rise to the transition of the traditional IT products. IT embodies the thought of "the network is the computer", will be a large amount of computing resources, storage resources, software resources link together to form a huge size of the shared virtual IT resource

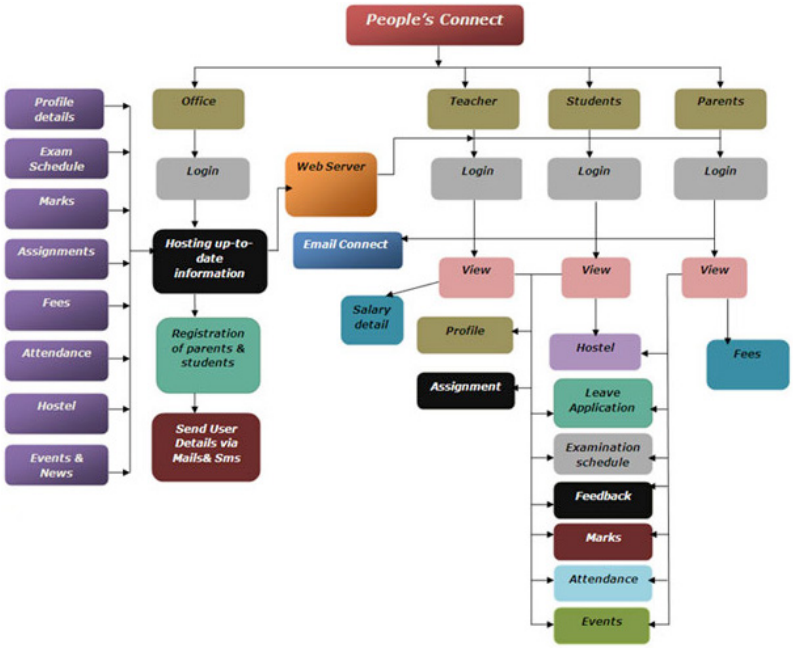


Figure 1 – The Sample Demonstration of the Education Management System

pool (Mora, 2014; Porter, 2014). Under this perspective, we will use this technique for the systematic implementation. Cloud computing is in the rapid growth of the size of the market at the same time, also faced with unprecedented challenges (Taras,2013). Due to the lack of scientific compensation mechanism, which leads to the cloud service provider for the punishment of service opportunity cost reduction, cloud service risk probability increases, and the serious influence the customer confidence in the application of the cloud services. SLA as a service provider and customer signed a formal contract, its fundamental purpose is to let the two sides in front of the service to reach a clear shared vision, establish the formal contract mechanism at the same time limit the default behavior to encourage the parties to reach or exceed the predetermined goals (Veletsianos, 2013; Vexler, 2014). Customers rely on SLA to require service providers to provide security for its service, and put forward compensation in the event of a service failure. In the later sections, to deal with the mentioned challenge and propose our new methodology, we conduct research on education management system optimization model based on wavelet neural network and adaptive weight analysis. To begin with, we show the sample demonstration of the traditional education management system in the figure one.

2. The SaaS and Cloud Computing

Software as a service as a new mode of software delivery been recognized more and more widely, and will become the next important operations of software services. As a kind of distributed system architecture, SOA can be heterogeneous platform application integration of the different services, through the well-defined interfaces between these services and standardize together in loose coupling way, the multiple existing services integrating it into a new system through the network. The SaaS has the following features and characteristics.

1. Service features. SaaS allows the software to the Internet as a carrier in the form of services used by enterprises as enterprises do not need to spend a lot of money to buy the ownership of the software.
2. Provide software through the Internet. SaaS provider will be unified plan of the software on the server that can according to the actual needs of their customers, order the products via the Internet providers.

According to the analysis of the SaaS system, the use of hierarchical control of the SaaS system to manage the implementation of multi-level access control, to ensure the security of the system and the flexibility of the data access with delamination and extension. SaaS “one-to-many” service model made it possible to mass service, help to realize the service provider’s economies of scale, and generate the long tail market. SaaS vendors use “one to many” service mode, develop an application can supply thousands of customers to use, can maximize the scale effect of the software, at the same time reduce the operating costs of software, including the production infrastructure, operating cost, upgrade costs, and many support costs(Wang, 2012). In addition, the SaaS provider can also be centralized control these costs that making use of the characteristic, the influence of SaaS long tail have a massive economic effect. In the table one, we define the primary components of the SaaS.

Component Name	Definition and Feature
Assign role authorization	Permission configuration said authority and the distribution of the many-to-many relationship between role that is, a role can be granted more authority.
Distribution organization permit	Implement a many-to-many relationship between organization and license. An organization can have multiple licenses as a license can be assigned to general multiple organizations.
Limits of authority	Permissions are for one or more data objects in a computer system access permissions in some way is the operation task data access interface of data resources.
The session	A session is a mapping of a user to a number of roles, and when that the user activates a part or all of the characters he is granted, he builds a session.
Assign user roles	Assigned user said the distribution of the many-to-many relationship between users and roles, that is, a user can be granted multiple roles, a role can be assigned to multiple users.

Table 1 – The Primary Components of the SaaS

For SaaS providers, use the intersection of design methods SaaS software must be able to meet the overwrite software costs, including the cost of software design and service operating costs, that is, as this method must be profitable. Therefore, the method needs to carry out the necessary conditions for economic analysis. It is worth noting that the non-fully trusted service operators to quickly and accurately reconstruct the data object. Based on the logical view of data objects in the physical storage block, non-trusted service operators can solve all the possible attacks, but still unable to determine what data block combination is true and what data block combination does not exist, so as to effectively prevent the combination of data privacy. Therefore, the safety concern is also the essential component.

3. The Proposed Core Methodology and Algorithm

3.1. The wavelet neural network model

Artificial neural network prediction method to predict nonlinear effect is very good, from the perspective of the characteristics of network traffic, also is nonlinear, in theory, neural network can approximate arbitrary precision any form of nonlinear sequence. Compactly supported wavelets makes wavelet neural network is superior in rapid change and learning containing discontinuous functions aspect would wavelet function as a function of the basic hidden layer neural network structure constituting the neural network wavelet neural network, wavelet neural network identification the parameters of the self-regulating, self-learning ability, that has the scale and translation parameters adjustable parameters large-scale smoothing function capable of learning, and small-scale able to function with partial singular learning. Theoretically, there are two forms of integrating wavelet. (1) Wavelet decomposition of network traffic time series, wavelet transform scale coefficients and wavelet coefficients of the sequence, and then input to a neural network to be trained to predict. (2) Neural network hidden layer of the transfer function instead of using wavelet function, this combination of essentially change the

structure of the forecasting model, in does not affect the premise of that prediction accuracy, shorten the training time of the model to improve the speed of the training, to overcome the neural network easy to fall into local advantages disadvantages.

Wavelet neural network forecasting model is made of three layers structure of wavelet neural network that chose a three layer structure, because most of the actual sequence of time series is a nonlinear, less than three layer structures is unable to approximate the nonlinear curve. When the layer number is more than three layers, of course that can also close to the curve, but increased the complexity of the calculation. In the following formulas, we define the architectures.

$$a_k^m = \sum_i w_{ij}^m b_{ik}^{m-1} \tag{1}$$

$$b_k^m = \varphi_m\left(a_k^m\right) \tag{2}$$

Minister-designate N network has the four layers: input layer, pretreatment layer, hidden layer and output layer. The transmission function can be then shown as the following formula.

$$y'(t) = \sum_{j=1}^{n} W_{jk}' \Phi\left(\sum_{i=1}^{n} W_{ij} x_i(t) - \theta_j\right) \tag{3}$$

Wavelet neural network weights by means of the criterion of minimizing evaluation function to obtain which can be obtained from the formula 4.

$$J_{optim}(W, W', \theta) = \frac{1}{N} \sum_{k=1}^{N} \left[y(k) - y'(k)\right]_2 \tag{4}$$

The optimization procedure is shown in the figure 2.

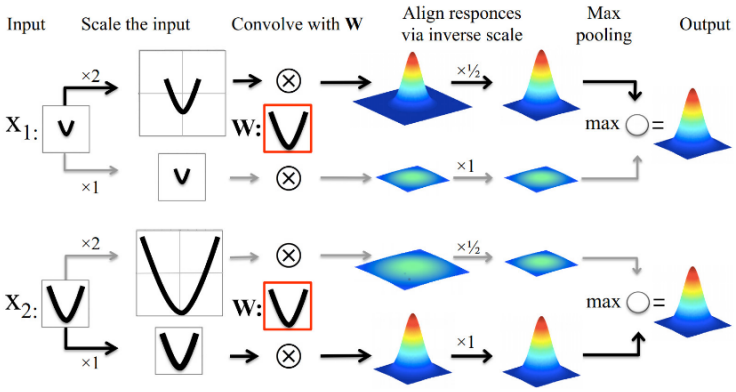


Figure 2 – The Optimization Procedure for the System

Before the network training to a number of levels of the wavelet decomposition and wavelet packet decomposition, and the wavelet decomposition algorithm adopts the cascade filter group to realize fast wavelet transform, the wavelet function and scaling function using the Malat pyramid method to construct compactly supported binary wavelet. The principles for the training can be organized as follows.

1. Modifications including network node split and delete. When the network node split, add a node and its connected to the power, divides the value assigned to the original node when delete network nodes, delete nodes and its connected to the right.
2. Wavelet packet decomposition is different from the wavelet decomposition of decomposition requires basis functions must be orthogonal compactly supported, but not that orthogonal dyadic wavelet, does not satisfy this requirement.
3. Once the network is trained using tree traversal algorithm, the leaf node of the search tree, the wavelet decomposition, so that each has a parent node, with wavelet decomposition or wavelet packet decomposition of general signal data, as a result of the output network preprocessing the input to the hidden layer, operation network, classification can be obtained results.

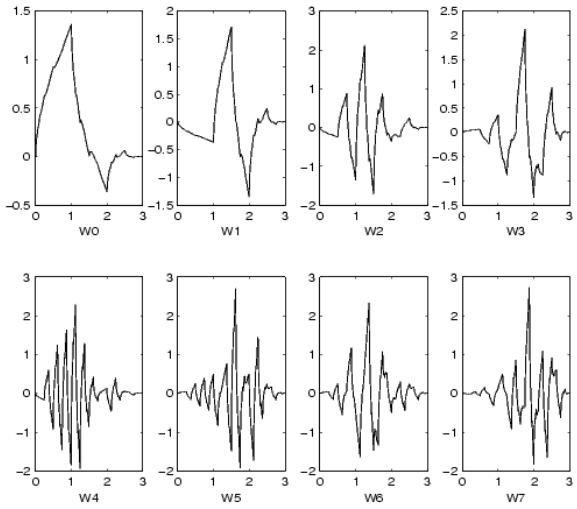


Figure 3 – The Selectin Comparison of the Wavelet Signal Forms

To finalize the WNN training procedure, we list the forms of the wavelet signals in the figure three. This method of combining wavelet transform and neural network, although a good prediction effect, but the essence is the neural network prediction, and not fundamentally improve the training speed of the neural network is slow, easy to fall into local advantages, it is difficult to find the global minima. Therefore, the optimization in the later section will be essential.

3.2. Neural network weights adjustment paradigm

We are adopted by the neural network with a hidden layer of three layer forward network, hidden layer and output layer nodes with a standard of Sigmoid function. General approximation theorem shows that the feedforward neural network has a hidden layer to achieve any approximation. To facilitate the discussion, the output neuron layer shown in simplified to contain only a linear neurons, hidden layer neuron activation function is sigmoid function. Without loss of the generality, this model can be extended to multi-output nonlinear monotonic output that neuron excitation former single hidden layer of the neural network.

In the reverse phase, using the error gradient descent the right to modify the value of the input layer to the hidden layer and the hidden layer cell threshold principle as BP is different from the traditional hidden layer to the output layer weights in the back propagation stage not to amend, reverse phase adjust only the connection weights between the input layer and the hidden layer and the hidden cell threshold. That error back through the output layer to the hidden layer is connected between the output layers is transmitted to the hidden layer, hidden layer as a unit assigned to modify the input layer to the hidden layer connection weights and hidden layer cell threshold based on gradient descent principle. The updated parameters are the listed formulas with the general integration and combination.

$$Net_{general} = \sum_{i=0}^{n} x_i w_{ij} \tag{5}$$

$$f(x)_{revised} = 1/\left[1+\exp(-x)\right] \tag{6}$$

Algorithm is different is that by the algorithm is to determine the optimal output power vector and that the reverse adjustment of input power vector, can make the adjustment of training the weights of neural network in the positive and negative two phases are implemented. Adjust the input vector of the above ideas are similar to normal BP algorithm, but BP back propagation is the error signal in order to inform weight changes, to reduce the error of the output. Our algorithm is based on the weight update, update as input and two learning methods. Weight adjusting nested in that the input

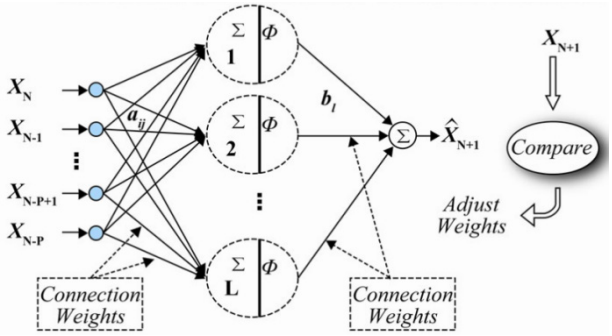


Figure 4 – The Demonstration of the Neural Network Weights Adjustment Paradigm

control inside. Several times after a weight adjusting input adjustment. Thus, increase the amount of computation is very few, but can bring the learning performance is greatly improved which is shown as follows.

4. The Implementation of the Framework

For our system, we primary use the Ajax. The core of Ajax is the XmlHttpRequest JavaScript object and supports asynchronous request, you can use the JavaScript to request and process the response to the server, without blocking the user. This updates the data, no need to refresh the entire page, just need to update the specific parts of the page can be referred. User or a basic user program using distributed database as centralized database, don't need to care about the distribution of global data in the distributed database distribution transparency also called distribution independence from the following aspects.

1. Location transparency: it is the middle layer distribution transparency, data on the user's program to understand global data fragmentation, but don't know the duplicate copy of each logical clip, also do not have to care about each fragment and the copy of the site location distribution.
2. No distribution transparency: the user to understand the global data fragmentation, replication of each logical fragment, while the site location distribution and the fragments and their copy of the heterogeneous data conversion model to users and their treatment program.
3. Shard transparency: is distributed at the highest level of transparency, at this point, the user to write programs for global relations only operate without considering the logic of data fragmentation.

The database management system is a management information system is an important support technology is the key of the network system. The database system selection

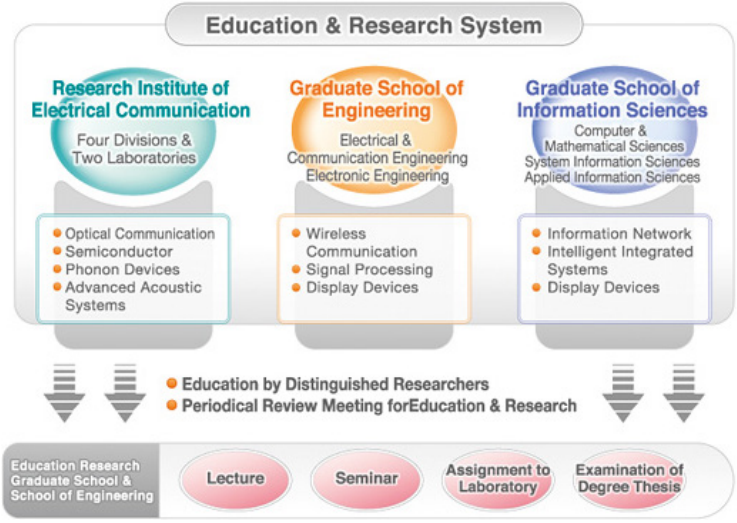


Figure 5 – The Systematic Architecture of the Design Platform

system should be consistent with the basic mainstream relational standard, client/ server architecture and the system should have good adaptability and extensibility based on. The figure 5 shows the systematic architecture.

The database system of this system adopts the distributed system design method. The Department as the center of teaching database that is responsible for the management of all student information. Each sub teaching point is also built with its own database of local students teaching management. The whole database system uses some rules for the data synchronization and application. The logical structure of the distributed database system is at the beginning of the system design as we consider the distributed management function which is directly used by the database software to meet the requirements of the distributed management system. But in the later design and testing, it is found that there are problems, which limit the application of the database software. For the further consideration, we list the primary components as the follows.

1. Cultivate management module. The module including the training plan formulation and the queries, training plan and query, curriculum planning statistics, cultivation plan submitted status query and funds management.
2. System management module. This module includes user management, system global parameter settings, system tools and the basic public code maintenance, etc. Used to definition, using the system user divides user permissions and maintains the user password.

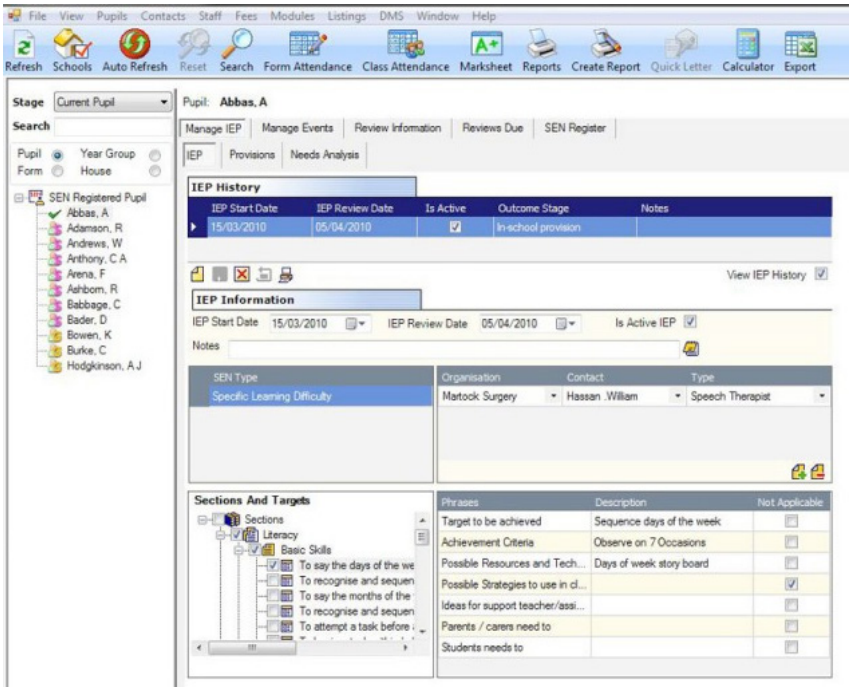


Figure 6 – The User Interface of the Designed System

3. Related to basic module. The teacher management, student management and the teacher module includes course management. Course management mainly include course maintenance, query and maintenance schedule.

5. Conclusion

In this paper, we conduct research on the novel education management system optimization model based on wavelet neural network and adaptive weight analysis. In information age, the frontier in the scientific research in colleges and universities, establish efficient management information system as an important part of promoting the management level of the education. The development of higher correspondence education management system and application has realized the correspondence station unified online teaching management, using advanced management technology, the construction of the management information system based on Internet platform, transfer data, release information, data and resources sharing, improve the timeliness of the information. How to effectively deal with scattered data and can implement centralized management? Therefore we designed in distributed database platform to build the remote teaching management system, so as to better achieve the teaching management information exchange and basic management. The proposed methodology is implemented with the Ajax, the user interface is well designed. In the future, more modifications will be down.

Acknowledgement

This paper is financially supported by the Social Science Fund of Jilin Province (2016BS41).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 20/05/2016
Aceitação/Acceptance: 10/08/2016

Research on the Cross Period Optimal Mining Method of Non-renewable Resources in South China Sea based on Resource Utility Perspective

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Pages: 234–245

Abstract: Effective exploitation and utilization of non-renewable resources has been a hot research topic. As the South China Sea is the largest sea area in China, and has the most abundant resources. In this paper, the authors study on the cross period optimal mining method of non-renewable resources in South China Sea. At the same time, we analyze the South China Sea resources development issues, such as fisheries resources, oil and gas resources. On the basis of this, we analyze the uncertainty factors of resource exploitation, and construct the optimal exploitation scale model.

Keywords: Optimal exploitation scale, Cross period mining, Resource utility, South China Sea

1. Introduction

In early 1980s, strategists make prediction that twenty-first Centuries will be the century of the ocean. 2001, in the document of the eleventh meeting of the conference of the States parties to the Convention on the law of the sea; the twenty-first Century is the century of the ocean. China in 1996 to develop the "China Ocean twenty-first Century agenda" also clearly pointed out that "twenty-first Centuries is a comprehensive understanding of human beings, the development and use of the ocean and the protection of the new century". 2013, General Secretary Xi in the Central Committee of the Communist Party of China on the construction of maritime power of the eighth collective learning pointed out that "the construction of maritime power is an important part of the cause of socialism with Chinese characteristics" and stressed that in order to improve the ability of marine resources development, efforts to promote the marine economy transforms to the mass effect (Baolin, 2013; Lu, 2015). It can be seen that China's national leaders attach great importance to the development of marine resources, as well as the determination of China's construction of marine power. In order to further improve the ability of marine resources development, build a strategic goal of marine power, cannot be separated from the development of the South China Sea resources (Ming, 2015; Pereira, 2015). The South China Sea, China's four largest sea areas, the area of the largest and most abundant resources, the problem is the most, the most sensitive. As long as the solution

to the problem of the South China Sea strategy, we must be able to achieve the strategic objectives of China's marine power.

According to the latest data show, global primary energy consumption for billion tons of oil equivalent, which reached million tons of oil consumption, accounts for the world a total energy, natural gas consumption reached million tons, accounts for the world total primary energy, the two together accounted for the proportion of. With the increasing amount of oil and gas resources in the world, the proven reserves of oil and natural gas resources are increasing, and the natural gas resources will be the main body in the global energy pattern (Xijun, 2014; Rui, 2015). Oil as the "barometer" of the development of the world economy, largely reflects the economic situation in the world; and those who have a clean, efficient, rich resources, convenient transportation and other advantages of natural gas, under the climate change is paid attention more and more, countries competing to develop the background of low carbon economy, its market share will continue to expand, prospect is more and more broad (Yong, 2012).

Petroleum and natural gas, although belonging to exhaustible resources, but compared to coal resources, they are more clean fossil energy, is the natural resources to use a relatively high value of the part, is the human survival and the development essential material foundation. After years of development, China's oil and natural gas industry has a considerable scale: production of oil and natural gas will continue to rise, consumption is also increasing year by year. In 1994, our country become the world's fourth largest oil producing country, years, China's oil consumption more than 100 million tons, second only to the United States, ranking second in the world; for at the beginning of natural gas as a clean energy source, has become second only to coal, oil consumption of the three major energy, the exploitation of the potential and demand is also growing (Yufeng,2015). In the past year, China's natural gas production with an average annual growth rate of 100 million cubic meters, annual growth in consumption, and the annual breakthrough billion cubic meters to billion cubic meters. With the acceleration of industrialization and urbanization and the upgrading of the consumption structure of the residents, the petroleum and natural gas resources will occupy an increasingly important position in China's energy consumption structure in the future.

2. South China Sea resources

2.1. Characteristics of the South China Sea

The South Sea of China, named for its Chinese is located in the south of the continent, it is a marginal sea of southern China; surrounded by Chinese mainland, Taiwan Island, Philippines islands, and the Indochina Peninsula, north-south length about 1800km, east-west length about 900km, it is a part of the Western Pacific; water area is 3 million 560 thousand Km2, is the world behind the Coral Sea and the Arabia sea third sea, which belongs to the jurisdiction of the China waters 2 million 100 thousand Km2, is the largest Chinese off the coast of South China Sea; the average depth of 1212m is about 67 times the average depth of the Bohai sea, the Yellow Sea 27.5 times the average depth of the sea; the South China Sea is high in the northwest, southeast low, China from continental margin to the center part of the South China Sea ladder was dropped; the seafloor topography is roughly diamond, an area of 400 thousand Km2, the basin water depth of about 400 M, maximum depth of 5567m, the periphery of the central basin is

a steep continental slope, is divided into four areas of North, South, East, and West, the periphery of the continental slope next to the continental shelf; South China Sea Islands is formed on the steps of the basin uplift, which area of more than 500m2 islands about 1700, coastal area of more than 3500 km2, located near the continental shelf of the fishing area of total 1.821 million km2. The development of the sea area and the sea area are more than the other three waters.



Figure 1 – The South China Sea

area	area	coastal area	Continental shelf fishing ground	Mainland coastline	Average water depth	Deepest deep
Bohai Sea	7.7	6794.9	7.7	2500	18	86
Yellow Sea	38	5818.0	35.3	4362	44	140
East China Sea	77	5557.5	54.9	5746	370	2719
South China Sea	356	3538.5	182.1	5792	1212	5567

Table 1 – Four sea areas of China

2.2. Problems faced by the development of the South China Sea resources

Faced with the development of the South China Sea resources, we must first mention the issue of the South China Sea dispute. We usually say the South China Sea dispute is around the Nansha Islands Sovereignty Dispute and part of the waters of jurisdiction. Only by solving the problem of sovereignty disputes, can we create a peaceful external environment and a good development environment for the development of resources in the South China Sea.

1. Disputes over sovereignty over the South China Sea

Sovereignty dispute over the South China Sea is mainly from the beginning of 1970s, which is the root of the United Nations in 1968 on the South China Sea oil and gas resources survey report. This caused the South East Asian countries to the South China Sea sovereignty dispute, and the more play the more intense. Along the Southeast Asian countries have regardless of the historical facts and the Chinese people's feelings, and completely to the interests of their own country to divide its range of sovereignty in the South China Sea, and practices, based on each are not identical, also each country still exist serious overlap region, the strict heavy damage to the sovereignty and interests of the Chinese nation. China in the South China Sea issue to follow the historical and legal basis, in strict accordance with the historical basis for the implementation of the "nine sections of the line" demarcation method, but the South China Sea around the Southeast Asian countries to ignore China's history, contempt of China

The "nine section line" method, based on the way of maximizing the interests of their respective countries, carry out unilateral delimitation of the South China Sea waters. On March 10, 2009, the Philippines signed the so-called Republic No. 9522 act, the baselines of the territorial sea act "bill, announced will be included in the scope of its territorial waters of Nansha Islands part of a natural islands and Zhongsha only exposed surface of the Huangyan Island, and a separate submission to the United Nations for deliberation. So far, the Philippines have occupied South China Sea a number of islands and reefs, and through the occupation, to seize the vast areas of the intermittent in the South China Sea in the "nine section line. Followed by the Southeast Asian countries joint action, May 6, 2009, Vietnam and Malaysia, the two countries regardless of the historical facts, unite, to develop a so-called 200 nautical miles from continental shelf delimitation map, and avoid China alone to the United Nations Commission on the limits of the continental shelf submitted "sketch map of outer continental shelf delimitation, belong to the original of the South China Sea vast areas and islands included in their respective areas, and the two countries have put forward the so-called" sovereign "sound cable. Brunei claims it has Nantong reefs of Nansha Islands Sovereignty, at present although not in Nantong reef garrison, but the occupation of the South China Sea about 5 000 km^2.

2. The South China Sea reef ownership problem

Scattered countless number of islands and reefs in the South China Sea, the fourth largest island in the number of islands widest range was undoubtedly the Nansha Islands. According to incomplete statistics, the Nansha Islands total 256 reefs, but most of the islands are below the surface, only more than 50 islands surfaced, accounting for one fifth of the whole island. But is this a few more than 50 islands, also was to seize the countries around the South China Sea, China only control including Yongshu Reef, reef benevolence, eight Islands, the Taiping Island controlled by China Taiwan.

3. South China Sea resources development issues

China has plenty of fishing and oil and gas resources in the South China Sea, and how to develop and use the energy security issues related to China's future. This paper mainly discusses the concrete problems in the process of the development of the South China Sea in terms of the exploitation of the fishery resources, the exploitation of oil and gas

resources, the infrastructure and the comprehensive management. In the development of fishery resources, the South China Sea area is facing serious problems. First of all, in terms of fisheries resources, the South China Sea

Right problem has not resolved, long-term fishermen fishing in the South China Sea, in addition to Chinese fishermen, there are a large number of Southeast Asian countries fishermen. The fishermen due to the limit of their cultural level and mutual competition, often excessive and illegal fishing, serious damage to the regeneration of fishery resources, resulting in South China Sea fishery resources recovery ability decreased, fishery population greatly reduced. Followed by fishing vessels tonnage is small, equipment is backward, in the fishing process energy consumption, serious pollution, and almost all of them is to individual fishermen as a unit for sea fishing, the fishing technology of the original, the fishing efficiency is low.

In oil and gas resources, although China has the sovereignty of the South China Sea, but in the development and utilization of oil and gas resources are very lagging behind, and now has not opened in the South China Sea oil wells, a drop of oil. Circled around the South China Sea in the Southeast Asian countries are using their respective advantages, and foreign big Petroleum Company cooperation, driven by the interests of the oil and gas resources, Southeast Asian countries intensified, more frantically to the South China Sea proposed claimant, and each individual designated area of South China Sea region, in an attempt to carve up the South China Sea, the collapse of China's sovereign interests in the South China Sea. In the South China Sea, China is facing great challenges in its infrastructure and integrated management. In the integrated management, the South China Sea are mainly two problems: one is due to the "six countries" in the dispute over sovereignty, the South China Sea will be multi police and law enforcement phenomenon, due to the national law enforcement procedures, prone to confusion in the process of enforcing the law, damage the interests of fishermen behavior; second is China itself in

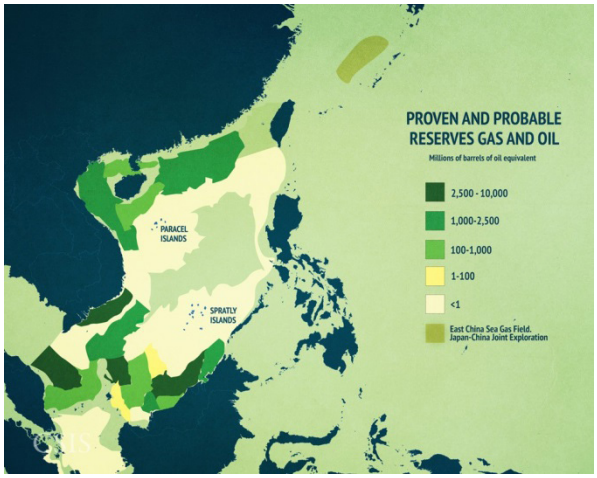


Figure 2 – South China Sea resources

the sea there is a lot of jurisdiction and law enforcement departments, such as public security, transportation, marine, customs, fishery and other, resulting in long maritime affairs management, easy to cause confusion in the process of enforcing the law.

3. Identification and evaluation of uncertain conditions of resource exploitation

3.1. Uncertainty of resource exploitation

Because oil and natural gas resources exploitation process is a dynamic process, not subject to the resource itself. Besides, it also relates to various exogenous factors, such as reserves, price, technology progress, cost, resource policy, and between these variables constitute the intricately interrelated, the relationship between them is not simple linear causal relationship, but more complex interaction, bidirectional and multidirectional construction mechanism. More importantly, the occurrence of these mechanisms or not, but also depends on the specific time, scene and other random variables. In addition, petroleum and natural gas resources in the system is an open system, in the mining process, continuous with the external economic and social environment for the exchange of information and feedback, in order to adapt to the requirements of the dynamic changes of external environment, which makes the uncertainty has become the petroleum and natural gas resources, market important feature.

Uncertainty problem not only in the interior of the petroleum and natural gas resources in the market, such as market factors (i.e. the supply, demand and price, market structure and also comes to the petroleum and natural gas resources of the external market environment, such as policy resources, backup technology. The specific performance is: the change of resource supply. On the one hand is due to resource reserves with the exploration found increased, with mining using reduced. Therefore, exploration precision, mining economic factors and so on will cause reserves the size of uncertainty (Gonçalves et al., 2015); on the other hand, because the supply side is the pursuit of profit maximization of economic entities, they will encounter political conflicts and other emergencies, resulting in supply of uncertain. According to the availability of data, the article focuses on the supply changes brought about by the uncertainty of reserves. The main resource value of instability, and market changes in supply and demand and resources for the future market expectations, this paper mainly analyzed the price of uncertainty influence on petroleum and natural gas exploitation scale; (3) resource demand changes. Due to changes in market conditions and technological change, it is difficult to predict the demand response, mainly as follows: demand imbalance and resources can be replaced. The imbalance of demand is mainly due to the uneven distribution of resources in space, and the level of economic development in different regions is different. But there is certain relevance in resources between alternative and supporting technology, the technology progress of uncertainty resource demand as the main object of study; (4) resource policy reform. Policy is dynamic and difficult to maintain consistency, the government can by changing the policy making the prospect of creating uncertainty, to influence the behavior to the exploitation of resources, and this paper considered joining the environmental costs, the resources exploitation scale. Therefore, according to the source of uncertainty in the market of oil and gas resources, the uncertainty is divided into four aspects: resource supply, resource demand, resource price and resource policy.

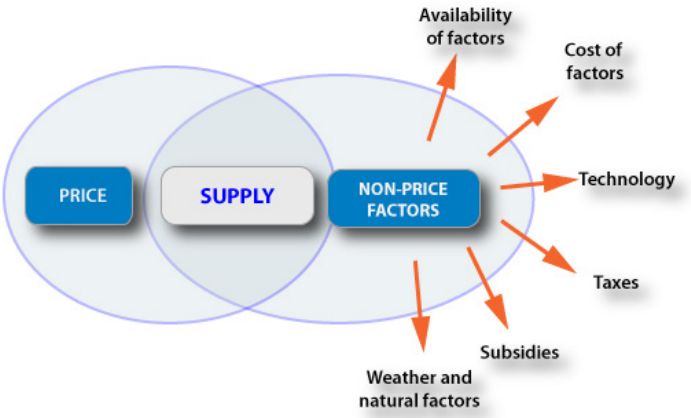


Figure 3 – Energy supply and demand and price

3.2. Factors influencing the exploitation of oil and natural gas resources

1. ***Reserves:*** Resources reserves is a dynamic concept, on the one hand with the exploitation of resources reserves will reduce, on the other hand with exploration, discovery of the reserves and increase, which is mainly caused by changes in technology, human cognitive ability and level, exploration and exploitation of ability change, in a special period of the economic ability, so it has great uncertainty. Buried oil and natural gas resources are non renewable resources. Under normal circumstances, the reserves is in the prediction based on the amount of resources, with petroleum and natural geologic theory and exploration technique level raise, exploration data accumulation and the understanding of the conditions of petroleum and natural gas deepening increased year by year. However, the stock of oil and natural gas resources has great uncertainty, which is determined by the inherent characteristics of underground resources, it is impossible to fully grasp the occurrence of underground resources. In terms of recoverable reserves, the reserves of oil and natural gas resources are constantly changing due to the progress of technology and the improvement of exploration and production capacity.
2. ***Technical progress:*** In the process of oil and gas resources exploitation, with the rapid development of society and economy, the factors that affect the uncertainty of technological progress are also increasing. As an alternative to the new energy, its applications continue to emerge, which makes the oil and other renewable energy use value has weakened, resulting in the energy industry to pursue technological progress of the original lack of power. Due to the dispersion and incomplete knowledge, the uncertainty in the process of technological progress is inevitable. Any technical progress, product innovation and process innovation, the goal of innovation may contain little or no previous experience to do on the results of the prediction. The common function of these factors makes the technical progress facing many uncertain. Economic recoverable reserves of oil and natural gas resources, depending on mining technology and

equipment level, petroleum and natural gas technology innovation and improve can improve resource recovery rate; technical progress promotes the occurrence of the poor condition of the petroleum and natural gas resources in the first exploitation, utilization and comprehensive exploitation of petroleum and natural gas derivatives, but also to change the quality of the practitioners, to improve the performance of mining and the tool of labor, so that significantly improve the mechanization and automation degree of the production.

3. ***Cost:*** As a special industry, the production of petroleum and natural gas cannot be changed with the increase of working and maintenance, because of the complicated geological structure. With the oil and natural gas field in mining in the middle and late, oil and natural gas reserves are gradually reduced, mining more and more difficult, capital increase will be caused by mining cost to rise substantially, visible, in the exploitation of petroleum and natural gas process facing cost uncertainty. At the same time, as a huge investment, great risk exploration and mining activities, we must always adhere to economic efficiency as the center with the lowest cost in exchange for the greatest benefits. Especially in the petroleum industry, with the increase of the level of international competition, China's oil industry is facing more and more severe challenges in the field of cost competition.
4. ***Policy:*** Petroleum and natural gas resources tax policy as a national regulation of the important economic lever of petroleum and natural gas industries, are essential to the development of the petroleum and natural gas industry, but also directly related to the sustainable development of petroleum and natural gas industry. China began to levy resource tax on crude oil, natural gas and other resources, but there are still many problems in China's resource tax: tax scope is too narrow, the tax burden and tax rate is too low, etc. These problems not only affect the local tax, the blind exploitation of resources, resulting in serious waste of resources and environmental damage, and bring a heavy blow to the security of resources. So the state continuously according to the actual situation of the exploitation of resources were tax reform, in this process there are many uncertainties, the government can not only through the implementation of policies and measures to reduce the uncertainty faced by the enterprise, but also by changing the policy outlook to create uncertainty. At the same time, due to changes in the level of economic development, environmental awareness and the protection of resources concept factors, resulting in the need for timely adjust the tax rate and the size of the tax, the visible resource tax policy reform exist many uncertainties.

In this paper, we use the C-D production function to make an empirical study of technological progress. The input of production factors is the capital and labor input which can actually play the role in the production process. This paper intends to use the total capital actual investment (K), the oil industry as a labor force (L), in order to analyze the impact of the technology is not determined on the scale of China's oil industry. Selection of 200-2015 statistical yearbook of China and China energy statistical yearbook data and the raw data on a logarithmic scale, the multivariate linear regression was performed using C-D production function $\ln Y=\ln A_0+ \lambda T +\alpha \ln K+\ln L$, operation and the output results such as table 2:

term	parameter values	error	T value	Prob> $\|t\|$	R2	F value
constant	1.862599	1.512384	1.167487	0.000078	0.976558	8.39-13
λ	0.044450	0.066258	0.656238	0.000002		
α	0.623529	0.336528	1.834238	0.000005		
β	0.326548	0.184458	1.743256	0.000058		

Table 2 – Determination of technical progress in petroleum industry

Based on the analysis of the above factors and the availability of the data, the influence of the exploitation cost on the mining scale is analyzed by taking the oil as an example. Oil production costs are related to the cost of the oil industry in the production of oil products, this paper intends to select the cost of oil production and oil production in china. By the China Statistical Yearbook and China's oil industry related information to get the total oil production costs and production, the use of software SPSS to obtain the fitting results as shown in table 3.

Equation	R2	F value	Sig.	Constant	First coefficient	Second coefficient
second degree	0.9652	397.784	0	316.36	-75.145	9.6328

Table 3 – Mining cost and yield fitting results

4. Results and analysis

4.1. Construction of model

Assuming oil and natural gas resources in [0, t] period is continuous mining, considering the time variable is discrete, in order to make the model simple and reflect the essence of, life cycle of oil and natural gas resources in t years, the problem can be divided into mutual contact of T stage, namely: t = 0, 1, 2,... ; P_t for the petroleum and natural gas resources in the market price of the, as an exogenous variable; X_t for the T in petroleum and natural gas resources in the mining scale, as the decision variables; C (X_t, A_t) for the T in petroleum and natural gas resources exploitation cost, which at the t in the petroleum and natural gas mining technological progress level; P is the discount coefficient, $P^t = (1 + R)^{-t}$, where R is the discount rate. Generally speaking, with the continuous exploitation of the oil and natural gas resources, gradually increase the difficulty of exploitation, the rising cost of extraction and with increasing speed is increased. At the same time, with the continuous improvement of technical level of, beginning may will increase the cost of production, but in the long run, will reduce the mining cost and marginal production cost, the goal of oil and gas resources exploitation is to maximize the value of mining.

$$MaxV=\sum_{t=0}^{T-1} \rho^t[P_tX_t-C(X_t,A_t)] \quad (1)$$

In addition, due to the oil and gas resources are not renewable, with the continuous development of mining, its reserves gradually reduced:

$$\begin{cases} Qt+1-Qt=-Xt \\ Qo=S(o) \\ QT=o \end{cases} \tag{2}$$

The scale model of reasonable exploitation of oil and natural gas belongs to the extreme control problem of "terminal state fixed and terminal time variable", which has T+1 constraints, and the formula 1 changed into an unconstrained Lagarangian extreme value problem:

$$L=\sum_{t=o}^{T-1} \rho^t[P_tX_t-C(X_t,A_t)]+\sum_{t=o}^{T-1} [\rho^{t+1}\lambda t+1(-X_t+Q_t-Q_{t+1})]$$

$$=\sum_{t=o}^{T-1} \rho^t[P_tX_t-C(X_t,A_t)+\rho\lambda t+1(-X_t+Q_t-Q_{t+1})] \tag{3}$$

Further introduction of Hamiltion functions:

$$L=\sum_{t=o}^{T-1} \rho^t[H(.)+\rho\lambda_{t+1}(Q_t-Q_{t+1})] \tag{4}$$

When X_t^* (t=o, 1,..., T*-1) is the optimal mining scale sequence of the objective function (4.1), T* is the optimal mining period, meet the following conditions:

$$\begin{cases} \dfrac{\delta L}{\delta Xt}=\rho^t[P_t-C(X_t,A_t)-\rho\lambda_{t+1}]=o \\ \dfrac{\delta L}{\delta Qt}=\rho^{t+1}\lambda_{t+1}-\rho^t\lambda_t=o \\ \dfrac{\delta L}{\delta\lambda\, t+1}=\rho^{t+1}(-X_t+Q_t-Q_{t+1})=o \end{cases}$$

As:

$$P_t-C\,(X_t,A_t)\,-\rho\lambda_{t+1}=o$$

$$P\lambda_{t+1}=\lambda_t$$

For the above functions and boundary conditions (the composition of the equations can be known, as long as we know the various periods of C_t, Q_t, X_t, A_t, the specific functional relationship, we can get the λ_t.

4.2. Optimal mining scale model

The scale cross period optimization model of oil and gas exploitation is a general model, and the empirical analysis under the uncertainty of reference factors can solve the reasonable exploitation scale of China's oil and natural gas resources. Needs to be pointed out is that in China's petroleum and natural gas exploitation, natural gas started relatively late, and China's price change little floating. Therefore, this paper in the case of oil, the use of this chapter constructs the model to analyze and research the exploitation scale of our country's petroleum optimal.

$$Xt^{*}=\frac{1}{2c}\,Pt\text{-}b\text{-}(1+r)^{t}\times\frac{\sum_{t=0}^{T-1}(Pt-b)-2cS(0)}{\sum_{t=0}^{T-1}(1+r)t} \tag{5}$$

5. Conclusion

This article analyses the current situation of the development of the South China Sea resources and systematically examines the uncertainty problem of petroleum and natural gas resources in the market, and then combined with the factors of uncertainty of empirical analysis, established to oil at a reasonable scale of mining for the dynamic programming model of the control variables, combined with the petroleum resources of our country mining influencing parameters of specific data for oil exploitation of the scale of the numerical solution, at the same time, scenes of income data validity analysis, come to the conclusion that the comprehensive account of technological progress and the environmental costs of the mining model is the most realistic value.

Acknowledgments

This study is supported by the Mechanism Study of Multi-period Exploiting and Using about Non-renewable Resources in South China Sea (No. 16AJY008).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 28/05/2016
Aceitação/Acceptance: 05/08/2016

Research on the Structure Characteristics of the City Image System based on GIS

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Pages: 246–256

Abstract: Geographic information system refers make scientific analysis and management of spatial data by using computer systems engineering. In this paper, the authors research on the structure characteristics of the city image system based on GIS. Any system is being and changing by the definite structure. The city image system presents the definite structural relation, which not only has the structure of common image system but also holds the particularity of the city. The essay begins with the concept of the structure and discusses the structural perceive of the city image system by way of the view of the system theory.

Keywords: City image system, Geographic information system, CI structure, Model evaluation

1. Introduction

Under the influence of the standardization of the modern industry, the image of many cities in China is weak, and ignores its own characteristics. This simple and blind "reproduction" caused by the weak city identification, has aroused the concern of the community, but the professional field of research is still to be further (Choi, 2008; Jankowski, 2015). The concept of structure of city image system, the city construction concept, behavior and visual physical environment and visual elements of standardization, symbolization, structured, and model, make the development of city image system of the formation of structural optimization and integration, to build a bridge to the public mind and eyes (Zhang,2014). Geographic information system is a new subject in 1960s rise, computer and geographic information science is the combination, in support of the computer software and hardware, using the theory of system engineering and information science, scientific analysis and management connotation of space geographic data technology system to provide for the planning, management, decision-making and research needs of information (Kapetanakis, 2014; Rocha & Sá, 2014; Mora,2014). Provide the geographic information system is the main raw data and the low level of information, provide data support in decision making in GIS only, and does not provide substantive decision, decision problems are difficult to solve the complicated structure.

Geographical information is a general term for the number, quality, distribution, interaction and change law of the elements of the geographical system. Geographical information belongs to the spatial information, and its location identification and data link, which is different from other types of geographic information (Tassinari, 2011;

Skelton, 2014). It is the most significant sign of information. The location feature of geographic information, geographic coordinates is established by latitude network or highway network to realize spatial location identification, geographic information also has the characteristics of multi-dimensional structure, which based on multi feature in two-dimensional space in three-dimensional structure.

2. GIS supports urban design

Geographic information system is a computer system to collect, store, manage, analyze, describe and apply the whole or part of the earth's surface and spatial and geographical distribution of the data. It is composed of hardware, software, data and users. Its main function is to realize the collection, editing, management, analysis and statistics of spatial data. The role of geographic information system is the most important for quantitative analysis of statistics and related information of geographical space, its biggest characteristic is that it can make the earth surface space location and characteristics of things together organically, and through the computer screen, visually displayed (Yasmin,2015; Suyoto, 2015). This feature makes the geographic information system has a wide range of uses. With the accelerated process of information, the field of urban planning will be more and more use of GIS technology, the application of GIS technology to urban planning has brought a broad space for development. The traditional data analysis, mapping results and a series of process that involves the processing of city spatial information can be used to place GIS technology, GIS technology and traditional methods or means, has the advantages of There is nothing comparable to this. The use of GIS technology and remote sensing technology can promote the analysis from qualitative to quantitative and more planning, the overall design of the traditional city form mainly qualitative analysis, the lack of a unified and standardized criteria, therefore, various elements of the GIS integrated analysis of city form the overall design to the formation of a relatively perfect system the form of city design, to provide efficient quantitative analysis tools, to support the overall design scheme of city form a scientific and reasonable.

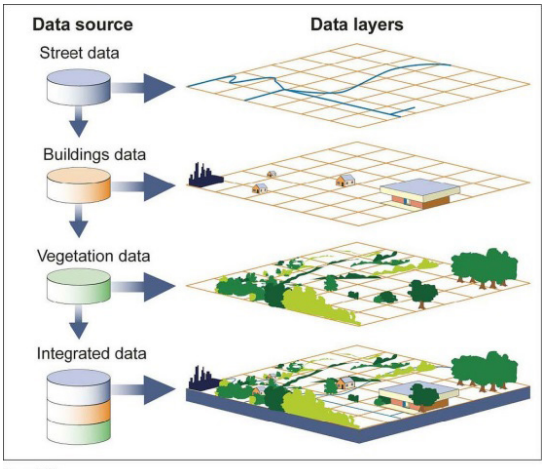


Figure 1 – Geospatial Database

Geographic information system is a kind of spatial data management system, which is a kind of special and very important information system, which is based on the computer as a tool, and has the function of geographical pattern and spatial location. The data processed by geographic information system includes two categories: spatial data and non-spatial attribute data. Spatial data refers to the data of natural, social and human economic landscape, which can be used as a reference to the natural, social and cultural landscape. They can be input to the geographic information system through the digital instrument, the scanner, the keyboard, the tape recorder or other input devices. Spatial analysis is a spatial data analysis technique based on the location and shape characteristics of geographical objects. Spatial analysis is the basis of all kinds of comprehensive geological analysis model. By using the spatial analysis technique, we can gain new experience and knowledge by the observation and experiment of the original data model, and then it can be used as the decision basis of spatial behavior.

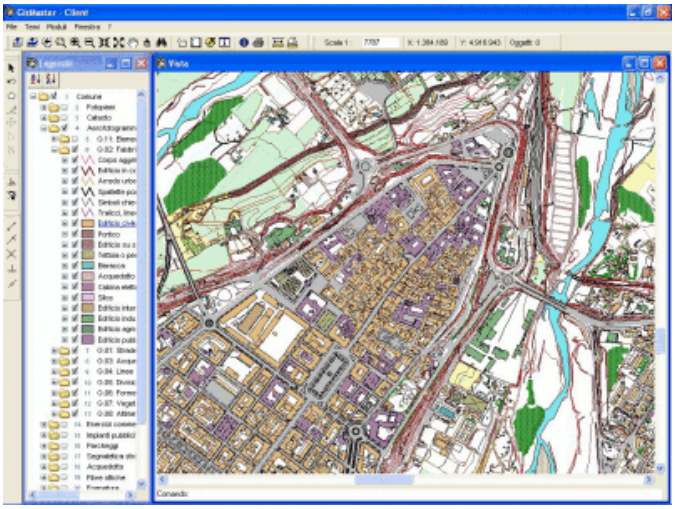


Figure 2 – GIS software Mapobjects

- ***System interoperability:*** Interoperability of GIS also refers to data standardization; interoperability of geographic information systems can be understood as GIS system integration platform, it realizes the communication and cooperation between the system and its application system in heterogeneous environment, to accomplish a specific task.
- ***Data cube:*** The GIS data only to adapt to the modern requirements for multidimensional development can generally reflect the three-dimensional, multi-dimensional, before the research focused on the design of 3D data structure, optimization and implementation, and the application of 3D visualization technology, system function and module design etc..
- ***System modularization:*** The modular GIS is the geographic information system of object oriented and component technology, the function modules of GIS for multiple controls, each control to perform different functions, integrated through visual software, the formation of the final GIS applications.

- ***System intelligence:*** Providing decision support services is the embodiment of GIS system intelligence, and this is particularly important at present, the current research focuses on how to combine the research results in the field of decision support with GIS.

3. City image system

3.1. Concept of urban image system

City image system refers to the planning and design under the guidance of all aspects of the city image and with the help of diffusion media or other channels. So, it is aim to form a unified system engineering value for the city view of highly personalized features in the public mind. The city is a big system, the city image system is one kind of cultural expression form in this system, this has been doomed the city image system is a complex social system. The establishment of the urban image system involves many fields, such as politics, economy, culture and so on, which is a huge system. System is an integral part of the organic connection of the urban image system, including the urban management concept, the city's main acts and the city's overall perception of the three subsystems.

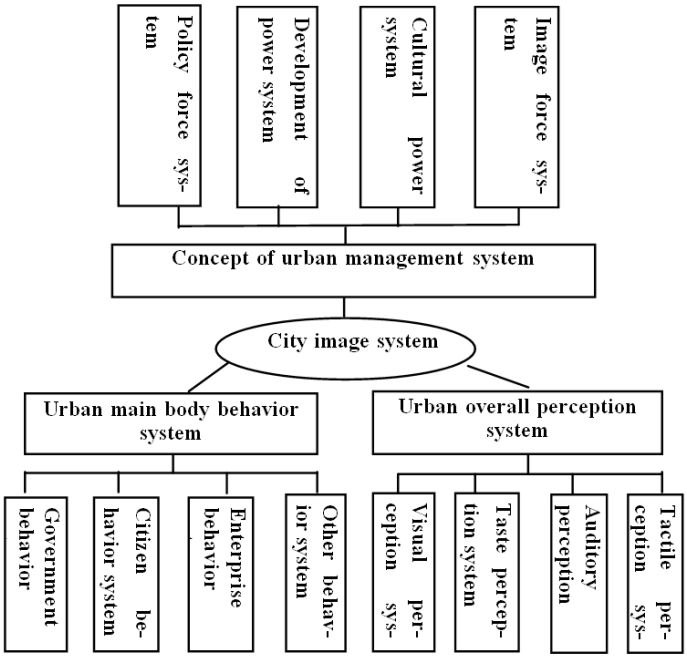


Figure 3 – the constitution of City Image System

City image promotion is based on the integration of city image system of internal subsystems, establishing the concept of city construction and social development of the city, at the same time in order to unify and standardize the behavior of the city

landscape performance and visual expression, so that the development of the various elements of the city more harmonious and stable, so as to make the city construction more standardized. Because the city image system involves all aspects of the city, so it must follow the principle of the whole system and structure in the process of city image promotion in the interactive relationship between the various subsystems to fully focus on mutual restriction and mutual effects. The organic connection between the elements becomes the foundation of the system structure of the city image.

3.2. City image system structure

"System theory" in the definition of structure is: "refers to the system within the various components of the relative stability of the contact, the organization of the order and its spatial and temporal relations in the form of expression". According to this definition, the structure of the system depends on the elements of the system, the relationship between the formation of these elements and the integration of the performance, and by such a comprehensive led to a system of the overall provisions. The structure of city image system reflect the internal relationship of the system, is an internal system, reflects the elements in the system of interrelated constraints, it is because of this contact and restrict each other to make the system have the overall behavior, the integrity of the system has become the reason.

3.2.1. Urban CI structure

The image of the city is an open complex system, as a whole, the diversity of complexity not only from the system, more important is the interaction between the various subsystems, which are produced by the interaction of the relationship and the relationship between the integration of elements constitute the basic structure of city image system. Using system optimization theory, this paper puts forward the concept of urban image system structure from the perspective of urban system. The so-called urban image system structure (CI structure) is an organic whole which is formed by the interdependence and mutual restraint of the urban image system elements in a certain time and space. As a summary, the city CI structure can be expressed as the relationship between the elements and the interaction, "the relationship between the expression" and "the mechanism of action" has become the core content of the city CI structure.

3.2.2. Characteristics of urban CI structure

The structure is manifested in the coordination and unification of the relationship in the organic body, and it is the reaction of the inherent order of the system. The generation of order is the result of the complex function of the system, the inherent complexity of the system makes the system structure constitute the integration of the process, and the performance of a number of dynamic transformation system". This transformation system has the characteristics of integrity, and it is embodied in the stability of the organization structure. The structure of urban CI is the integration of various relationship patterns in this transformation process, which has the integrity of structure, the structure of organization, the complexity of structure relation, and the transformation of structural system.

3.2.3. Functional performance of urban CI structure

Function refers to the nature, ability and effect performance system and the external environment and the interactions between the external manifestation system of relatively stable internal contact, order form and space organization. The construction of city image system is a kind of structure, and it must have its functional performance, which is mainly reflected in the:

1. The relationship between the elements of the city CI and mutual restraint;
2. The logic level of the construction of urban CI;
3. The strategic development of the medium and long term city brand in the construction of urban CI;
4. Structural framework and theoretical basis of urban CI strategy;
5. The effective ways and means of accumulation and increment of intangible assets in urban CI;
6. The operation mode of urban CI cultural capital.

3.2.4. The target form of urban CI structure

The structure reflects the relatively stable contact way, between the system elements of the organization order and its temporal and spatial forms, namely the structure of the system is relatively stable, the structural stability of CI city is reflected in its target form, set up the city image system to achieve the goal of city development goals, including the goal, the main city cultural city quality objectives city image target.

4. Integration of urban CI structure relationship model

4.1. City CI structure relationship

Because the city image system involves all aspects of the whole city, so we must follow the principle of system and structure in the process to enhance the image of the city in the full emphasis on the interaction between the subsystem of mutual restriction and mutual effects.

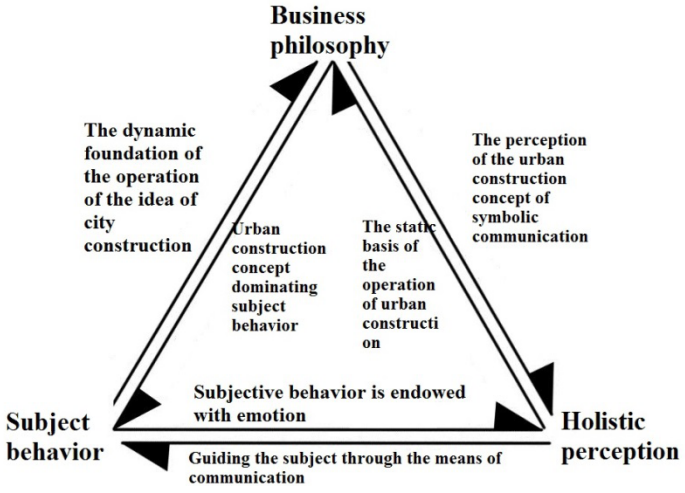


Figure 4 – Factor relation of City Image System Structure

City image elements of the system mainly includes city management, city and city overall perception behaviour between the three part, city management idea, behaviour and overall perception of the three elements of mutual connection, mutual restraint, the formation of triangle stable structure: city management idea dominates the behaviour pattern and city cognitive way, behaviour and the whole City perception is the realization of the dynamic and static city based business philosophy to; at the same time, can give the city to emotional expression through cognitive behaviour, cognitive style can turn through the city to guide the behaviour of the subject towards the direction of healthy development.

4.2. Urban CI structure model

4.2.1. The pyramid principle

In the literary world, Barbara point out the "Pyramid principle": the brain automatically information to the different groups of Pyramid structure, in order to understand. Any thought in the pre - return to Pyramid structure is much easier to understand. This means that any written document should be consciously organized into the Pyramid structure. The core of the theory is: first, put forward the theory of the summary, and then put forward the concrete idea of the summary.

4.2.2. Hierarchical model construction in Pyramid

Based on the construction of theoretical model of CIS structure of the city this principle: Pyramid hierarchy model, namely: first proposed city macro management idea, in view of the city planning subject behaviour, finally implement the static visual micro specific communication.

In planning the design, the different levels of city image elements in Pyramid structure, a city management system to guide the whole image of the city at the macro level of control operation, level norms constitute the dynamic image of the city operation, while the micro level is a static basis convey the image of the city operation; on the other hand, is the projection of Pyramid a hierarchical model of the formation of a concept system of city management for the whole structure of the core and foundation of the kernel structure and external radiation; the main behaviour of the system in the performance of the structural meaning to stabilize the structure and control system of material properties, function level and range of effect; visual perception system reflects the kernel structure of the existence and representation of external performance in turn, the external performance and constantly adjust and affect the existence and development of city image system. In the cultural function, its core structure is formed by the inner and outer core cultural level, the middle layer and the surface layer.

4.2.3. Structure model expression

Through the construction of the Pyramid hierarchy model, we can understand the deep connotation and extension of the urban CI structure more intuitively. The expression of the structural model we summarized as "1334", that is, from a support kernel, three levels, the formation of a positive projection of the three cultural systems and the four surface of the Pyramid level model.

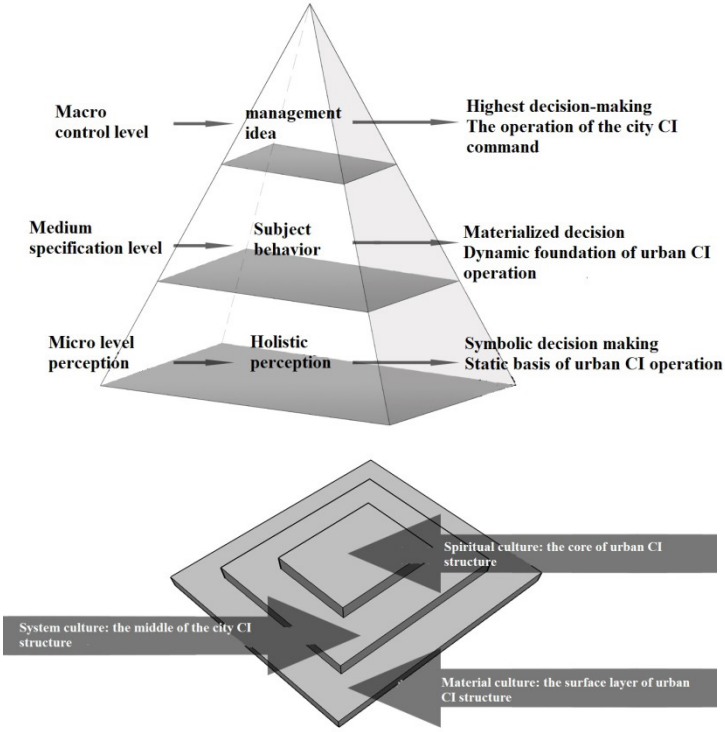


Figure 5 – Pyramid Hierarchy Model of CIS Structure

1. A kernel: The Pyramid hierarchy model of urban CIS structure is supported by a core structure, which is from top to bottom: urban spirit, human and nature. The so-called "urban spirit" is the value of the existence of the city as well as the existence of the city to bring us a spiritual sustenance and trust, the image of the city construction is to strengthen the city in the minds of people with a sense of identity and belonging. The so-called "people" is to respect human nature, people-oriented. The construction of city image is to respect the needs of the people in the city, the habits of the people, the tradition of the people and the relationship between the people and the people. The so-called "natural" is to respect our survival of the land.
2. Three levels: Construct the three control levels of urban CI structure, that is, the micro level of the city, the level of the middle level of the city and the level of the city's macro control. The micro sense level is the dominant structure level, which is made up of the City material, mainly refers to the cognition and understanding of the City material layer, which is the most direct expression of the city image; The middle level is the middle structure of the city's behaviour culture, which mainly refers to the standard and guide of the city's main behaviour, and is the management layer of the city image; The macro control level is the invisible structure formed by the urban immaterial elements, mainly refers to the orientation and expression of the urban management concept, and is the ideological level of the urban image system.

3. Three cultures: From the structure model, the core structure of urban CI structure can be obtained. In the cultural function, the inner core structure is formed by the inner outward radiation, which is the core culture, the middle layer and the surface layer. Urban material culture is the surface culture of urban CI structure, which is composed of external, visible and visible infrastructure. City system culture is the middle level culture of city CI structure, and it is an entity of city culture. Urban spiritual culture is the core culture of the city CI structure, including the city's knowledge, belief, art, morals, customs and all the ability and habits as the city people, is the core elements of urban culture.
4. Four expansion surfaces: From the four main aspects of the city's policy, development, culture and image, the theory framework of the structural model of urban CI is constructed. The organic integration of these four aspects constitutes the city's comprehensive competitiveness. Urban policy power mainly includes three aspects: the city's decision-making power, the executive power and the government's image; City development it is a comprehensive system, including the development of city economy, enterprise development, social development and city brand competitiveness of city on the basis of the formation of the city's comprehensive competitiveness; Urban cultural power mainly from the perspective of urban cultural capital accumulation and operation, in order to enhance the cultural connotation of the city image; The city image force mainly includes the city brand management, the city environment cognition and the city image design and so on.

4.2.4. Structural model evaluation principle

- ***Holistic principle:*** City image design is the overall design of the city image system of all kinds of elements, designers should fully consider various factors interact with each other and organic whole, overall grasp of the overall planning, the city image system of the formation of structural optimization.
- ***Stability principle:*** The concept of city management, the main body of the code of conduct, as well as the city's overall perception system design should be balanced, coordinated development of the three indispensable.
- ***Structure optimization principle:*** City image system design is not a step in place, but to go through repeated practice, exploration and summary of the process, only in this way can ensure that the city CI structure is gradually reasonable and optimization

4.2.5. Structural urban CIS model

1. **New mode of transmission:** City brand image is a kind of city overall innovation, the ultimate goal is not only to show city image communication of the external image, the deeper meaning is to meet the growing city of the whole city living environment, work environment, development environment requirements. We can promote the image of the city by the media, major events and other ways of radiation, the image of the city to carry out tangible or intangible impact. Only through the spread of the city image to produce value, only through the spread of the design can produce value, especially economic value, the city image of the intangible assets to produce benefits.

2. **New development model:** City image design management (City Image Design Management, referred to as CIDM) is the image design activities as an important part of city cultural image in the capital operation, decision management, behaviour management, system management, interface design of image design series of management, good at using the design method, implement the design oriented thinking and behaviour, and the process of the city is transformed into productivity and competitiveness. The basic elements of the framework of the theory are: design decision-making, design organization environment, design project management and design innovation, etc.. Design and management of city image in China is still lagging behind, with the deepening of reform and opening-up, the continuous improvement of the market economy, the increasingly fierce competition, design management is an organic system of city image construction undoubtedly lead to the healthy and orderly development.
3. **New cultural model:** The process of city image communication is a process of "transforming business city" to "city marketing", city cultural communication model is created from the "city cultural capital" the sense of creation and management of city image and cultural resources, this business model than the economics of operation is more rational and cultural asset substitutability and creative cultural resources.

5. Conclusion

The construction model of city CI structure theory, straighten out the relationship between the various elements of the city image system, grasp the city planning CI from management to the behavior of the final implementation of the overall perception of system design has the logical relationship, can provide a comprehensive and systematic structure model as a reference for the construction of city image, the city image construction in health system under the guidance of structural and orderly.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 10/05/2016
Aceitação/Acceptance: 25/08/2016

Differences Analysis and Collaborative Development Research on Low-carbon Logistics in Beijing-Tianjin-Hebei

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Pages: 257–266

Abstract: The collaborative development of low carbon logistics is the important content to realize the coordinated development of Beijing, Tianjin and Hebei, which are important areas of energy conservation and emissions reduction, low carbon environmental protection of China. Due to different political and economic environment, Beijing, Tianjin and Hebei have big differences in low carbon logistics environment, low carbon logistics strength, low carbon logistics level and low carbon logistics potential, etc. All these seriously affect the three areas to achieve synergistic effects and processes. Therefore, based on cooperative development plan, it is the inevitable choice to Beijing, Tianjin and Hebei for vertical integration and horizontal cooperation development direction of reposition logistics functions from low-carbon transport, low-carbon logistics technology and Talent joint training.

Keywords: Beijing-Tianjin-Hebei, Low-carbon logistics, Differences analysis, Collaborative development

1. Introduction

With increasingly obvious eco-environmental problems, the call to seek low-carbon economic development becomes higher in China and even the whole world. At present, “low-carbon” has become the important method and direction for long-term environmental protection all over the world. The core belt of China, Beijing-Tianjin-Hebei is enveloped by haze in recent years. Therefore, a series of logistics measures are implemented, including traffic control, yard protection, and freight control. In such situation, it is urgent to develop low-carbon logistics (Li, 2013). In order to adapt national reform and regional economic development, the Party and country consider the situation to make a great arrangement, collaborative development, in Beijing-Tianjin-Hebei. This arrangement can complement advantages in Beijing, Tianjin, and Hebei to promote the development in Circum-Bohai Sea Economic Zone and northern interior. Beijing-Tianjin-Hebei logistics leads the regional economic development. With this this good opportunity, regional restrictions should be broken to make low-carbon integration and optimization of the logistics by multiple ways and views.

Located in the center of Circum-Bohai Sea area, Beijing-Tianjin-Hebei has special geographic location and development trend. Therefore, this area is called as "the third pole of economic growth in China" by scholars. However, the economic development level of this area remains to be improved. Particularly, the traffic advantages have not been fully played and utilized in the inferior of north China, Hebei which relies on Beijing and Tianjin. This makes the effects of economic development in Beijing-Tianjin-Hebei insignificant.

Therefore, Beijing-Tianjin-Hebei must break the restriction of administrative areas to realize comprehensive and collaborative development of multiple industries. Logistics collaboration will certainly become the foundation and guidance of other industrial collaboration in Beijing-Tianjin-Hebei.

2. Function mechanism of low-carbon logistics collaborative development in Beijing-Tianjin-Hebei

As the important measure to realize collaborative development in Beijing-Tianjin-Hebei, low-carbon collaborative development is also important in striving for energy conservation and emission reduction, as well as low-carbon environmental protection. The low-carbon logistics collaborative development in Beijing-Tianjin-Hebei is beneficial to not only smooth collaboration in other industries, but also resource integration in Beijing-Tianjin-Hebei. Therefore, advantages can be complemented in low-carbon logistics to integrate harbor and inland logistics and improve regional logistics competitiveness.

2.1. Low-carbon logistics collaborative development is the important content in Beijing-Tianjin-Hebei collaborative development

In the general trend of low-carbon economy and regional economic integration, Beijing-Tianjin-Hebei collaborative development has become important to optimize resource allocation and improve regional competitiveness. Logistics is an important component in national economy when advancing low-carbon and collaborative development in Beijing-Tianjin-Hebei. Therefore, low-carbon logistics collaboration is of course important in Beijing-Tianjin-Hebei collaborative development. Moreover, low-carbon logistics collaborative development can promote the collaboration and cooperation of other industries and regional integration in Beijing-Tianjin-Hebei. As guidance and foundation, the development provides reference to the establishment of capital economy circle and the collaboration of other industries (Trkay, 2004; Sá et al., 2016).

2.2. Low-carbon logistics and collaborative development supplement each other in Beijing-Tianjin-Hebei

In Beijing-Tianjin-Hebei, the key goals in logistics development are low carbon and collaboration which supplement and promote each other. On one hand, collaborative development can promote low-carbon logistics. Logistics collaboration is based on the complementation of capacity advantage, optimization of resource allocation, and scientific and rational division and cooperation in Beijing-Tianjin-Hebei (Xu, 2012). Therefore, one of important products is low-carbon logistics. On the other hand, low-carbon logistics meets urgent demands of environmental improvement and intention of

collaborative development in Beijing-Tianjin-Hebei. Therefore, breaking administrative boundary and reducing redundant links, low-carbon logistics can further consolidate collaborative development by energy conservation, emission reduction, and low-carbon environmental protection (Zhu, 2015).

2.3. Beijing, Tianjin, and Hebei have natural conditions to develop low-carbon collaboration

Connecting in region and frequently communicating in economy, Beijing, Tianjin, and Hebei have natural relation in geology, people, and industry. Firstly, with mountains behind and sea beside, Beijing-Tian-Hebei is the important channel to the sea in north China. The densest traffic network, improved sea-road-air facilities, and convenient traffic provide fundamental conditions for regional collaborative development. Secondly, as the largest industrial compact district in north China, Beijing-Tianjin-Hebei cooperates with each other in industrial development, infrastructure construction, and environmental protection to some extent. Therefore, good environment is provided to logistics collaboration and low-carbon development in this area (Li, 2011). Thirdly, there is obvious difference in resource endowment, economic development level, industrial structure, industrial advantages, talent education, etc. in Beijing-Tianjin-Hebei. Such strong complementarity sets solid foundation for the complement and collaboration of logistic capability.

3. Difference analysis and evaluation of low-carbon logistics development in Beijing-Tianjin-Hebei

Beijing, Tianjin, and Hebei are quite different in logistics capability and development level for the difference in historical development and resource endowment. Therefore, there are various difficulties in logistics collaboration and communication between regions. Referring evaluation indexes of logistics capability, this part highlighted features of low emission, energy consumption, and pollution (Zhang, 2010). Moreover, low-carbon logistics development in Beijing-Tianjin-Hebei was diagnosed by analytic hierarchy process in the comprehensive evaluation system with secondary indexes, including environment, strength, capability, and potential of low-carbon logistics (Ma, 2014). Therefore, the reference can be provided to determine the difference in low-carbon logistics development of Beijing-Tianjin-Hebei. The specific analysis steps are as follows:

Step 1: Establishing the structural model for analytical hierarchy process

As shown in following figure, level A is the general objective. Level B includes low-carbon logistics environment, low-carbon logistics strength, low-carbon logistics level, and low-carbon logistics potential represented by B_1, B_2, B_3, and B_4, respectively. Level C includes 14 evaluation indexes which are represented by C_1 -C_{14}.

Step II: Construct pairwise comparison matrix

Pairwise comparison matrix was constructed for every hierarchy to each element in the last hierarchy according to scale 1~9 proposed by Saaty et al. Table 1 shows the specific scale value:

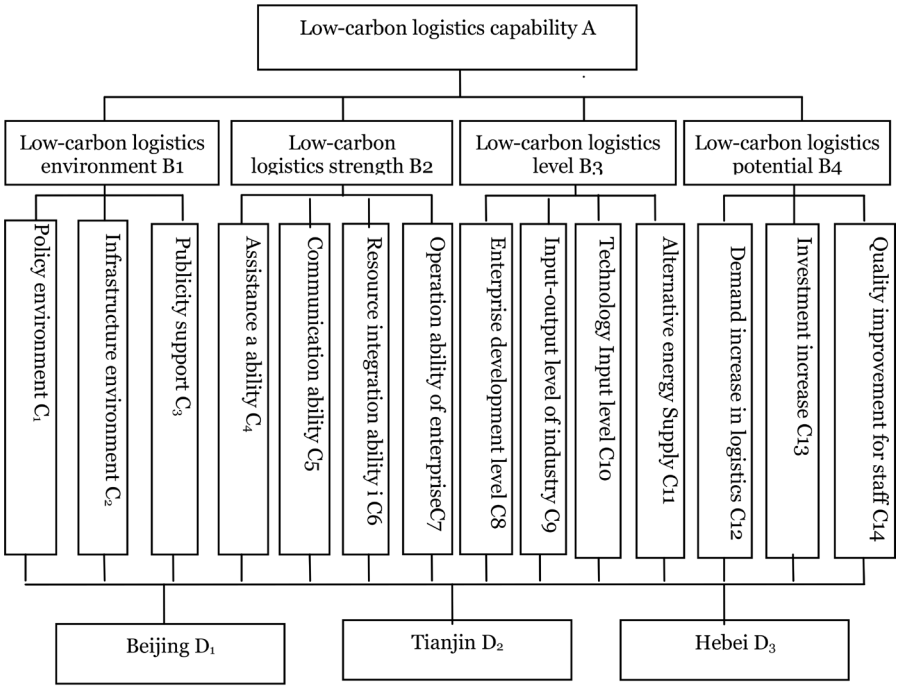


Figure 1 – Hierarchical Structure of Low-carbon Logistics

Scale	1	2	3	4	5	6	7	8	9
B_i :B_j	Same		Slightly strong		Strong		Significantly strong		Absolutely strong

Table 1 – Scale 1-9 and Relevant Significance

After pairwise comparison of element between two hierarchies, relevant expert scored every element with above scale 1~9. Then, the pairwise comparison matrix was obtained with arithmetic mean. The maximum characteristic root and corresponding characteristic vector were calculated for every matrix after normalization processing. Table 2-6 shows the judgment matrix and characteristic vector of criterion hierarchy to target hierarchy and sub-criterion hierarchy to criterion hierarchy.

A	B_1	B_2	B_3	B_4	Characteristic vector
B_1	0.067	0.075	0.057	0.059	0.064
B_2	0.467	0.528	0.566	0.471	0.508
B_3	0.333	0.264	0.283	0.353	0.308
B_4	0.133	0.132	0.094	0.118	0.119
Total	1.000	1.000	1.000	1.000	1.000

Table 2 – Judgment matrix and characteristics vector of criterion hierarchy to target hierarchy after A-B normalization

Comparison was conducted for the weight of elements in second hierarchy to general target. It can be seen that the risk from logistics operational hierarchy is the largest, followed by that from the hierarchy of supply chain and enterprise management. Relatively, the risk from the hierarchy of external environment is small.

B_1	C_1	C_2	C_3	Characteristic vector
C_1	0.188	0.172	0.333	0.231
C_2	0.750	0.690	0.556	0.665
C_3	0.062	0.138	0.111	0.104
Total	1.000	1.000	1.000	1.000

Table 3 – Judgment matrix and characteristic vector of sub-criterion hierarchy to criterion hierarchy after B1 –C normalization

B_2	C_4	C_5	C_6	C_7	Characteristic vector
C_4	0.100	0.077	0.120	0.087	0.096
C_5	0.200	0.154	0.160	0.130	0.161
C_6	0.400	0.462	0.480	0.522	0.466
C_7	0.300	0.308	0.240	0.261	0.277
Total	1.000	1.000	1.000	1.000	1.000

Table 4 – Judgment matrix and characteristic vector of sub-criterion hierarchy to criterion hierarchy after B2 –C normalization

B_3	C_8	C_9	C_{10}	C_{11}	Characteristic vector
C_8	0.492	0.522	0.462	0.455	0.482
C_9	0.246	0.261	0.308	0.273	0.272
C_{10}	0.164	0.130	0.154	0.182	0.157
C_{11}	0.098	0.087	0.077	0.091	0.088
Total	1.000	1.000	1.000	1.000	1.000

Table 5 – Judgment matrix and weight characteristic vector of sub-criterion hierarchy to criterion hierarchy after B3 –C normalization

B_4	C_{12}	C_{13}	C_{14}	Characteristic vector
C_{12}	0.546	0.571	0.500	0.539
C_{13}	0.273	0.286	0.333	0.297
C_{14}	0.182	0.143	0.167	0.164
Total	1.000	1.000	1.000	1.000

Table 6 – Judgment matrix and characteristic vector of sub-criterion hierarchy to criterion hierarchy after B4 –C normalization

This method was used to obtain judgment matrixes and through characteristic vectors of project hierarchies to each sub-criterion hierarchy. To save space, this work only listed characteristic vectors of project hierarchies to each sub-criterion hierarchy as shown in Table 7.

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}	C_{12}	C_{13}	C_{14}
D_1	0.396	0.388	0.423	0.481	0.363	0.413	0.381	0.408	0.418	0.387	0.391	0.336	0.298	0.339
D_2	0.351	0.334	0.293	0.316	0.346	0.331	0.329	0.334	0.334	0.324	0.334	0.286	0.287	0.318
D_3	0.253	0.278	0.284	0.203	0.291	0.256	0.29	0.258	0.248	0.289	0.275	0.378	0.415	0.343

Table 7 – Characteristic vector of project hierarchies to each sub-criterion hierarchy

Step III: Make consistency check

Consistency check was conducted with the maximum characteristic root for every pairwise comparison matrix. If the check passes, the characteristic vector is weight vector.

Define consistency index CI:

$$CI = \frac{\lambda - \mathrm{n}}{\mathrm{n} - 1}$$

The larger CI is, the more severe the inconsistency will be.

2. Define consistency ratio CR: CR = CI/RI.

When CR<0.1, the consistency check passes. Consistency check was conducted for each matrix with above two formulas. The consistency ratio CR was less than 0.1 for each matrix by calculation, so consistency check passed.

Step IV: Calculate and sequence compound weight vectors

The compound weight vector of the forth hierarchy to the first hierarchy was (0.394, 0.327, 0.279) T according to respective weight vectors of the second, third, and forth hierarchies to the first, second, and third hierarchies.

Low-carbon logistics capability is mainly dependent on low-carbon logistics strength and level according to evaluation indexes in above calculation results. Low-carbon logistics potential and environment have weak effects on the capability. However, the strong influence factors are industrial resource integration capability and enterprise logistic functional capability in low-carbon logistics strength. Key factors to affect low-carbon logistics level are development level and input-output level of logistic enterprise (Bart, 2014). Moreover, low-carbon logistics potential in one area is dependent on the potential of logistic demand increase and investment growth (Dudek 2007). In low-carbon logistics environment, the key influence factors include low-carbon logistics infrastructure and policies. The development difference in Beijing-Tianjin-Hebei shows that Beijing has the strongest comprehensive capability of low-carbon logistics, followed with Tianjin and Hebei. Beijing is strong in government coordination and management capability, logistics

input-output level, management of industrial resources, and development level of logistics enterprise. Tianjin has some advantages in infrastructure, policies, and technology of low-carbon logistics and development level of alternative energy. Hebei has obvious advantage in potential of low-carbon logistics, but is relatively weak in other three aspects. (Jiao, 2008) In particular, Hebei is significantly inferior to Beijing and Tianjin in low-carbon logistics infrastructure, propaganda work, and government coordination and management.

4. Direction of low-carbon logistics collaborative development

In current development status, Beijing-Tianjin-Hebei should focus on collaborative and low-carbon development according to regional difference in low-carbon logistics capability. Guided by fright transport, multimodal transport is combined with direct allocated transport. By optimizing and integrating the third party logistics enterprises, port and inland logistics and urban and rural logistics are integrated in multiple views and layers. Therefore, the direction of low-carbon collaborative development can be further explored in Beijing-Tianjin-Hebei.

4.1. Relocate logistics functions

In the environment of regional economic integration, Beijing, Tianjin, and Hebei have strong correlation and complement even with different development status. Therefore, it is necessary to integrate logistics resources to relocate logistics functions. Therefore, logistics resources can be fully and rationally utilized. Logistics functions in Beijing are dispersed to Tianjin, Tangshan, Baoding, and Shijiazhuang, so are logistics resources and facilities. Moreover, the commercial logistics is transferred to Baoding, Shijiazhuang, Tangshan, Handan, etc. because Beijing trade enterprises are dispersed to cities in Hebei. Focusing on port logistics, Tianjin takes responsibility of shipping function in Beijing-Tianjin-Hebei with Qinhuangdao Port, Caofeidian Port in Tangshan, and Huangye Port in Cangzhou. Hebei should be scientifically planned in virtue of logistics resource input from Beijing and Tianjin. Logistics functional cluster zones with characteristics should be established in Tangshan, Baoding, Shijiazhuang, Handan, Cangzhou, etc. to form air-sea-land stereoscopic network facing the whole country and serving Beijing-Tianjin-Hebei.

4.2. Develop inter-governmental low-carbon logistics collaborative capability

Regional logistics collaborative development can be realized with collaboration capability between local governments to great extent. At present, it is feasible to develop logistics collaboration by formulating collaboration policy and balancing long-term mechanism of various interests based on collaborative development in Beijing-Tianjin-Hebei. Therefore, governments in Beijing, Tianjin, and Hebei make common plan in this opportunity. On one hand, logistics cooperation and interest coordination mechanism are established among Beijing, Tianjin, and Hebei to give play of cooperation and coordination capability of governments. Policies are formulated for integrating traffic, communication, and energy conservation and emission reduction to realize horizontal cooperation and butt joint of logistics in three areas. On the other hand, led by local government, collaborative mechanism among industrial departments is established to promote orderly and high-efficient operation of logistics. Bock segmentation is broken

and longitudinal cooperation enhanced in all industries with low energy, pollution, and emission as target. Therefore, a high-efficient and low-carbon logistics system network is formed with professionalization, socialization, and informationalization.

4.3. Promote regional logistics collaboration

As the principal factor affecting logistics performance, transportation is the key to realize collaborative development of low-carbon logistics and the foundation to implement collaboration in other industries in Beijing-Tianjin-Hebei. Firstly, modern highway network can be constructed with national highway trunks and expressways as principle by further improving the input and utilization rate of transportation infrastructure and continuously enhancing the construction of modern comprehensive transport network in and between Beijing, Tianjin, and Hebei. Secondly, guided and coordinated by local government, the transportation system of highway and rail way is connected with port, aviation, and information systems to positively develop "sea-land-air", "land-sea", "land-air" and other multimodal transport systems and through transport systems. Therefore, green, effective, and convenient development of transport system can be driven by informationization. Thirdly, transport enterprises should coordinate functions and benefits. On one hand, situation of "various, small, scattered, and disordered" is changed by various methods by consolidation, recombination, cooperation, etc. On the other hand, scientific and technological transformation should be developed in logistics enterprises to optimize logistics process and links and improve the technology level of logistics facilities. In order to reduce the energy consumption and pollution in logistics, the environmental friendly new energy should be encouraged, while the awareness and capability of environmental protection be enhanced for transport enterprises. Fourthly, transport resources should be integrated and distributed in Beijing-Tianjin-Hebei. All the airports and ports are coordinated to transform homogeneous competition to rational collaboration and labor division coordinating in Beijing-Tianjin-Hebei. Therefore, an international shipping network with orderly assembly can be formed all around the world.

4.4. Operation with modern logistics technology

The vigorous R&D and application of advanced logistics technology is necessary to realize the collaborative operation of low-carbon logistics in Beijing-Tianjin-Hebei. On one hand, attention should be paid to the application of information technology and construction of information platform. Modern logistics is strongly dependent on electrical information technology. In particular, the transregional and trans-enterprise logistics is inseparable from the application of information technology and the construction of information sharing mechanism. On the other hand, low-carbon logistics technology should be positively developed in logistics operation and management. In the aspect of logistics operation, effective measures should be taken in low-carbon storage, green package, transportation, and distribution processing. Therefore, the economic benefit of reducing logistics cost can be unified with the social benefit of energy conservation and emission reduction. In aspect of logistics management, overall planning should be conducted to commerce flow, material flow, and information flow in the system. The information flow can guide the commerce flow and material flow to orderly and effectively

flow. Management technology of green supply is applied with attention to the rational revolution and recycling of logistics tools, equipment, etc. This technology considers the low-carbon of positive forward logistics and reverse logistics system in supply chain. Therefore, collaborative development can be realized across the enterprises and regions in Beijing-Tianjin-Hebei to create "multi-win" situation in enterprises and society.

4.5. Combined cultivation of logistics talents

The joint culture and flow of logistics talents are crucial to low-carbon collaborative development in Beijing-Tianjin-Hebei. Firstly, governments in Beijing-Tianjin-Hebei should take the lead to take full advantage of rich scientific and technological resources and intensive university talents in Beijing and Tianjin. Secondly, colleges and universities should enhance practical teaching of professional logistics talents with logistics enterprises as practical teaching bases for intern (Hernandez, 2011). On the other hand, logistics enterprises can send employees to colleges and universities by batches and levels for professional education and theoretical training. Thirdly, joint cooperation can be led between low-carbon technology enterprises and logistics enterprises to establish effective and orderly strategic relationship. Therefore, high-tech logistics talents can be introduced to promote R&D and application of low-carbon logistics technology. In this way, the endless power can be injected to the collaborative development of low-carbon logistics in Beijing-Tianjin-Hebei fundamentally.

5. Conclusions

The development of low-carbon logistics is the important measure to solve environment pollution. It is also the important component and realization approach to promote economic low-carbon and collaborative development in Beijing-Tianjin-Hebei. However, Beijing, Tianjin, and Hebei have various differences in administration, system, economy, and resource, so there is also great difference in the environment, strength, level, and potential of low-carbon logistics. With the planning opportunity in Beijing-Tianjin-Hebei, the collaborative development should be led by transportation collaboration with support of low-carbon logistics technology by joint training for logistics talents. This difference impedes the realization of collaborative development. Therefore, the idea must be transformed from "separately development" to "multi-win by cooperation" in Beijing-Tianjin-Hebei. The collaborative development should be established by horizontal cooperation between governments and enterprises and vertical cooperation in transportation, storage, distribution processing, expressage, and other industries.

Acknowledgement

This work is the phased research achievement of key subject of Hebei Federation of Humanities and Social Science "Evaluation of Logistics in Hebei with Collaborative Development of Beijing-Tianjin-Hebei and Study on Promotion Strategy" (2014020207), and the project of Hebei Social Science Foundation "Logistics Network Structure in Beijing-Tianjin-Hebei and Study on Collaborative Development Mechanism" (HB14GL026).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 25/05/2016
Aceitação/Acceptance: 05/08/2016

Research on Physical Education of Special Children and Countermeasure Based on Computer Aided Data Mining

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Pages: 267–276

Abstract: In recent years, the development of computer information technology promotes the progress of statistical analysis technology. In this paper, the author research on physical education of special children and countermeasure based on computer aided data mining. With the development of social civilization, the special physical education become more important, and we should pay attention to the education and development of the disabled children. Through the investigation and analysis, we find out the factors that affect the teaching of special physical education, and put forward the development countermeasures and suggestions of special children's physical education.

Keywords: Data Mining, Neural network, Physical education, Special Children

1. Introduction

In the past twenty years, with the development of China's socialist economic construction, China's sports industry, especially in the field of competitive sports has made remarkable achievements (Chung, 2013). At the same time in the field of sports, but also accumulated a lot of data on sports training (Mahony, 2012). With the development of our country sports and Olympic glory requirements, the efficiency of sports training is also put forward higher requirements, sports scientific training need to stand on a higher platform, sports training management complexity and management difficulty also increased (Gopinathan, 2012; Porter, 2014). But at present the training data management of sports training in China is basically in a state of disorder, there is no good use of our country sports development data accumulated decades, but cannot effectively find the model law and speculate on the outside of the experience (Taras, 2013). Data mining is an emerging discipline in the last 10 years. It is from large, incomplete, noisy, fuzzy and random data, in which the extraction of implicit, people does not know in advance, but is potentially useful information and knowledge (Ferreira et al., 2015); this paper expounds the application of data mining technology in sports training (Veletsianos, 2013). Using data mining technology to discover the scientific rules of the data accumulated in the process of physical training will have a positive impact on the scientific guidance of physical training.

Mentally retarded children is a disabled, is due to congenital or acquired causes of their physical or mental defects caused by mental disorders, the ability to adapt to their behavior than the average children of the same age. With the development of social civilization, the education and development of the social vulnerable group, which is concerned with intellectual disability, has become an important part of the special education, and it is a symbol of social civilization and progress (Vexler, 2014). At present for the mentally retarded students using different means of education have been more common, mentally retarded children's intelligence and adaptive behavior ability development is the foundation of their integration into society, including the ability to live independently, ability to adapt to the natural and social environment, special education is an effective way and method of mentally retarded children's intelligence and adaptive behavior ability development (Wang, 2012; Mora, 2014). There is a direct relationship between human potential, intelligence and adaptive behavior ability and the development of education and training, the degree of effect of mentally retarded children with the same training and development potential, its intelligence and adaptive behavior ability can be acquired through hard training congenitally deficient is improved (Walton,2012). The development of intellectual and adaptive behavior of mentally retarded children by means of physical education and methods is an important part of special education, which provides the basis for the formation of basic skills of children and the development of quality in all aspects. This paper puts forward the concept of physical education of mentally retarded children, we plan through the construction of teaching content system of intellectual sports training, make supplement and perfect the means and methods of mentally retarded children's sports teaching, it will have important theoretical and practical significance to promote the development of special education.

2. Computer data mining

The computer application technology has the obvious development potential in the storage, the simulation analysis data. So, how to find the relationship between the various factors in the mass data, and find out the changing rules between them, and further analysis of the data has become one of the important development direction of the computer. Therefore, the research and application of data mining technology has become one of the indispensable content in sports science research. The application of data mining technology is an interdisciplinary, it covers the statistics, machine learning, artificial intelligence, fuzzy mathematics and many other fields of science, form and data analysis and knowledge extraction system according to specific tasks. Similarly, for the same problem can also be based on the characteristics of different applications to select different algorithms. For example, the processing of descriptive mining tasks such as data characteristics and data abstraction and data summary summary of the data processing; predictive mining tasks due to the different attributes of the target variable classification and prediction methods.

The main methods of data mining are:

1. ***Classification:*** according to the attribute analysis object be arranged to define a group.
2. ***Regression:*** using a series of existing values to predict the possible values of a continuous value.

3. ***Prediction:*** estimate the future value of the attribute based on past observations of the object's properties.
4. ***Clustering:*** it is a set of data according to the similarities and differences are divided into several categories, its purpose is to make the similarity belonging to the same category of data as large as possible, the similarity between the different categories of data as small as possible.
5. ***Association:*** it is to find out the event at the same time. The main is to find out: if a factor appears in a part of an event, then B factors also appear in the event of the probability of how much.

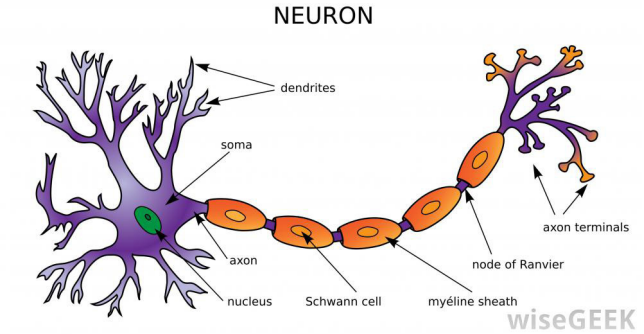


Figure 1 – Neural neuron

Neural network is built on the basis of mathematical model, it can analyze a large number of complex data, and can be completed on the human brain or the general computer is extremely complex pattern extraction and trend analysis. The neural network system is composed of a series of processing units similar to the human brain neurons. These nodes interconnect each other through the network, if there is data input, they can be determined to work to determine the mode of data. Neural network processing is mainly through the learning function of the network to find a proper connection weight value to get the best results. One of the typical learning methods is -propagation back.

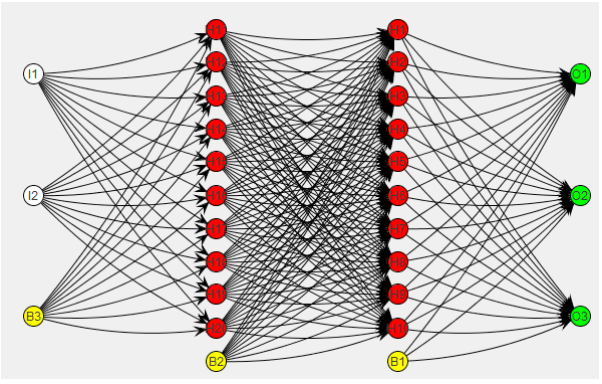


Figure 2 – Neural network

It compares the output result with some known values, and constantly adjust the weight value, get a new output value, and then through the continuous learning process, and finally the neural network to get a stable result. The network topology of BP model is composed of input layer, hidden layer and output layer, and the connection between each layer of neurons is reflected by the weight. The learning process consists of forward calculation and back propagation, first learning samples into the forward calculation process, from the input layer hidden layer by layer to the output layer learning results; if the output is not up to the requirements to the backward propagation process, connection error will be the output signal and the signal along the network of teachers return connection weights from the output layer to the input layer neurons in each layer by layer modification. The model is also called BP back propagation model through the forward calculation and inverse propagation of the learning samples until the minimum error signal or the learning result is satisfactory.

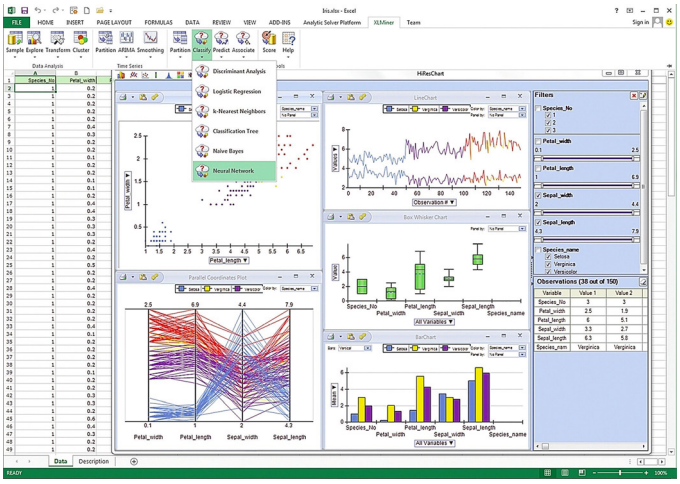


Figure 3 – Computer aided data mining

3. Physical education for special children

3.1. Special education

Special education, also called special children's education, it refers to the physical and mental development of children and adolescents of the abnormal education. Education, including genius (abnormal), bad character (juvenile delinquency), mental retardation, visual impairment, hearing impairment, physical disabilities, mental disorders, speech disorders, learning disabilities, multiple disabilities, such as education. Special education in special education is also called "defect education" and "education for handicapped". The education of children and adolescents with mental and physical development defects, but does not include the education of gifted children and poor quality of moral education. The object of special education is mainly different types of people with disabilities. Persons with disabilities refer to those who have lost their ability to engage in certain activities in a normal manner, in the psychological, physiological, and

human body structure. In summary, special education (Special Education) is a pointer to the physical and mental deficiency groups of children due to congenital or acquired causes, using special materials, special equipment and carry out the teaching methods, to achieve the development of intelligence and special children's adaptive behavior ability in a series of educational activities. Special education can be divided into sensory disabilities education and special education for the disabled.

- ***Special education school:*** Special education schools is organized by the government according to law, enterprises and institutions, social organizations, other social organizations and individual citizens, for young children with disabilities, the implementation of the use of general or specially designed courses, teaching materials, teaching methods and teaching organization and teaching equipment in a specific range, obligation educational institutions for special children in special education in order to achieve the general or special training objectives. Such as: special education school, special education school, school for the blind and sound view has the special nature of the social welfare belong to special education schools category.
- ***Special children:*** Special children are the physical and mental defects due to congenital or acquired causes, which need to be used to compensate the defects, tap the potential, and develop the intelligence and adaptive behavior of children. According to the nature of special children can be divided into two categories. A category for sensory disabled children, including: physically disabled children, hearing disabled children, disabled children with visual impairment and speech handicapped children. The other category is the special disabled children, including children with intellectual disability, children with autism, cerebral palsy and multiple developmental disabilities.

3.2. Special physical education

Special physical education, also known as the disabled sports, provides physical exercise, physical exercise, sports training and recreation and rehabilitation for people with disabilities and people with disabilities. Disabled sports, is through the special training of teachers, the use of special materials and teaching methods, so that the obstacles in the health and sports to get the maximum benefit. Also called special sports for the disabled, a defect in the hearing, vision, speech, intelligence, body etc, through physical exercise, to enhance physical fitness, health promotion, help rehabilitation, willpower and the ability to live in the sports activities

1. ***Sensory disabled sports:*** A sensory disabled sport refers to a normal development level, body structure or organ of people sensory deficits and loss of function to carry out sports activities. Including physically disabled, disabled sports, disabled sports, speech disability groups and hearing disabled sports, can participate in the Paralympics' games.
2. ***Special disabled sports:*** Special people sports include the development of special physical fitness, improve health, and enhance physical fitness and ability to adapt to the purpose of carrying out a series of physical education and training in the process. It includes people with mental retardation, autism, sports, and the group of people with multiple disabilities sports and sports.



Figure 4 – Special disabled sports

4. Special physical education

4.1. Design of questionnaire

The purpose of this questionnaire is to study and discuss the influence of physical education teaching and training in special education schools on the development of mental and adaptive behaviour ability of mentally retarded children. The questionnaire mainly on the special physical education curriculum development and the special school sports teaching content creation principle and implementation method, and the special physical and adaptive behaviour in children with special children's intelligence development influence as the main content of the investigation. The questionnaire reliability test was used in the two measurements. The random sample survey of special education school teachers were measured two times, the interval time was 30 days, the relevant analysis of the questionnaire by using SPSS13.0 statistical software, the correlation coefficient of two measurements for r=0.924, that accords with the sociological survey questionnaire reliability requirements.

Item	Very reasonable	reasonable	commonly	Unreasonable
Content design	4	9	3	0
The amount set	3	11	2	0
Topic response	5	12	0	0
Survey content	6	8	3	0

Table 1 – Validity test evaluation

4.2. Factors affecting the teaching of special physical education

Visible from the table 2, the impact of the current special education school physical education teaching in charge of the leadership of the impact of factors accounted for

14.7%. It shows that the current relevant management department and the competent leadership are not paid enough attention to the special physical education, which has seriously affected the development and implementation of special physical education. Performance in: (1) the relevant management department and the competent leadership to the special sports teaching and the training function understanding insufficiency, insufficiently takes seriously, affects the physical education teacher teaching and the training enthusiasm. (2) the shortage of capital investment, the impact of special sports venues and equipment to improve, to restrict the development of special sports teaching and training. The factors that affect the development of special physical education teachers accounted for 37.2%. Performance in: (1) the lack of professionalism. Most of the physical education teachers are graduates of non special physical education graduates, special sports related knowledge is insufficient, the students with intellectual disabilities are poorly understood, the lack of special education from the experience of teaching. (2) Part-time PE teachers are in the majority. Part of the physical education teachers are non sports graduates, sports knowledge, technology and skills are relatively lacking, the business level is not high, the reaction of special education schools full-time physical education teachers are inadequate. (3) the responsibility is not strong, the attitude is not correct. The impact of sports teacher education object and treatment benefits, teaching burnout and the sense of responsibility is not strong phenomenon. Such as: because of the special children's acceptance and implementation capacity to achieve the goal of teaching, the use of "sheep" teaching methods. Wages and benefits did not meet their expectations, the lack of enthusiasm for the teaching of physical education.

content	Leadership attitude		Teacher factor		Student factors	
	N	%	N	%	N	%
Result	11	14.7%	23	37.2%	35	52.1%

Table 2 – Factors affecting the teaching of special physical education

4.3. Physical education for special children

In inclusive education concept and the "zero refusal" education placement trend, there will be more and more special children return to the general class, in the least restrictive environment to accept the appropriate education. In this way, each physical education teachers should have the concept of inclusive physical education, to master the specific teaching strategies and principles for the benefit of every special child.

1. All children have the right to be educated and to oppose any discrimination.

Therefore, every special child, regardless of the extent of their disabilities should be educated, which of course, including physical and mental development of children play an important role in sports. And students with disabilities than ordinary students need more exercise and physical fitness activities, school physical education can not only provide their learning skills and action performance ability, but also cultivate their daily life for the "functional" ability. So the concept of inclusive education for special children should receive physical

education enjoys the same rights as ordinary children, enjoy the "convenience" and "safe" movement environment, the full development of a variety of physical and mental function, learning all kinds of sports skills, physical exercise strong, really enjoy the fun and joy of movement, and thus enhance the quality of life, lifelong sports the habit.

2. Every special child should be adapted to its characteristics and the ability of effective physical education

Special children as a person, he is not different from the normal children are completely equal, he has the right to accept the quality of education to ensure quality. However, there are differences between special children and normal children in physical and mental characteristics and special needs, so the quality of education is also different. This also means that the teaching of special physical education from the assessment to the development of IEP (Education Program Individual), the teaching is based on the characteristics and needs of children. The students of every disabled sports curriculum must be adjusted to the individual design, formulate the individualized education plan is feasible, and the normal development of students with disabilities of motor function, promote students with disabilities can maintain and improve itself strength, enhance physical activity of students with disabilities adaptability, establish disabilities the students' self-confidence.

3. Implementation of inclusive physical education requires the integration of personnel and resources

All inclusive physical education courses are often designed by the general class of physical education teachers and special physical education teachers and related professionals. Therefore, in the formulation of special children's physical education program in the regular class teachers (teachers and teachers, including teachers of health and physical education) and special teachers (teachers, to adapt to the physical education teachers or consultant), related professionals (such as doctors, physical therapists, occupational therapists, etc.) are important members of the. Implementation of inclusive physical education needs of all kinds of people to cooperate, jointly assess the amount of the development of IEP, and its education. Their cooperation can be said to be the key to inclusive education. At the same time, the family, school, society also need to carry out the integration of resources. Only by fully integrating the existing sports resources, can we maximize its benefits, fully guarantee the rights and effects of special children's physical education.

5. Conclusion

Inclusive education in the field of sports is an important part, not only the development of personal health and physical fitness and special children related to its lifestyle, quality of life and the harmonious interpersonal relationship is closely linked, but due to the limits of the body, and the influence of the old concept of the disabled sports education right is often neglect or deprivation, while ordinary class sports teachers often because of the limits of knowledge or attitude, so people with disabilities were excluded from outside the physical education, or is unable to benefit from the common physical education curriculum. Specifically, first of all, lack of social resources and discriminatory attitudes, effects of vigorous development, special sports at the same time, the lack of integration of science and technology research, it also hinders the progress of special physical education; secondly, the idea of inclusive education is not yet universal, many

sports teachers including teachers in other subjects, the correct understanding has not been formed on inclusive education; third, put forward higher requirements for teachers' knowledge structure. Teachers' knowledge structure can not only stay in normal children, how to find the special needs of special children, which have their physical and mental characteristics, how to design suitable for common children and special children's sports activities, a series of problems challenge the existing knowledge structure of teachers. Fourth, the existing assessment methods and teaching methods are also challenged. Physical education teachers' assessment of children is no longer a traditional single assessment, but the assessment of ecological, individual and progressive. At present, the teaching method and the teaching method of physical education teachers are in urgent need of reform to the normal children and the serious defects. Add the disabled sports curriculum in physical education colleges and universities, so that college students understand the special children, have the right to inclusive education idea and the education method, so that in the days after the teaching, truly zero to actively improve the mental status of students with disabilities.

Acknowledgments

The work of this paper is supported by Hebei province education science "twelfth five-year" plan project (1413020).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 05/05/2016
Aceitação/Acceptance: 22/08/2016

Research on Reliability for Gearbox Shell Production Line Fuzzy Analytic Hierarchy Comprehensive Evaluation

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Pages: 277–291

Abstract: The author investigated two different enterprise gearbox shell production lines of producing same breed production. The article uses six months maintenance annals of two production lines which has run ten years to calculate dynamic reliability indexes: F(t), R(t), λ(t) and static reliability index, MTBF, MTTR, K,A,C. The static reliability index which gets across contrast analyzing two charts indicates: the rigid line reliability is better than the flexible one. Furthermore, it formats the basis of variables base on the static reliability index. Fuzzy hierarchy comprehensive evaluation model of gearbox shell production line is constructed by using fuzzy mathematics and AHP. This fuzzy analytic hierarchy model validates that the rigid line reliability is better than the flexible one. Lastly, the cause of different reliability of these two production lines is analyzed base on the enterprise fact.

Keywords: Gearbox shell, Production line, Reliability, AHP, Fuzzy evaluation

1. Introduction

The process of market globalization has put forward higher and higher requirements for manufacturing system. Manufacturing enterprises to survive in the fierce external environment changes under the environment and development, manufacturing process to innovate and optimize the products constantly, at a faster speed and lower price, to provide good products and high quality services to meet customer demand for diversification and individuation (Sha, 1999; Ji, 2008). That is to say, only the manufacturing process or the overall optimization of the manufacturing system can achieve the goal of an invincible position in the market competition.

Manufacturing system reliability evaluation can be divided into enterprise, workshop and equipment level, and the workshop is the core of the manufacturing system (Hu, 2008; Lino et al., 2016). In the analysis of the reliability of manufacturing system, it should be focused on the analysis of the reliability of the system (Gao, 2007). In the paper, the reliability of the two stage serial production line with variable productivity is analyzed, and the analytical solution of the performance index of the production line is obtained by analyzing the operation state of the buffer and the production line. In literature, the author of the Clarke type CIMS production line reliability analysis is

studied in detail with phase type life (Sun, 2000), reliability problems of finite buffer with two different types of flexible mechanism of Clarke type CIMS production line (Ryiala, 1989; Lu, 1995). First of all, given the change rules, the processing time of each job type generalized phase structure secondly; using two-dimensional values of closed loop network theory in the steady state, and the main algorithm formula gives the system steady-state production index and reliability index. The influence of equipment structure on the reliability of production system is discussed (Li, 1997), and the reliability of equipment and the reliability of production system are analyzed in the paper. First of all, the quality of the products and equipment aging problem considering the reliability of the manufacturing equipment based on reliability model; secondly use the equipment to estimate the reliability of the production system, the mixed structure of the mixed operating system from the angle of system reliability. Different from, this paper is to study the structure of manufacturing system and the change of system reliability.

Most of the existing literature on the production line of a production line or production unit reliability analysis (Hu, 1995; Rao, 1999; Wu, 2000), a single analysis of a production line or manufacturing units cannot fully reflect the reliability of the system. In this paper, by using the method of fuzzy comprehensive evaluation, we analyze the reliability of the two shell production lines of a transmission plant, and to study the relationship between the reliability of the production line and the structure of the system.

2. Research object and the choice of reliability index

2.1. Object of study

The object of this paper is the production line A, B, of the two transmission case. Through the field investigation that:

The technological process of the A of the shell production line is:

The benchmark process - process inspection - motor transmission – finishing - Inspection - motor transmission - finishing - Inspection--motorized conveyor - cleaning machine - sealed inspection - product inspection

Among them, the benchmark process using HBL-201334 work of the rotary combination machine for processing, inspection of each process is completed by the operator; complete the roughing and finishing process by 2 overall automated assembly line, is composed of a plurality of processing units; cleaning process by the cleaning machine to 4 minutes to complete the cleaning.

The technological process of the B of the shell production line is:

Rough machining - process inspection - finishing - Motor Transport - cleaning machine cleaning

Among them, the roughing process using BS062-002 special milling machine tool; process inspection is completed by the machining process of workers; finishing operations from eight sets of NA-60HB machining center and work; cleaning process by washing machine to 4 minutes to complete the cleaning.

From the process point of view, there are strict procedures order between the shell production line A technology of each processing unit, a strong correlation between

poor flexibility; machining center machining process shell production line B technology correlation, according to the different types of housing, production of large flexible adjustment, flexibility. But because of the high degree of automation of the A production line, the production capacity of B is stronger than that of the.

Taking into account the two manufacturing systems, although the function is completely consistent, but the composition of the system and the process has a large difference, so it can be used as a comparative analysis of the research object. Through the observation of similar manufacturing system, with different structure and different environment and different yield and reliability of different maintenance system differences, in order to find the reasons of differences from, and puts forward effective suggestions for improvement. It has a certain practical significance for the enterprise to better manage the manufacturing system and maintain the manufacturing system.

2.2. Selection of index

This paper relates to the reliability index is divided into two categories: one for the time dependent reliability index, such as: the cumulative failure probability $F(t)$, reliability function $R(t)$ and failure rate function $\lambda(t)$, the paper called the dynamic reliability index; the other is reliability index and time independent, it is the average time interval $MTBF$, mean time to repair $MTTR$. Technology utilization coefficient K, steady state availability A, cost effectiveness C, the paper called the static reliability index. In this paper, the reliability of the two production lines are investigated based on the parameters of the above parameters. It is worth noting: the study object of this paper is the manufacturing system, rather than equipment, calculating the index is the manufacturing system as equipment, on the basis of manufacturing system maintenance records to calculate the indexes, including technical utilization coefficient, the definition of cost effectiveness is as follows:

Technology utilization coefficient K

$$K = \frac{T_w}{T_w + \sum_{i=1}^{n} T_{ri}} \tag{1}$$

T_w : Actual working time of the system;

T_{ri} : the repair time of the I fault of the core equipment;

n : the failure frequency of the core equipment during the inspection period;

In this formula, the frequency of failure of the core equipment is high and the characteristics of the stop time length can be directly reflected. It can be seen from the formula that the smaller the value K, the more serious the fault of the core equipment is, the lower the stability of the production line.

Cost effectiveness C : the index is a measure of the system maintenance cost, and it has important role in the comprehensive evaluation of reliability.

$$C = \frac{\sum_{i=1}^{n} Q}{MTBF} \tag{2}$$

Q : The equipment maintenance cost of the first i failure

n : The number of faults in the manufacturing system during the inspection period

3. Lateral comparison study of A and B line reliability based on dynamic reliability index

According to the actual research, the gearbox housing production line A to buy in 1994, gearbox housing production line B in 1997 to buy, in comparison, the equipment should be collected after the same period of failure data. Therefore, here the use of two normal production line after 10 years of use, the gearbox shell production line A in July 2004 to December 2004 the fault data, the gearbox shell production line B in July 2007 to December 2007 of the comparative study of fault data.

Firstly, the function of time t is compared with the reliability index, which are the cumulative failure probability, reliability function and failure rate function.

The time function curves of A and B of the gear box production line are shown in Figure 1, 2 and 3.

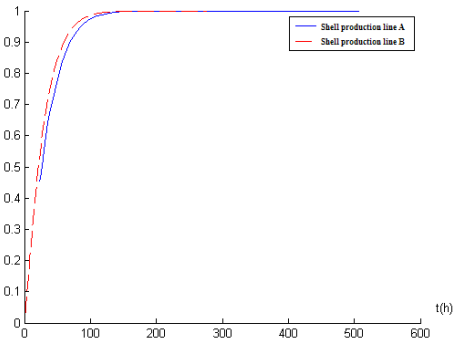


Figure 1 – Cumulative failure probability function curve

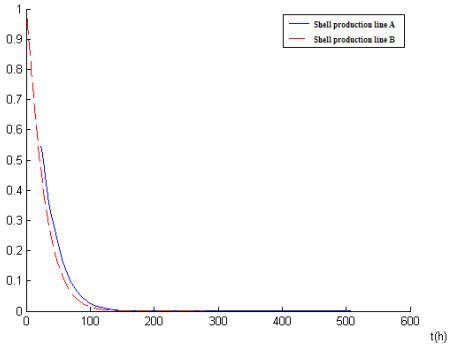


Figure 2 – Reliability function curve

The cumulative failure probability, shown in Figure 1, is the probability that a failure occurs within a specified time period. This shows that the probability of failure of A, B two production line is close to 1 when the time of the fault is greater than 150h. The reliability function shown in Figure 2 is the probability that the time from 0 to t does not appear to be a failure. The diagram shows that the probability of failure of 150h, B two production lines is close to zero when the time of failure is greater than A. Because of failure and failure is the complementary relationship between them and the probability is 1, therefore, can be inferred from Figure 1: reliability of shell production line of B is lower than the reliability of shell production line A, this conclusion was also confirmed in Figure 2 curve.

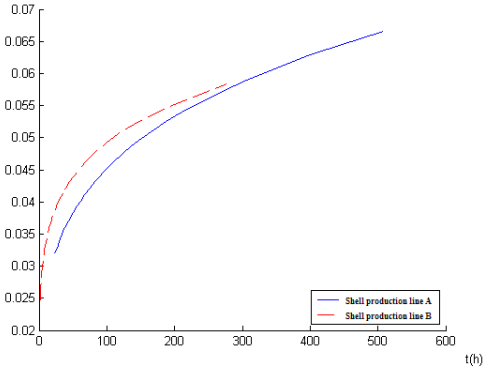


Figure 3 – Failure rate function curve

We can see from Figure 3: Weibull distribution shape parameter β of two production lines are more than 1, said the equipment failure types belong to loss failure, therefore, the function curve of 2 production lines are increasing function, are third stages of the bathtub curve. The reason is: after a long period of use, the equipment has a significant wear and tear, fatigue and aging, with the increase in the use of time and the probability of failure is also increased. It shows that the failure rate of the B of the shell production line is much higher than that of the shell production line A, which indicates that the B of the shell production line is more serious.

4. Fuzzy comprehensive evaluation of the reliability of AB line based on the static reliability index

4.1. Fuzzy comprehensive evaluation method

(1) determine the evaluation factors and evaluation levels

Set $U = \{u_1, u_2, \cdots u_m\}$ as an evaluation factor set, where m is the number of evaluation factors.

$V = \{v_1, v_2, \cdots v_n\}$ for the rating set, where n is the number of reviews.

(2) Structure evaluation matrix

First, the single factor fuzzy evaluation, from the factors $u_i(i=1,2,\cdots m)$, the factors of the evaluation degree $v_j(j=1,2,\cdots n)$ of membership, so that the first factor to draw a single factor evaluation set $r_i=(r_{i1},r_{i2},\cdots r_{in})$

A total evaluation matrix R is constructed.

$$R=(r_{ij})_{m*n}=\begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & & & \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix},(i=1,2,\cdots,m;j=1,2,\cdots,n) \tag{3}$$

Among them, r_{ij} it is indicated that the evaluation object can be judged as the degree of membership v_j.

(3) Calculation of membership degree

The formula (3) can be used to calculate the membership value:

The bigger the indicator value, the better:

$$r_{ik}(u_i)=\begin{cases} 1 & u_i \geq v_{ik} \\ \dfrac{u_i-v_{i(k+1)}}{v_{ik}-v_{i(k+1)}} & v_{i(k+1)}<u_i<v_{ik} \\ 0 & u_i \leq v_{i(k+1)} \end{cases} \qquad k=1 \tag{4}$$

$$r_{ik}(u_i)=\begin{cases} 0 & u_i \geq v_{i(k-1)}, u_i \leq v_{i(k+1)} \\ \dfrac{v_{i(k-1)}-u_i}{v_{i(k-1)}-v_{ik}} & v_{ik}<u_i<v_{i(k-1)} \\ \dfrac{u_i-v_{i(k+1)}}{v_{ik}-v_{i(k+1)}} & v_{i(k+1)} \leq u_i \leq v_{ik} \end{cases} \qquad k=2,3,4 \tag{5}$$

$$r_{ik}(u_i)=\begin{cases} 0 & u_i \geq v_{i(k-1)} \\ \dfrac{v_{i(k-1)}-u_i}{v_{i(k-1)}-v_{ik}} & v_{ik}<u_i<v_{i(k-1)} \\ 1 & u_i \leq v_{ik} \end{cases} \qquad k=5 \tag{6}$$

The smaller the indicator value, the better the situation:

$$r_{ik}(u_i)=\begin{cases}0 & u_i \geq v_{i(k+1)} \\ \dfrac{v_{i(k+1)}-u_i}{v_{i(k+1)}-v_{ik}} & v_{ik}<u_i<v_{i(k+1)} \\ 1 & u_i \leq v_{ik}\end{cases} \qquad k=1 \tag{7}$$

$$r_{ik}(u_i)=\begin{cases}0 & u_i \geq v_{i(k+1)}, u_i \leq v_{i(k-1)} \\ \dfrac{u_i-v_{i(k-1)}}{v_{ik}-v_{i(k-1)}} & v_{i(k-1)}<u_i<v_{ik} \\ \dfrac{v_{i(k+1)}-u_i}{v_{i(k+1)}-v_{ik}} & v_{ik} \leq u_i \leq v_{i(k+1)}\end{cases} \qquad k=2,3,4 \tag{8}$$

$$r_{ik}(u_i)=\begin{cases}0 & u_i \leq v_{i(k-1)} \\ \dfrac{u_i-v_{i(k-1)}}{v_{ik}-v_{i(k-1)}} & v_{i(k-1)}<u_i<v_{ik} \\ 1 & v_{ik} \leq u_i\end{cases} \qquad k=5 \tag{9}$$

In the formula, u_i as the characteristic value, r_{ik} is the form the membership degree of the fuzzy relation matrix, the fuzzy relation matrix is obtained, which is not enough for the evaluation of the things. In the evaluation of factors, each factor in the "evaluation objectives" in the possession of a different weight. Therefore, it is needed to give the weight distribution of evaluation index, that is $A=(a_1,a_2,\cdots,a_m)$, a fuzzy subset on a given U:

$$B=A \bullet R \tag{10}$$

Comprehensive evaluation score:

$$Q=B \bullet V^{\mathrm{T}} \tag{11}$$

4.2. Fuzzy hierarchy comprehensive evaluation model of manufacturing system reliability

In this paper, the fuzzy hierarchy comprehensive evaluation model of manufacturing system based on static reliability index is shown in figure 4:

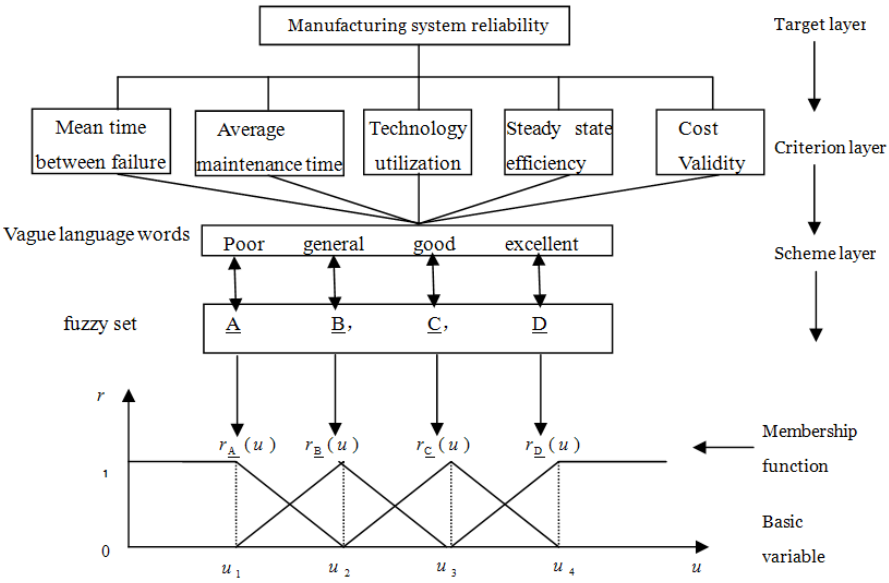


Figure 4 – Fuzzy hierarchy comprehensive evaluation model of manufacturing system reliability

4.3. Determine the weight of each reliability index

The author based on Figure 4, respectively according to the weight coefficient of the reliability evaluation index AHP to determine the mean time between failures (MTBF):0.2462, the average repair time: (MTTR):0.1614, technology utilization coefficient (K): 0.0711, steady-state availability (A):0.0617, cost effectiveness (C):0.0617. The calculation process is detailed in the literature.

In order to make the weight coefficient of the existing 5 reliability indices sum to 1, the weight coefficients are normalized:

The weight coefficient =0.2462/ (0.2462+0.1614+0.0711+0.0617+0.0617) =0.4088

The weight coefficient =0.1614/ (0.2462+0.1614+0.0711+0.0617+0.0617) =0.2681

The weight coefficient =0.0711/ (0.2462+0.1614+0.0711+0.0617+0.0617) =0.1181

The weight coefficient =0.0617/ (0.2462+0.1614+0.0711+0.0617+0.0617) =0.1025

The weight coefficient =0.0617/ (0.2462+0.1614+0.0711+0.0617+0.0617) =0.1025

Then the weights are set as:

$$A=\{a_1,a_2,a_3,a_4,a_5\}=(0.4088,0.2681,0.1181,0.1025,0.1025)$$

4.4. Determine the evaluation criteria

Valuation standard is to evaluate the equipment to use the level of reliability of the scale; it is relative to the evaluation index, and common to reflect the level of the use of equipment reliability. Evaluation criteria include two parts of the evaluation criteria and evaluation limits. According to the analysis of the MTBF, MTTR, K,A,C in production line of the transmission case, and the analysis of the standard, this paper takes 4 grades, namely, "excellent, good, general, and poor". In order to facilitate the final evaluation and comparative analysis, according to the conditions of the use of the housing production line for each fuzzy evaluation criteria as shown in table 1.

index / standard	MTBF(h)→ $V_{1,j}$	MTTR(min)→ $V_{2,j}$	K→ $V_{3,j}$	A→ $V_{4,j}$	C(Y) → $V_{5,j}$
excellent	≥300	≤60	≥0.97	≥0.97	≤500
good	≥100	≤180	≥0.93	≥0.95	≤800
general	≥50	≤300	≥0.89	≥0.90	≤1000
poor	≥20	≤600	≥0.85	≥0.85	≤1200

Table 1 – Evaluation standard of reliability index

4.5. Determination of membership function of equipment availability index

By using the index of reliability and economy of equipment observed according to the formula and table 1 respectively establish fault interval, fault time, fault evaluation set, the average effective number of degrees and annual maintenance costs are as follows for the membership function of the fuzzy comment set:

(1) the membership function of the fuzzy set of time (MTBF) with the mean time between failures

Actual production research shows that the longer the average time between failures, the higher the reliability of the production line, the better the availability, on the contrary, the shorter the average time to failure, the lower the reliability of the production line, the worse the availability.

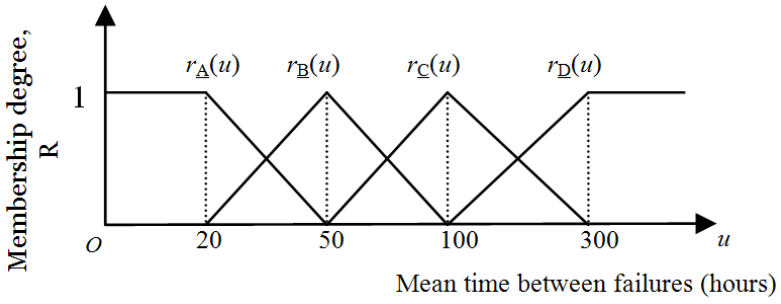


Figure 5 – Membership function of fuzzy evaluation sets on MTBF

Mean time to failure (MTBF) on the fuzzy evaluation of “excellent”, “good”, “general”, “poor” membership function as shown in Figure 5.

(2) the membership function of the fuzzy set of time (MTTR) with the mean time to failure

Actual production research shows that the shorter the average fault repair time, the higher the reliability of the production line, the better the availability, the other hand, the longer the average fault repair time, the lower the reliability of the production line, the worse the availability.

Mean time to repair (MTTR) is the membership function of the fuzzy evaluation “excellent”, “good”, “general” and “poor”, as shown in Figure 6:

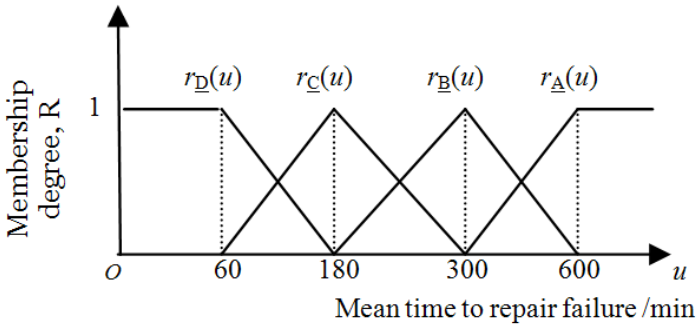


Figure 6 – Membership function of fuzzy evaluation sets on MTTR

(3) the membership function of the technology utilization coefficient (K) on the evaluation set

According to the actual situation of the scene investigation reflect the manipulator fault, is the core problem of gear box shell processing production line, not only the frequency of occurrence of high maintenance costs more, but failure stop for the longest time, the

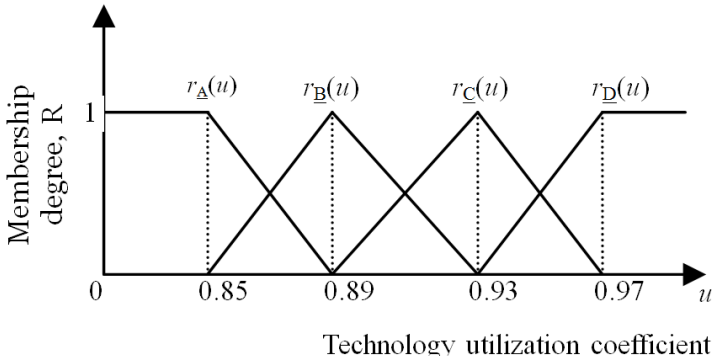


Figure 7 – Membership function of fuzzy evaluation sets on utilization coefficient of technology

harm to the production is the largest. By the formula (1) can be seen, the smaller the value of the core equipment, the more serious the fault occurs, the lower the stability of the production line.

Technology utilization coefficient (K) of fuzzy evaluation “excellent”, “good”, “general”, “poor” membership function as shown in Figure 7.

(4) the membership function of the inherent availability to the fuzzy set of reviews

Inherent availability of integrated feature Reliability Generalized measuring reliability and maintenance of mechanical equipment, as the MTBF ratio relative to the mean time between failures and troubleshooting time and average, due to the greater the higher the effective degree of said system, the inherent availability of fuzzy evaluation of “excellent”, “good”, “general” and “poor” membership function as shown in figure 8:

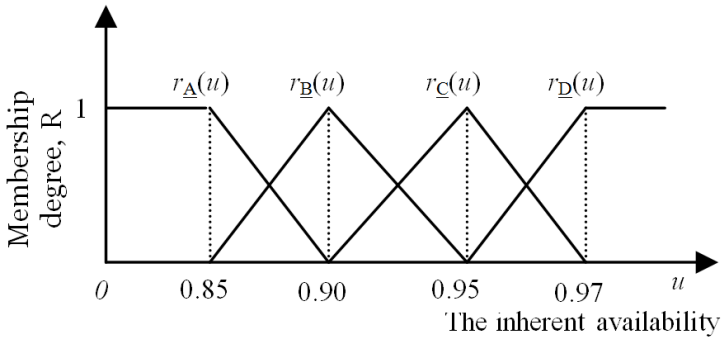


Figure 8 – Membership function of fuzzy evaluation sets on inherence availability

(5) The membership function of the cost effectiveness on the evaluation set

The actual production research shows that the system maintenance cost is higher, the system reliability is lower, the cost effectiveness of the fuzzy evaluation “excellent”, “good”, “general”, “poor” membership function is shown in Figure 9:

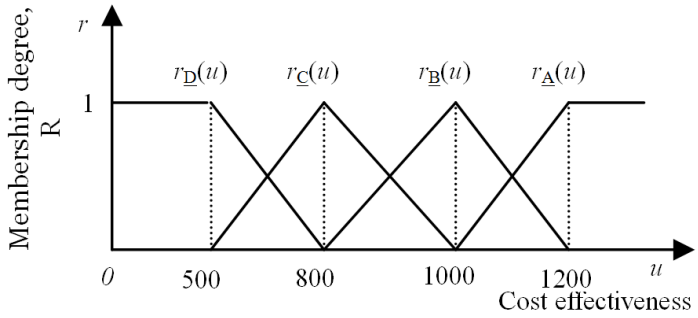


Figure 9 – Membership function of fuzzy evaluation sets on cost availability

4.6. Fuzzy comprehensive evaluation of the reliability of AB line

Based on the reliability index calculation formula in the literature, respectively on the basis of gearbox production line of A from July 2004 to fault record and gearbox production line in December 2004 B calculated from July 2007 to December 2007 related to the reliability index of the fault records are shown in Table 2

Device \ index	MTBF(h)	MTTR(min)	K	A	C(yuan)
Production line A	103.1544	14.04	0.9645	0.9998	775.0295
Production line B	57.5560	40.5	0.9762	0.9976	824.55

Table 2 – Index value of reliability index

For the production line A: according to table 2 the first line of the first row of data and Figure:

$$r_1 = (r_{11}, r_{12}, r_{13}, r_{14}) = (0.0158, 0.9842, 0, 0)$$

In the same way, other single factor evaluation sets can be got, and the synthetic fuzzy relation matrix is as follows:

$$R_A = \begin{bmatrix} 0.0158 & 0.9842 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0.725 & 0.275 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0.0832 & 0.9168 & 0 & 0 \end{bmatrix}$$

For production line B:

$$R_B = \begin{bmatrix} 0 & 0.1511 & 0.8489 & 0 \\ 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0.8773 & 0.1227 & 0 \end{bmatrix}$$

Therefore, the comprehensive evaluation results are:

$$B_A = A \bullet R_A = (0.4088, 0.2681, 0.1181, 0.1025, 0.1025) \begin{bmatrix} 0.0158 & 0.9842 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0.725 & 0.275 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0.0832 & 0.9168 & 0 & 0 \end{bmatrix}$$

$$= (0.4712, 0.5288, 0, 0)$$

$$B_B = A \bullet R_B = (0.4088, 0.2681, 0.1181, 0.1025, 0.1025) \begin{bmatrix} 0 & 0.1511 & 0.8489 & 0 \\ 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0.8773 & 0.1227 & 0 \end{bmatrix}$$

$$= (0.4187, 0.1517, 0.3596, 0)$$

According to the formula (11), the comprehensive evaluation score can be calculated as follows:

$$Q_A = B_{\mathrm{A}} \bullet V^{\mathrm{T}} = 0.4712 \times 90 + 0.5288 \times 80 = 84.712$$

$$Q_B = B_{\mathrm{B}} \bullet V^{\mathrm{T}} = 0.4187 \times 90 + 0.1517 \times 80 + 0.3596 \times 60 = 71.395$$

From the final two production lines A, B reliability of the fuzzy hierarchy comprehensive evaluation score is visible, that is $Q_A \rangle Q_B$, the reliability of the production line A is better than the reliability of the production line B.

5. Discussion and Analysis on the reliability evaluation results of two production lines

The evaluation results show that the reliability of B is lower than that of the shell production line A. The results we expect the opposite, because we think that the flexible line because it involves fewer equipment, so the reliability should be high, but the reliability is based on the actual maintenance records to get the evaluation result of A is better than that of the rigid line flexible line B. The main reasons for the above results are summarized through the discussion and summary of field research and field engineering:

1. System components

The main process of gearbox production line is composed of B CNC machining center to complete the equipment, circuit structure is relatively complex, high failure rate, and adjust the work is tedious, the main process of A shell production line is completed by automated assembly line, each processing unit is relatively independent, therefore, in the maintenance of equipment, production line A is B production line maintenance difficulty, short maintenance time, low maintenance cost. In the maintenance of the equipment, the production line B is more easy to operate than the production line A.

2. The operation level of the workers

The shell of the B production line workers in the process of operating equipment, processing method of small fault is not standardized, lack of professional training and guidance, individual to try and use brute force, often make the problem worse fault. The production line for its A each processing unit technology has a strong correlation, a failure will cause all production, therefore, treatment of small faults require higher timeliness, systematic training of workers, and are equipped with the standard operation manual, troubleshooting is more timely and effective.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 09/05/2016
Aceitação/Acceptance: 24/08/2016

Research on Barrier Free Design of the Landscape Environment of the City Walking Street Based on Computer Multimedia: A Security Perspective

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Pages: 292–301

Abstract: At present, there are many unsafe factors in city walking street, how to carry out the relevant regulation in the light of these unsafe factors, we need to analyze from different aspects. In this paper, the author research on barrier free design of the landscape environment of the city walking street based on computer multimedia. Through the analysis of various cities walking street landscape environmental unsafe factor, we study and formulate detailed assurance city walking street landscape security measures. At the same time, we put forward the design criteria of general appearance and size of city walking street landscape system, and find out a reasonable design scheme for the accessibility of urban pedestrian street landscape system.

Keywords: Barrier free design, Computer multimedia, Security perspective, Walking street

1. Introduction

The safety problem of street landscape environment construction of the city on foot, for ordinary people, not too concerned about these issues, but for those children in our lives, the disabled and the elderly, the construction specifications of city pedestrian street landscape environment relative to guarantee at a higher level (Cao, 2014; Kapetanakis,2014). Because if in the city pedestrian street landscape environment, even if it is a small point of failure, it will lead to its activities blocked, serious will lead to the risk of life (Wang, 2016). So, in order to avoid accidents caused by injuries or death, it is necessary for us to establish a good city pedestrian street landscape environment barrier system, the first is to coordinate the relationship between man and environment, protect the environment based on the environmental landscape construction facilities to create a good, then is to teach people in the face of danger (Mora, 2014; Skelton, 2014). However, at present, only do these two aspects of the work is not enough, because the solution security problem are in many aspects, so we should think through this to find the corresponding safety measures.

In today's information age, digital multimedia has become the latest information carrier after the language, text and electronic technology. Information processing technology, computer technology and communication technology, and information related to the integration of the technology, it has produced a digital multimedia technology (Suyoto,

2015; Tagliafierro, 2016). Digital multimedia technology is the use of modern computer and communication method, text, images, sounds, graphics and other information for centralized processing, make the abstract information become able to perceive, interact and be a technical management. Under the renewal of technology and material, multimedia art emerges as the times require (Yasmin, 2015; Yan, 2015). It is based on digital technology and modern media technology, will be the rational creation of human and emotional thinking. It has changed the traditional art of people passive experience, enhancing the initiative of appreciation and participation, increase the interaction between the public and the works of art (Leite et al., 2014; Zhang, 2014). It can be said that the development of multimedia technology, to promote the dissemination of information and artistic creation, improve people's participation in the enthusiasm and interest.

2. Safety of urban pedestrian streets

2.1. Multimedia urban landscape

The role of digital multimedia technology in landscape architecture, landscape planning and design of production units, each unit in the process of city gardening work, much of the application of network information retrieval and query, publish, including landscape information program collection, network program evaluation etc.. In addition, the geographic information system (GIS) for landscape architecture professionals provides intuitive and rational spatial analysis tools, extract the various areas of the global information through GIS, a spatial database required in landscape assessment and planning, can extract the required data for each kind of landscape if statistical information, and edit output. The landscape includes landscape planning and design and landscape real operation, practical work, usually need a large number of data and graph information to express the intention of landscape design, in the hope of not built before you can see the design effect, timely according to functional needs, artistic requirements, environmental conditions and other factors to modify relevant personnel put forward the

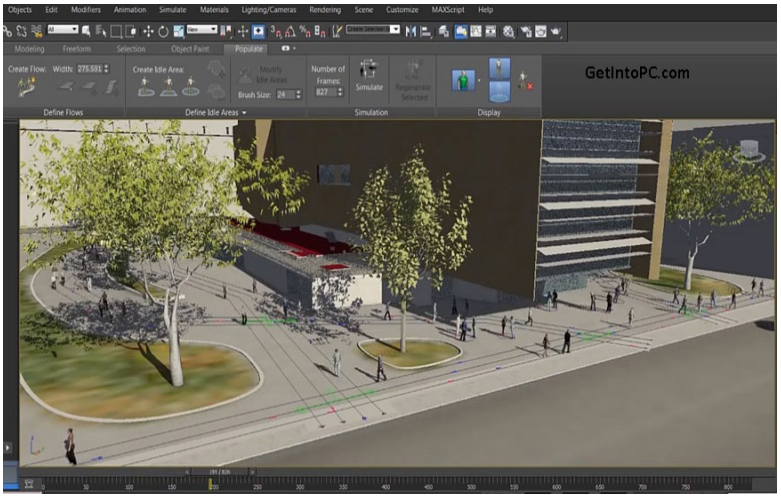


Figure 1 – Multimedia urban landscape

proposal and the design scheme of decision making. In this way, it is a good solution to the previous drawings to modify the difficulties, the expression is not intuitive, but also left a lot of regret after the completion of the problem. In addition, the three-dimensional model can also be established to display the three-dimensional effect. The 3D model of landscape architecture is a kind of image and graphic expression, it should be combined with the global positioning system technology, geographic information system, the complex natural landscape pattern, through integration with Internet, Web, voice link and photos, browse and enjoy the various attractions multi-level comprehensive users dynamic and multi angle in the three-dimensional virtual landscape architecture, to feel personally on the scene.

The influence of digital multimedia technology on urban architectural design, in order to meet the increasing needs of the people, in the architectural design of digital multimedia technology has a higher requirement. In practical work, we need to combine the environmental problems and the rational use of space to form an environment for people to use, live and watch. Real estate vendors have begun to use three-dimensional graphics to display and promote the advantages of the project before the house began to build. In order to meet the needs of the times, many colleges and universities in the course of making up architectural design three-dimensional thinking education and 3D graphics, which shows that the community has been applied to the digital multimedia technology in this project expressed concern and support. For a long time, we can according to customer needs, the function of art needs, environmental conditions and other factors in this field, outlines the general design intent, then the digital production personnel according to the design intent, the two-dimensional graphic design of the CAD format, into the standard data file format to the 3D modeling software, 3D drawing on reasonable distribution for the environment and space, to determine the rationality of the design.

2.2. Pedestrian street safety problem

The most common risk in the city pedestrian street landscape environment is a fall phenomenon, the elderly and disabled children, the incidence is relatively large, the

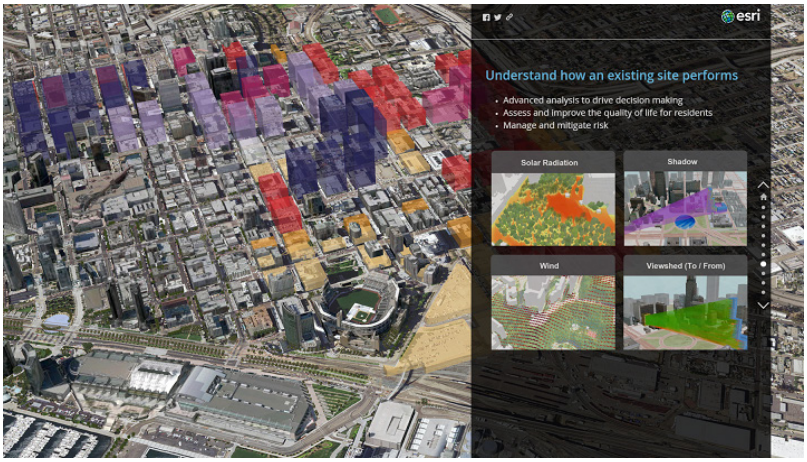


Figure 2 – GIS computer aided design

most prone to accidents in the process of walking, because of vision problems some handicapped or elderly people, the lack of judgment for dangerous things, will not be able to predict the risk okay, so the relatively easy to stumble or fall. And that's more for those with poor physical balance. For children, the nature is playful and energetic, love some of the more intense jumping exercise, so it is prone to fall, fall is a common accident, take certain measures can be effectively avoided, but will appear, also it does not necessarily exist only child, the elderly and disabled people, there are a lot of body in healthy adults, inattention condition, will accidentally fall, so the measures to solve specific issues should be viewed. Deal with the fall, in the urban landscape environment, there is an accident that is more serious than the fall, it is falling. The risk of this accident depends on the height of the drop and drop the physical condition, if it is a normal person who fell from the two floor relatively high altitude, it may also only minor injuries, if a body disease people fall from such a height, is likely to appear serious hurt even life danger. This also requires us to safety issues specific to the dialectical view, however, no matter what kind of risk factors or the degree of risk, we should try our best to solve the, to reduce the risk caused by the people to travel and activity. Specific method is to increase the urban landscape environment, the existence of a high degree of protection of the construction of the gap.

After the analysis of the fall and fall of these two security issues, there is still a common security problem that is the collision. Now in some places, often can see for the blind building was occupied, causing the blind during the walk, it is easy to collide. Because of the development of city construction, the road continues, many road, in the construction environment is not in place in case it is prone to accidents. This also makes some of the physically unable to walk wheelchair patients, there is no space to walk.

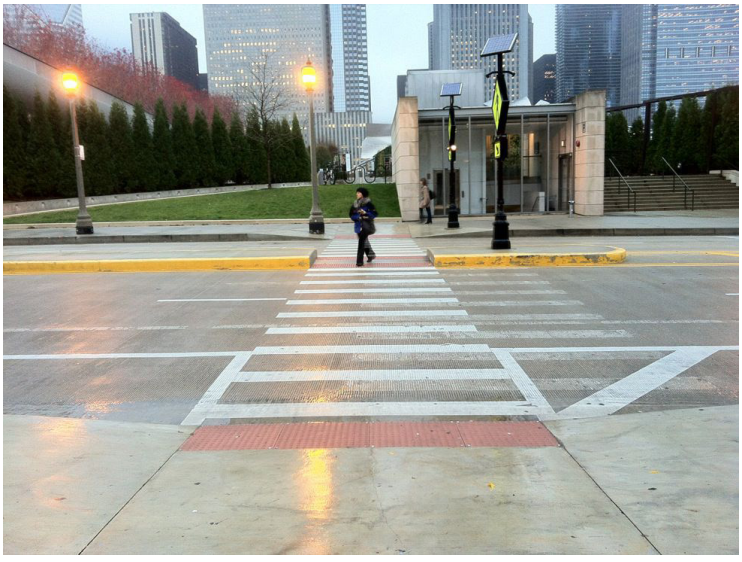


Figure 3 – Pedestrian street safety

3. Design method for improving the safety of urban pedestrian street landscape environment

In view of the above common security problems, the fundamental solution is to strengthen the urban pedestrian street landscape environment of the safety design, the main method of measures:

1. Construction of a neat and orderly non slip surface: In the city there is indoor and outdoor ground tilt, should take the corresponding measures, in daily life, we can see a lot of people, because the ground is too slippery and fall, mild sprain, severe fractures. And this phenomenon is particularly prominent in the rainy day. Therefore, it is necessary to construct the non-slip work. In the process of lying on the ground, but also to ensure that their level of consistency, to prevent the uneven laying of the uneven, and cause tripping phenomenon.
2. Installation of a strong extension of the arm for the disabled: Because of this special group of persons with disabilities, in order to make it through the stairs or ramp is not unexpected, need to increase the firmness of the handrail, so that each arm fulcrum could bear the weight of 120 kilograms, and on this basis to increase deputy at both ends of the length, specific for 0.35m, so you can make in the blind can be relatively stable, will not feel uneasy. The width of the two ends of the arm is designed to be either curved or bent to both sides, thus reducing the influence of the width of the stair or the ramp.
3. Reduce the angularity of pedestrian street landscape construction, strengthen the construction of the handrail height step ramp: Now the city pedestrian street landscape environment construction, we should try to change the construction style of people in the corners, avoid accidentally fall, accident met and the occurrence of sharp corners. And for some high slopes, should strengthen the construction of the railing deputy, especially in some areas or places more people, but also requires a strong degree of protection work of the road. In the case of children or children, the distance between the railing of the railing of the lower rail should be within the 9cm, and do not set the horizontal grid barrier. Compared with the stairs, the height difference of the ramp is not so big, but from the angle of safety, it is necessary to set the side wall or railing. When people pass through the ramp, or at the top of the rest, can be through the railing to ensure its safety, improve people's sense of security for a high degree of. The ramp should also be set up some security block table, its height is best kept at about 50mm, so you can bring people to safety in wheelchairs or crutches.
4. The step or ramp of the walking street is put out of the anti-slip mark, and the construction of non-slip is strengthened: To pay attention to the construction of the slope of the ramp, for its non-slip facilities, to start from the end and the beginning. The construction should pay attention to the pavement, to prevent eye diseases and accidents due to personnel vision problems. To strengthen warnings to the facilities of the ramp ends, to remind people to slow down the attention of anti-skid, especially in the rainy day, but also increase the safety of red light slip font.
5. In the construction of the pedestrian street blind specification: At present, the blind is any occupation phenomenon meet the eye everywhere, which leads to the disabled travel has become very convenient, lost security space. So, we should

strengthen the focus on standardizing design work of the blind, blind design principle has three main points; the first is to protect the vision problems, there is a relatively safe walking space; second blind design is to reduce interference to the normal pedestrian mall; third and more people, to the appropriate the distance and the other road, and from the middle of the segmentation, the green belt or the green wall form, but also in the road outside the establishment of stone, to maintain its green belt or green walls and stone road and flat line. If the edge of the stone and uneven road, it will give a wheelchair disabled people travel inconvenience, for people with vision problems, but also provide a reminder. In real life, due to its proximity to the sidewalk curb tilt angle is larger, it is easy to make a person in a wheelchair through, cannot control its speed, so, in the construction of inclined curb this design, can choose to build a platform in the middle of the sidewalk, a slope at the end of any construction so, to solve the safety problems for wheelchair users good through the sidewalk.



Figure 4 – Blind street design

4. Barrier free design of urban pedestrian street landscape environment

For the urban pedestrian street landscape system, the barrier free design mainly revolves around two aspects, namely, “shape” and “scale””. Design is actually a kind of people’s subjective consciousness, to achieve this kind of subjective consciousness, and it will be transformed into a real thing, which is bound to be a form of existence. People in the design of products, mostly from the perspective of the United States, and the form is a demanding of the United States of external manifestations, the same form is the most primitive state of all substances. The shape design of urban pedestrian street landscape system is mainly based on the rational use of resources and low consumption of manpower and material resources. With respect to the form of loose scale design of pedestrian street landscape system is more stringent, in the design of the main problem, some people with disabilities scale research and life, there is a close relationship between

the child and the. These are the factors that need to be taken into consideration in the scale design. In the design of the urban pedestrian street landscape system, the design and analysis are carried out from the following two aspects.

4.1. Design direction of arm

The design of the arm is mainly aimed at people with disabilities. Since most people are not very good to maintain their own balance, so, the construction of the arm is very important to its very important, the use of appropriate arm shape, a reasonable installation location, can effectively avoid the phenomenon of falling. The cross section of the handrail, mostly round, which is about 40mm in diameter, handrails should be set to double the height were 65cm and 85CM, the handrail is made of double, because of the disabled and children. In order to allow people with disabilities to use the railing to maintain consistency, the rest of the arm can be designed into a L shape. Ensure that the inside of the arm and the wall between the left and right 0.40m space. This can facilitate the people to grasp the railing, will not produce friction with the wall. For some people with amblyopia, we should strengthen the colour and texture of the urban pedestrian street landscape facilities. The safety measures of walking street, which is suitable for a number of people, are designed from the specific analysis of the hint, decoration, comfort, and slip resistance.

4.2. Method of designing the bottom interface

In the design of the bottom interface of pedestrian street landscape system, we focus on the outdoor ramp, blind and curb ramps to carry out specific analysis, see how to reasonably design.

1. Outdoor ramp design

Its main ramp form requires us to according to different terrain characteristics, combined with the actual situation to carry out the design, the specific design includes L shape, linear shape, U shape. Because the ramp uses more mainly can be connected to the ground and high altitude, the establishment of good access roads between them; so, at present many of the city's new project facilities, are applied to the construction of the ramp, and after the completion of the people's praise. However, it should be noted that the ramp was officially put into operation, the two ends of the hanging signs, warning people to pass, attention to safety, slip or fall. In the modern outdoor ramp, we are more common linear ramp, because it is more convenient to use, not time-consuming, so it has been widely used.

For the form of the ramp design, we need to consider the actual environment. Because of the imbalance of the centre of gravity when taking into account the wheelchair users through the ramp, so, in the design of the ramp should be avoided as far as possible, and the circular ramp curved ramp design concept.

Slope of the ramp can be based on international standards, to be less than or equal to 1/12, the depth of the buffer zone is greater than or equal to 1.55m. This slope is designed primarily to allow wheelchair users and the elderly to be able to pass under the conditions of autonomy. In the urban landscape environment of the ramp design, for wheelchair

users to accept the maximum slope value of 1/20, and if it is in the condition of the region, will be adjusted in the slope of the 1/16 is the most appropriate. The ramp ends and wheelchair set buffer zone with depth more than 1.50mm, which is mainly in order to increase the wheelchair users uphill momentum, reduce uphill resistance. If some areas of the slope gradient of less than 1/12 design standards, you can reduce to about 1/10. The width of the ramp can be combined with the local flow and the distance of the ramp, according to the reference value provided to the specific analysis. If the ramp flow of people less and shorter distance, ramp width is greater than 1.2m, to achieve a body sideways width and a wheelchair width; if the slope road traffic, and long distance, ramp width is greater than 1.5m, to ensure two wheelchairs by, in fact, in the life of some of the large flow of people city landscape environment, the surface width of ramp is greater than 1.8m, this design is common in china.

2. Blind design

The basic types of blind design mainly have two kinds: walking blind road tips and strip the dot shape. Walk the streets in the city landscape environment, for some of the major roads should be set accordingly in the blind road, bridge, pedestrian underpass, bus station to design the corresponding origin prompt blind, blind regulations construction, remove obstacles on blind. Blind travel is arranged at both sides of the sidewalk, and set the stone in the flower bed or the blind side, the walking safety of patients with eye protection. In addition to the main function that dot the blind patients with blindness, also have regional features such as tips, city square, bus station, pedestrian underpass, and bridge, each place that according to their environment are different, so that blind people can identify obstacles well.

For the blind width of the best in 0.3m to 0.6m, each bar travel tips than the blind brick surface higher than about 5mm, to make people feel to walk on. According to each person's walking speed and step length is different, need to build with prompt action in the intersection and blind curb ramp edge, to avoid accidentally crossed stone edges lead to fall. For the straight blind width can be about 5cm, need to design tips in moving the blind ends and the corner, suggesting that the blind length is greater than the width of the blind road, at about 0.45m.

3. Edge stone ramp design

In the bottom of the interface design, the edge of the stone ramp design is also very important; the basic appearance of the form of one side and three sides, compared to the side of the stone ramp is more practical. In the current city pedestrian street landscape environment construction, in order to enable people to be more convenient and safe through the crossroads, through the vertical stone separating the sidewalk and driveway is very good, and the corresponding curb ramp is arranged in the space between. Through the comparison of practice, we know that the application of the single edge stone is more convenient, its main shape is rectangular and the sector. For the three stone ramp its history is long, its main application in the intersection corner, and set the crossing crosswalks at arc tip. The width of the side slope and the width of the sidewalk are the same, the width of the three sides of the ramp should be greater than or equal to 1.2m. The fan-shaped curb ramp port width should be greater than 1.5m for the upper width single stone slope crossing road corner should be greater than 1.8m, the slope of

the ramp side stone should be less than or equal to 1.2m, the slope of the ramp three stone surface should be less than or equal to 1.5m.

5. Conclusion

Through the analysis of the barrier free design of city walking street landscape environment, so if we want to build a harmonious city landscape environment, must be based on corresponding standards, strengthen the hypothesis of the city landscape design, combined with the actual life, starting from the special group of people's point of view, and strive to build a harmonious and unified city accessibility the landscape environment, provide more security and good security convenience for people living and travel.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 18/05/2016
Aceitação/Acceptance: 12/08/2016

Study on Collaborative Mechanism of Social Organizations Participating and Social Governance in Anhui Province Based on Data Mining

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Pages: 302–312

Abstract: With the development of information technology, computer data technology has been widely used and social and economic analysis. In this paper, the author analyzes the collaborative mechanism of social organizations participating and social governance in Anhui province based on data mining technology. Social organizations have a natural advantage in participating in public affairs, providing public service and make up for the vacancy of social governance. At the same time, the government plays a leading role in social governance, but it should also take care of the main body status of the social organization and the operation mechanism, promote social organizations to participate in social governance mechanisms.

Keywords: Collaborative mechanism, Social organizations, Data Mining, Social governance

1. Introduction

Social management is an important part of social governance. For the metropolis, the particularity and difficulty of social management not only displays in the spatial dimension of geography, but also in the time dimension of metropolitan development (Chen, 2014). Reform and opening up the accumulated social problems are complicated, and the city needs special treatment to be effective. With the continuous deepening of reform, system of metropolitan social management in China will face the change of depth and breadth, and the advantages of social organizations in social management have become increasingly prominent (Esteban, 1994; Freixo, 2014). How to play the advantages of social organization, to build a long-term mechanism of social management has a very important theoretical research value and practical significance (Jiang, 2009). The metropolitan social governance in China has experienced the process of institutional change, although the mechanism of different governance is different, but the pattern of the national dominant has not been fundamentally changed (Lu, 2013; Mora, 2014). Before the reform and opening up, whether in the city or the country, China's social practice is a single management mode, namely, the party and the state unit system to realize the management of the society. In view of the effectiveness of governance, social management mode under the condition that focuses on the control methods are very effective, but the objective also caused the high cost of social governance and social loss of autonomy.

Large urban social organizations are relatively developed, the ability and level of participation in social management is relatively high, with a representative. Under normal circumstances, the existence of urban social organizations has comparative advantages, both social demand and development of natural advantages, but also has the regional advantages of talent pool and training (Sá et al., 2014; Zhang, 2015). In particular, a number of highly specialized social organizations, they have a large number of professional and technical personnel, to grasp the specific professional technology, with high human resource endowments, which is the value of their participation in social management (Pan, 2006; Qian, 2013). At the same time, we must see that the social organizations belong to public domain is different from the country, there is still a gap between their mechanism and governance of the party and the government target, if there is no institutional constraints, the game of social organization of Party and state will be to induce a new crisis. Don't be in "strong government, weak society" under the background, the government's strong position how cannot inhibit the role of social organizations, the government plays a leading role in social governance at the same time, to fully take care to social organization's main body status and the social organization's operation mechanism and rules, to be fully metropolis show.

2. Computer neural network and data mining

With the development of computer and network technology, the relevant information is very simple and easy to be realized. But for a large amount of data concerning wide fields, the former simple summary, according to the specified model to analyze the statistical method is unable to complete the analysis of such data. Data mining is a kind of intelligent, comprehensive application of various statistical analysis, database, and intelligent language to analyze large data technology. In a simple way, data mining is to extract or "dig" knowledge from a large amount of data. Data mining is a process, which uses one or more kinds of computer learning techniques to automatically analyze and extract knowledge from the data of the database. The knowledge acquired by data mining is given in the form of a model or data generalization. Knowledge discovery in databases (KDD) is a term that can be used to exchange data with data mining. KDD is a scientific method for data mining.

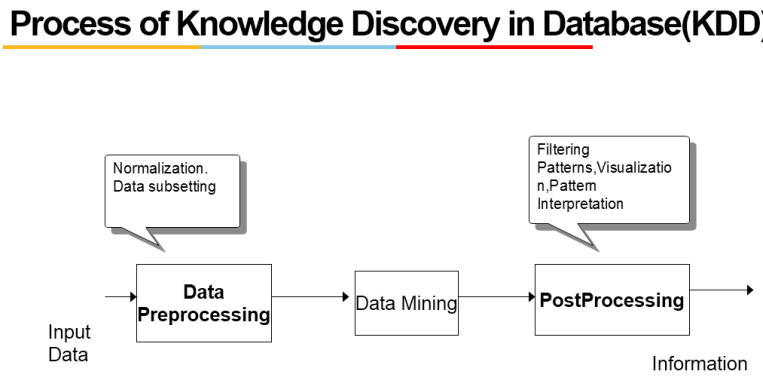


Figure 1 – Knowledge discovery

Neural network presents a mathematical model, which attempts to mimic the human brain. Knowledge is often represented as a hierarchical set of processing units that are connected to each other. These processing units are usually called neurons, which indicate the relationship between the brain and the brain. Each node has a weighted connection between the other nodes on the adjacent level. Each node from the node connected to the input, and combined with a simple function, the use of weights to calculate the output value. A neural network is an information processing system consisting of one or more neurons. For the M neural network with input nodes and output nodes of the N, the relationship between input and output can be regarded as a mapping model of m dimensional Euclidean space to n-dimensional Euclidean space. The error between the actual output of the network and the expected output is a measure of the performance of the network. Neuron is the basic processing unit of the neural network, which is generally expressed as a multi input and single output nonlinear computing device, and the network structure can be displayed from the single neuron structure. The advantages of data mining based on Neural Network: (1) the neural network can work very well when the data contains a lot of noise input data. Neural network evaluation function, such as S shape function can naturally smooth the external and random errors caused by input data variation. (2) the neural network not only can handle and predict the numbers, but also can process and predict the classification results. However, the transform of categorical data is a difficult problem. (3) the neural network can be used to request the information contained in the data in the data.

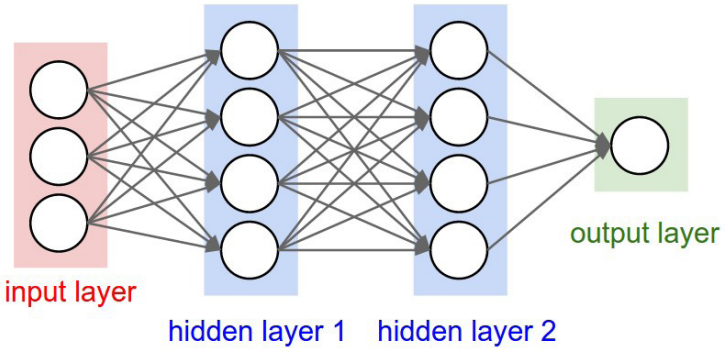


Figure 2 – The neural network

The process of data mining based on neural network is generally divided into three stages: data preparation, rule extraction and rule evaluation.

1. ***Data preparation:*** The first condition of data mining is to have data, of course, it is not enough to have the data. Data preparation is a necessary step in the implementation of data mining. Data preparation is the definition, processing and representation of data, and these data are the data after mining, finally make it adapt to the specific data mining methods. Because the data in the database are often noisy, incomplete and inconsistent data, if such data for data mining, search the data mining process is misleading, these are the issues of data so that to improve the quality of data set, in order to obtain high quality

knowledge model of data mining, data cleaning is essential. Data cleaning is mainly to fill incomplete data, correct the wrong data and filter duplicate data.

2. ***Rule extraction:*** Because the neural network has the advantages of high classification accuracy and good robustness in classification, many researchers focus on extracting rules from neural networks. The basic ideas are based on the search algorithm, for any given hidden node or output node, first extracted symbol rules, and then the generated rules according to the network transmission path connection and finishing. Generally speaking, extracting rules from neural networks is a complex process.
3. ***Rule evaluation:*** The evaluation of the rules can be based on the following assessment rules goals: (1) is the optimal sequential extraction rule evaluation is one of the most important standard comparison rules, so that it has the best effect in a given data set; (2) the correctness of the test rules are extracted; (3) detection in neural networks and how much knowledge not be extracted; (4) the inconsistency between the rules and the trained neural network detection is extracted out of the place.

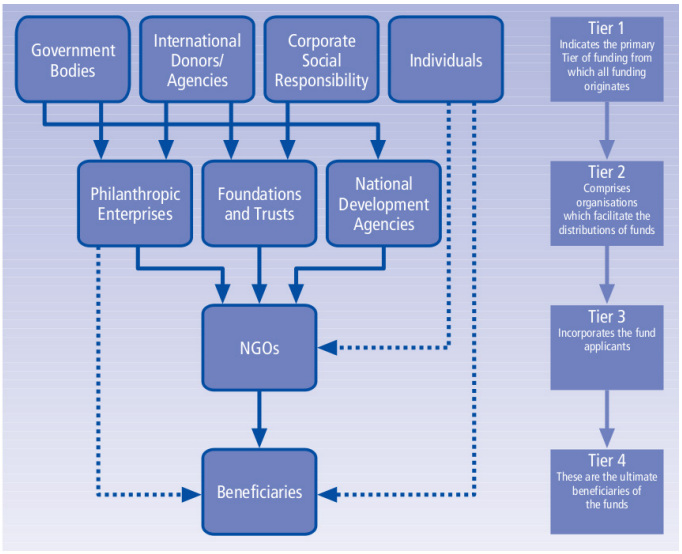
3. Social organizations participate in social governance

3.1. Social organization

Social organization participation in social management is also one of the forms of social democracy and public participation. With the deepening of the democratic politics, the social citizen began to worship and pursues democracy, freedom, independence and autonomy. The concept of "citizen consciousness" of common citizens are no longer a student with difficult public management proprietary vocabulary, instead they through various ways, such as articles, blogs, posters and other ways of deepening understanding and opinion on citizen consciousness. The formation of social organization is highly voluntary, can be fully assembled with professional knowledge in social relations of individual citizens can form a think-tank, ways to expand access to resources and improve resource scarcity in social management problems. Citizens through the association activities, choose their favorite social groups, the expression of different views and opinions and suggestions in the organization, in fact it lies closely connected with their public affairs initiative. The social organizations that participate in the social management are in essence the legal carrier of the citizen's full use of the decision power of public affairs, and one of the ways to realize the social democracy.

Social organizations participate in the management of social public affairs rooted in the internal logic of social organization. This endogenous logic comes from the preference of the organization subject, namely the social public's action tendency. The formation of social organizations is often based on the common action goals of citizens, such as voluntary, trust and solidarity. The public to form social groups in the association process, expression and appeal and interest according to the default rules of the organization, and for individuals with limited social interests in small groups, continue to promote civic consciousness, enhance the resolution of citizens in public life and initiative. With the continuous evolution of gradually advancing social democracy and civil society, the members of the society is the inevitable requirement of building a harmonious society of social justice; harmonious society is a prerequisite for sustainable development of

social civilization, provides good environment condition for the orderly development of social organizations. The social organization is the spokesman of the social justice; the speaker and the actor, so the social organizations participate in the social public affairs are driven by the logic of social justice.



Source: Adapted from Corporate Social Investment Handbook (2003)

Figure 3 – Non-Governmental Organizations

The existing social organization in the metropolis although experienced a certain time of accumulated experience, but due to the characteristics of China's social restrictions, voluntary failure problems but contrarian growth, hindered the development process of social organization, but also influences the social action effectiveness and management efficiency of social public affairs. On the one hand, social organizations in the social management of professionals in terms of long-term supply shortage, and the brain drain phenomenon, to a certain extent, restricted the participation of social organizations. Because of the voluntary and nonprofit participation of social organization members, the staff of social management will be faced with a shortage of personnel, instability and so on. Institutionalization is one of the common understandings of social organizations to participate in social management. The so-called "institutionalized" means the participation of the main body in a just system environment, the formation of a stable actor structure, and can get other main political identity process.

3.2. Mechanism deficiency

Objectively speaking, although the function and role of social organization in the field of social governance has been the initial play, but there are still many problems. From the game analysis of social organizations in the social governance can be seen in the main body of nurturing and support mechanism of social organization is not perfect, social organizations to participate in social governance to establish coordination and

cooperation mechanism is not perfect and the governance process is not mature and so on, are the result of governance inefficient or ineffective, even is not able to fully participate in social organizations the deep-seated reasons to the governance. Combined with the actual analysis, influence of reality and history, system and concept and other factors, the overall level of development of social organizations in China is still very low, the corresponding mechanism construction lagged behind the implementation of network governance in competition and cooperation, communication and learning, sharing and complementary, multi element and governance model of social governance there is a considerable gap pattern. Therefore, actively explore the social organizations to participate in social governance mechanism defects and deficiencies, analysis of its cause, is currently the primary meaning of social governance innovation. Governance subject diversification is the precondition of the application of network governance theory to the construction of social governance system, and the social organization is the development of economic and social development. As a "post occurrence organization", the community's awareness and acceptance of it are still inadequate, coupled with the extensive and spontaneous growth of the system outside the organization, the government is difficult to make an accurate legal position.

- ***Lack of legitimacy of the basis of identity:*** First, from a legal perspective, today, China is still not a complete laws against social organizations, social organizations to unify the clear definition, rights and obligations, and the status of personnel management, and security and related legal liability etc.. Social organization in the growth and development at the same time, the legislation has not followed up in time. The rule of law construction is lagging behind, so that the identity of the social organization is questioned, the legal status of the main body is missing, but also hindered the healthy development of social organizations. Secondly, in the management system level, such as the legislation as the legal basis for the legitimacy of social organizations, the political basis for the legitimacy of social organizations is related to the management system and administrative regulations. The dual management system of social organization is the current management system of social organization in China. Refers to the social organizations should go through the business unit in charge of the review, and submit the approval document of the competent business unit to the registration authority, and then by the registration authority to approve or disapprove the preparatory decision, so the social organization to set up a double unit and the competent departments of the competent registration authority approval.
- ***Social identity is not high:*** The legitimacy of social organizations is not only including the legitimacy of the identity, but also includes a wide range of social identity. Social identity is not only the premise of the existence of social organizations, but also the foundation of social organizations to carry out the social governance activities smoothly, however, it is not the case. The new things and the inertia of the thinking of the fierce collision, the social organization of social identity is still at a very low level. Mechanism, as a kind of national will, is a legal procedure, which is recognized and implemented by the government. However, the use of the mechanism for the community needs a process of adaptation and acceptance, in order to get the corresponding social identity. To analyze the relationship between identity constitute the executive

subject from the embedded collaborative mechanism, namely the government, market, social organizations and other subjects for each other's participation in social governance mode and method of participation in social governance recognition. First of all, the government is represented by the authority of the state, is the national long development mainly relies on social management, is also the leader of social governance, and whether from legal or social identity of folk generated are already formed and fixed into the heart. Second, since the implementation of market players in the market economy, the continuous development, capacity and effectiveness of participation in social governance in general has been approved and accepted by the government and society, so the high degree of recognition on the subject. Third, social organization as a new force in social governance and executive subject, although widely emergence and development, but the government and market of the traditional subject still unfamiliar, resulting in uncertainty evaluation of the role of new things, further formation of uncertainty on the joint governance.

- ***The deviation from the relationship between the government and the government:*** At present, the state of the relationship between social organization was not completely out of strong government and weak society, the existence and development of social reality in many tissues depends largely depends on the will of the government or social organizations so easily become a vassal of the government, choose to become extending the interests of government departments and government officials retreat tools. At present, to separate the government has become an important task of cultivation and development of social organizations and ongoing, due to historical and realistic factors, the speed of progress still needs improving. The deviation of the mode of production causes the social organization to take the government instruction as the benchmark on the action target, and the excessive resource dependence in the course of action. According to the strict definition of modern NGO, social organization should pay attention to the relative independence of the public sphere and the provision of public service. But at present the common interests of the social organization is not entirely representative of certain social groups, more is to exist as a government department deputy, to the government management system together, hope can change to public participation by private. On the superior, borrow to promote the organization's development and seek more benefits. Social organization as an important force in the field of social governance is indeed an important supplement to the government management of the community, but from its own origin should be representative of the broad masses of the public interests and their own interests.

4. The realization mechanism of social coordination mechanism

4.1. The adaptation mechanism of social organization participation

Influenced by the complex environment of social cooperation and governance network, there are differences in the effectiveness of social governance in the network. In order to fully exploit the advantages of each function of governance, improve the level of social governance of the whole network, need to ensure and enhance the level of external adaptability of each network participants, namely the establishment of the network

structure and the reasonable arrangement of the order. Therefore, the adaptation mechanism is introduced to guarantee this requirement. In terms of social organization, the adaptive strategy of the main body position, relationship building and process reengineering is the premise condition to fully guarantee the participation of social organizations in social governance. On the social organization for the establishment of network governance pattern of social governance of multiple subjects, solid foundation to the formation and development of social organizations, social organizations play a more effective function and unique advantages in the field of social governance, to achieve its own value and social value, but also for social cooperative governance smoothly paved the way. The key to the establishment of the subject lies in the acquisition of the legitimacy of social organizations and the adjustment of the cognitive structure of social organizations.

1. ***Reform of the dual registration management system:*** The social organization of the dual registration system registration due to the high threshold, the registration procedure is tedious, leading to the current real many legitimate social organizations, especially the grassroots social organizations registration prohibitive for registration, unable to obtain legal status beyond system, so the reform imminent. Under the situation of the current legal system is not perfect, according to the characteristics of different types of social organizations, the implementation of differentiated, classified registration management is very necessary. First of all, the direct registration management needs to further expand the scope of application, while reducing the registration conditions. Such as community, public welfare, social services and other social organizations without affiliated units and corporate identity registration directly to the Civil Affairs Department, or by direct filing system. In reducing the pressure of government departments to manage, but also to a certain extent, improve the management ability of the organization itself. Secondly, for social services, the need for industry norms of social organization, the competent departments should be clear, but need to reduce the administrative examination and approval procedures, reduce the competent departments of the administrative examination and approval function, weakening its discretion, gradually shifted from business to business and guiding the transformation of the way.
2. ***Establishing social organizational identity and status:*** Relevant laws and regulations of the support is the guarantee of social organization has the legitimacy of social governance, while social organizations to improve and perfect the relevant laws is not easy, but still need to mention the fast pace, clear direction, continuous efforts. First, the government should improve the legal level, the level of innovation in the legislative model as soon as possible the introduction of legal norms on social organizations. Clearly define the nature of social organizations, types, should do the obligations and enjoy the rights and other content and further detailed provisions of the organization registration required qualifications, materials, registration methods and relevant regulatory rules. Second, improve the organization law system, the legal form to determine and optimize the organization of social governance. The government should organize according to law, gradually realize the flat structure and social organization to decentralization, decentralization, promotion and clear social status. Third, in the laws and regulations of social organization on the government

to intensify propaganda and organizational learning efforts, popularization of legal knowledge, enhance social organization for understanding and awareness of legality, encourage social organizations to automatically and consciously and willingly cooperate with relevant departments to carry out the registration

3. ***Strengthening the adjustment of social organization structure:*** The research shows that the social organizations have a clear weak autonomy and dependence because of the lack of support and norms of social organizations. If you need to ensure that social organizations into full play in the field of social governance function and role, then the government first needs to cultivate and develop social organizations in the ideological orientation will be incorporated into the construction of socialist modernization, improve national governance system; improve the tone of foundation engineering of national governance capacities such. Need to enhance the cultivation and development of social organizations to their career development and construction height, fully aware of Chinese civil society development process, the relationship between state and society, the reconstruction of the government's economic reform and administrative reform smoothly, all cannot do without the social organization development and growth, cannot do without the in the field of social governance intimate partner. To abandon the concept of social organization and the wrong understanding of the new things to eliminate the sense of conflict and strange, changing the structure of thinking, to adjust the awareness of social organization.

4.2. The cooperative mechanism of social organization participation

In the mode of network governance, building a mature social governance cooperation mechanism, the formation of cooperative interaction of multiple governance of the situation, can effectively guarantee the healthy and orderly development of social organization. The construction can make the government and social organizations, the market and the new citizen fully integrated use of social resources and smooth cooperation mechanism, unified thought of joint operation, and improve the timeliness and effectiveness of social governance. The establishment of social governance mature cooperation mechanism is still set up in cooperation on governance mechanism of map, to ensure that cooperation in information transmission, resources integration, cooperation, establish the legitimacy of choice, benefit distribution and cooperation in all aspects of the smooth expansion.

First of all, the government should have a complete and timely release channels and methods in the public affairs of the government. Government departments, especially the local government should further improve the e-government platform for the government information disclosure work. With the current rapid development of information technology, e-government, e-government and information resources sharing technology matures, transfer and sharing between the government and other governance information should keep pace with the times, the rapid development of e-government, can effectively promote the efficiency of the Chinese government, to the integrity of the social governance open and transparent. Among them, the party and government cadres should strive to strengthen the e-government, public cognition and grasp the related knowledge of information training and learning, improve the level of

information and information disclosure skills; the government should strengthen the construction of public information section of the electronic platform, expand distribution channels, improve the government information release mechanism and feedback mechanism of consultation, convenience the effectiveness of the promotion of social information; pay attention to the annual reporting system. Make the social organization fully understand the government's policy and the direction of public governance, and grasp the opportunity to carry out social cooperation with the government. Second, the government shall adopt the social organization or the people's intake of information, strengthening the social organization of publicity and guidance, and set the widely accepted window and channel feedback information, to transmit information on the cultivation of social organization power and ability.

Because of the existence of the scattered resources held by the government with the reality, including administrative, financial, policy and system resources to deal with the increasingly complex social public affairs, to provide all the public services are often the high cost of management, the management efficiency is low and even invalid status. Through the use of social organization and social capital, professional skills, knowledge and demand of information resources have, it can make up for the shortcomings of the government management mode, through a joint network of multiple subjects, the integration of resources, play the main advantage, can better respond to the needs of society. And through the development of policy and social organization members of the guidance of education, strengthen the social organization of the use of their own resources to control the ability and the ability to expand the accumulation of resources. Rather than allow social organizations to use their inferior resources to play the role of social governance.

5. Conclusion

Social organizations have a natural advantage in participating in public affairs, providing public service and make up for the vacancy of social governance. The growth and development of China's social organization, not only conform to the trend of international development, but also with the national reform and opening up, the transformation of government functions, the market economy is mature and so on. In the continuous deepening of reform, comprehensively promote the rule of law under the background of social governance function transformation of government functions and decentralization needs to undertake social organization; citizens participating in public affairs to social organizations as the carrier; the growing demand of urban and rural residents basic public services for people in need of social organizations to provide. Therefore, it has become a very urgent task for our country to develop the social organization and make it in order to participate in the social governance. To fully stimulate the vitality of the social organization needs a reasonable logic and norms, that is, the scientific development of social organizations to participate in social governance top-level design, development and improvement of social organizations to participate in the operation mechanism of social governance. This requires us to clarify the scientific social organizations for relations with the role of social governance, excellent experiences of the western social governance, and lack of judgment and analysis of the current social governance mechanism according to the actual situation,

mechanism perfection and innovation rely on mature theoretical tools to promote social organization and social governance.

Acknowledgments

The work of this paper is supported by 2014 Ministry of Civil Affairs theoretical research policy issues "Perfecting Social grassroots governance mechanism" (Private letter [2013] No. 253); 2015 Anhui Province Department of Education College of Humanities and Social Science Project "Anhui society organizations in the community Collaborative governance mechanism will" (SK2015A485); 2016 Humanities and Social Sciences Research Development Fund major projects Hefei University (16RW05ZDA).

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Iberian Journal of Information Systems and Technologies

Recebido/Submission: 06/05/2016
Aceitação/Acceptance: 27/08/2016

Application of Information Technology and Data Mining in Evaluating Physics Teaching Effect

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Pages: 313–323

Abstract: With the rapid development of information technology, many new technologies have been widely applied in the field of education. Traditional learning concepts and learning models have been unable to meet the needs of the current learning status, especially in physics learning. In this paper, the authors analyze the application of information technology in evaluating physics teaching effect. By using data mining method, the result shows that online physical learning has a wealth of information resources, at the same time with a high interactive. Learners can choice the learning content and develop a learning plan according to their own interests, hobbies and knowledge structure. At the same time, we put forward the countermeasures to improve the effect of physics teaching.

Keywords: Information Technology, Data Mining, Teaching Effect, Physics education

1. Introduction

At present, it is a highly information-based society, and the social development put forward higher requirements to the members of the society. The traditional learning concept, learning mode has been unable to meet the needs of the current learning, learning change is imperative (Gopinathan, 2012; Chung, 2013; Gonçalves et al., 2015). And the modern information technology based on computer technology and network technology provides a new teaching environment for the study and development of the information technology. Using modern network and information technology to construct a reasonable and effective network teaching environment is a very important and urgent system engineering to promote the development of the network learning in our country (Gikas, 2013; Kozhevnikov, 2014). This is conducive to the smooth implementation of the project to make full use of our learning resources, universal learning quality, build a life-long learning system. With a large amount of network teaching resources, an important question is how to use and efficient organization problem. Although the development of computer technology has achieved great success, but now the research of network teaching also have many deficiencies (Mahony, 2012; Porter, 2014). The

network teaching is still in the sharing of teaching resources, traditional classroom education will just simply ported to the remote education system, teaching mode is single, the system self-centered, students can only passively accept the learning content the same system and not learning, teaching, communication with the intelligence of the system (Taras, 2013; Schoonenboom, 2014). Low level and not according to the learner's learning to provide suitable, personalized, interactive learning environment, in order to arouse learners' interest in learning. The learner's interest characteristics cannot be tracked automatically to provide personalized content.

Most studies still remain in the study of teaching theory, from the traditional teaching mode of behaviorism to cognitive learning theory to constructivism learning theory, provides a theoretical basis for the teaching based on network, but due to the complexity of personalized services in distance education network, in the actual application is not particularly successful (Veletsianos, 2013; Ferreira et al., 2015). To solve the above problems, the introduction of personalized service in the network teaching is necessary and efficient, personalized service means can provide learners with personal interest characteristics of teaching resources, with learner interest change or transfer, network teaching system can automatically track the changes and adjust the content of teaching resources. In this way, the learner's interest will be transferred (Wang, 2012; Vexler,2014). In the process of active learning, the personalized service will automatically provide the targeted teaching resources. Teaching resources not only stay at the level of simple retrieval, but also enhance the status of the dynamic and learners' interest matching (Mora, 2014). Learners according to their unique interests and teaching resources have good interaction, become positive active learners. In order to achieve this goal, it is an effective way to introduce personalized service in the network teaching of physics.

2. Related theories and techniques

2.1. The MVC pattern

MVC structure for the same data to provide multiple views of the application, it is good to achieve the separation of data layer and presentation layer. As a development model, MVC is usually used in the design and analysis of distributed systems, and it is also used to determine the relationship between the various parts of the system (Walton, 2012). According to the requirement of the MVC mode interface design variability, the interaction system can be divided into three parts, the model, the view and the controller.

1. View parts that represent model data, logical relationships, and status information to the user in a specific form. It obtains information from the model, and can have multiple different display forms or views for the same information.
2. The control unit is used to process the interaction between the user and the software. Its responsibility is to control the transmission of any change in the model, and to ensure the correspondence between the user interface and the model. It accepts the user's input, the input feedback to the model, and then realizes the model of the calculation and control, is to make the model and view the coordination of the work of components.
3. The model component is saved by the view display, which is controlled by the controller. It encapsulates the core data of the problem, the logic and the function of the computing relationship, which is independent of the specific expression and

operation of the interface. The model, view and controller are separated, so that a model can have multiple display views. If the controller of a certain view changes the data of the model, all the other views that depend on the data should be able to reflect these changes. Therefore, whenever the data changes occur, the controller will notify all of these changes to the view, resulting in the display update.

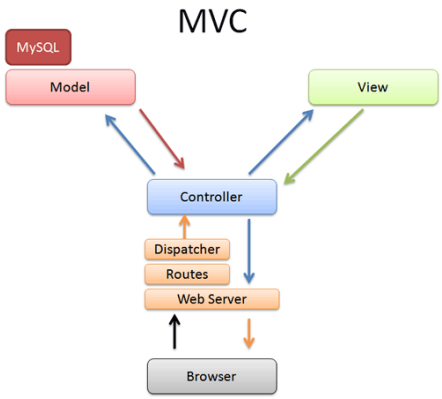


Figure 1 – The MVC structure

2.2. Data mining and SVM

Data mining refers to a complete process, the process from the large-scale database mining previously unknown, effective, practical information, and use the information to make decisions or enrich the knowledge. Data mining is just emerging in twentieth Century intelligent data analysis technology, because it has wide application prospect and attracts more attention, as a new and promising field of database and data warehouse research and application, it can be seen from the database or data warehouse, and other various types of data, or find out automatic extraction pattern knowledge. Its main methods are statistics, association rule, decision tree, neural network, rough set, Web mining.

1. ***Statistics:*** Statistical methods in data mining are based on the traditional methods of mathematical statistics, and many algorithms are derived from statistical methods. Commonly used Bayesian inference, factor analysis, correlation analysis, regression analysis and other methods, can be used to solve practical problems in the classification, modeling and other issues.
2. ***Decision tree:*** Decision tree is a kind of data mining method, which is based on a series of simple decision tree rules from a large amount of heterogeneous data. This method can be used in data mining to classify or predict the actual problems based on the discrete or continuous objects.
3. ***Artificial neural network:*** Artificial neural network is through the way of brain information processing simulation, information parallel complex network system, processing and nonlinear transfer in other words, the artificial neural network is a computational tool to identify data patterns or structures through data exploration and model building

4. ***Association rules:*** Association rules are rules that describe the relationship between different data items in a database. The discovery process is usually divided into two steps: frequent item set acquisition and rule generation. Association rule mining is through correlation analysis between items in the database to find out the hidden association rules, and combined with the existing information of the unknown speculation.

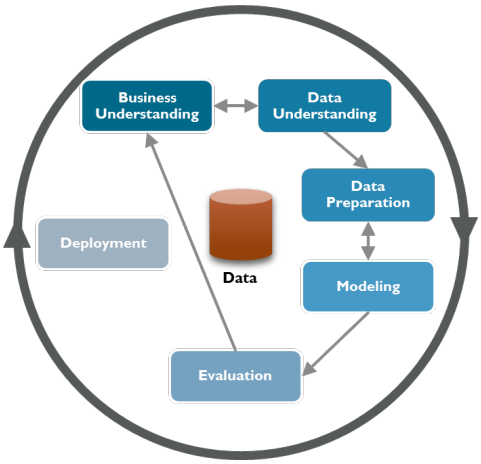


Figure 2 – Data mining

Here we consider a loss function of SVM; the original problem is constructed as:

$$\min \frac{1}{2}\|w\|^2 + C\sum_{i=1}^{l}\xi_i$$

$$s.t. \qquad y_i\left((w\cdot x)+b\right)\geq 1-\xi$$

The Lagrange function of the original problem is introduced:

$$L(w,b,a)=\frac{1}{2}\|w\|^2 + C\sum_{i=1}^{l}\xi_i - \sum_{i=1}^{l}\alpha_i\left(\left((w\cdot x)+b\right)-1+\xi\right)$$

The sample points on the two standard hyper planes are called support vectors, and the name of the support vector machine is obtained. Define the classification interval (margin) as:

$$\rho = 2r = \frac{2}{\|w\|}$$

As a result, the optimization problem for linearly separable SVM is:

$$\min J(w,b)=\frac{1}{2}\|w\|^2$$

The above problem is the main problem of SVM, which is a convex two optimization problem. The problem can be solved by constructing the Lagrange multiplier method to solve the problem.

$$\max W(\alpha)=\sum_{j=1}^{l}\alpha_j-\frac{1}{2}\sum_{i.j=1}^{l}\alpha_i\alpha_j y_i y_j x_i x_j$$

$$\sum_{j=1}^{l}\alpha_i y_j=0$$

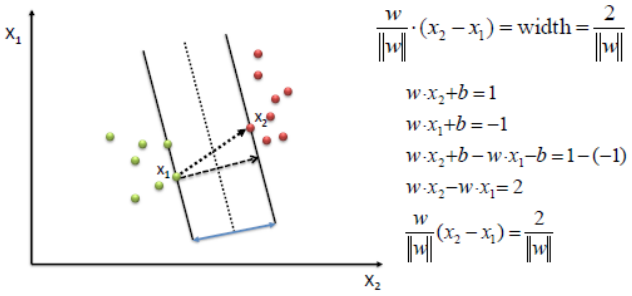


Figure 3 – SVM classification

3. Personalized physical learning based on Web

3.1. Advantages of Web based personalized learning

Intelligence is another important feature of web-based personalized learning, and it also makes it possible to be a technical support. The traditional learning environment, if you want to personalize learning, don't let the teacher to provide a personalized learning program for each student, even if is to provide individual guidance also need to spend a lot of time, manpower, material resources, financial resources, practice seems to be unrealistic. But in the network environment, the intelligent and fuzzy control technology into the education, the system will automatically collect each learner's personal information, according to the personality characteristics of learners of different knowledge base, learning readiness, learning content and interactive situation, automatic tracking service, provide intelligent guidance. Personalization is the most fundamental characteristic of network based individualized learning. Learning resources, content organization, the diversity of learning mode makes the dream of individual learning from ancient times become a reality. Learners can customize the settings of the learning environment, according to their own learning needs to make personalized learning content and learning methods to make personalized choice.

1. **Information feedback in a timely manner:** In the network based personalized learning, as a result of the high interactivity and the information transmission of the human and the machine makes the learners encounter problems in the learning process, which can be timely feedback and guidance. In the traditional learning environment, learners encounter problems in general to meet with the teacher to solve. In a general network learning environment, the process of learning problems can only be through the email or BBS form of the request, because the students and students of the quasi time and space to get an extension of the answer
2. **Abundant information resources:** Computer network learning environment of information resources rich, human-computer interaction, cross time and space, and so on the advantages of personalized learning to create a new world. Learners can accord their own interests and hobbies, knowledge structure, learning ability, such as the choice of learning content, the development of learning plans. The system itself will also be aimed at students' needs, providing personalized cognitive tools, appropriate resources and so on, so that the personality of learners in their learning process can be fully reflected, which is conducive to the full development of learners
3. **Comprehensive development:** The rational allocation of learning resources and the comprehensive development of human resources is also an important part of the development of education in China. Personalized learning based on the network makes it necessary for the students to take the higher self. Any learner can study at any time, any place, or any resource. Learning process is no longer a unified pace, the learner's learning objectives, learning content, learning path, the choice of learning environment are custom personalized settings, so that greatly optimize the knowledge of learners.

3.2. Application of individualized learning in Physics Teaching

The establishment of WEB based personalized learning website has opened up a new way for teaching reform, which provides a large database of information resources, which is a collection of advanced schools, Research Institute, library and so on. This is easy for students to learn, to understand the current social development and scientific and technological progress of the latest knowledge, but also can get online teachers to provide personalized instruction. In the Internet, the content of physics teaching, examination and so on can vary according to the needs of people, independent choice, learners' subjective initiative and personality potential can be fully realized, so as to achieve personalized learning. "Can the text, graphics, images, sound, animation and other advanced technology of multimedia teaching software together, can simulate the real environment, the effect of any single way is unmatched, and maintain access to knowledge is conducive to learning; teachers and students meet without using the network, lectures, online counseling and answering, message system, E mall and BBS information technology can of course teaching; on the other hand, students can also according to their different needs in different periods, through the Internet for a purpose, there are plans for learning. This kind of study not only can exist in the school, but also can appear in the family and social activities.

WEB personalized learning in the teaching philosophy emphasizes students as the center based on active exploration to encourage students in teaching objectives; cultivate students' information literacy and the ability to solve problems; pay attention to the

student in the teaching organizational form of self-regulated learning, and promote cooperative learning; emphasize the integration of multimedia and network technology in the penetration of physics in the teaching content, curriculum is the main media understanding of students. Therefore, based on the WEB environment to carry out the physics course independent study has the following advantages:

- ***learning efficiency:*** The feedback of the traditional mode of learning not very good for the students, a student cannot know the knowledge of the situation, and in the personalized learning mode, students can real-time understanding of their mastery of knowledge, to make up for their deficiencies, improve the efficiency of learning.
- ***Ability training:*** The traditional education to impart the knowledge as the only goal of classroom teaching, and in the personalized learning mode in the teaching task is not only to impart knowledge, more important is to cultivate students' autonomous learning ability and develop their ability to solve problems, to cultivate lifelong learning interest and ability, so that they can continue to independently access the new knowledge, explore new knowledge.
- ***All-round development:*** In the WEB based personalized learning, the cognitive ability to enable students to have rich knowledge and high, they should have a good emotional intelligence, good self-experience and self-regulation, good communication and cooperation with others, can better recognize themselves, others and society.

4. Physics teaching evaluation system

Based on the students' access to records on the server mining, students can understand the network usage, have a clear grasp of the research field of students concerns and interest, according to the actual situation of the students, develop the most appropriate teaching plan, equipped with appropriate exercises and so on, truly serve the students target. Teachers can set up online courses on the platform, the learners can choose to learn the curriculum and independent course content learning. Different learners, as well as between teachers and learners can be based on teaching, learning needs to be discussed around the course of the teaching, communication. Make application system, the most important supporting network of distance education for teachers and students provides a powerful teaching and learning online virtual environment. Teachers can manage the teaching, editing courseware, online examination, examination and approval operations, the organization of online Q & A, statistics of student learning. Platform is a powerful learning tool that can be customized according to the needs of the course.

4.1. Design principles

1. ***The principle of taking students as the centre:*** Constructivism theory holds that learning is a cognitive tool, with thinking as an intermediary, in order to more directly influence the learning process should be reduced has been excessive focus on the transfer of technology, and more concerned about how to ask learners thinking in different tasks in technology. Curriculum integration, emphasis on information technology services to the specific task, students with

information technology in a natural way to use information technology as access to information, explore the problems and collaborative problem solving cognitive tools, to cultivate the students to use information technology as information acquisition, exploration, cooperative discussion, problem solving, information technology as presentation tools, communication tools, coaching tools.

2. ***Take the physics course as the main body:*** The subject of the course is the course, not the information technology. So, must fully consider the characteristics of physics, the information technology organically into physics teaching, physics teaching and learning support; it must be to improve the students' science literacy as one of the main goals, let the students' scientific literacy naturally get promoted.
3. ***The principle of contact with the actual:*** Curriculum integration emphasis on specific issues specific analysis, we must not ignore the actual teaching, in order to simulate instead of the actual operation, the network experience instead of living experience, to replace the scene of the media to reproduce the observation. We also cannot adopt an integrated program, different teaching content, different teaching objects; the integration of the program should be different. Integration is a systematic optimization project, in the course of the network media is not involved in the integration of information technology and curriculum standards.
4. ***Principle of internal and external binding:*** In a sense, the discipline construction of auxiliary multimedia teaching website, digital learning resources library, intelligent simulation demonstration base, the formation of interactive collaborative learning network, has erased the dividing line in and out of class, so when we design, must adhere to the principle of combining in and out of class.

4.2. Learning evaluation of Physics

The structure of physics is an important basic component in the knowledge structure of the natural phenomena and the laws of nature. Physics is the basic concept of masonry, based on the basic principle for the skeleton, the basic method to guide a rigorous scientific grand building, therefore, the basic structure of physics, is the basic concepts of physics, the connection between the basic principle and method as well as their. In fact, according to the different branches of physics, according to the main function of physics for scientific research, production or teaching differences, the structure of the physics of the subject can be expressed or decomposed into many different forms.

Physics is an experimental science, which occupies a prominent position in the study of the experiment. Many concepts in physics, the law is summed up from the experiment, of course, these concepts and laws of physics should be further applied in practice. Now, the research object of physics is more extensive, from the microscopic tiny basic particle to macroscopic huge galaxy, from the physical form to the invisible field. People know more about the physical world. From each division: the most simple mechanical movement mechanics research; molecular motion thermal research complex; electromagnetic electrical research complex: Optics and atomic physics research more complex atoms even basic particle motion. Although there are still a lot of physical problems have not been resolved, but physics is the development of Natural Science in the most perfect, the most rigorous system, and the most mature of a theoretical science. Physical subject personalized

network teaching platform will be the original teaching platform for learning platform to improve, in the system, the introduction of personalized analysis and evaluation module, the user login to the system, through the identification of the identity. The information collection module system to collect user request, tracking user behaviour, the collected information is then sent to the database and personalized analysis and evaluation, the analysis results of feedback to the user, which makes the personalized platform according to the personality characteristics of students to provide teaching resources.

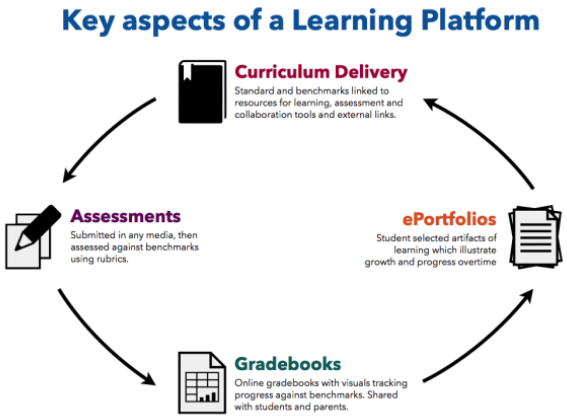


Figure 4 – Learning platform

5. Conclusion

Personalized study the rise of online teaching for the urgent need of online students, this is the biggest shortcomings of traditional education mode, but also the urgent need of reform, also is to provide personalized teaching resources for students, improve the quality of teaching. Traditional university physics teaching mode is often to explain the light. To make full use of modern technology such as computer multimedia features, the physical principle, the concept of knowledge, the use of computer multimedia image and text, sound, it can greatly reinforcement learning understanding and feelings of abstract things and process. The use of modern teaching technology can effectively assist physics teaching can greatly enrich the university physical teaching information capacity, improve teaching efficiency to adapt to the actual situation of the current university physics teaching is less common to be easy to measure many physical phenomena and hard to teach and learn the teaching content through digital simulation, animation and drawing of the image processing is convenient for the students to understand the physical concept of the abstract image and. At the same time in the teaching process to optimize the existing teaching methods will find the method of teaching, case teaching method, discussion teaching method using organic methods to teaching the college physics teaching more attractive and persuasive so as to improve the classroom teaching effect.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 11/05/2016
Aceitação/Acceptance: 29/08/2016

Logistic Regression Model Analysis of Institutional Environment, Corporate Governance and IPO Change to Raise Funds: A Big Data Perspective

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Pages: 324–334

Abstract: The purpose of this study was to analyze the influencing mechanism of institutional environment and corporate governance on the IPO change to raise funds by real evidence of 782 IPO listed corporations on A-share Market. The logistic regression model study results show that: good corporate governance could effectively lower the rate of IPO change to raise funds; optimized institutional environment could effectively restrict local government's interference on listed corporations, and thus to lower the rate of IPO change to raise funds of listed corporations; local government more likely interferes the normal operating of local state-owned enterprises and non-state-owned enterprises, having little influence on state owned key enterprises. Moreover, the bigger local government burden, the greater rate local state-owned enterprise IPO change to raise funds.

Keywords: Institutional Environment; Corporate Governance; Initial Public Offering; Change to Raise Funds

1. Introduction

The resource configuration process of the capital market is actually a continuous circulation process that numerous enterprises raise funds and invest. Whenever the enterprise needs capital, it may choose to perform equity financing on capital market, which specifically includes three ways: (1) Initial Public Offering (IPO); (2) seasoned equity offerings; (3) other mode of raise funds (such as convertible bonds, etc.). The purpose to raise funds is to invest. Investment is the key and risky activity of enterprise to maintain development and create value for shareholders in market competition. Therefore, no matter for IPO or SEO, it seems that change to raise funds is always concerned. Especially for these years, the problem of IPO change to raise funds of listed enterprises is becoming more and more serious and attracting great attention of supervision, theoretical, and practice fields.

As the mostly used fund raising mechanism, IPO is also the main investment source of listed enterprises. However, with the gradually increasing amount of IPO enterprises mixed with both good and bad conditions, and due to the imperfect legal policy and supervision vulnerability, the problem of change to raise fund of listed enterprises has become

the "chronic disease" of Chinese capital market. According to relative requirements of Measures for the Administration of Initial Public Offerings and Listing of Stocks issued by China Securities Regulatory Commission, for IPO enterprises, the issuer shall formulate and disclose the prospectus according to the requirements of the China Securities Regulatory Commission. And the prospectus shall be clearly stipulated with the raise funds utilization and invested project name and amount. However, for lots of enterprises, the IPO raise funds utilization varies to those stipulated on the prospectus (in year of 2008, such rate of change even reached 58.97%, namely over a half of the enterprises' raise funds were not used according to the utilization stipulated on the prospectus). Such kind of large scope change is nearly forbidden in western developed capital markets. Then what kind of reasons results in so high rate of change in Chinese capital market? Lots of learners analyzed from the view angle of corporate internal governance and found that, the corporate governance is the key factor influencing the IPO change to raise funds. But few learners' research findings on external factor mechanism could be found.

For this reason, the author collected data relating to IPO change to raise funds and analyzed the relation between two factors of corporate governance and institutional environment to IPO change to raise fund by real evidence methods of principal component analysis and logistic regression analysis.

2. Relevant Theoretical Analyses and Study Hypothesis Proposing

Due to the special economic system of China, most domestic listed enterprises were transformed from original state-owned enterprises. After being listed, though the corporate governance structure is optimized to some extent, the government holds controlling interest, the equity is highly concentrated, and the phenomenon of "One Shareholder Controlling" is serious. The listed enterprise even becomes the "cash dispenser" of several shareholders. Lots of learners have studied and found that: over-concentrated equity structure is not an effective corporate governance mechanism for large shareholders may sacrifice minority shareholders' interest in order to realize their own interest. The large shareholders may randomly embezzle the resources of the enterprise, which is called "Tunneling Effect" by learners. With the multinational company and economic globalization development, the "Tunneling Effect" has evolved to be a more serious principal – agent problem (Lino et al., 20016).

Good corporate governance structure is beneficial for enhancing enterprise value. And good corporate governance structure also needs a rational equity structure; good corporate governance structure could make clear about the principal-agent relation among different levels; decentralized equity structure could help to make scientific decision on major decision-making events by balance of shares. Li Wei'an (2006) considered that: the corporate governance is a set of mechanism arrangement including formal or informal, internal or external systems or mechanisms taken to coordinate interests of corporation and all shareholders. This is to guarantee that the enterprise could make scientific decisions and maintain interests of all parties. The value of corporation has close relation with corporate governance (Bai Chong'en, et al., 2005). And corporate governance structure has close relation with equity structure of the corporation. Currently, domestic corporate governance structure is adopted with "separation of two powers". The board of supervisors, which is responsible for supervising and appraising

the behaviors of the board of directors and manager, is the supervision institute of the listed enterprise organization. The purpose of setting the board of supervisors is to prevent the board of directors and manager from abusing the power, which would harm the interests of minority shareholders and the company. The more effective the board of supervisors executing its power, the more optimized the corporate governance, and the smaller possibility of listed enterprise changing its raised fund investment project.

Based on the analysis above, the following hypotheses are proposed in this paper:

H1: corporate governance optimization and rate of listed enterprise changing IPO investment project are of negative correlation.

China is now at the special period of transforming from planned economy to market economy. Due to the influence of geological environment and national industrial policies, economy in different regions of China is not evenly developed. Just because of such obvious regional features, the unbalanced economic development pattern that eastern part is better than middle part and middle part is better than western part is formed. Enterprises survive in social environment. Social institutional environment changes and economic development would affect the decision-makings of enterprises. The inflation rate could reflect local economic development status. Therefore, in this paper, inflation rate is taken to judge local economic stability and government control to local economy. The higher inflation rate, the stronger local government will of interfering economy and the easier enterprises being interfered by the government.

The financing environment of the place where the enterprise is located in would influence the enterprise's intention of changing to raise funds. If the financing environment is difficult or fund raising is seriously restricted, the enterprise would strictly consider its feasibility at the time of setting up the project. If so, even when the IPO funds arrive, the investment project would not be easily changed; but If the financing environment is loose and fund raising is convenient, the enterprise may only perform "perfunctory" feasibility study at the time when setting up project for IPO, or even omit the study. If so, when the raised fund arrives, the enterprise is more likely to change the investment project. And this would make it suffer "Winner's Curse".

The functions of local governments are to promote employment, guarantee local economic and social undertakings development. And the objective of enterprise is to maximize enterprise value. Though the above two have some certain economic and social responsibility overlapping parts, they are not totally unified, or even have contradiction or conflict in certain aspects. If a region is featured in good economic development tendency, sufficient financial income, and low unemployment rate, the government would merely interfere enterprises' financing and investment related decision-making. Or, it may launch more preferential policies to promote local enterprise development. At this moment, the objectives of the government and enterprises are coherent; but if a region encounters economic difficulty, fiscal deficit, high unemployment rate, in order to maintain regional stability, enhance employment rate, and make up fiscal deficit, the local government may interfere normal decision-making of enterprises and force the enterprise to invest in projects featured in obvious government achievement, good social benefits, but the economic benefit may not be so high. In such occasion, enterprise would bear high "political cost" (Fan et.al., 2013). IPO raise funds are the main source of enterprises investment.

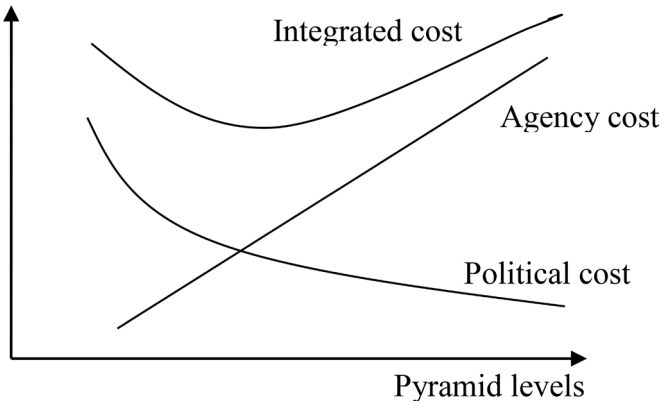


Figure 1 – Pyramid Levels and Integrated Cost Relation

Speaking of realizing its own achievement and official career, local government has the motivation to interfere with the utilization of enterprise raise funds.

Though local government could interfere with the decision making of listed enterprise, it cannot control all enterprises within its jurisdiction. Most of the enterprises that the government could easily influence are state-owned enterprises. Therefore, the over-investment problem in listed enterprises that the state holds controlling interest is more serious than that in non-state-controlling listed enterprises (Ma Lianfu, Cao Chunfang, 2010). According to the type of ultimate controller, the state-owned enterprises can be divided into local government holding controlling interest and central government holding controlling interest. Since the enterprises that the central government holds controlling interest are directly under the leadership of State-owned Assets Supervision and Administration Commission of the State Council, local government is hard to interfere with the normal decision making of these enterprises; and the enterprises that local government holds controlling interest are directly or indirectly controlled by local government. Therefore, local government has powerful motivation and ability to interfere with the decision making on investment and financing of these enterprise for its own benefits. For non-state-owned enterprises, the shareholders holding controlling interest are usually natural persons or corporations. But in order for its own development, such enterprises are likely to change to raise fund since they could easily be induced by local government preferential policies and likely rely on local government's administrative rules via collusion between government and enterprise. Though the local government control to listed enterprise may seriously interfere with the normal decision-making and investment direction, it still has advantages. The interference may restrain the occurrence of listed enterprise agency conflict and restrict the "opportunism" behavior made by listed enterprise's senior management on investment decision. For state-owned enterprises, since the governmental cost resulted by local government administrative behavior and the agency cost resulted by agency conflicts are of phenomenon that "as one falls, the other rises", the integrated cost is of "U-shape" curve (see Figure 1) (Li Dongxin, Li Xindan et.al., 2014). The senior management of state-owned enterprises is mostly appointed by the government directly. Local government interference could, to

some extent, restrict the phenomenon that the senior management sacrifices interests of shareholders and the enterprise for its own.

In this paper, the following hypotheses are listed:

H2: the better local economic environment, the lower rate of IPO change to raise funds;

H3: local government's interference more likely affects the listed enterprises that the local government holds controlling interests, and non-state-owned enterprises.

3. Sample Selections, Data Source, and Variable Selection and Definition

3.1. Sample Selection and Data Source

According to the study of this paper, 847 A-share IPO listed enterprises in Shenzhen and Shanghai Stock Exchange between the year of 2007-2011 was selected as the initial samples of this paper. And during the filtering process, enterprises satisfying the following standards were eliminated: (1) enterprises whose financial data of three years before and three years after listing could not be found in database; (2) enterprises lack of ultimate controllers; (3) enterprises whose office address could not be found in database; (4) enterprises having abnormal variables; (5) enterprises lack of data. Finally, 782 usable samples were obtained.

Data of whether the IPO listed enterprises' raise funds changed or not came from CCER; listed enterprise financial indicators among corporate governance variables and control variables came from CSMAR; institutional environment variables came from CEInet Industry Database, website of State-owned Assets Supervision and Administration Commission of the State Council, and the Statistical Yearbook of China issued by the National Bureau of Statistics of the People's Republic of China.

3.2. Selection and Definition of Variables

The China Securities Regulatory Commission requires that the listed company shall release the utilization of financing fund after successful fund raising. In this paper, the representation method for change to raise funds taken by Ma Lianfu, Cao Chunfang (2011) is taken as reference to describe the rate of change to raise funds by virtual variables. If the utilization status of IPO raise fund is not accorded with the released description on the prospectus, it means the enterprise changes the investment project of the raise fund. And if so, the value shall be 1, or else, the value shall be 0.

Bai Chong'en et.al. (2005) proposed a G-indicator concept, which is the evaluation system weighing Chinese listed company integrated governance level. The G-indicator contains 8 variables. Considering that, in this paper, the main study issue is the corporate governance and IPO change to raise fund, and the corporation balance of shares and accepted supervision are the two parts that matter, the share holding proportion of the first largest shareholder (top1), the concentration of share holding of 2nd to 10th largest shareholders (H(2-10)), and the scale of board of supervisors, are adopted for weighing the corporate governance structure quality.

It needs to be pointed out that H (2-10) represents the quadratic sum of share holding proportions of 2nd to 10th largest shareholders. It is the transformed Herfindahl exponent that is often used in the references, and is the important index weighing the balance of shares. Generally speaking, the bigger the variable value is, the more serious restriction the big shareholder would bear, and the better corporate governance structure would be realized.

In this paper, local unemployment (Un.ment), inflation rate (Inflation), and credit scale (CrScale) are taken to weigh the institutional environment. Local unemployment rate comes from the urban registered unemployment rate released on the Statistical Yearbook of China. It is the variable weighing the local government interference. And the unemployment rate of a region always affects the economic development and social stability of the region. And now in the world, it is generally recognized that, when the unemployment rate of a certain region reaches 5%-10%, it would become economic problem. And when the unemployment rate exceeds 10%, the specific region comes into unstable status. Among the performance indicators that the central government takes to examine local government personnel, the unemployment is one of the very important indicators. Therefore, the unemployment rate of a region is of positive correlation with local government interference. The inflation rate is an important variable for judging the regional macro environment, which has close relation with the regional economic growth. The inflation rate can be taken to weigh the government control on market, which has close relation with enterprise financing related decision-making. Credit scale refers to the loan balance by the end of the year of the bank. In this paper, the credit scale (CrScale) variable is defined as the logarithm of bank loan balance by the end of the year, which is convenient for judging the scale of bank credit of respective years. The credit scale of a region directly relates to the enterprise financing decision-making. If the credit scale of a certain region is small, the cost of borrowing money from bank would be high, then the enterprises may seek for other channel to raise fund. If so, the IPO raise fund would become the important source of enterprise investment fund. Under the circumstance that the cost of borrowing money from bank is high and the project is in urgent need of money, the enterprise would likely change the IPO raised fund investment project.

In this paper, the company size (Size), return on equity (Roe), and asset-liability ratio (Debt) are adopted for judging the financial status of the enterprises; and meanwhile, two virtual variables of government controlling (Gov) and central government controlling (Cgov) are adopted for judging how serious the enterprises are controlled by the government.

The variable of company size (Size) is the mean value of the total assets natural logarithm of the first three years since the company was listed; the return on equity (Roe) and asset-liability ratio (Debt) are the mean value of the first three years since the company was listed.

For specific meanings of variables, please see Table 1:

4. Empirical Inspections and Result Analysis

4.1. Descriptive Statistic and Analysis

the rate of Chinese listed enterprise IPO change to raise funds is comparatively high. The data reached the highest 58.97% in 2008, and then gradually descended year by year.

	Name of Variable	Definition and Computing Method	Expected Symbol
Dependent variable	CH	Whether change or not; if changed within three years, the value shall be 1, or else, the value shall be 0	
Independent Variable	Top1	Share holding proportion of the 1st largest shareholder	+
	H（2-10）	Share holding proportion of 2nd largest to 10th largest shareholders; quadratic sum of share holding proportion of 2nd largest to 10th largest shareholders	-
	BS	Scale of board of supervision	-
	Un.ment	Local unemployment rate; registered urban unemployment rate	+
	Inflation	Inflation rate	+
	CrScale	Credit scale; loan balance natural logarithm by the end of the year of the bank	-
Control Variable	Size	Company size; mean value of the total assets natural logarithm of the first three years since the company was listed	
	Roe	Return on equity; mean value of first three years since the company was listed	
	Debt	Asset-liability ratio; mean value of first three years since the company was listed	
	Gov	Government commanded; virtual variable; if ultimate controller of the company is government, the value shall be 1, or else, the value shall be 0.	
	Cgov	Central government commanded; virtual variable, if ultimate controller of the company is SASAC, the value shall be 1, or else, the value shall be 0	

Table 1 – Variable name, meaning, computing method and expected symbol

This may be because of the ever optimizing capital market legal system (in the year of 2008, the Shenzhen Stock Exchange and Shanghai Stock Exchange respectively issued the Administration Method for Raise Funds of Corporations Listed on Shenzhen Stock Exchange and Regulations on the Administration of Raise Funds of Corporations Listed on Shanghai Stock Exchange), and stricter supervision.

It can be found from the enterprise nature that: the change rate of raise funds of enterprises that the central government holds controlling interest is smaller than that of the enterprises that the local government holds controlling interest; and the change rate of raise funds of enterprises that the local government holds controlling interest is smaller than private enterprises. This is the same with the research findings of Ma Lianfu, Cao Chunfang (2011) and Yan Taihua, Liao Fangli (2015).

4.2. Regression Analysis and Empirical Test Results

In order to clearly verify the hypotheses proposed aforesaid, in this paper, the explained variables are performed with Logistic model check. For the results, please see Table 2.

Style Name	Model 1	Model 2	Model 3
CG	-.543**		-.552**
lnstitu		-.479**	-.476**
Roe	0.031	0.094	0.064
Size	-0.071	-0.053	-0.029
Debt	-0.129	0.002	-0.166
Constant	1.024	0.584	0.182
N	782	782	782
Nagelkerke R²	0.094	0.06	0.06

Note: **. Significantly correlated at 1% level (both sides); *. Significantly correlated at 5% level (both sides); it is P-value inside the brackets.

Table 2 – Logistic Regression Results(1)

Model 1 is to separately analyze the influence of corporate governance on IPO change to raise funds; Model 2 is to separately analyze the influence of institutional environment on IPO change to raise funds; Model 3 is to put both the corporate governance and institutional environment into one model to analyze the influence on IPO change to raise funds. It can be seen from the regression results of Model 1 that, the corporate governance and IPO change to raise funds are of significantly positive correlation, which indicates that good corporate governance could effectively reduce the rate of IPO change to raise funds, verifying Hypothesis H1; it can be seen from the regression results of Model 2 that, the institutional environment and IPO change to raise funds are of significantly negative correlation, which indicates that the better economic environment, the smaller rate of IPO change to raise funds, verifying hypothesis H2.

In order to verify the government interference with listed enterprises, in this paper, the listed enterprises were divided into central government controlling enterprises, local government controlling enterprises, and non-state-owned enterprises according to the ultimate controllers. And regression analysis is performed respectively for the three groups. The results are as shown in Table 3.

Table 3 shows the logistic regression analysis for central government controlling enterprises, local government controlling enterprises, and non-state-owned enterprises. It can be seen from the regression results that, except Model, the corporate governance is of significantly negative correlation with IPO change to raise funds: it is of significantly negative correlation with local government controlling enterprises at the level of 5%, and is of significantly negative correlation with non-state-owned enterprises at the level of 1%; except Model 4, the institutional environment variables are of significantly negative correlation with IPO change to raise funds, and are of significantly negative correlation with local government controlling enterprises and non-state-owned enterprises at the level of 1%. This indicates that the institutional environment more likely influences local government-controlled enterprises and non-state-owned enterprises on IPO change to raise funds, verifying hypothesis H3.

Style Name	Model 4	Model 5	Model 6
CG	-1.614	-0.719*	-0.523**
Institu	-0.862	-1.056**	-0.382**
Roe	-0.126	0.456	0.152
Size	-0.621	-0.036	0.021
Debt	-1.431	-0.351	-0.095
Constant	13.715	-0.002	-0.829
N	26	89	667
Nagelkerke R^2	0.462	0.365	0.114

Note: **. Significantly correlated at 1% level (both sides); *. Significantly correlated at 5% level (both sides); it is P-value inside the brackets.

Table 3 – Logistic Regression Results(2)

5. Conclusions and Policy Suggestions

5.1. Main Conclusions

By taking the A-share IPO listed corporations in Chinese capital market as the sample, the purpose of this study was to analyze the influences of institutional environment and corporate governance on the IPO change to raise funds. The adopted empirical analysis methods include: descriptive statistics, correlation analysis, principal component analysis and logistic regression analysis. According to different ultimate controllers, the listed enterprises are divided into central government-controlled enterprises, local government-controlled enterprises and non-state-owned enterprises. And the corporate governance and institutional environment influence on these three types of enterprises are respectively compared. Based on the above mentioned analysis, the following conclusions are achieved:

1. The quality of the corporate governance structure directly affects the rate of IPO change to raise funds. The better the corporate governance structure, the smaller rate of IPO change to raise funds. On the contrary, the rate of IPO change to raise funds would be greater. For weighing the quality of corporate governance, the three variables of share holding proportion of 1st largest shareholder, 2nd to 10th largest shareholders, and scale of board of supervisors are adopted in this paper. Based on the data analysis for listed enterprises, it is found that the problem of "One Shareholder Controlling" is serious among Chinese listed enterprises. And the equity structure of the Chinese listed enterprises is seriously improper. The mean members of board of supervisors could reach 3, but there are lots of enterprises failed to meet this legal requirement.
2. The institutional environment of a certain region could directly affect the rate of IPO change to raise funds of enterprises of this region. The better institutional environment and market supervision mechanism, the better compliance to prospectus stipulated investment project of the listed enterprises.
3. Local government's interference with listed enterprises more likely happens in local government-controlled enterprises, but merely happens in central government-controlled enterprises. That's because the central government-controlled enterprises

focus on its own reputation for the great public attention to them. Therefore, the central government-controlled enterprises can better abide by the set rules, and are of the smallest rate of IPO change to raise funds. And for local government-controlled enterprises, since the largest shareholder of such enterprises is often the local government, the manager of such enterprises is mostly appointed by local government directly, so that the local government may directly interfere with the operation decision making of these enterprises, which makes such enterprises have to shoulder certain social responsibilities that the local government shall originally shoulder. In this case, such enterprises may give up the investment project with good economic benefits stipulated on the prospectus, and turn to invest the IPO raise funds into projects featured in good social benefits, but not economic benefits, and consequently pays for certain part of "governmental cost".

5.2. Policy Suggestions

1. The listed enterprises shall further optimize the corporate governance structure, strengthen the internal share balance, and optimize internal supervision system. "One shareholder controlling" equity structure is commonly seen in Chinese listed enterprise. Large shareholder totally controls the enterprise, which makes it have the power and will to change IPO raise funds. Optimized and diversified corporate governance structure is helpful for forming effective share balance mechanism inside the enterprise, and guarantees democratic decision making in order to effectively restrain the behavior of the large shareholder (Salma Ben Amor, Maher Kooli, 2016）. The ways of strengthening enterprise internal supervision mechanism, expanding scale of board of supervisors, and strengthening supervision on shareholders and managers, can be helpful for effectively restraining the behavioral decision-making of the board of directors and manager, making the board of directors have more scientific decisions, and effectively controlling the behavior of manager chasing for short-term benefits.
2. Optimize law system and supervision mechanism of the capital market. The Chinese capital market has just started. It still has lots of things to be optimized. Healthy operating of capital market is good for rapid development of Chinese economy. And optimized law system and supervision mechanism are indispensable for healthy capital market.
3. Establish optimized listed enterprise reputation evaluation system. The phenomenon of random IPO change to raise funds is merely seen in western developed capital market. This is because not only do they have a set of optimized institutional environment and supervision mechanism, but also they pay great attention to their reputation and credit. The listed enterprises of western developed countries focus on their reputation. Random IPO change to raise funds would make them lose reputation in public. Therefore, their rate of IPO change to raise funds is low. But in China, the listed enterprises pay little attention to their reputations and the public have no ideal about the reputation of listed enterprises. The establishment of optimized reputation evaluation system, enhancement of public legal knowledge and recognition of moral reputation are good for making listed enterprises pay more attention to their reputations, and reduce rate of IPO change to raise funds as a result.

Acknowledgments

We thank for the support of Jiangsu Provincial Social Science Fund (15EYB005).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 13/05/2016
Aceitação/Acceptance: 17/08/2016

Experience Comparison on the Choosing of Coal Enterprise Vertical Integration Architecture and Path Based on Panel Data Mining

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Pages: 335–345

Abstract: Under the macro policy background of the government promoted "economical low-carbon transform" and "energy production and consumption revolution" during the "13th Five-year Plan" period, the purpose of this paper were to study the theoretical explanation to vertical integration architecture path selection of coal enterprises and to verify the influences of coal enterprise vertical integration architecture path selection on transaction cost and effects of resource configuration of material resource, intangible resource, and financial resource by taking 2010-2014 five successive years' listed coal enterprise sample data as the basis and establishing balance panel model.

Keywords: Vertical Integration; Transaction cost; Material resource; Financial Resource; Intangible Resource

1. Introduction

China is a country typically featured in "rich coal, less gas, poor petroleum". And for a long time in the future, coal would still be the main element of Chinese energy structure. With the ever rising of call for national energy production and consumption structure adjustment due to the forcing of low-carbon type economy demand, the coal industry would become one of the key reform elements. In the future, the coal enterprises shall not only stay on the level of "mining coal – selling coal", but to extend towards upstream and downstream of the industry by scientific and high efficient mining, thus to realize transforming of high-pollution low-end "Coal" to be clean energy, and greatly develop "coal-fired power, mine, power plant, and transportation, and coal chemical industry" vertical integration industry chain. The vertical integration of coal enterprise industrial chain can help to realize industry transformation and upgrade, which meets the energy reform theme and is the good weapon realizing profit gaining instead of suffering losses. Therefore the vertical integration effect of the coal enterprises shall be deeply studied to help the coal enterprises to better implement the vertical integration. According to different integration directions, the vertical integration can be divided into forward integration and backward integration: the forward integration refers to the way of integrating along output direction or product sales direction; and the backward integration refers to the

way of integrating along production investment or raw material supply direction. What's the effect of choosing different vertical integration paths on corporation M&A transaction cost and resource configuration is the main purpose of this paper.

2. Literature Review

2.1. Transaction Cost Theory and Vertical Integration

For the transaction cost theory (Williamson, 1985), as a comparatively mature theoretical view explaining the corporate boundary of corporation vertical integration, it needs to consider the key characteristic of economic transaction – transaction specific investment level. The normal market transacting relation shall be adopted to manage the transactions with low specific investment level; strategic alliance shall be taken to manage the transactions with intermediate specific investment level; and the transactions with high specific investment level shall be included into the corporate boundary to accept graded management, thus to form the vertical integration (Barney, 2007; Rocha & Freixo, 2015).

According to the transaction cost theory, the logic deciding corporate boundary is: when the transaction specific investment level of a certain transaction is high, the high cost of hierarchy governance would to large extent be offset by its ability of reducing threat of opportunism. Therefore, compared with market governance and intermediate governance, the hierarchy governance is more popular. When the transaction specific investment level of a certain transaction is low, compared with hierarchy governance, the intermediate governance is more proper. That's because the intermediate level opportunism threat would not offset the extra cost of hierarchy governance. Compared with market governance, the intermediate governance is also proper: because there's always certain opportunism threat that cannot be eliminated by market governance. If the transaction specific investment level of a certain transaction is low, the threats of the opportunism are also low. And at this moment, the market governance with the lowest cost would be the most popular way.

2.2. Resource-based Theory and Vertical Integration

Wernerfelt (1984), as one of the founders of the resource-based theory, was the earliest one realizing the key function of M&A expansion act based on resource and resource combination on the corporation competitiveness in product market competition. The idea of competitive advantage hypothesis developed based on this thought considers that, the product market position combination taken by the enterprise is the comprehensive reflection of its controlled resources, namely, the competition of enterprises product status competition can also be deemed as competition of the enterprise controlled resources.

Transaction cost theory considers that, the opportunistic problem produced by transaction specific investment must be solved through the selection of governance. However, being different from transaction cost theory (Williamson, 1975), Rumelt (1984) studied the enterprise rent generating and grabbing characteristic, revealed that the existence of enterprise is the effective way to minimize threats of opportunism in the transaction, and is a kind of more effective method than other forms of governance, including the market, in terms of creating and grabbing the economic rent. Connerand Prahalad (1996), Grant(1996), Liebeskind(1996), Kogut and Zander(1996), Spender(1996)combined several themes of rent generating, transaction cost and governance, and finally developed a

kind of resource-based corporate vertical integration theory, which became the theoretical bridge between enterprise performance resources theory and transaction cost governance theory. In particular, in the two theories, the transaction specific investment is taken as the important independent variables to explain dependent variables. In resource-based theory learner's point of view, the transaction specific feature or corporation specific investment are both deemed as the resource that may generate economic rent (Barney, 2001).

Compared to the transaction cost factors, the empirical study also verifies that the resources factor is more important for vertical integration decision making. Argyres (1996) found through the case analysis that when the suppliers have remarkable ability, enterprises can choose outsourcing. And when the resources of two companies haven't overlap, or when these resources fully overlap, enterprise ability weight would be bigger in vertical integration decision making. Leiblein and Miller (2003) "internal production or market buy" empirical study found that the ability and strategy of corporation level are independent, and significantly affect the enterprise vertical boundary selection. The research findings of other domestic learners show that, about the vertical integration of empirical studies, compared with the transaction cost factors, resource factor play an important and even independent role in vertical integration.

2.3. Research Review

On one hand, when making economic decision by transaction cost theory, the corporation resource and capacity are often ignored. This theory considers that, the productivity of the enterprise in transaction is fixed. And it only focuses on the fortune (obtained from a certain transaction) distribution in the enterprise. Among lots of studies on transaction expenses, no problem about relative resource and capability of enterprise and its trading partners has been proposed at all. In the traditional transaction cost analysis of enterprise boundary, enterprise resource and capacity actually have no obvious function at all. Why the explaining function of resource and capacity is so tiny when explaining enterprise vertical integration by transaction cost? Resource-based theory clearly focuses on enterprise's production resource and capability, and explores the possibility of governance selection by analyzing how all the enterprise controlled tangible and intangible resources in a certain transaction create value. Then, what kind of theory decides the vertical integration of Chinese coal enterprise?

On the other hand, the vertical integration path selection is divided into forward and backward types. Current existing theories cannot clearly stipulate how these two theoretical system affect the choice of Coal enterprise in vertical integration path. Therefore, in this paper, the comparison and analysis on influence effect of coal enterprise vertical integration path are performed from the two theoretical systems in order to provide certain supplementation to relative study.

3. Definitions to Variables

3.1. Explained Variables

1. Transaction Cost

Transaction cost refers to the costs happened in all market transaction steps of supply-demand info search, finding object, negotiating, and delivery, including contact

negotiating cost, contract concluding cost, and breach of contract cost. These costs are mainly reflected in selling expenses of business cost in financial statements. In this paper, the transaction cost is represented by selling expense changes before and after M&A of the corporate (selling cost happened in the year of M&A – selling cost of previous year) / business income by the end of previous year.

(2)Corporate Recourse

In this paper, the accessible corporate resources are weighed from aspects of material resource, financial resource, and intangible resource after vertical integration of sample corporations, among which, material resource is represented by fixed assets / total assets, financial resource is represented by long-term borrowed money / total assets, and intangible assets is represented by intangible assets / total assets.

3.2. Calculation of vertical integration path explaining variables

The current references show three types of vertical integration calculating methods: value-added method, major-minor sorting method, input-and-output method. Considering the accessibility of research purpose and data, the input and output method is general and can have better performance. In this paper, Zhang Weihua (2011) method is taken as reference and method of combining input-and-output table and financial data (partial business income) is adopted to respectively establish forward integration and backward integration coefficients. The bigger values of these coefficients, the higher level of vertical integration. On the contrary, the smaller values of these coefficients, the lower level of vertical integration. For variable definitions, please see Table 1.

Classification	Name	Symbol	Definition
Explained Variables	Transaction Cost	TC	Selling cost of the year of M&A – previous year sales cost) / business income by the end of previous year
	Corporation Resource:	CR	
	Material Resource	MR	Fixed assets/total assets
	Financial Resource	FR	Long-term borrowed money/total assets
	Intangible Resource	IR	Intangible assets/total assets
Explaining Variables	Vertical Integration:		
	Forward integration	FORWARD	See Formula 2
	Backward integration	BACKWARD	See Formula 2

Table 1 – The Definitions of Variables

Forward and backward integration coefficient calculation method is as follow:

It shall firstly confirm the industries that the corporation spans, calculate the proportion of various business incomes in total income, and then calculate the volume of enterprise industry unit output flowing into other industries (or other industries' investment required by each unit) and sum up the coefficient. And finally, use the ratio of enterprise partial income occupying total income as the weight to multiply total coefficient to represent the integration degree. The specific calculating steps are as follows:

1. Perform industry matching: match the main business part name with the industries in basic matrix released by the nation.
2. The investment of unit output of industry "i" flows into other industry (other industries required by unit output) "j" is calculated according to the basic matrix (i≠j), among which, "j" is the industry of the corporation. This coefficient is defined as θ_{ji} . Sum up the coefficient:

$$\theta_i = \sum_{j=1, j\neq i}^{n} \theta_{ji} \tag{1}$$

   This coefficient represents the investment of unit output of industry "i" flows into other industry (other industries required by unit output) "j".
3. The income is taken as the weight to weigh. For θ_i , it shall be weighed according to the income of specific part of the corporation, thus to constitute the forward (backward) integration weighing index:

$$V_{forward(backward)} = \sum_{i=1}^{n} \omega_i \theta_i \tag{2}$$

ω_i is the proportion of "i" part income in total income of the specific industry. This index is used for measuring the forward (backward) integration degree of all parts of the corporation. The interval of this index is [0， 1). And the bigger value of this index, the higher level of forward (backward) integration.

The forward and backward integration index during 2010 to 2014 of the sample corporations are obtained based on calculation according to the above method. For specific, please see Table 2.

4. Panel Data Mining Model

In this paper, the coal enterprise vertical integration effect is respectively studied from transaction cost and basic resource theory. Therefore, for the empirical analysis, the transaction cost, corporation resources (material resource, financial resource, and intangible resource) are variables to be explained. And the panel data model is formed as follow:

$$TC_{it} = \alpha_i + \beta_i BACKWARD_{it} + \gamma_i FORWARD_{it} + u_{it} \tag{3}$$

$$MR_{it} / FR_{it} / IR_{it} = \alpha_i + \beta_i BACKWARD_{it} + \gamma_i FORWARD_{it} + u_{it} \tag{4}$$

i=1,2,...20, t=1,2,...5

TC_{it} , MR_{it} , FR_{it} , IR_{it} respective represent transaction cost, material resource, financial resource, and intangible resource of Corporation i in t period; $BACKWARD_{it}(BAC_{it})$ is the backwards integration index of Corporation i in t period; $FORWARD_{it}(FOR_{it})$ is

the forward integration index of Corporation i in t period. α_i is the constant term, u_{it} is the error term. Model 1 is the influence effect model of vertical integration architecture path selection under view of transaction cost; and Model 2 is the influence effect model of vertical integration architecture path selection under fundamental resource view.

In this paper, the coal enterprise vertical integration that is defined by the real evidence refers to the process that the coal enterprise, as the main body performing merger and acquisition to other enterprises have the input-output relationship with it on M&A chain. And in this paper, The coal enterprise listed on Shenzhen Stock Exchange and Shanghai Stock Exchange from 2010 to 2014 are taken as the research samples, and are filtered according to the following criteria: (1) eliminate the samples having only coal income in industry-based main business income disclosed on the company's financial statements; (2) eliminate samples whose coal income ratio of occupying total income is smaller than other industry incomes; (3) eliminate the samples whose data is not complete; (4) eliminate samples having abnormal financial position or the auditor provides rejection or negative opinions. Through the above filtering process, actually 100 samples of observation values of 20 sample companies from 2010 to 2014 is obtained, The annual report data in the empirical analysis comes from Sina finance and economics website and Shenzhen Stock Exchange website, other financial data comes from the annual report, CCER and CSMAR database.

S/N	Stock Code	2014		2013		2012		2011		2010	
		FOR%	BAC%	FOR %	BAC %	FOR%	BAC%	FOR%	BAC%	FOR%	BAC%
1	601088	24.92	11.19	24.79	11.26	25.56	11.29	25.49	11.28	22.36	9.76
2	000983	43.89	8.88	42.89	7.62	42.91	7.65	43.56	7.58	42.26	7.74
3	600123	4.06	1.52	4.72	1.56	4.36	1.54	5.09	1.58	4.75	1.56
4	601699	12.01	6.29	11.97	6.30	12.60	7.06	12.47	7.07	12.62	7.05
5	600121	10.35	12.91	12.28	12.93	14.42	13.63	18.69	14.48	19.97	14.23
6	600546	1.37	5.80	1.37	5.91	1.37	5.97	1.37	5.97	1.37	5.97
7	600652	0.21	0.27	0.21	0.27	0.21	0.27	0.21	0.28	0.21	0.28
8	600188	4.28	12.92	4.28	12.92	4.30	12.96	3.85	13.06	3.74	13.03
9	600348	34.03	6.27	34.01	6.27	34.01	6.27	31.22	6.64	33.33	6.36
10	600395	33.60	6.33	33.37	6.36	33.24	6.38	33.17	6.38	32.67	6.45
11	600408	1.49	1.59	1.44	1.44	1.48	1.58	2.45	1.96	1.93	1.76
12	600508	0.69	1.82	0.70	1.78	0.70	1.78	0.68	1.85	0.76	1.62
13	600971	33.89	6.29	33.85	6.30	33.71	6.31	32.86	6.43	32.95	6.41
14	600997	2.36	1.41	2.67	1.43	3.05	1.46	3.00	1.45	3.26	1.47
15	601001	13.11	7.03	13.13	7.03	13.16	7.03	13.17	7.03	13.17	7.03
16	601898	11.52	6.52	11.34	6.50	11.15	6.36	10.67	6.61	10.93	6.56
17	000780	1.38	4.98	1.37	5.52	1.38	5.42	1.37	5.54	1.38	5.38
18	000933	5.58	4.00	5.88	6.50	5.26	6.19	5.08	6.10	3.80	5.45
19	000937	8.57	7.05	8.48	6.98	8.63	7.09	8.58	7.04	8.79	7.19
20	000968	40.14	7.99	39.98	7.98	40.33	8.00	40.51	7.99	39.67	7.99

Table 2 – The Vertical Integration index table for coal companies from 2010 to 2014

5. Empirical Analysis

5.1. Descriptive Statistics

Table 2 is the descriptive statistics of the main variables. It can be seen from this table that, between 2010 and 2014, the overall average backward integration value is significantly lower than the forward integration. That's because, as the fundamental energy, the coal corporation mining and selling are generally at the upstream industry position. Therefore its vertical integration architecture path is normally forward.

Variable Name	Variable Code	Samples	Mean Value	Standard Deviation	Median	Mini mum	Maxi mum
Backward Integration Level	BACK WARD	100	6.17%	0.0359	6.36%	0.27%	14.48%
Forward Integration Degree	FOR WARD	100	14.51%	0.1429	9.57%	0.21%	43.89%
Transaction Cost	TC	100	0.40%	2.08%	0.21%	-13.88%	8.74%
Material Resource	MR	100	36.42%	13.38%	36.11%	7.45%	75.14%
Financial Resource	FR	100	9.50%	0.50%	8.74%	0.20%	33.59%
Intangible Resource	IR	100	10.33%	8.55%	8.27%	0.29%	31.06%

Table 3 – The statistical characteristic of vertical integration for coal companies

But the fluctuation of the forward integration level of the coal corporations is far higher than the backward integration. On the whole, the coal industry overall levels of vertical integration is low. In terms of the forward integration, for every yuan's output, it needs 14.51 fen's input. For the company with highest level, for each yuan's output, it needs 43.89 fen's internal input, and minimum 0.21 fen's input. But for backward integration sample companies, for each yuan's output, minimum input is 6.17fen, maximum 14.48fen. Table 3 reports the regression results of model (1) and (2). It can be seen from the table that, raw coal production of coal enterprises in the upstream industry chain, the vertical integration is usually forward integration. In this paper, the relation between coal enterprises forward integration and transaction cost and corporation resources is taken as the core object of research.

5.2. Panel Data Regression Analysis

It can be seen from table 4 that, when taking transaction costs as the explained variable, forward integration level of coal enterprises is of negatively correlation with it, and is significant at 1% level. This indicates that the higher of coal enterprise forward integration level, the more transaction cost can be saved. If coal enterprise integrates resources, perform merger and acquisitions to downstream enterprises of the industry chain, and makes external transaction as internal transaction, it would not need to invest a lot of manpower, financial and material resources to find transaction objects or negotiation, which could help to greatly save the transaction cost.

Explained Variables	TC	MR	FR	IR
C	0.0017 (0.7841)	0.2924*** (0.0019)	0.1333**(0.0170)	0.1127*** (0.0000)
BACKWARD	0.2199* (0.0878)	3.7040** (0.0430)	-0.5893 (0.4684)	-1.4355*** (0.0086)
FORWARD	-0.0784* (0.0607)	-1.0818 (0.1398)	-0.0132 (0.9580)	0.5464** (0.0359)
R-squared	0.3186	0.8803	0.8777	0.9468
Adjusted R-squared	0.1352	0.8480	0.8448	0.9324
F-statistic	1.7370**	27.3055***	26.6649***	66.0379***
Prob(F-statistic)	0.0422	0.0000	0.0000	0.0000
Hausman Value	0.8367	0.0775	0.5113	0.3397
Observed Samples	100	100	100	100

Note: the content inside brackets is p-valve, ***, **, and * respectively represents 1%, 5%, and 10% significance level.

Table 4 – The estimation results of dynamic panel data model

It can be seen from the material resource panel regression that, the coal enterprise forward integration is of negative correlation with the material resource. But such correlation is not significant. The backward integration is of positive correlation with the material resource at 5% significant level. The significance level of the equation is 1%, the explaining strength of variables to the equation is 84.8%. This sufficiently shows that, with the enhancement of coal enterprise backward equation, the acquirer may obtain more material resource. This has close relation with coal industry features. On one hand, the nature hosting regional features of the coal resource decides that the construction mine is always accompanied with assisting construction of transport, water, power, and machinery and equipment for it needs huge volume of material and financial capital; on the other hand, with the ever improving of Chinese supervision on environment protection, safe production, mine scale, the investment of coal enterprises in relative facilities also increases year by year. Therefore, the coal enterprise has the motivation of acquiring upstream industry infrastructural equipment and capital investment via backward integration.

Viewing from financial resource panel regression that, the forward integration and backward integration level of the coal enterprise is of negative correlation with financial resource. But the correlation is not significant. This shows that the motivation of Chinese coal enterprise selecting vertical integration is not to obtain financial resource.

Viewing from the intangible resource panel regression result that, the forward integration level of coal enterprise is of positive correlation with intangible resource at 5% significance level, and the backward integration level is of negative correlation with intangible resource at 1% significance level. After adjustment, R2 value is 93.24%,

and the equation is significant at 1% significance level. The intangible resource richness and quality have great impact on whether the corporation can win in intensive market competition. They have become the main representatives of core competitiveness of the corporation. The nature of state-owned resource decides that, on one hand, the coal enterprise must have the rights of mining and prospecting; and on the other hand, good enterprise image and powerful competitive strengthen are the important guarantee for the enterprise obtaining national credit and policy support. Therefore, the coal enterprises would selectively implement the vertical integration strategy to obtain more intangible resources and improve market competitiveness.

5.3. Robust test

In order to check the robustness of the research conclusions, the following tests are performed for this paper: firstly, the proportion of long-term liability and total liability is taken to replace the proportion of long-term borrowing money occupying total assets to weigh the financial resource of the corporation; secondly, the inventory is included into material resource index weighing scope, and the proportion of fixed assets plus inventory occupying total assets is taken as the replacement variable of material resource; thirdly, the proportion of R&D investment and main business income is taken to replace the value of intangible assets divided by total assets as the intangible resource replacement variable; fourth, when the transaction cost happens, one part is counted into selling cost, while the other part is counted into management cost. Therefore, the proportion of sum of selling cost and management cost, and the business income is taken as the transaction cost replacement variable. After replacing by the above variables, the empirical results show that the conclusion of this paper basically stays unchanged. Therefore, the above empirical result has robustness.

6. Conclusions

In this paper, the experience data of the Chinese listed coal enterprises is taken as the samples. And the empirical study is performed to check the influence of coal enterprise's vertical integration architecture path selection on transaction cost, material resource, intangible resource, financial resource configuration. The research results show that: transaction cost conservation and obtaining of intangible resource are the main factors affecting coal enterprise's selecting of forward integration merger and acquisition. And the backward integration is mainly for obtaining material resource.

The inspirations brought by this paper:

1. Giver overall consideration to both the upstream and downstream of the coal resource industrial chains, reduce government interference

Facing to the miserable coal industry transition, seizing the high-end products upgrade and technological innovation is the only right way of coal enterprise to realize vertical integration. Speaking of the relationship between the upstream and downstream industry chain of the vertical integration, the coal enterprises in at the upper position. Since the coal is nonrenewable resources, excess coal capacity is not permanent. For government, it has been actively promoting electricity and coal integration, and has

repeated for many times that the joint operating of coal and power would be taken as long-term policy to adhere to. And it has been giving preferential treatment in aspect of project examination and approval. But in China, there still exists "the market coal" and "planned electricity", which has distorted power and coal integration. If the government and leadership of coal enterprise still blindly promotes the integration of coal and power, it will further enlarge the coal and power marketization difficulty and cost of economic sustainable development. And in the future, the coal resource integration marketization flow shall be studied to force the enterprises to change the development mode and find the path of coal industry sustainable development.

2. Adhere to the market-oriented operation, guide and motivate enterprise to voluntarily and independently participate in mergers and reorganization

The coal enterprise integration and restructuring that was promoted during the "Twelfth five-year plan" period, changes the coal enterprise overall "small, scattered and disorderly" status, improves the condition of "frequent accidents, difficult supervision". But the status of "state fund investment forcing out private fund" becomes more serious in state-owned coal enterprises, which results in rigid enterprise mechanism and low investment rate. During the period of "13th five-year plan", with the national economy development, energy structure adjustment, and market condition changes, the coal enterprise may perform scientific forecast and sufficient research according to its own conditions. Under the circumstance of energy structure adjustment, environmental protection strengthening, impact of imported coal, and enhancement of production and construction compliance standard, the vertical integration would face to new tendency and new challenge. Being in line with the principles of "optimal capital, technology drive, and efficiency priority", the conducting industrial cluster with operating features and market competitiveness would be finally determined. Since China's enterprise merger and reorganization lags behind the adjustment of industrial structure and the requirement of the transformation of the pattern of economic development, during the period of "13th five-year plan", government departments should adhere to the market-oriented operation, fully respect the enterprise will, guide and motivate enterprise to voluntarily and independently participate in mergers and reorganization.

Acknowledgments

This is the phase achievement of "Study on Jiangsu Development Zone Innovation-driven Transformation, Upgrade, and Environment Regulations" of Jiangsu Provincial Social Science Fund (15EYB005).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 04/05/2016
Aceitação/Acceptance: 23/08/2016

Research on Collaborative Decision Model Based on the Internet of Things Industry Chain

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Pages: 346–359

Abstract: The core value of Internet of things is that it has changed the way of information communication, improved the quality of traditional information, promoted the transparency of management process, and reduced the transaction costs between the real world and virtual media. The mathematical modeling and simulation experiment of refining division of labor and cooperation explain the growth process and key elements of the Internet of things industry chain. The collaborative decision-making process of the industrial chain of the Internet of things is the detailed process of the production division of things. It is the process that the transaction cost of the industry chain of the Internet of things is decreasing, and it is also the process of increasing the added value of the industrial chain of the Internet of things.

Keywords: Internet of things, industrial chain, collaborative decision

1. Introduction

Due to the development of hardware and networking technology, especially the miniaturization, low cost and low power consumption electronic components manufacturing technology breakthrough, networking and the development of economy and society are becoming increasingly closer, the networking industry rapid rise (Hamel, 1996; Gonçalves et al., 2015). The core value of the Internet of things is that it has changed the way of information communication, improve the quality of traditional information, promote the transparency of the management process, and reduce the real world and virtual media between the transaction costs (Gulnen, 1987; Prahalad, 1990). The concept of things first proposed by the United States Massachusetts Institute of Technology scholar Auto-ID in 1999, refers to all the items through the RFID Technology (especially RFID) and other sensing devices connected to the Internet, to realize intelligent identification and management of the network. In fact, the Internet of things is a dynamic concept; its connotation will be with the development of the Internet of things technology and the application of innovative breakthroughs and changes. Specifically, networking is the sensing devices embedded in the real world of specific items, automatic reading, information transmission and intelligent processing by induction identification technology and special network and information system, so as to realize the system of people and objects, and the free exchange of information and intelligence operations.

2. Structure of the industrial chain of the Internet of things

Industrial chain refers to the path of one or several kinds of resources that are transferred to the downstream industry through a number of industries, until they reach the consumer. Currently, the world of things industry is in a rapid formation period, the Internet of things industry chain is still in its infancy (Port, 1998; Ting, 2010).

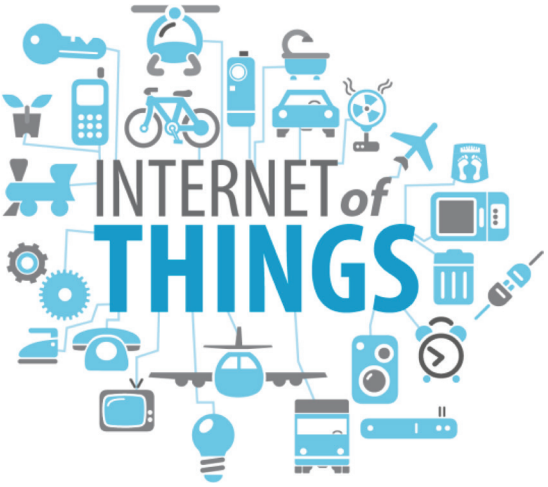


Figure 1 – Internet of things

Compared with other industries, the Internet industry chain structure is longer. First, the length of the downstream industry chain is particularly long. From the network structure of industrial chain can be seen, networking front involves cutting-edge technology perception (such as sensor technology, optical technology and so on) the design, manufacture and sales of related enterprises; relates to the data acquisition, data transmission and network management related enterprises; back-end involves massive data processing, software development, system integration, to provide solutions the application of personalized, and other related enterprises. Such a long chain in the current real estate industry even the automobile industry, also can match. Second is a particularly multi link. Things from the perspective of industry chain the main view of the networking industry involve the induction chip developed by the core components, manufacturers and network providers to the user channel and many other links, each link has multiple links, each link itself is an independent sub industry. Overall, the Internet of things industry chain with chain length, technology driven, application driven, strong correlation and other aspects of the characteristics (Gerd, 2010; Reidar, 2011; Daskala, 2011). The networking industry chain mainly includes the induction chip and the core device development, network communication service providers and system integrators, software developers, and intelligent information system and communication terminal sensing equipment manufacturers, professional application service providers, application and other aspects (Vermesan,2007; Roma, 2011; Claus, 2002). Among them, the most important aspect is the induction chip and the core device research and development, system integration services; the former determines

the technical level of the whole industry chain, which has very high requirements on business model innovation of the chain complex. The structure model of the industrial chain of the Internet of things is shown in figure 2.

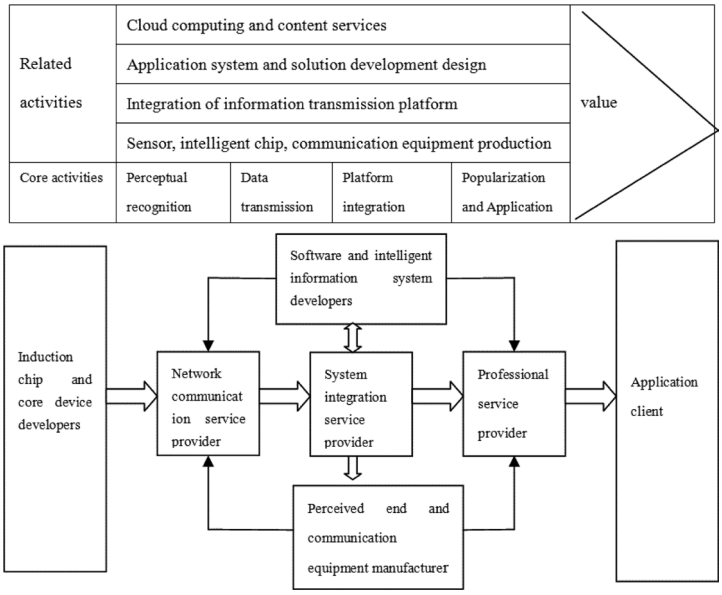


Figure 2 – Structure model of the industrial chain of the Internet of things

3. Collaborative decision model of the industrial chain of the Internet of things

In the industrial chain of the Internet of things, the decision of each node is affected by the other nodes, and this decision will affect the decision of other nodes. In this process, the interests of the decision are undoubtedly the wind vane. In order to obtain the maximum benefit of the enterprise, the node enterprises must study the decision making strategy of other enterprises in the industry chain, and make their own decisions.

1. Assumptions and definitions

In this paper, the collaborative decision model and its analysis based on the Internet of things industry is mainly based on the following assumptions:

1. Networking products (including the final products and various components) market demand Q_d is a decreasing function of the price P, the price increased demand, prices reduced demand, demand function can be written in the form of $Q_d = a - bP$, a for the absolute demand of the product quantity, $b = -dQ_d/dP$ is the product demand is more sensitive to the price. Each enterprise has the complete information to the product demand function.
2. The total production cost of the related enterprises in the industrial chain of the Internet of things is a monotonically increasing function of the output.

Recorded TC as the total production cost, C as the production cost for the unit, Q_s for the output, the cost function can be written in the form $TC = C * Q_s$.

3. Internet of things business profits for the total sales revenue and total production costs of the difference. Record π for profit, $\pi = P * Q_d - C * Q_s$.
4. The Internet of things industry chain link mainly consists of upstream and downstream of the production of the Internet of things components and downstream of the final product (system integration services).
5. The Internet of things industry chain, only two products: Product 1 for the final product of the Internet of things needed components, product 2 for the final product of the Internet of things, Q_{d1} , Q_{s1} , P_1 for the Internet of things (product 1) market demand, production, price, and Q_{d2} Q_{s2} P_2 for the final product (product 2) market demand, production, price. When the component and the final product completed by the same enterprise, the end product of the unit production cost C for the enterprise profit π ; when the component and the final product completed by different enterprises, C_1 as the components of the unit production costs C_2 for the production of final products, in addition to the purchase cost of the components of the unit production cost, π_1 and π_2 for the relevant the enterprise profit.
6. Internet of things business in pricing decisions and production decisions, according to the principle of profit maximization to determine the price, according to the principle of production and marketing to determine the balance of output.
7. Internet of things product components in addition to the final product of the Internet of things, but also for the production of a variety of other products, the number of components of the system integration of things to buy only part of the component sales.

2. the production of all aspects of the industry chain are analyzed by the profit of 1 Enterprises

When the production of all aspects of the industry chain in the Internet of things is completed by an enterprise, the market demand for the final product of the Internet of things:

$$Q_{d2} = a_2 - b_2 P_2$$

When the enterprise production and marketing balance, $Q_{d2} = Q_{s2}$. As the components and the final product is completed by the same enterprise, the unit production cost is C . Then the profit function of the enterprise is:

$$\pi = (P_2 - C)Q_{d2}$$

Enterprises in their own profit maximization goal are given under the:

$$P_2^* = \frac{a_2 + b_2 C}{2b_2}$$

At this point, the output of the enterprise

$$Q_2^* = \frac{a_2 - b_2 C}{2}$$

Profit margin is:

$$\pi^* = \frac{(a_2 - b_2 C)^2}{4b_2}$$

3. The production of all aspects of the industry chain is completed by 2 enterprises, and the profit analysis of the enterprise's independent decision-making

The unit production cost of the Internet of things is C_1 that the sales volume is Q_{d1}, the price is P_1 ($P_1 \geq C_1$), $Q_{d1} = a_1 - b_1 P_1$ when the production and marketing balance, the profit function of the manufacturer of the Internet of things:

$$\pi_1 = (P_1 - C_1) Q_{d1}$$

In the non cooperative state, the component manufacturers take their own profit maximization as the decision-making goal $Q_{d1} \geq 0$, when the $\pi_1 \geq 0$, $P_1 \geq C_1$.

Clearly, the manufacturers of the Internet of things in their own profits to maximize the target price are given:

$$P_1^{**} = \frac{a_1 + b_1 C_1}{2b_1}$$

At this point, the output of the component product:

$$Q_1^{**} = \frac{a_1 - b_1 C_1}{2}$$

Component manufacturer's profit is:

$$\pi_1^{**} = (P_1^{**} - C_1) Q_1^{**} = \frac{(a_1 - b_1 C_1)^2}{4b_1}$$

In the final product of the Internet of things, the cost of the product is the cost of the product C_2, the sales volume of the final product is Q_{d2} ,Price is P_2 , $Q_{d2} = a_2 - b_2 P_2$. When the output $Q_{s2} = Q_{d2}$ of the system integration service provider for the component of the demand for constant kQ_{d2} , said a final product needs to consume parts. The profit

functions of the integrated service provider of the Internet of things system at the balance of production and marketing:

$$\pi_2 = (P_2 - kP_1 - C_2)Q_{d2}$$

When the price of a given component P_1 is given, the system integration service provider gives the price of the system under its own profit maximization goal:

$$P_2^{**} = \frac{a_2 + b_2(kP_1 + C_2)}{2b_2}$$

At this point, the output of system integration products $Q_2^{**} = \frac{a_2 - b_2(kP_1 + C_2)}{2}$

In the industrial chain $Q_2^{*} = \frac{a_2 - b_2 C}{2}$, the difference of the final output is different, the vdifference of the size of the enterprise is affected by the price of the component P_1.

$$Q_2^{**} - Q_2^{*} = \frac{a_2 - kb_2P_1 - b_2C_2}{2} - \frac{a_2 - b_2C}{2} = \frac{b_2}{2}[C - (kP_1 + C_2)]$$

System integration service provider's profit is:

$$\pi_2^{**} = \frac{(a_2 - kb_2P_1 - b_2C_2)^2}{4b_2}$$

Component manufacturers bring profits to system integrators:

$$\pi_{1s}^{**} = (P_1^{**} - C_1)kQ_2^{**} = \frac{k(a_1 + b_1C_1)[a_2 - b_2(kP_1^{**} + C_2)]}{4b_1}$$

The total profit of the whole industry chain is:

$$\pi_{1s}^{**} + \pi_2^{**} = \frac{k(a_1 + b_1C_1)[a_2 - b_2(kP_1^{**} + C_2)]}{4b_1} + \frac{[a_2 - (b_2kP_1^{**} + C_2)]^2}{4b_2}$$

And the industrial chain of all aspects of the completion of the situation by a business compared to the difference in profits:

$$(\pi_{1s}^{**} + \pi_2^{**}) - \pi^{*}$$

$$= \frac{k(a_1 + b_1C_1)[a_2 - b_2(kP_1^{**} + C_2)]}{4b_1} + \frac{[a_2 - b_2(kP_1^{**} + C_2)]^2}{4b_2} - \frac{(a_2 - b_2C)^2}{4b_2}$$

It can be seen from the above formula, the system integration service providers, when the purchase of other components of the enterprise can bring cost savings, real-time $kP_1^{**} + C_2 \le C$, at this time:

$$\frac{[(a_2 - b_2(kP_1 + C_2)]^2}{4b_2} \ge \frac{(a_2 - b_2C)^2}{4b_2},$$

$$\frac{k(a_1 + b_1C_1)[a_2 - b_2(kP_1 + C_2)]}{4b_1} + \frac{[a_2 - b_2(kP_1 + C_2)]^2}{4b_2} - \frac{(a_2 - b_2C)^2}{4b_2} \ge 0,$$

That is $(\pi_{1s}^{**} + \pi_2^{**}) - \pi^* \ge 0$. At this time, the effective division of industry chain can bring the total profit of the industry chain. However, $kP_1^{**} + C_2 > C$ at that time, $(\pi_{1s}^{**} + \pi_2^{**}) - \pi^*$ may be less than 0, that is, the division of the industry chain, although the cost of production can be brought down, but the profit is also likely to reduce the industrial chain. The index of total profit of industry chain is C_1, C_2, P_1^{**}, C. Among them, P_1^{**} is the component manufacturer based on their own understanding of the market demand for components made by the pricing decisions, when the production cost to the timing, the industry chain P_1^{**} is a key indicator of profit.

4. The production of all sectors of the industry chain is completed by 2 enterprises, but the profit analysis of enterprise collaborative decision-making

If the node enterprises in the chain can be in the decision-making and production decision-making price to achieve synergy, to meet the demand of end product and to maximize the total profit of the industry chain as the decision objective, the price, yield and profit will be different and independent decision-making.

In the coordinated state, because each system integration product needs to use the component product, each link production cost is invariable, the unit production cost of the final product is $kC_1 + C_2$. For the market demand for the final product $Q_{d2} = a_2 - b_2P_2$, component requirements $Q_{d1} = kQ_{d2}$ are recorded with the profits π_{t1} and $\pi_{t2/}$ that are brought to the system integration service provider sales components for the component manufacturer.

$$\pi_{t1} = (P_1 - C_1)Q_{d1}, \pi_{t2} = (P_2 - kP_1 - C_2)Q_{d2}$$

The total profit of the industry chain can be written as:

$$\pi_t = (P_1 - C_1)Q_{d1} + (P_2 - kC_1 - C_2)Q_{d2}$$

P_1 Q_{d1} are collaborative pricing and collaborative supply for the supply of industrial chain components. Under the objective of maximizing the total profit of the industry chain, the optimal output of the final product is:

$$Q_{2t}^{*}=\frac{a_2-b_2(kC_1+C_2)}{2}$$

Optimal pricing:

$$P_{t2}{}^{*}=\frac{a_2+b_2(kC_1+C_2)}{2b_2}$$

The maximum value of the total profit of the industry chain is:

$$\pi_t{}^{*}=(P_1-C_1)k\frac{a_2-b_2(kC_1+C_2)}{2}+\frac{[a_2-b_2(kC_1+C_2)]^2}{4b_2}$$

For final product pricing $P_{t2}{}^{*}$, there are:

$$P_2^{**}-P_{t2}{}^{*}=\frac{a_2+b_2(kP_1+C_2)}{2b_2}-\frac{a_2+b_2(kC_1+C_2)}{2b_2}=\frac{k(P_1-C_1)}{2}\geq 0$$

When the final product pricing is higher, the final product pricing $P_2^{**}\geq P_{t2}{}^{*}$.

For the output of the final product:

$$Q_{2t}^{*}-Q_2^{**}=\frac{a_2-b_2(kC_1+C_2)}{2}-\frac{a_2-b_2(kP_1+C_2)}{2}=\frac{kb_2(P_1-C_1)}{2}$$

The output of the final product is higher than that of the final product when the product is in the cooperative decision, $Q_{t2}{}^{*}\geq Q_2{}^{**}$.

For the total profit of the industry chain, there are:

$$\begin{aligned}&\pi_t{}^{*}-(\pi_{1s}{}^{**}+\pi_2{}^{**})\\&=(P_1-C_1)kQ_{t2}^{*}+(P_2-kP_1-C_2)Q_{t2}^{*}-(P_1^{**}-C_1)kQ_2^{*}-(P_2^{**}-kP_1^{**}-C_2)Q_2^{**}\\&=(P_1-C_1)kQ_{t2}^{*}-(P_1^{**}-C_1)kQ_2^{*}+(P_2-kP_1-C_2)Q_{t2}^{*}-(P_2^{**}-kP_1^{**}-C_2)Q_2^{**}\end{aligned}$$

$(P_1-C_1)kQ_{t2}^{*}-(P_1^{**}-C_1)kQ_2^{*}$ as profit margin for component manufacturers in collaborative decision making and non cooperative decision making. Component manufacturers to accept the price, should meet $(P_1-C_1)kQ_{t2}^{*}-(P_1^{**}-C_1)kQ_2^{*}\geq 0$, at this time the price:

$$P_1\geq C_1+(P_1^{**}-C_1)Q_2^{*}/Q_{t2}^{*}$$

Therefore, $P_1\geq C_1+(P_1^{**}-C_1)Q_2^{*}/Q_{t2}^{*}$ the bottom line is the price of the component manufacturer in cooperative negotiation.

$(P_2 - kP_1 - C_2)Q_{t2}^* - (P_2^{**} - kP_1^{**} - C_2)Q_2^{**}$ as the profit margin of the system integration service provider in the cooperative and non cooperative decision making. When:

$$(P_2 - kP_1 - C_2)Q_{t2}^* - (P_2^{**} - kP_1^{**} - C_2)Q_2^{**} \geq 0$$

$$P_1 \leq \frac{1}{k}[P_2 - C_2 - (P_2^{**} - kP_1^{**} - C_2)Q_2^{**} / Q_{t2}^*]$$

Collaborative decision making can bring profit to system integration service providers.

$P_1 \leq -[P_2 - C_2 - P_2^{**} - kP_1^{**} - C_2)Q_2^{**} / Q^*{}_2]$ is the highest price acceptable to the system integration service provider in the collaborative negotiation.

(5) Numerical example

In order to further study the collaborative decision model of the industrial chain of the Internet of things, the author makes a numerical experiment. Assume that there are two companies to jointly complete the production of the product A networking products. B in the production of the need to use A products (components). Known A product market demand function $Q_A = 1000 - 5P_A$, the system integration stage by a business can be completed, the unit production cost is 20. B product market demand function $Q_B = 3000 - 20P_B$ for a company to produce B production unit production cost is 15, B enterprise production B unit production cost is 10. Each A product needs to consume 2 pieces of B production, namely.

1. When all the links in the industry chain is completed by a company

A production A product unit production cost is 50 (the cost of component 15*2 and the integrated cost of 20 and a profit for the enterprise), a, at that time, the profit of the enterprise, profit value is 28125, the yield of A product was 375 B, the product yield is 750

2. When the production of all aspects of the industry chain is completed by the 2 enterprises, and the enterprise independent decision-making

B production is completed by the B company, the unit production cost is 10, B company's profit is $(P_B - 10)(3000 - 20P_B)$, at that time, the company's plans to profit maximum profit, profit value of 98000, at this time B product plan production is 1400.

A production is completed by the enterprise, the unit cost of production is 180 (component purchase price 80*2 and integrated cost 20), a profit for the enterprise $(P_A - 180)(1000 - 5P_A)$, at that time $P_A = 190$, a corporate profit maximization, profit value is 500, the yield of A product is 50, the number of components to buy B company is 50*2=100 part (the actual supply of ethylene enterprises in the industrial chain, the enterprise of a company B) supply assembly may have the actual profit $(80 - 10)*100 = 7000$, the actual profit of industrial chain and 7500.

3. when the production of all aspects of the industry chain is completed by the 2 enterprises, and enterprise collaborative decision-making

A production by a company, B products completed by B enterprises, industrial chain link unit production cost and 40 (cost of component 10*2 with integrated cost 20), industrial chain profit $(P_A - 40)(1000 - 5P_A)$, at the time, total profit of industrial chain, profit value is 32000, the A product the yield is 400, the yield of B product is 800, the number of components to buy B company is 400*2=800, a B enterprise to enterprise supply component prices for collaborative price, the highest price can be a cooperative enterprise in the price negotiations for decision making:

$$P_1 \le \frac{1}{2}[120 - 20 - (190 - 2*80 - 20)50/400] = 49.375$$

B enterprises can accept the lowest price bottom line as:

$$P_1 \ge C_1 + (P_1^{**} - C_1)Q_2^{**}/Q_{t2}^{*} = 10 + (80 - 10)\ 50/400 = 18.75$$

4. All kinds of decision-making conditions of comparative analysis

Content	Jia product A and B	Jia product A,Jia product A, Independent decision	Jia product A, Yi product B, collaborative decision making
B unit cost	15	10	10
B price	none	80	
B collaborative pricing ceiling	none	none	49.375
B collaborative pricing lower limit	none	none	18,75
B yield	750	100	800
A unit cost	50	180	40
A price	125	190	120
A yield	375	50	400
A company profits	28125	500	Affected
B company profits	0	7000	Affected
Industry chain profit	28125	7500	32000

Table 1 – Comparison of the data under the three conditions

From the table, the industrial chain division of B after the production cost reduced from 15 to 10, but when the two enterprises with independent decision-making, because of $C = 50$, $kP_1^{**} + C_2 = 2*80+20 = 180$ and does not meet the conditions $kP_1^{**} + C_2 > C$,

the total profits of the industry chain has not been improved, but decreased from 28125 to 7500. And when the two companies in the Internet of things final product output, component supply and component supply price to adopt a cooperative strategy, the industry chain profits have been effectively improved. B product collaboration price cap 49.375 is lower than the price of independent decision-making 80, 18.75 lower than the price limit of industrial chain division of labor when the cost of production 15. The final pricing structure is affected by the bargaining power of the enterprises in the industry chain, and determines the division of industrial chain profits.

4. Theoretical interpretation of the cooperative decision making mechanism of the development of the Internet of things industry chain

The growth of the Internet of things industry chain is the process of production division of things, is the process of reducing the transaction costs of the Internet of things industry chain, but also the process of increasing the value of the industrial chain of the Internet of things (David, 1996; Thiesse,2009). The analysis framework of Figure 2 is a theoretical explanation for the collaborative decision making mechanism in the development of the Internet of things industry chain.

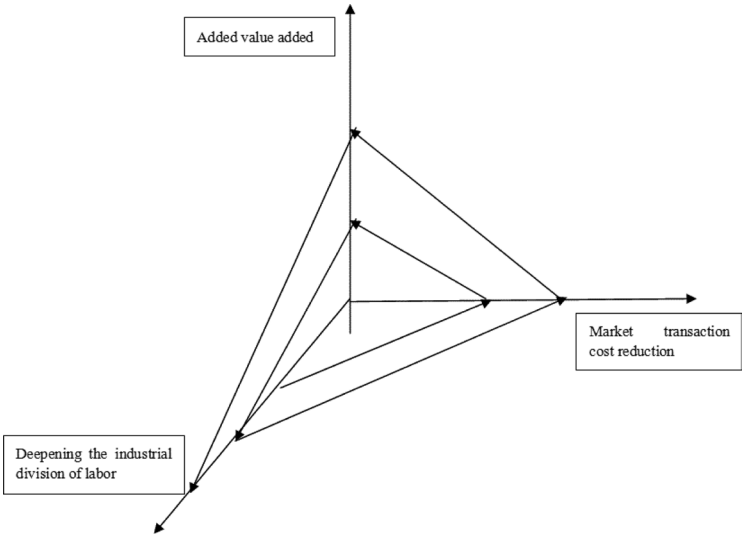


Figure 3 – The theoretical interpretation model of collaborative decision making mechanism in the industrial chain of the Internet of things

1. Networking industry division of labour to deepen the development of the industry chain to create the conditions

Enterprises in the process of production, due to the scale of the economy, the scope of the restrictions, such as the scope of the production process cannot be all of an enterprise to bear, so it produces the association between the companies (Sellitto, 2011). And the

association between enterprises promotes the formation of the industrial chain. With the diversification of technical progress and the expansion of market size and demand, some of the functions originally borne by enterprises began to separate, the company undertakes the functions are becoming more and more professional, with each link in the same division of enterprises continued to increase, industry vertical division formed more and finer. A typical example is that with the development of information technology and the formation of the global market, the vertical separation, and outsourcing of intermediate products or intermediate services began to appear in large numbers. With the deepening of division of labour in the industry and the evolution of relations between enterprises has evolved, both cooperative and complementary to each other, there are competition and constraints, this prototype chain became apparent(Lee,2007).

The growth of the Internet of things industry chain also follows this principle of division of labour. With the beginning of this century, the popularity of the network information, the process of globalization deepening, further deepening of specialization, the special relationship and the dependency relation between the numerous networking business, and promote mutual coordination and cooperation between enterprises and industry specialization circuitous cooperation, enhance the level, vertical production chain extended, produce reward increasing the endogenous dynamic mechanism, through a positive feedback loop, finally realizes the networking industry chain development.

2. The division of things in the Internet of things to promote the reduction of the transaction costs of the Internet of things industry chain

Specialized division of labour causes the enterprise to produce the transaction the need, the market mechanism produces. The core of the market mechanism is to clear the trading conditions, trading system and trading mode, and reduce the transaction cost (Gyu, 2010). Only the transaction costs, the industry chain is more competitive, and will rely on strong competitiveness to attract more enterprises to enter the field, the formation of a stable and rational relationship between enterprises, promote the formation of the industrial chain (Benedikt, 2011).

The growth process from the networking industry chain, the huge market demand and profit is expected to make a large number of enterprises to enter the field, in the enterprise division mechanism gradually formed after the market trading system of IOT industry gradually formed and improved, the standardization of the market trading system to reduce transaction costs greatly, which enhance the enterprise the market competitiveness, and attract more resources to enter this field, so as to form a new market trading system, again to reduce the transaction cost.

3. The reduction of transaction costs promotes the increase of the added value of the industrial chain

When the networking industry chain, reducing transaction cost, enterprise operation and management cost of the industrial chain decreased, when production costs and product prices unchanged, enterprises from production and sales in the profit growth, increase the added value of products or services.

4. Increasing the added value of the industrial chain to promote the further refinement of the division of labour

When the value of the industrial chain of the Internet of things is higher than the average value of the average industry, will attract more companies to enter the Internet of things industry, the scale of industry growth, industrial division of labour to a more detailed direction, and then the process of entering a new round of industrial chain growth cycle.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 07/05/2016
Aceitação/Acceptance: 22/08/2016

Research on the Land Resource Assessment and Management of Urban Growth based on Statistical Modeling and Optimization Theory

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Pages: 360–370

Abstract: In this paper, we conduct theoretical research on the land resource assessment and management of modern urban growth based on the statistical modeling and optimization theory. Land resources learning grows with the development of the social economy and science and technology, the potential evaluation of land suitability evaluation, land, land use investigation, land use classification, evaluation of land degradation and land sustainable utilization research work on the land resources investigation and appraisal to make land resources develop rapidly into a mature discipline. This study based on the statistical modeling method, and the development trend in recent years the research of the land resources in China were analyzed and prospected, aims to analyze the current hotspot in research of land resource and the phase change. The flowchart and performance of the proposed methodology is well proved that can be generally regarded as the references for the further research.

Keywords: Land Resource Assessment, Urban Growth, Statistical Modeling, Optimization Theory, Literature Survey

1. Introduction

Land resources evaluation is an essential before land use planning of the research content, work is the foundation of the construction of agricultural modernization. To protect land resources, rational utilization of general land, the development of agricultural production, attaches great importance to many countries and regions in the world study of land resources, and according to the characteristics of the region to make appropriate evaluation system and general method (Alvarenga, 2013; Besio, 2016). Land owned exploration is an important part of the human existence in order to save material core basis, but also exploration of natural resources. Full use of natural resources and economic resources, local conditions to the implementation of professional production, diversification, so that the agriculture, forestry (Abreu, 2015). Animal husbandry, the sideline production and fishery and off-site due to the development of the progressive introduction of district city, professional, social and commercialization. This is a large country like ours a population

density which are essential important advantages. The land evaluation commonly used mathematical methods mainly include the following categories.

1. Delphi method is also called the expert scoring method that is a kind of objective comprehensive most experts experience and subjective judgment skills that can be used in various fields of decision-making process.
2. By means of regression analysis, the relationship between the land evaluation factors and the land productivity in a certain region is approximately described as a function of linear correlation between the variables (Baker, 2013). By the regression analysis method, the correlation between the land productivity and evaluation factors can be approximately determined, so as to achieve purpose of screening evaluation factors and determining the weight with the corresponding references.
3. Principal component analysis, when land evaluation, we will encounter a number of factors, and there is a correlation between the factors, principal component analysis by a number of factors that can be integrated into a minority mathematically evaluation factors, and make the new factor represents both the original information factors and independent of each other, by simplifying the problem and miss the point.
4. Analytic hierarchy process is a kind of qualitative and quantitative decision analysis method, which is a process of modeling and quantitative decision making process.

Besides the mentioned methodology, the well adopted approach is the parameter based tool. World application parameters based on in-depth study of local resource characteristics to grasp the relationship between crops and land between various elements of the premise that requires a lot of factors involved on the basis of the test (Brough, 2014; Hamada, 2015). So strict, the workload is big, to have the meaning of quantitative factors parameters. Areas if the evaluation area, land type is simple (Lieberei, 2016). And the accumulation of a large amount of experimental study on the data, to carry out specific crop land evaluation and application to a certain extent, the method can reduce the subjective effect of artificial factor evaluators, thus it can improve the accuracy of

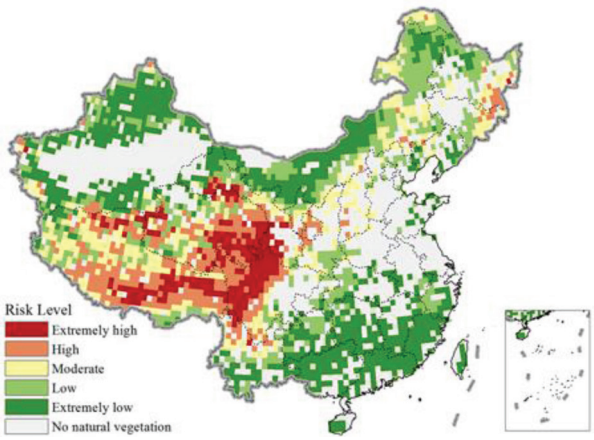


Figure 1 – The Land Resource Assessment of China

the land evaluation result. Now there are many deposits, the qualitative land evaluation methods, but these methods have their shortcomings (Natarajan, 2015; Mekonnen, 2016). Most eye only on the present state of Pu. In fact, the impact of land resources, natural conditions mountain itself over time varies. For example, some forms of land use in the short term seem to be very favorable. But long-term use may cause soil erosion. Although there is land legislation cake, natural environmental impacts that may occur in the future and so on swamp (Mellino,2015; Ohsawa, 2015). Therefore, at this stage of the quantitative or qualitative assessment of the land later, the need for evaluation of the results of qualitative dynamic pre-continent, so as to make its Tsuen basis of land use planning more scientific and more reasonable. To deal with these challenges, in the paper, we focus on the land resource assessment and management of the urban growth based on the statistical modeling and optimization theory. Before the systematic analysis and modelling, in the figure one, we show the land resource assessment of China.

2. The Fundamental Analysis of the Optimization Theory

Distributed optimization theory and application has become one of the important development directions of current system and control science. In the optimization process of the theory research, optimization design, the proof of the convergence, complexity (including complexity analysis and arithmetic complexity) the analysis is the study of some key problems in them. In the distributed optimization, the corresponding problem is attracted great research interest from many fields of that science and the technology workers (Shimada, 2015; Schoepfer, 2016). Now there are two kinds of the distributed optimization problem research: one is the optimization of the performance index function, the other is the optimization of the dynamic process of the system (Vaze, 2013; Faria et al., 2015). The distributed optimization has just started and the main study highlights the theory still belongs to the first class optimization. In the recent years, more and more researchers have paid attention to the core distributed computing, which has been applied in many of the practical problems, such as the reconstruction of the image reconstruction, the best approximation of the convex projection and the target location. Before further analysis of related theories, we summarize the traditional approaches and algorithms as the follows.

1. Variable density method. Variable density method in the core form of the probability density function of continuous variable explicitly expressed unit relative density and the corresponding relation between the general elastic modulus of materials, the method based on isotropic material, no need to introduce microstructure and additional homogenization process, it takes the relative density of each unit as design variables.
2. Homogenization method. The present method has been used for the processing, uniform two-dimensional multi-dimensional continuum structure topology optimization, topology optimization of thermal elastic structure, topology optimization problem of structural vibration, buckling considerations, and is used in the design of composite materials.
3. The optimal criterion method. The optimal criterion method is one of the biggest advantages is the number of the number of requirements analysis and general variables not matter much, the fast convergence and high calculation

efficiency, and its principle is simple, intuitive, easy to accept for engineering design personnel and master, so to use Morer optimization algorithm is also criterion method.

As a core convex optimization is the basic problem in the centralized optimization, unconstrained distributed convex optimization is also one of the most general basic distributed optimization problem and research starting point. In the general core condition, the optimization task can be modelled as the follows.

$$x^* \in \bigcap X_i = X_0 \tag{1}$$

Multi-objective optimization method is the most commonly used above the vector problem into a single objective problem of scalar processing and these methods when applied to the structure design is mainly the following obvious deficiencies and defects that should be avoided.

1. These methods have no sensitivity information is given.
2. These methods provide only a kind of design scheme that is the only one optimal solution.
3. Existing methods are only limited to some discrete points to obtain Platon optimal solutions. Therefore, the constraint relation between the objective function and the constraint function, and the core influence of the optimal solution is not clear.
4. Not in accordance with the intention of the basic designers through a small amount of calculation in the objective function space evenly distributed Plato optimization solution, the designer can't correctly describe the whole optimal solution set of the overall distribution also cannot according to the result of local trends for design requirements describe the precise choice.

Under this condition, we can transfer the challenge into the listed issues.

$$\min f(X) \quad s.t. \quad g_i(X) \le 0 \tag{2}$$

$$\min \sum\nolimits_k w_k \beta_k \quad \text{s.t.} \quad \begin{cases} f(X) \le \beta_k \\ g_j(X) \le 0 \end{cases} \tag{3}$$

According to this method, the coordinator first to predict the associated input and output of each subsystem, below each decision unit is according to the prediction of associated variables to solve their own local decision problem, and then feed the local solutions to the coordinator, the coordinator of modified association predicted until the overall goal to achieve the optimal as shown in the figure 2. All about distributed convex calculation problem above is based on access to general accurate projection point, in practice, however, the projection point of calculation, inevitably there are some error actually that received is often just an approximation precise projection point.

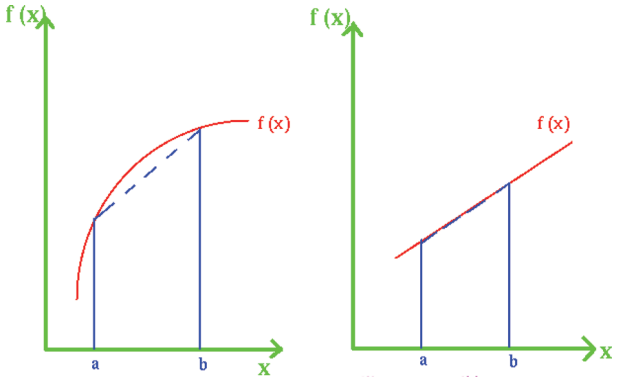


Figure 2 – The Demonstration of the Optimization Strategy

3. The Land Resources Evaluation Methodologies

3.1. Statistical modeling of land use

Land use maps of all the maps, linear features and that scattered objects are from points, lines, free curves, closed curves, arcs and some other basic elements. Each statement is equivalent to a job, each time we open a graphic or open the graphics to zoom, pan and other operations and it is equivalent to the above graphics file stored in the metadata processing. Therefore, each element of the basic storage of information data is independent of each other that can be distributed to the idea of storing the database. Land use status as the distributed data warehouse has three obvious characteristics that can be categorized as the follows. (1) In parallel, the distributed in the local data warehouse in different regions can cooperate to solve a common problem, such as the global (province) of land use and the analysis tool in global data warehouse under the control of the implementation of general land use information parallel statistical analysis. (2) Autonomous, general distributed data warehouse is a high degree of autonomy. There is no main and the auxiliary control relation between local data warehouse, that is to say, each local data warehouse is equal. (3) Modularity, the local data warehouse in the distributed data warehouse forms the relative independent module marked by the region, and the local data warehouse forms a unified system through the Internet.

3.2. Evaluation of land resources

Land evaluation unit is independent of the characteristics of land units are basically the same, is the smallest unit of land evaluation, the division should fully reflect the differences of general land quality, reasonable division and not directly related to the evaluation results. Evaluation unit division should be in a certain evaluation purposes, in order to cause the evaluation of land quality in the region of the key factors for the basis of the difference. From the systematic level, the evaluation of the land resources can be organized as the listed aspects.

1. Economic evaluation of the land resources. The result of the economic evaluation of the land can be used to determine the maximum economic benefit

of a particular land use pattern for a given land, thus providing a reliable basis for land users or policy makers to develop land use planning.

2. Evaluation on sustainable utilization of land resources. Land resource sustainability assessment is the core of sustainable land use research, is an essential part of sustainable land use research, and an important means to implement sustainable land use. Evaluation of land resources sustainable use is based on land potential evaluation and land suitability evaluation.
3. Evaluation of land resource suitability. Land suitability evaluation not only reveals the land production potential, but also reflects on the possibility of using land suitable degree and some improvement in the way of using is the core part of regional sustainable land use and management.

New measurement methods, 3S technology, mathematical model technology and database technology in the domestic land evaluation of a wide range of general applications, greatly improve the land evaluation process can be and the accuracy of the results, to provide more reliable and accurate decision-making basis for land managers and related departments. The flowchart is shown as follows.

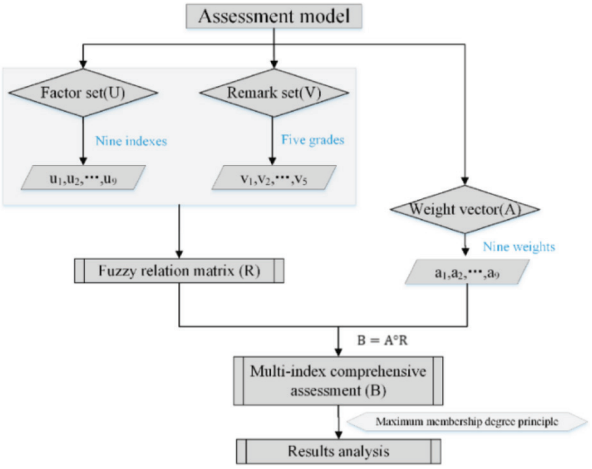


Figure 3 – The Flowchart of the Assessment Model

The commonly used indicators of land productivity are yield (basic yield), output value and the net output value and so on. According to the author's research on land economic evaluation, the energy form (dry card) selection of output value and net output value is better. By comparing the results of as each index selection, the factors of participation were selected rationally, and the weights were determined according to the influence factors of land productivity index. The calculated based form of the function can be expressed as the follows.

$$Y_{general} = b_0 b_1 x_1 + b_2 x_2 + \ldots + b_m x_m \quad (4)$$

The importance of inspection and the overall effect of that each variable on the regression equation built, eliminate the secondary factor, so as to establish the index system of the land productivity and participating factors multiple regression equation, the equation of regression coefficient to calculate the reference standard regression coefficient, to determine its weight. Now more directly by participating factors rating criteria of soil survey and other factors, but the author thinks that for the specific assessment area, evaluation factors grade standard should adapt to the local conditions, reflect the changes of factors in the area level range cannot simply copy. At present the evaluation factors classification for qualitative methods and a factor of the maximum and minimum values, with a uniform grade of tolerance. In the following table one, we show the parameters under consideration.

Class No.	Comfort Level	Sub Level	Comfort Unit
-	S1	-	-
-	-	S2w	S(2k-1)
S	S2	S2w	-
-	-	S2v	S(2k-1)
-	S3	-	-
N	-	-	-

Table 1 – The parameters taken into consideration by the system

4. The Urban Growth Management Paradigm

4.1. Urban growth general background

As a kind of technical means and policy tools, contain the spread of the city urban growth boundary refers to the city wall around the boundaries of the independent, continuous to limit the growth of the city, and through conscious planning, guide urban skin texture along the transportation corridor development and control the chaotic spread of city space, reasonable to guide urban land development and the redevelopment. Therefore, the development and evolution of city space expansion is not absolute, and literally because of the impact of the administrative divisions of the city, as the city space growth boundary growth tools and policies should also be an inevitable result of city development in the region environment as should not be confined to within the administrative boundaries. Both the normative research of urban spatial growth management and empirical research are to be combined with China's national conditions further. In detail, we should consider the follows.

1. Should be systematically discussed the historical background, theoretical system of the foreign city space growth management theory, to China system environment, resource endowment, economic and that the general social development for the city space China frame structure analysis of the growth

management theory, such as the basic legal system, policy system, decision-making system, etc.
2. The mechanism of urban spatial growth management policy tools should be studied. There is positive and negative externality in any policy tool, and complex interaction between different policy tools.
3. It is very necessary to carry out an empirical research on the urban spatial growth management in a specific city. With the historical process of urban development as the clue, the use of GIS and quantitative analysis tools to analyze urban space planning with the urban space growth management to shape the city's gains and losses, to investigate the effectiveness of urban spatial growth management.

4.2. Urban growth modelling and the management

From the perspective of system engineering, urban system is a typical of the open complex giant system, involving resources, economy, population, the livelihood of the people, environment, policy, many aspects, such as general complex coupling relationship between each related factors, it is difficult to quantitative description. Especially in the current environment of the market economy, the government can directly to the urban development process and regulation means greatly reduced, which further improved on the evolution process of the urban system of the core complexity of the mathematical modeling and optimization.

Therefore, we in the population of the geographic information system in a large city or big city as the center, to a certain distance within the scope of the urban economy, urban population, urban population than scores etc. as index to analyze urban agglomeration, urban system. The specific method is: first to megacities or big city as the center, 250 km for the radius of a circle, and then in the basic administrative zoning map layer do overlay analysis that determines the range of administrative units. Next to measure urban system condition of urbanization are rated standard, determine involves the administrative units of urbanization level.

$$S_{level} = \sum_{i=1}^{13} N_i * C_i \tag{5}$$

Study the bearing capacity of the city as the key to understand the city resources can carry the population limit, and further to master relevant control measures to improve how the population carrying capacity, plays an important role in urban development related major decisions. Unlike previous studies, this paper argues that population of the city level is the dynamic change of bearing capacity, with the city's industrial structure, such as financial capital investment are closely related. Therefore, this paper focuses on establishing reflect the resources, economy, population, ecological environment of logical relationship between the population bearing capacity model of the dynamic analysis. The complexity of factors affecting the development of urban economy and different cities face the specific problems in economic development and have very big distinction, in the study of the urban population bearing capacity model, we try to grasp the key factors influencing the population carrying capacity and the relationship between them. In the figure 6, we show the experimented simulation of the proposed methodology.

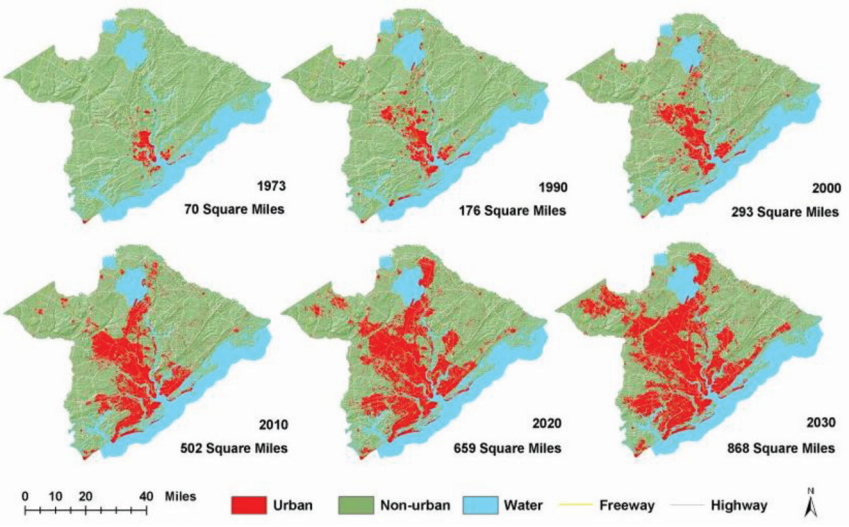


Figure 4 – The urban growth modelling visualized demonstration

5. Summary

In this paper, we conduct theoretical research on the land resource assessment and management of urban growth based on the statistical modeling and optimization theory. Evaluation of land resources is the important basis of development and the development strategy research is to coordinate regional land development and land protection, basic means to realize the sustainable development of land resources and scientific evaluation of land resources, which is beneficial to understand the characteristics of regional land resources distribution, to better provide a scientific basis for protection and utilization of land resources and strategies. Land resources assessment has been widely used in various fields, as one of the technical means in the process of land development planning that is an important component of land resource survey and a basic work of the land management. The purpose of land resource assessment is to evaluate the quality of different land units with the focus on the potential of biological production of the land and to find out the quality, quantity and distribution of land resources. We systematically analyze the issues with the theoretical analysis and mathematical modelling. The result is proven to be effective of the satisfactory robustness.

Acknowledgement

This paper is supported by open project of Key Laboratory of Carrying Capacity Assessment for Resource and Environment of the Ministry of Land and Resources: Measurement on Urban Sprawl and Control Patterns Comparison (CCA2012.12)

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 26/05/2016
Aceitação/Acceptance: 04/08/2016

Research on Hospital Human Resource Management based on Cloud Platform

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Pages: 371–380

Abstract: The development of information technology improves the efficiency of management; hospital management information system can manage the flow of people, logistics and capital by using computer technology. In this paper, the authors research on hospital human resource management based on cloud platform. Virtualization cloud platform has changed the past distributed, independent system environment, through the centralized management of data resources of the hospital system, all maintenance work will be completed through the automated management process. At the same time, through the analysis of the problems existing in hospital human resources management system, we put forward the relevant recommendations to improve the hospital human resources management.

Keywords: Cloud platform, Human resource management, Hospital, Management information system

1. Introduction

Human resources management is an important part of modern management science. The competition among modern hospitals is the competition of human resources in hospitals (Li, 2014, Rocha & Rocha, 2014). With the advent of knowledge economy, the nature of competition in the industry has been reflected in the talent competition, talent has become the most important resource in today's society, the environment, and construction of the hospital must strengthen the talent team, so the scientific and effective management of human resources is extremely important (Eisenberger, 1986; Chen, 2014). In the face of changes in the social and economic development and labor market reform in western countries, the health system of the personnel system is mainly reflected in 3 aspects: decentralization and flexible employment system, have more flexibility to allow hospital administrators to get medical resources in determining priorities (Creed,2013; Carvalho et al, 2015), at the same time to limit the number and function of time, work rules occupation physician planning, medical payment system; rational allocation of technical personnel, through the rational allocation of technical personnel and control labor costs in order to achieve a reasonable and effective configuration; hospital organizational structure change and restructuring, many European countries have joined the union hospital employees, but also so there is no opportunity to set up their own incentive

and reward mechanisms (Zhou, 2009). American hospital employees do not participate in any organization, the American hospital cost control mainly by changing technology allocation of staff and the number of employees to reduce labor costs. The research on human resource management of hospital in our country started late, but it still got some achievements (González, 2015). The human resource management of non-profit hospital has 3 trends: the battle for talent has a trend which cannot be halted and the human resources management system of scientific and human resources management of occupation (Yang, 2014; Wang, 2015). According to the present situation of human resource management in our country, because the market economy is not mature, the understanding of human resources value is one-sided, fuzzy, and surface. Human resources on the whole did not achieve effective allocation, so that many outstanding human resources due to the lack of a good environment and cannot fully realize their own value, resulting in a waste of human resources (Yang, 2006; Rocha & Freixo). According to the present situation of human resource management in public hospitals in China and existing problems, put forward the necessity of the construction of hospital human resources management system standardization, performance evaluation and performance management is an important link of hospital human resource management, performance management is the effective organization guarantee to achieve the goal.

Cloud computing technology is a technological revolution in the IT industry, has become the direction of the future development of the IT industry, governments have regarded the cloud computing services as a new opportunity for the development of the software industry. Cloud platform and the development of computer technology for hospital management model, method and segment has brought a revolutionary impact, hospital management and development in the cloud technology is also a step on the way to a new level of information technology. How to adapt to the needs of the market and development situation, realize the information management of modern hospital, is an important problem in current hospital management. With the development of market economy, between the major hospitals in the increasingly fierce competition, the development of hospital information make the hospital management and medical staff to realize the standard and convenience brought by information technology. This makes the management of information technology to put forward more requirements, in order to achieve the management of the hospital by means of information technology to enhance the overall strength and comprehensive competitiveness.

2. Integrated management of modern hospital based on cloud platform

2.1. Hospital Management Information System

Management information system (MIS) is a kind of system which can measure the various operation conditions of the organization, and provides an integrated man-machine system for the management, management and decision-making functions of an organization. The system to comprehensive utilization of computer hardware technology, network communication technology and other modern means software, MIS system is the main pillar of information technology (IT), organization and management

(OM) and system engineering (SE). MIS in the management of the introduction is a traditional way of management information technology innovation, on the one hand to improve the management efficiency of services, on the other hand, but also to make the management of the development of ways to change. Hospital management information system (HMIS) is the use of computer technology to carry on the integrated management of the hospital and its affiliated departments of people, logistics, financial flow, collection, storage, processing, extraction, transmission, processing, production of various kinds of information summary was conducted in each stage of the activities of medical data, so as to provide the overall operation of the hospital the comprehensive and automatic management and service information system. Hospital management information system is a comprehensive information system, which is recognized as an important branch of modern medical informatics by the international academic community. The main goal of HMIS is to support the hospital administrative management and transaction processing business, reduce the labor intensity of the transaction, the auxiliary hospital management, assist senior leadership decision-making, improve the work efficiency of the hospital, so the hospital to obtain the social benefits and economic benefits of better with little input. Like the financial system, personnel system, hospital patient management system, drug inventory management system, etc. it belongs to the scope of the HMIS. Hospital management information system is the most complex of the existing enterprise information systems in the world. This is the goal of the hospital itself, the task and nature of the decision. It is not only with all other MIS systems to track the management information generated by people, property management and logistics, so as to improve the hospital operation efficiency, but also to support the patient medical record information as the center of the whole medical treatment, teaching and research activities.

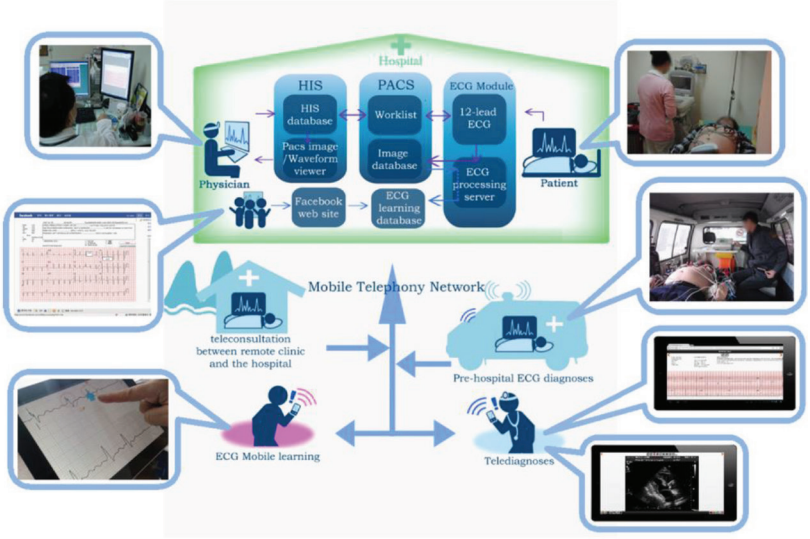


Figure 1 – Medical information construction

2.2. Cloud platform

Comprehensive management system for modern hospital based on cloud platform is the comprehensive management of computer technology and the hospital together, the use of cloud technology platform integration and processing large amounts of data, the original single function, through the integration of hospital disperse HIS, PACS, LIS and other clinical information system, the data resources of the clinical information system, teaching management system the scientific research management system, human resources management system, two level hospital comprehensive management system, logistics equipment management system can fully share and transfer, to break the current hospital information construction scattered, chaotic situation, release information island hospital of the predicament, and establish modern integrated information management system covering all aspects of the hospital.



Figure 2 – The cloud computing model

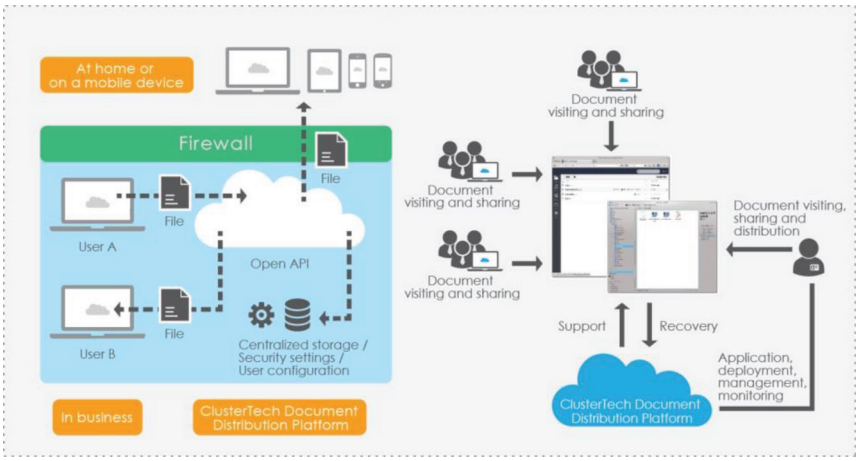


Figure 3 – Cloud platform management system

Through the construction of modern hospital integrated management system based on cloud platform, and constantly improve in practice, make it become the hospital information construction standards, and in the city and the national health care system, medical industry wide standards. This is the ideal stage of hospital management and reform of traditional management, is the only way to achieve sustainable development of the hospital. This system will comprehensively improve the comprehensive performance of the hospital, and ultimately will become a new growth point of the construction of modern hospital.

- ***Centralized management, less maintenance cost:*** The virtual cloud platform has changed the past decentralized and independent system environment, through the centralized management of hospital data resources of the system, all maintenance work completed by the automation management process, including the upgrade patch, automatic updates, security upgrade program. Not only reduces the technical staff to maintain a lot of work, but also improve the speed of handling the fault, to enhance the hospital data back to the background of the maintenance support services.
- ***Remote data hosting:*** effectively guarantee the data security in the cloud platform, storage and operation of hospital data is in the cloud data center, there is a problem with the hospital information system, the cloud platform to ensure that data is not lost. Cloud user terminal device does not exist any copy of such data isolation measures, to effectively ensure the safety of the data.
- ***Provide flexible business support anytime, anywhere:*** Cloud client access provides support for business process flexible medical staff, the medical staff either in the ward or in the office can be in the system at any time to understand the number of hospital beds, the patient's basic information, patient diagnosis records, course records and other information. These problems affect the development of the health care team and improving the quality of China's non-profit hospital, objectively restrict the reform and development of medical industry in our country, cannot meet the needs of people for quality of medical service.

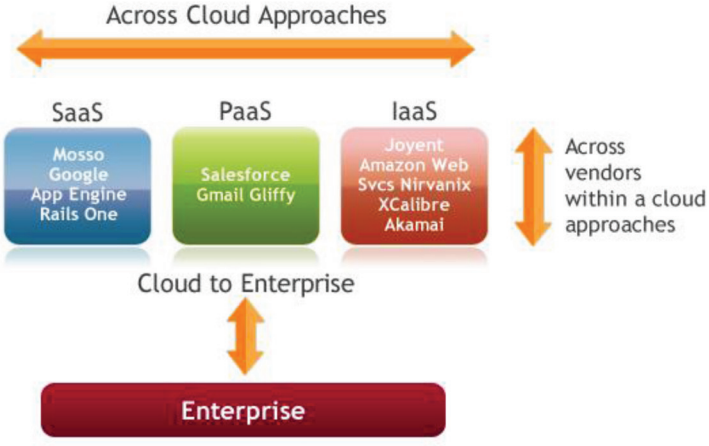


Figure 4 – Cloud computing enterprise application architecture

3. Hospital human resources management system

The long-term planned economy system on deep in China's state-owned non-profit hospital brand, hospitals in China at this stage of the personnel department is only an administrative services department, the work is often limited to the job transfer, attendance, wages approval, and the development of non-intelligence staff resources, which can provide quality the human resources of products and services for the hospital. At present, our hospital human resources management is mainly faced with the following problems.

1. Personnel management system is rigid, and the mechanism of talent flow is not perfect.

The hospital cannot become the real subject of management, its operation by the administrative department of excessive intervention, the government hospital too much, leading to the hospital want people not to enter, people want to go away, you want people to enter, professional and management personnel lack of enthusiasm. At the same time, the influence of historical factors and cultural factors, managers too much by the strict system and simple executive order management, lack of scientific, neglecting the needs of subjective initiative and the sense of belonging and sense of accomplishment and self-realization.

2. Lack of scientific performance evaluation system, staff enthusiasm is not high

Public hospitals are listed as public institutions; most of the hospitals are still in use in the past the level of wage system, wage structure and wages, salary distribution is difficult to play the role of incentive. No matter in the hospital professional and level in the application of unified assessment criteria, it is difficult to reflect the different positions of the performance contribution, lack of quantitative standard system and standard, leading to the essence of performance appraisal management did not achieve.

3. Lack of professional management personnel

This is the most public hospitals are the common problems faced by managers, mostly from the hospital in all business sectors, with strong medical technology business, but in the management of human resources is the most rely on experience or replace the management technology, can meet the general operation and affairs work.

4. The establishment of hospital culture

Nowadays, more and more enterprises take the establishment of enterprise culture as the key to the construction of enterprise. Similarly, hospitals want to in the market economy as the independent market main body development, we must also put values, hospital management criterion of style, moral norms and development goals are unified as the hospital culture, the deep heart of medical staff. In this way, it can promote the hospital staff to improve the sense of loyalty to the hospital, clear hospital and its own direction and goals of the struggle, improve work efficiency, health care and service levels. At the present stage, most hospitals in China have not a good cultural atmosphere and values.

Human resources are the core elements of today's social organization competition. As the high technology and high quality talent team, human resources management has become the most important part of hospital management. In addition, the health needs of the people as people continue to improve, continue to expand the size of the hospital, the emergence of a variety of employment patterns, the traditional human resource

management means and mode cannot adapt to the new situation perplexing. Using advanced computer network technology to build a modern hospital human resource management model based on information system has become an urgent task. The information system of hospital human resource management involves HIS, finance, research and training, performance etc., the phenomenon of information island, no interoperability, no data sharing, directly affect the timeliness and accuracy of personnel decisions, restricts the overall development of the hospital.



Figure 5 – Hospital human resources management objective

Hospital human resource management information system provides a complete management platform of the system for the whole process of human resource planning, recruitment, selection, training and development, personnel information, attendance and vacation, salary and welfare, performance management, turnover, retirement, personnel management, and personnel management, finance, research and training, performance and other information systems and related integration development through the system authorization to achieve collaborative management different management departments for different employee identity.

1. Post management: You can set all the hospital jobs, make the job description, you can publish, modify, query all the rules and regulations of the hospital human resources management, browse open to all personnel, and make sure the system is transparent. The data can be classified filing, archiving project can make their own changes, and the operation is simple, easy to browse.
2. The preparation of management: To achieve the preparation and design of all departments, subordinate units and personnel of the hospital, the classification of the situation of the lack of classification and query statistics, and the Department of history, characteristics,.
3. Appointment and transfer management. Implement recruitment plan, registration, information management, employment situation face written inquiries, staff rotation arrangement, personnel placed, process management personnel transfer.

4. Training management. Provide the training institutions, training teachers, training materials, training courses, training time, training staff and other training resources management; provide training results archiving function.
5. Salary and benefits: In salary management, establish the wage structure system of the unit needs, both to support a variety of different salary system, salary system can define the different salary project, different salary project can perform different salary standard and formula, can realize batch wage adjustment, reduce the workload. In insurance management, can be based on the need to set the insurance base, unit payment, personal payment, etc..
6. Attendance management: Provide information on overtime, night shift, duty and other self-input and confirmation. The registration statistics function provides leave, leave, tolerance and other basic information, automatic alarm function, convenient master leave. Support for all kinds of holiday management, users can define the types of false, can automatically calculate the number of days to leave, the number of days to leave, the remaining days and so on.
7. Performance evaluation: The system can deal with the different categories of personnel; establish different assessment criteria, quantified performance evaluation results according to the evaluation method and its calculation method, the automatic recording performance appraisal history and the improvement of performance in order to assess the comparative analysis. In particular, can produce tens of thousands of HIS original data analysis summary, the formation of an objective and accurate assessment basis, to achieve the dual assessment of staff work quality and quantity.
8. Accommodation management: it can realize the maintenance of the basic information of the hospital apartment, dormitory, the use of its management. It will implement the staff to track the location of the location, and effectively achieve the fixed position.

4. Countermeasures of improving human resource management in hospital

4.1. Market oriented, human resources as the core competitiveness

Market oriented is the basic requirement of various resources allocation in the society under the condition of modern market economy. From the beginning of reform and opening up from medicine to private hospital now hot rise, domestic public hospital technical backbone of a large number of loss, and now foreign hospitals have gradually entered Chinese health market, the Chinese breakthrough is inevitable to attract high-quality medical talents, and the software and hardware conditions, especially there is the advantage of There is nothing comparable to this compensation, at present only in the premise of human resources as the core competitiveness of the hospital, thinking about human resources management in our hospital is reasonable way.

4.2. Establish a scientific incentive mechanism, and comprehensively improve the salary distribution system

Compensation is a very important tool for human resource management in hospital. The compensation allocation is proper, not only can save the manpower cost of the hospital, but also can arouse the enthusiasm of the staff, so that the hospital can keep a good

benefit. In modern hospital management, it is very important to establish a fair, fair and reasonable salary system. The salary system of fair and equitable compensation, is the design, structure and level of analysis and evaluation must be established in the scientific work and performance appraisal basis, truly reflect the distribution according to work and fairness.

4.3. Establishing the management system based on hospital culture

The guiding role of hospital culture in human resource management mainly refers to the guiding role of value concept and thinking mode. The possibility of the combination of hospital culture and human resource management is still in the two elements of hospital culture. Hospital culture is also a kind of management, focusing on the optimization of people's thinking, ideas, consciousness and behaviour habits of soft management. It is only with the human resources management system, management measures, management methods and management process combined with infiltration of them, in order to truly play its "living soul" role. Only in the hospital culture oriented human resource management, human resource management will be more efficient.

4.4. Perfect the training mechanism of human resources

As a hospital employee occupation career to the existence and development of the carrier, must provide a continuous personal growth and tap the potential and play the opportunity for every employee to provide good development space for employees, allowing them to achieve career success and satisfaction, so that employees can realize the hospital respect for them. In the future the talents training mode about diversified and personalized, hospital training ways are not limited to the formal institutions of education, continuing education and training forms, the model will be more abundant and diversified.

5. Conclusion and proposal

Medical and health services as a public utility, state financial investment to do physical security, especially public health agency personnel of public health expenditure in wages and welfare expenditure, medical education expenditure is the material basis of hospital strategic reserve personnel. Because of the particularity of the medical profession, for some special positions but also give occupation safety protection, and give all leave treatment according to the provisions of the state, let employees enjoy all kinds of legal protection for hospital contribution. The personnel system reform of health institutions is an important part of the reform of human resources, to promote the employment system and job management as the main content of the personnel management system comprehensively, and will employ the basic system for the production of health institutions. Public institutions to recruit staff, to implement the public recruitment system, to establish a scientific position, competitive posts, job evaluation, rewards and punishments, contract management as the main content of the post management system. Reform of personnel system in health institutions should pay attention to health care reform and other measures to cooperate, overall planning, step-by-step

implementation, promote each other, combined with the actual situation in the region, the unit, to develop specific implementation plans.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 03/05/2016
Aceitação/Acceptance: 23/08/2016

Research of Customized Shuttle Bus Route Selection Based on Granular Computing

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Pages: 381–388

Abstract: A new method of customized shuttle bus route selection is proposed based on granular computing, which is good at processing the massive, fuzzy, uncertain and incomplete data. As recognizing the crowd with the similar traffic trip law, the data of traffic characteristic, individual characteristics and travel characteristics is collected. Using the desensitization of bus card data, bus APP data, bayonet car and driver data, objective group can be mined, which have the similar travel time, location, direction, and destination. Based on the results, it is more reasonable to make a decision the direction, length, and stops of customized shuttle bus.

Keywords: Granular Computing, Data Mining, Customized Shuttle Bus, Route Selection

1. Introduction

Custom bus is a kind of exclusive public transport service, the service object is similar to the time of starting point, travel time, travel plans are relatively stable (mainly for commuter travel and travel), timeliness, comfort and high demand of group (Gonçalves & Rocha, 2012; Xu, 2013). In recent years, the public on travel mode diversification demand rising, and the multiple factors promoting Internet plus "technology is widely used under the custom bus in a number of domestic city operation and gradually developed.

At present, the domestic bus companies are based on the reverse operation of passenger demand to operate custom bus. The basic process is: 1.first by the passenger to the bus companies to submit their own needs; 2.bus companies combined with the needs of passengers, the design of the best lines; 3. carry out the recruitment of passengers; 4.open operation. This line operation mode can effectively save the cost of public transport enterprises in the stage of investigation of demand, but there are obvious shortcomings: one is the demand for access to information is difficult, it is difficult to provide decision support for the operation of large data line. Since the line opened by the passengers need to submit travel demand, so the public transport enterprises, access to demand information is passive, which will cause the number of effective demand information can get less, low efficiency, directly affect the correctness of the line opened decision; two is the influence of the experience of passenger travel, resulting in the loss of customers.

According to the literature (WANG, 2015), Beijing city bus ride customized passengers, there are about 60% before driving to work, this part of the main line of custom bus passengers booking accessibility, convenience, comfort is more sensitive, so in the case prior to the travel demand, if the demand is not met, it is easy to cause this some of the passengers not try to use custom bus travel. Thus, the custom bus lines operating plan is reasonable, to a large extent depends on the accuracy of the demand for investigation, and the current passive survey methods are difficult to do.

With the increasing of traffic data collection methods, the spatial and temporal data of traffic travel is increasing. Through the analysis of traffic data mining on these massive, multi-source, heterogeneous, can be extracted the travel characteristics of city population, so as to provide a guarantee for the scientific development of public transportation enterprise custom bus lines operation scheme. Granular computing (Computing Granular) is a new concept and computing paradigm of information processing, which covers all theories, methods, techniques and tools of all relevant granularity. The theory, fuzzy set theory, rough set theory, a superset of the theory of quotient space and interval calculation, a branch of soft computing science (LI, 2005). Granular computing is not limited to the details in the process of information processing, so it is a unique advantage in the analysis of massive, fuzzy, uncertain and incomplete information. The size calculation of the travel spatio-temporal data mining analysis of city public traffic, commuter travel characteristics (ZHANG, 2007), including commuting time and location, direction, route, preferences, and extraction may take a customized bus group number and distribution of information, provide the decision-making basis for the opening of custom bus lines.

2. Granular computing theory

Granular computing theory to the “size” as guiding ideology, the core idea is that everything can be in different dimensions, different levels of definition, measurement and reasoning, thus forming different integrated particles. Particle size calculation process is based on the actual needs, to find the problem to study the optimal dimension and level, so as to ensure that the problem can be quickly and accurately obtained the approximate solution of the problem (ZHANG, 2007).

A simple case of granularity thought: a group of some existing influenza patients with clinical data D, data attributes as $\{ M \mid$ gender, age of onset, date, whether fever...$\}$, In order to extract the information from the data, it can be used to measure the data from different levels of granularity. To obtain the influenza virus infection in the existence of gender differences, gender, the male and female {} for particle size, particle size of data integration, this level is relatively rough; for the influenza virus infection population information needs to be further fine granularity, the gender of {male and female age}$\cap${age$\mid$ < 10, 11~20, 20~30, 30~40, 40~50, 50~60, >60} as the particle size, particle of data integration, in order to get what one age, what kind of people belonging to high-risk groups.

1. Information granule

To the final domain (or can obtain information space) O_r , with no resolution or similarity of the relationship P_r between the division O_r , each of which is known as the information particles X_r , which $P_{r1} \ni P_{r2}$. U can be one of the methods of clustering, coupling, dividing and so on. The tools used are fuzzy set, rough set, quotient space theory, etc.

2. Information granularity

The amount of information X_r contained in the information granule is called the information granularity. If the domain O_r is discrete, the information granularity represents the number of data contained X_r in the information granule; if the domain is continuous, it represents the measure of the length of the information particle X_r. Information granularity can be used to describe the coarse and fine, when dividing the relationship $P_{r1} \ni P_{r2}$, then to divide the particles P_{r1} than the coarse grain P_{r2}.

3. Information extraction

Carried out mining operations on the information particle "X"_"R", the original data will be no intuitive meaning processing process can obtain the information of the objective.

3. Line selection model

The basic principle of customized bus route optimization model based on granular computing is the traveler spatio-temporal data is hierarchical clustering using fuzzy quotient space theory, the choice of travel characteristics (demand, direction, tools etc.) homogeneous target groups, and to target population size as system bus lines provide the basis for the optimization (YAO, 2010). First of all, the establishment of travel mode choice factors evaluation system, and carries on the attribute reduction, improve the efficiency of the next cluster; secondly, construct the homogeneous travel fuzzy similarity matrix, and calculate the dynamic cluster analysis; finally, according to the operation strategy of bus companies choose different strategies, adjusted in different level of granularity and get the final clustering result.

The basic steps to build a customized bus route optimization model based on granular computing are as follows:

Step 1: Construction of travel mode selection impact factor evaluation system

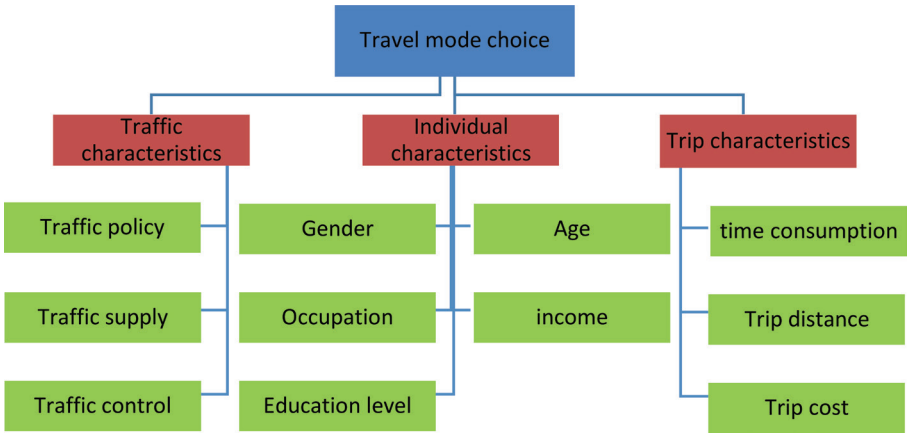


Figure 1 – Influential factor evaluation of travel model selection

From three aspects of traffic characteristics, individual characteristics and trip characteristics, the construction of 3 first level indicators, 11 two level indicators. The traffic features include traffic policy, traffic supply and traffic distribution; individual characteristics including gender, age, occupation, income, education degree; travel characteristics includes travel distance, travel time, travel destination (ZHANG, 2012), as shown in figure 1.

Step 2: determine the level of granularity of each evaluation factor, and reduce the evaluation factor.

Calculate each travel mode influence factor sensitivity using rough set, and according to the importance of the sort; according to the ranking results, first from fine-grained to multi-dimensional travel mode choice factors set of metrics, and according to the size of data on the impact factor of the grain coarsening gradually, attribute delete some weak correlation, improve the calculation efficiency of subsequent clustering.

Step 3: the collection of the impact factor data for Standardization

Make α_{il} the value of the first influence factor i contained in the l object. For each travel mode to select the corresponding factors of all the data mean $\overline{\alpha}_l = \frac{1}{n}\sum_{i=1}^{n}\alpha_{il}$ and variance $S_l = \frac{1}{n}\sum_{i=1}^{n}\left(\alpha_{il} - \overline{\alpha}_l\right)^2$, and then all the data into a standard value $\alpha_{il}^* = {\alpha_{il}^* - \alpha_{l\min}^*}\Big/{\alpha_{l\max}^* - \alpha_{l\min}^*}$.

After the first standardized treatment, the value $\alpha_{il}^* = {\alpha_{il}^* - \alpha_{l\min}^*}\Big/{\alpha_{l\max}^* - \alpha_{l\min}^*}$ is not determined in the [0,1] range, which needs to be processed by two times, $\alpha_{l\max}^*$ and $\alpha_{l\min}^*$ are the maximum and the minimum value $\left[\alpha_{1l}^*, \alpha_{2l}^*, \cdots, \alpha_{nl}^*\right]$.

Step 4: construct the fuzzy similarity matrix, and cluster analysis on the standardized sample data.

Defined $Q_{ij} \in \left[0,1\right]$ as the similarity between any two objects α_i and α_j the value of the degree of representation, calculation:

$$Q_{ij} = 1 - M\left[p_1\left|\alpha_{i1} - \alpha_{j1}\right| + p_2\left|\alpha_{i2} - \alpha_{j2}\right| + \cdots + p_n\left|\alpha_{in} - \alpha_{jn}\right|\right]$$

Construct similarity matrix. p_n ensure that the value of the weight , M is in the interval [0,1], and the clustering method is used to get the clustering results.

Step 5: determine the threshold ϕ, and adjust the size of the conversion, until the clustering results are satisfied.

According to the solution requirements and the corresponding velocity, the threshold value ϕ is determined, and the satisfactory solution is obtained at different levels of grain size.

4. Model validation

4.1. Data preparation

Select the influencing factors to the users ultimately choose sensitive customized bus travel for quantitative analysis of the way to travel, 542 sets of data collected by the questionnaire; in addition, collected in Yantai from July 20, 2015 to July 26th, the Yantai public transportation card data bus APP data, a car and driver bayonet data (the driver data automatic matching by the vehicle data). The bus card and APP data is mainly used for screening by bus travel to customized bus travel crowd; a car and driver bayonet data is mainly used for screening by private car travel to custom bus travel crowd.

4.2. Attribute reduction

Establish travel mode to select the influence factors of the discretization of the rule, the collected sample questionnaire survey data to discrete expression, to facilitate the next step of attribute reduction, as shown in table 1:

Discrete value	Traffic characteristics			Individual characteristics					Trip characteristics		
	policy	supply	Control	Gender	Age	Occupation	income (thousands)	education	Distance (km)	Time (min)	Cost (yuan)
1	Yes	Yes	Yes	Male	18-35	fixed	<1.8	Graduate	<3	<10	<5
2	commonly	commonly	commonly	female	36-50	free	1.8-3.2	University	3-5	10-30	5-10
3	no	no	no		51-64		3.2-5.5	high school	5-10	30-50	10-20
4					>65		>5.5	Junior school	>10	>50	>20

Table 1 – The rules of discrete data

The investigation on traffic characteristics, is in Yantai city traffic policy, traffic supply and traffic control to the respondents whether there is influence of travel mode choice, options include effect, general effect, no effect three; individual characteristics of the project and the characteristics of the travel income division standard, is based on the actual situation of the local Yantai to determine.

According to the discrete rules in Table 1, the discrete expression of the impact factor sampling survey data is obtained, and the decision table is constructed. Based on the resolution matrix heuristic algorithm, the formula (1) is used to calculate the sensitivity of each primary trip mode to the choice of travel mode:

$$f(c)=\sum_{i=1}^{n}\sum_{l=1}^{n}\frac{\alpha_{il}}{\left|c_{il}\right|} \quad (1)$$

The number of data contained in each of the factors that affect the. The sensitivity of each influence factor is calculated by the calculation, and the results are sorted according to the size, as shown in table 2:

Properties	**policy**	**supply**	**Control**	**Gender**	**Age**	**Occupation**
Importance degree	2.0561	1.9324	2.5769	3.0783	3.2315	3.1821
Properties	income	education	distance	Time consumption	Cost	
Importance degree	3.1836	2.8231	2.1459	2.7637	2.9322	

Table 2 – Sensitivity of Influential factor and scheduling

According to the influence factor on the way to travel from sensitive sort, followed by the traffic supply and traffic policy, traffic control, travel distance, travel time and travel cost of travellers, level of education, gender, occupation, traveller income, traveller age. The surveyed sample data analysis based on a custom bus as a traffic information technology based on the convenient and comfortable public transportation, the service object is affected by age, gender, occupation, income, cost, time and other factors, the literature mentioned 60% customized bus tourists from the driving population conclusions are basically consistent. This is because the private car travel to customized bus travel crowd more and better on the travel time, travel cost affordability. In addition, we can see that the young and have a fixed occupation, income groups prefer the custom bus; whether you choose Custom bus travel and transportation supply, policy and travel distance and other factors associated with weak, analysts believe that this has a certain relationship with the Yantai city road network and traffic circle curing range is small.

Select the main traffic distribution in Yantai city of Wanda Plaza to the Sports Park as a custom bus line terminal, the maximum value of the clustering analysis of the survey data and the data bus card, APP bus data, with traffic matching to path distance discriminant rules for standard structure size, according to the literature the standardized data value $\phi = 0.82$ as a threshold, to draw 3 lines, as shown in figure 2. Among them, a path (via South Street - two street - Guanhai Road) bear the full flow of 85%, green label; path two (the South Street - Victory Road - Red Road - sea view) bear the full flow of 78% red label; path three (via South Street - Jiefang Road - South - Ying Xiang Road Mountain Road Hong Kong - East Street) bear the full flow of 52% yellow mark. Therefore, we recommended route 1 for custom bus lines in operation, on his way to a commercial center in Luming station.

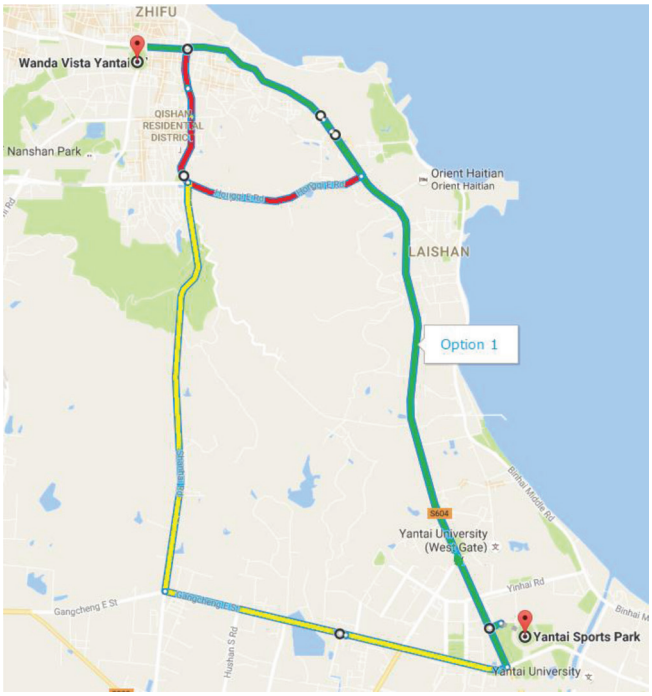


Figure 2 – Route optimization of customized shuttle bus

5. Conclusion

Build a custom bus route optimization model theory in dealing with massive, heterogeneous data traffic advantage is calculated by particle size, this model uses the original data preprocessing of rough set, excluding invalid and redundant data attributes, thus greatly reducing the amount of calculation; at the same time by using cluster analysis, clustering of data collection, the custom bus lines the traffic is relatively concentrated. However, as limited by the means of data collection, the amount of data and the number of less, in the future to consider adding more users attributes to improve the accuracy of decision making.

Acknowledgement

This paper is supported by Yantai science and technology project: “Research and development of customized public traffic information service system based on traffic time and space big data mining” (2015YT06000212).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 09/05/2016
Aceitação/Acceptance: 16/08/2016

Research on Performance and Influence Factors of Industrial Technology Innovation Strategic Alliances based on Cloud Computing Data Mining

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Pages: 389–398

Abstract: Industry technology innovation strategic alliance is helpful to the industry of science and technology achievements in industry. It plays an important role in economic growth, national innovation and optimizing the allocation of resources. Through literature analysis, this paper puts forward the research hypothesis, which is based on the five factors: the compatibility, trust, knowledge sharing degree, interest distribution mechanism and risk sharing mechanism. On the basis of theoretical research and empirical analysis, it puts forward the suggestion of improving the performance of strategic alliance of industry technology innovation.

Keywords: Information Technology, Industrial technology innovation, Strategic alliances, Structure equation modeling

1. Introduction

Industry technology innovation strategic alliance is the deepening of industry- learning-research, technology alliance and strategic alliance. It consists of enterprises, universities, research institutions and other organizations. Its goal is to integrate the advantage of all resources, enhance innovation ability of technology, so as to solve some industrial generic problems, such as the long period, high risk and investment (Caplan, 1980; González, 2015). In the strong support and promotion of national policy, all regions actively develop industry technology innovation strategic alliance, in order to promote the transformation and upgrading of the industrial structure, improve the industry innovation. According to statistics of the 2014 industry technology innovation strategic alliance launched by the Ministry of science, technology active degree is high, and higher activity alliances account for 63% of the total. Thus, the attention of Chinese industrial technology innovation is increasing, and industry technology innovation strategic alliance has become the focus of attention of the academic community. So which are the key factors to the realization of the strategic objectives: establish the strategic alliance of industrial technology innovation and improve its performance? How to improve the performance; improve the competitiveness of the industry and innovation ability?

With the continuous development of society, the information industry has gradually become an important pillar of the national economy, networking data mining is an important part of networking technology, is a large-scale increase in the number of future networking applications after the networking industry of strong complement (Fornell, 1981; Eisenberger, 2002). Although various characteristics of data networking make things data mining facing many difficulties, but things are still networking data mining technology in the future must solve the problem (Lirong, 2000, Carvalho et al., 2016). The emergence of cloud computing to the Internet data mining provides a very good idea, our country is being implemented in a number of industries based on the Internet of things cloud computing platform, cloud computing development make things have IT more powerful support capabilities, and data mining analysis ability and open platform expansion ability. Therefore, the development of the Internet of things industry, not only has great potential for development, but also the integration of Internet of things and cloud computing has a greater impact on social and economic development.

2. Cloud computing and data mining

Cloud computing is a new computing method based on the Internet, which provides users with on-demand and access computing through the Internet. Because the resource is on the Internet, and the Internet in a cloud pattern that can therefore image analogy for the cloud, "cloud" is also a kind of abstract concepts underlying IT infrastructure, it is through an Internet to provide dynamic scalable virtual resources calculation model (Xiaoming, 2004). Hadoop can be summarized as a distributed system based architecture developed by the Apache software foundation (Qingxiong, 2014). At present, Hadoop has been used in many research institutions as the basic development platform for cloud computing, it can be in the user does not understand the distributed program development of distributed technology. Hadoop is based on the distributed file system HDFS and MapReduce as the core, it provides the basic architecture of the underlying details of the system, the user can get a very good distributed computing and distributed storage

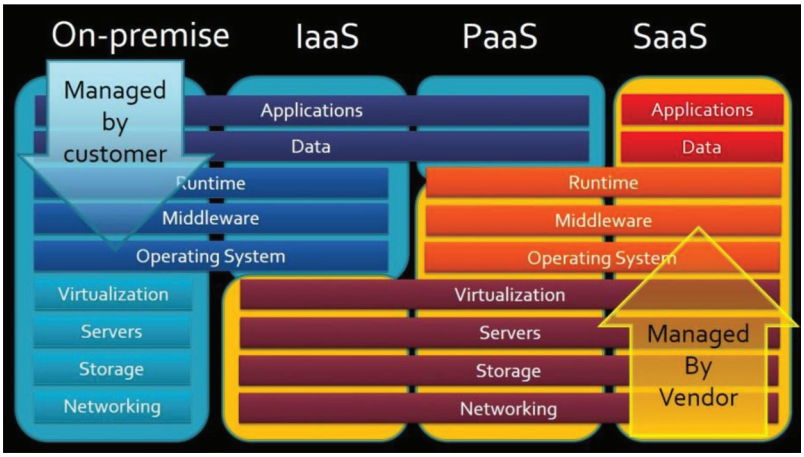


Figure 1 – Cloud computing platform

programming environment(Creed, 2013; Weiwei, 2014). HDFS has the advantages of high fault tolerance, high scalability, so that users can not only deploy Hadoop on the server, but also can be deployed in the low hardware, the formation of a distributed file system. MapReduce distributed programming model allows users to develop parallel applications in distributed systems do not understand the underlying implementation details, using MapReduce to integrate distributed file system data, can ensure the efficient analysis and processing. Users can easily use Hadoop to organize computer resources, and then build their own distributed computing cloud platform, and can make full use of cluster computing and storage capacity, to complete the processing of massive data.

Although the history of data mining is not long, but since the last century since 90s, people's attention more and more, because data mining is a cross subject, according to the Internet data characteristics, summarizes the characteristics of IOT data mining technology puts forward new challenges for data, mainly in the following points:

1. A large number of Internet data stored in different locations, so it is difficult to dig through the central mode of distributed data.
2. The data of the Internet of things is huge, there are a large number of sensor nodes, and the need for real-time processing, the general will use the central structure, which greatly increased the hardware requirements for the central node.
3. The node resources are limited, the use of the data on the central node optimization strategy without expensive resources, in most cases, the center nodes do not need all the data, but need to estimate some parameters can be performed to preprocess the original data in the distributed nodes, then send necessary information to receivers.
4. There are many external factors, such as data security, data privacy, legal constraints, and so on. It is usually not feasible to store all the data in the same data warehouse.

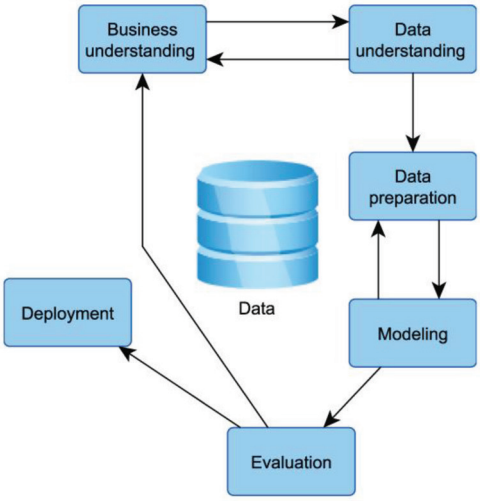


Figure 2 – The data mining process

3. Influence factors and assumptions

By reading, analyzing and studying the relevant literature, it is not difficult to find that most of the scholars have a research on the influence factors from one aspect or several aspects. This paper mainly studies the internal environment influence on alliance performance, including construction stage is the main influence factor of alliance members of compatibility, operation stage of the influencing factors mainly includes industry alliance members between trust and knowledge sharing degree, interest distribution mechanism and risk sharing mechanism, and the use of structural equation model of the of hypothesis and verification, analysis and discussion of the results of the verification, and puts forward some suggestions to improve alliance performance.

3.1. Compatibility

The better compatibility, the smaller the friction and conflict between each other, which is beneficial to the stability of the alliance and the improvement of the performance of the alliance. Harrigan (1988) study that the higher the degree of similarity, the more stable the alliance; he think that resources are different and complementary alliance members to develop new resources and skills; Chang (2002) in the respective research show that, alliance performance will be affected by the alliance members cultural similarity, complementary resources. In view of this, this paper puts forward the research hypothesis: H1 alliance compatibility is higher, while the industrial technology innovation strategic alliance performance is higher.

3.2. Trust

A high degree of integrity of the partners can effectively prevent the opportunism of speculation, And Teng (1997), Nielsen Bernhard (2002) research shows that trust is helpful to improve the performance of the alliance, both of which have a positive impact; Chen (2004) studies show that trust has a positive effect on alliance performance; Liu (2008) through the study of China's pharmaceutical industry found that trust as an intermediate factor, the impact of the alliance's performance has an important role. Based on this, we put forward the hypothesis H2: the higher the trust degree of alliance members, the higher the performance of industry technology innovation strategic alliance.

3.3. Degree of knowledge sharing

The degree of knowledge sharing plays an important role in the strategic alliance of industrial technology innovation. Some scholars believe that good knowledge sharing can improve the performance of the alliance, while others are against it. Among them, Yang think that when the knowledge sharing is limited, it is not conducive to the promotion of alliance performance; Sun through the questionnaire, knowledge sharing on the team effect has a positive impact; Pan Study shows that organizational knowledge sharing will eventually have a positive effect on organizational performance. Based on this, this paper put forward a hypothesis: H3 alliance knowledge sharing degree is higher, while the industrial technology innovation strategic alliance performance is higher.

3.4. Interest distribution mechanism

The strategic alliance of industrial technology innovation by enterprises, universities, research institutes, government technology research and development within the industry, to achieve the overall benefit, but each individual will strive to a "win-win" situation, thus, strategic alliance benefit allocation mechanism is perfect or not is the key to the success of the alliance. If the interests of union members in the alliance and assumed responsibilities and obligations do not match, interest distribution mechanism unreasonable, cause conflicts within the union continuously, so is not good operation. Therefore, this paper puts forward the hypothesis H4: the more perfect the benefit distribution mechanism, the higher the performance of the industrial technology innovation strategic alliance.

3.5. Risk sharing mechanism

One of the purposes of the industrial technology innovation strategic alliance is to reduce the risk, but the risk cannot be completely avoided, there will still be some risks, such as market risk, technical risk, speculative risk. A reasonable estimate of the risk of market risks, the market is constantly changing, in a state of uncontrollable, union is able to a good forecast of market demand, the logistics market may exist, which on alliance performance has an important influence. Risk sharing mechanism has a great influence on alliance performance. Finally, it puts forward the hypothesis H5: the more perfect risk sharing mechanism, industrial technology innovation and strategic alliances.

4. Empirical analysis

4.1. Definition and measurement of variables

In this paper, we use the questionnaire of the 5 level of the scale of the questionnaire designed by the scale of foreign and domestic related maturity. The compatibility of Andresen and Saxton reference, Teng (2003) maturity scale, including culture, strategic objectives and similarity of resource complementarity; Trust for reference and Hitt (2006), and Azeroual (2009) of the maturity scale; The knowledge sharing degree was developed from Hoof and Ridder, and three aspects of knowledge base, willingness of knowledge sharing and knowledge transfer ability were designed. Risk sharing mechanism, by reading the relevant literature, from the technical risk, market risk, speculative risk three angle survey design asked. The alliance performance is mainly from Andeson (1990), Nielen (2007) research, mainly reflected the economic, scientific research, industrial innovation. On the basis of previous studies, adjust the design of the questionnaire, to seek the views of relevant experts, and constantly modify and then form the final questionnaire.

4.2. Research sample

The total payment of 300 electronic questionnaires, recycling 201 questionnaires, and strict screening on the recovery of the questionnaire, the questionnaire excluding incomplete answer, answer a casual attitude, quality is not high and, ultimately, the 194 valid questionnaires. Effective questionnaires were described and statistics, found

that the unit of state-owned enterprises accounted for 32.5%, foreign enterprises 14.9%, 26.8% joint ventures, private enterprises 18.56%, other 7.24%;Investigators located units of the size of less than 500 people accounted for 29.38%, 500 to 1000 people accounted for 21.65%, 1000 to 3000 people accounted for 26.8%, 3000 to 6000 people accounted for 19.1%, more than 600 of the 3.07%;Survey unit of the unit's age from 4 to 6 years accounted for 4.63%, 7 to 10 years of 23.2%, 11 to 20 years of 40.72%, more than 20 years of the 31.45%;Survey of senior management staff accounted for 23.2%, middle management accounted for 41.24%, grassroots management staff accounted for 11.34%, technical staff accounted for 19.1%, accounting for 5.12% of the other.

4.3. Reliability and validity analysis

The reliability and validity of the questionnaire used SPSS17.0 to calculate, which the overall questionnaire Cronbach's alpha value 0.815, numerically larger than 0.8. Among them, compatibility, trust, knowledge sharing degree, interest distribution mechanism, risk sharing mechanism, alliance performance each item Cronbach's alpha coefficient is higher than 0.7, the factor loadings of the measuring index of each are both greater than 0.5, each group of items in the average variance extracted were greater than 0.5, indicating that the questionnaire the intrinsic quality of the ideal. The validity of the test is through two aspects of the test. Content validity, because of its reference to the relevant literature and mature questionnaire, and its revision, and thus has a high content reliability; Construct validity and Bartlett's test of sphericity is less than 0.001, kmo value is 0.701, greater than 0.7, compatibility, trust, knowledge sharing degree, interest distribution mechanism, risk sharing mechanism, the alliance mechanism of variance cumulative contribution rate were 88.929%, 87.578%, 65.131%, 75.322%, 67.794%, 73.334% that scale has good convergent validity and construct validity. Overall, the questionnaire was of high quality. The results are shown in table 1:

4.4. Data analysis

In this paper, the AMOS software is used to establish the structural equation model, and the model is analysed, and the fitting degree of the model and the theory of the previous hypothesis are supported. Model is adopted for the goodness of fit index including absolute fit index, value-added adaptation index, simple adaptation index three statistic value, from the table can see NFI, IFI, TLI, GFI and CFI were greater than 0.9, good fitting degree, RFI is greater than 0.8, considered to be acceptable, pgfi, pnfi, PCFI are greater than 0.5, good fitting degree, the RMSEA fit reasonable. Overall, the fitting index basically reached the proposed value, and the model fit better.

4.5. Result analysis

As can be seen from table 2, assuming H1 to H5, the H3 hypothesis has not been supported, H1, H2, H4, H5, the assumptions are verified.H1 is assumed to set up, that is, the higher the compatibility of alliance members, the higher the performance of the alliance. A similar alliance culture, strategic objectives and complementary resources has an important effect on alliance performance.H2 hypothesis was established, the higher the trust degree of alliance members, the higher the performance of the alliance. The H3 hypothesis reflects the relationship between knowledge sharing and the

Latent variable	Measurement index	average value	standard deviation	Factor load	Cronbach's a	Mean variance extraction
compatibility	Cultural and strategic similarity	3.52	0.604	0.803	0.8788	0.7851
	Resource complementation	3.59	0.493	0.962		
Trust	Level of trust	3.92	0.712	0.985	0.8717	0.7754
	Mutual trust	3.88	0.679	0.762		
Degree of knowledge sharing	Willingness of knowledge sharing	3.77	0.764	0.559	0.7634	0.5351
	Knowledge transfer ability	3.78	0.665	0.972		
	Knowledge base	3.75	0.815	0.59		
Benefit distribution mechanism	Distribution of intellectual property rights	3.99	0.705	0.600	0.8474	0.6566
	Alliance initial interest distribution	4.20	0.525	0.941		
	Distribution of benefits in the process of alliance	4.32	0.500	0.851		
risk pooling mechanism	Technology risk	3.95	0.638	0.603	0.7808	0.5513
	market risk	3.76	0.515	0.669		
	Speculative risk	3.91	0.506	0.918		
Alliance Performance	economic performance	3.54	0.509	0.797	0.75	0.51
	Scientific research achievement	3.48	0.658	0.500		
	Industry innovation	3.60	0.446	0.803		

Table 1 – The reliability and validity of industry technology innovation strategic alliance performance and influence factors

performance of industry innovation strategy alliance, which is not verified. As Eastvld, R Lane and other scholars' research, knowledge sharing does not necessarily improve the performance of technological innovation alliance, but sometimes it will cause the individual's mobility is strong. Hypothesis H4 and H5 reflect is interest distribution mechanism, risk sharing mechanism and industry innovation alliance performance relationship hypothesis. Whether the mechanism of interest distribution can be run

hypothesis	route	Path coefficient	C.R	Significant	Test result
H1	The better compatibility of alliance members, the higher the strategic performance of industry technology innovation	0.353	7.081	***	support
H2	The higher the degree of trust among alliance members, the higher the performance of industry technology innovation strategic alliance.	0.168	4.239	***	support
H3	The higher the degree of knowledge sharing among alliance members, the higher the performance of industry technology innovation strategic alliance.	-0.156	-2.738	0.006	Not supported
H4	The more perfect the benefit distribution mechanism among the alliance members, the higher the performance of the industry technology innovation strategic alliance is.	0.239	3.533	***	support
H5	The more perfect the risk sharing mechanism of alliance members, the higher the performance of industry technology innovation strategic alliance.	0.31	4.327	***	support

Note: * * * on behalf of P<0.01

Table 2 – path coefficient and fitting index

normally, whether the responsibility of members and the distribution of benefits is proportional to the development of the alliance is the basis for the development of the alliance. After the establishment of industrial technology innovation strategic alliance will face a variety of risk, if the risk is not to reduce or even eliminate, will affect the performance of the alliance.

5. Conclusion and proposal

The results can be seen in the order of importance are: compatibility, risk sharing mechanism, interest distribution mechanism, trust, has a strong role in promoting the alliance performance. Based on the results of empirical analysis, the following suggestions are put forward to improve the performance of the alliance:

1. Strict alliance member selection

In technology innovation and strategic alliances enable to choose similar to their own culture, strategic objectives are similar and complementary resources of alliance members, reducing friction in the running process of the alliance, gathering up the

resources of logistics enterprises, institutions of higher learning and scientific research institutions, to achieve the two heads are better than one, a total of technology research and development, promote the good functioning of the alliance, and ultimately strategic objectives, improve the performance of the strategic alliances.

2. Strengthen the trust mechanism in the League

The higher the degree of trust of the alliance, the better communication will be the closer relationship between the members of the alliance. First, we need strength the design assessment norms. Second, we need strength the coordination of the goal of the union. Third, the establishment of information exchange mechanism. Fourth, we need play the role of government oversight. Fifth, we need establish the alliance members to prevent speculation and fraud of the soft constraint mechanism.

3. Establish a reasonable mechanism for the distribution of benefits

The interest distribution mechanism, establish and perfect the comprehensive alliance members of the initial investment amount of resources, the contribution of the late and the in technology innovation and R & D take the size of the risk for comprehensive, scientific and reasonable evaluation, follow the multi input and multi output, pay more benefit, the principle of high risk and high return of interests of ownership and distribution and on the base of union members agreed to establish a contract.

4. Take a proactive risk prevention mechanism

Need to establish a sound risk prevention mechanism. First of all, institutions of higher learning and scientific research institutions should use professional knowledge reasonable removal technology risks and uncertainties, and establish perfect supervisory mechanism and the implementation of the measures, successfully developed the commercialization, to achieve the strategic objectives. the second, the government should guide the industry technology innovation strategic alliance, through financial subsidies, tax incentives, awards and subsidies, financing guidance, develop the relevant legal documents etc. method to reduce the risk of imbalance of a strategic alliance. Third, on the one hand, through the strict alliance member selection, establish perfect the mechanism of communication enable members of the alliance cooperation can smooth. On the other hand to establish detailed terms and prevent investment risk by using the commercial reputation and other soft constraints. fourth, the establishment of alliance risk compensation, to ensure the stability of the alliance, and thus improve the performance of the alliance.

Acknowledgments

The work of this paper is supported by Social Science Fund Project of Hebei province (HB16MK029); Project of science and Technology Department of Hebei province (No. 15456134); Project of Tangshan City science and Technology Bureau(2013CX-3).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 01/05/2016
Aceitação/Acceptance: 19/08/2016

Research on the Choice of Alternative Technologies of Coal Resources and Cost Trend Analysis under the Background of Coal Price Fluctuation

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Pages: 399–410

Abstract: In this paper, we conduct research on the choice of alternative technologies of coal resources and cost trend analysis under the background of coal price fluctuation. Compared with the traditional power generation, clean energy as a new generation of the distributed generation technology, the same type of decentralized power to form large-scale power generation clusters, both to meet the load needs of specific industrial users can also provide for the safe operation of large power grid to provide as the necessary support. In a future quite long time, our country's energy pattern focusing on coal will not have the big change and the sustainable development of coal industry will affect directly the sustainable development of Chinese social economy. This research based on the review analysis of the alternative technologies and cost trend analysis to provide the new idea of dealing with the related challenges that holds the vital significance.

Keywords: Alternative Technologies, Coal Resources, Cost Trend Analysis, Background, Coal Price Fluctuation

1. Introduction

Along with the progress of new industrialization in our country and the residents increased demand for daily energy consumption, economic growth and growing contradiction between energy effective supplies (Zhao, 2014; Bakhtyar, 2014). The price of the coal is becoming the most essential factor that will influence the strategy for the energy safety (Falivene, 2014; Chen, 2016). Factor that affects the price of coal is relatively more, many scholars at home and abroad from a different perspective on a wide range of discussion (He, 2014; Faria et al., 2015; Ding, 2016; Kim, 2016). For the literature review, we summarize the corresponding perspectives as the follows.

1. Kanamura based on the energy supply and the demand relationship, the energy price volatility is studied, and the shape of the energy supply curve is decided as the characteristics of fixed energy price fluctuation.

2. Joëts studied the relationship between coal, oil, natural gas and electricity price based on nonlinear panel data cointegration method, and concluded that there was a long-term stable cointegration relationship among the remaining factors except for the negative correlation between the crude oil price and electricity price.
3. Ma cooperate the entire engineering research based on the panel with the relations between Chinese region energy prices, thinks that its association entire relations had the difference in the time and space, the energy price distortion compare clearly improved in the past.
4. Zhang Based on the cointegration analysis between domestic coal price and international oil price, it is considered that international crude oil price is the granger cause of domestic coal price fluctuation (Zhang, 2016).

Under this circumstance, the research on the price and clean energy is becoming the trend. Compared with the traditional power generation, clean energy as a new generation of distributed generation technology (Wang,2014), the same type of decentralized power to form large-scale power generation clusters, both to meet the load needs of specific industrial users can also provide for the safe operation of large power grid to provide as the necessary support (Hoi, 2013; He, 2015). But at the same time, because the clean energy generating unit has unstable power output, a large number of absorption of reactive power, control and regulation means the single operating characteristics, a large number of put into operation will bring a lot of power grid problems to be solved (Pereira, 2015; Nie, 2016). To sum up, we organize the clean energy techniques as the follows. (1) Hydrogen produced from biomass. Biomass hydrogen production includes biological method and the thermo chemical conversion method (Peng, 2013). Bio hydrogen production according to the energy sources of the biological production can be divided into the anaerobic fermentation process for hydrogen production and photosynthetic microorganisms. (2) The stalks pyrolysis gasification legal system combustible gas technology, its technique of production flow is: First after the stalks cut to pieces, from the spiral conveyer transports to the carbonization gasified boiler, stalks under the oxygen insufficient condition, dry distillation, thermal decomposition and gasification. (3) Straw conversion steam and diesel (Seredin, 2013; Sun, 2016). The existing method utilizes the characteristics of

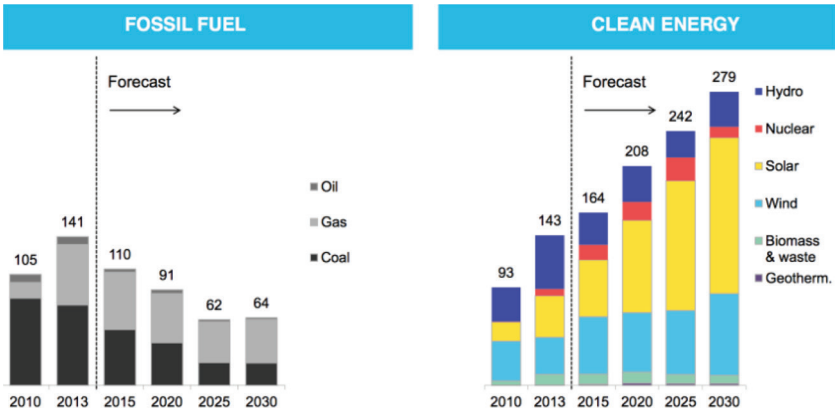


Figure 1 – The Developmental Trend of the Clean Energy from the Data Perspective

original carbohydrates and lignin in the straw to selectively control the carbon-carbon bond between the broken ether bond, the phenol ether bond and the linking unit under the action of the catalyst, 40% of the liquid fraction is diesel distillate, 20% is gasoline fraction, the rest is benzene, the other is benzene, and the other is benzene and phenol. (4) Straw power generation technology. The stalks are the clean renewable resource, the stalks pass through cut to pieces, the hammer grinds to 15~20 mm generates electricity, the quantity of heat that every 2t stalks have is equal to 1 t standard coal, its calorific value is equal to coal 85%~ 90%. The sulphur content of the straw combustion only then 3.3% that is lower than the coal of the average sulphur content.

In the following figure one, we demonstrate the developmental trend of the clean energy from the data perspective, in the later sections, we will discuss in detail.

2. The Coal Price Trend and Fluctuation Modeling and Analysis

China's coal price reform began in the late 1970s. With the reform of the economic system, the sales system and price system of the coal industry began to change, and coal prices were gradually liberalized. Starts from the historical analysis, we then summarize the development trend of that as the follows.

1. After 1980s, under the impetus of the economic system reform, coal price management began to loosen. In 1992, the country let loose the uniform allocation ore new production mine pit to reach the coal producer price that in the childbirth time produced, implemented the market regulation, in the meantime that has decontrolled the national control directional coal price, cancelled the unscheduled coal to limit the price high. The coal price reform is in official implementation stage, has implemented the diversified coal price form.
2. From 1993 to date, the coal price reform into a new stage, as basically established a market price based price mechanism. At this point, China's coal price formation mechanism has undergone a qualitative change, that is, from the government pricing into the formation of market prices, the allocation of coal resources by the government to allocate the allocation of market allocation, coal price reform has made remarkable achievements, that gradually to the market.

In the above table one, we show the coal market price statistical data with the mark of the profit level. The factors influencing the price of coal are relatively more. In the past, and the relationship between the variables was measured by individual subjective judgment, and the results of the research often deviated from the reality. For the specific expression of the prediction system, we model it as follows.

$$y_m = \Phi_1 y_{t-1} + \Phi_2 y_{t-2} + \ldots + \Phi_p y_{t-p} + \chi_t \quad (1)$$

Where the y_m represents the contains the domestic coal price and coal supplies, coal demand as well as the international coal price and the international oil price time series vector. For optimization of the model, we should consider the listed issues. (1) Coal supply. This article refers to as the current raw coal production, the current coal supply net imports and the cumulative value of coal inventory of the previous period.

Year	The coal average prices	Market coal sale prices	Profit level
1995	109.2	115.9	C
1996	114.8	132.0	C
1997	122.6	133.9	B
1998	166.7	179.4	B
1999	160.3	161.5	D
2000	143.8	156.4	B
2001	151.6	155.5	C
2002	166.9	178.4	B
2003	180.6	198.3	B
2004	200.6	211.0	B
2005	298.3	325.8	A
2006	311.5	322.1	B
2007	329.6	329.9	D
2008	335.6	350.4	B
2009	305.9	311.6	C
2010	311.6	312.9	D
2011	298.6	305.2	C
2012	299.8	300.8	D
2013	302.6	315.2	C
2014	315.4	326.8	C
2015	320.2	335.1	B

Table 1 – The coal market price statistical data demonstration

Among them, the coal stock index is expressed coal stock in the whole society. (2) Coal demand. In this paper, electricity, chemicals, metallurgy, building materials industry, the four coal consumption, said the total amount of data are derived from the Chinese coal market network. (3) International oil price. In this paper, the U.S. West Texas crude oil spot price, the data from the U.S. Department of the general energy information. (4) Domestic coal price. Domestic coal prices in the Qinhuangdao is generally considered the domestic coal price fluctuation of the wind vane, therefore, the average price of the closing price of Qinhuangdao coal.

To find the optimal solution to the formula one, we choose to use the SVM for the systematic analysis. Support vector machine is a kind of machine learning method based on the VC dimension theory and structural risk minimization theory, which is based on statistical learning theory and structural risk minimization theory. For the general structure of the SVM, we should formulize it into the listed form.

$$f(x) = w \cdot x + b \tag{2}$$

Where the w represents the weight vector and the b denotes the threshold value. For a given sequence of general training data, support vector machine based on the minimization objective function to determine regression function. In the formula 3, we demonstrate the fitting function.

$$\text{margin} \equiv \arg\min_{\mathbf{x}\in D} d(\mathbf{x}) = \arg\min_{\mathbf{x}\in D} \frac{|\mathbf{x}\cdot\mathbf{w}+b|}{\sqrt{\sum_{i=1}^{d} w_i^2}} \tag{3}$$

And the optimization procedures can be organized and simplified as the following formulas, respectively.

$$\min_{f,\xi_i} \|f\|_K^2 + C\sum_{i=1}^{l}\xi_i \tag{4}$$

$$\min_{\pm_i} \sum_{i=1}^{l}\pm_i - \frac{1}{2}\sum_{i=1}^{l}\sum_{j=1}^{l}\pm_i\pm_j y_i y_j K(\mathbf{x}_i,\mathbf{x}_j) \tag{5}$$

Using SVM for regression analysis is essentially a linear model to train the basic regression function in the feature space by mapping the X to the high dimensional feature space. As the demonstration, in the figure 2, we use the captured data to predict and analyze the coal price with the revised SVM model.

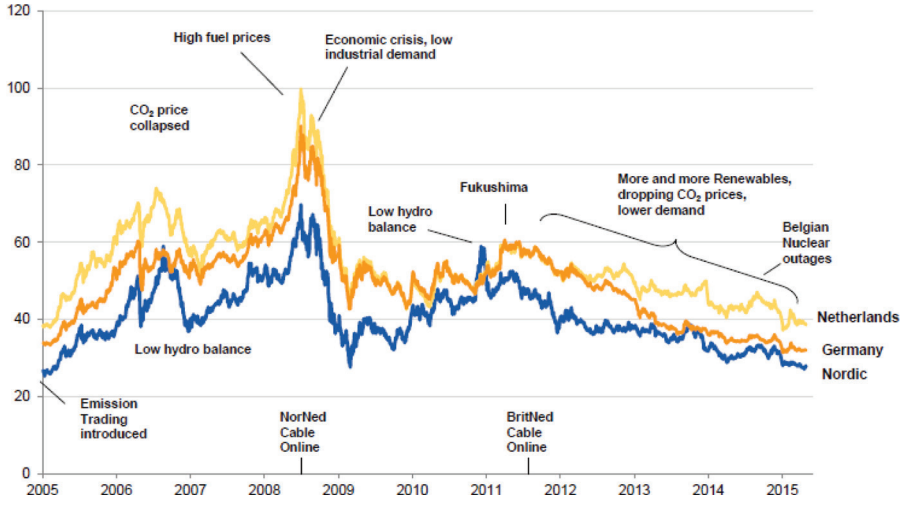


Figure 2 – The Coal Price Prediction from the SVM Perspective

3. The Clean Energy and the Coal Substitution Product

3.1. The clean energy

Clean energy is a kind of clean and efficient system for energy. Clean energy has a narrow sense and broad sense which can be separated into the listed aspects.

- In the broad sense, clean energy refers to the basic development and the utilization of the whole process is generally not or very little pollution of the environment and ecology, or the degree of pollution is less than the use of energy, such as geothermal energy, coal, bioenergy, etc.
- In a narrow sense, clean energy refers to the energy that can not cause any pollution to the environment and ecology during the process of mining, transportation, use and discharge, such as solar radiation, wind, hydro, geothermal, bioenergy and ocean wave.

Presently the stage, along with the unceasing progress of development and society of the economy, the ecological environment issue also more and more receives attaching great importance to of various countries. Some developed countries and developing countries had realized the clean energy in the important position of the future fuel supply, in abundance and introduces the peripheral area, to study the new technical system to safeguard mining and application of clean energy through the improvement legal framework. For the detailed demonstration, we therefore listed the essential techniques as the reference.

1. Wind energy. From the perspective of the development velocity of the installed capacity of clean energy, wind power installed capacity after solar, annual rate of 28%. Germany ranked first for the capacity of countries around the world.
2. Bioenergy. Ethanol supplies 78% of the total energy for the Brazilian non-diesel fuel. Ethanol provides 57% of the total non-diesel fuel in the United States. That year, nine EU countries have gradually become the biodiesel producer.
3. Tidal energy. In the background of the ecological crisis and the energy crisis becoming more and more serious, the tidal energy itself will not change because of the flood, flood season and other hydrological factors, so the tidal energy social and that economic advantages are more and more obvious.
4. Coalbed gas. Coalbed methane is a kind of potential clean energy source, which is a potential clean energy source. It is also a kind of greenhouse gas. In the same condition, the greenhouse effect is 24.5 times of CO.
5. Liquid fuel technology. Liquid fuel technology is mainly refers to the fuel ethanol, biomass fuel oil, etc. Ethanol technology is the main development direction of the liquid fuel as the raw materials, and also will be the main development direction of the liquid fuel. The United States uses corn as the main raw material to produce ethanol fuel, while Brazil uses the low cost of biomass resources to produce ethanol fuel.

However, considering the cost and the general balance, the challenges still exist. Here, we summarize some based on the literature review as table two.

Challenge	Reasons and Difficulties
Clean energy economy is difficult to solve.	From the current point of view, the early stage of clean energy R & D investment in equipment and raw materials investment is much higher than the traditional energy.
Part of the clean energy needs to look for alternative materials.	For example, corn and other grain crops are the main materials of ethanol, but the world total grain output is insufficient at present, the grain question still exists.
Part of clean energy technology problems need to break through.	The domestic parts of the gear box and other core components of the equipment needed for wind power generation have high damage rate, so it is difficult to be self-sufficient, so it is necessary to further research and development of technology.
The development of clean energy lacks the corresponding policy support.	Clean energy action is a huge systematic project, which needs the support of all aspects of the policy. To make good use of the role of good coordination of relevant policies and the general support.

Table 2 – The challenges of the clean energy strategy

3.2. Coal substitution product

The energy primary product is a major concept and big set. Because the different energy products by providing power as basic function attribute, therefore, the different energy products can substitute in the function mutually, and among the energy products has the possibility of substitution.

1. Incremental substitution is the expansion of energy products through the imbalance, to achieve a relatively large extent of expansion of the energy products to the extent of the relatively small expansion of energy products. Stock substitution is the same as the total size of the energy consumption, the expansion of an energy product is accompanied by a shrinking of another energy product.
2. Energy product function substitution is some initial energy source product or turns into the unification through the directly-burning the secondary energy sources that realizes to the substitutions of the other initial energy source products.

The concept of substitution is that a substance is replaced by another substance that is functionally similar or similar. Resources can be divided into the renewable resources, non-renewable resources and the versatility of resources and to meet the diversity of resources with the same characteristics of the decision between the resources can have a substitution effect. The development of recycling economy is to use renewable resources as much as possible to replace essential non-renewable resources, with the regeneration speed, regeneration of the large-scale renewable resources to replace the slow, small-scale renewable resources, with rich resources to replace depleted resources.

Alternatives are one of the main ways to delay the arrival of the nonrenewable resources and to gain time for new sources of the resources. Coal mining area ecological system design

should then follow the listed guidelines. (1) To energy-saving emission reduction as the goal, according to the relevant resources of the property, use and related areas of demand, optimize the structure to achieve a reasonable flow of resources within the system. (2) In the design and implement process China of overall system, the whole staff in company should participate, reinforce the entire staff's resource conservation consciousness, enabling the design system to be implemented complete, this can achieve the best frugal effect overall. (3) System design and implementation process is based on science and technology, only the scientific analysis of the characteristics of various resources and the use of value, and the relationship between each other can be used in order to optimize the overall design structure to achieve the greatest degree of resource conservation.

4. The Clean Energy Costs Modeling and Evaluation

For the modelling of the methodology, we take the specific application of optimal allocation of electric power as the example. The issue of electric power optimal allocation is the unit commitment issue, and it attempts through the optimized different energy category, different capacity and different geographic distribution the electricity generation plan of power source, while satisfying social peak demand achieves the electric power supply efficiency and environment-protective goal. In the formula 6, we firstly show the power generation cost function.

$$f\left(g_t\right)=a^f+b^f\times g_t+c^f\times\left(g_t\right)^2 \tag{6}$$

Where the a^f , b^f c^f represent the reference parameter, respectively. The receiving area is often far away from the fossil energy source, so the marginal cost of power generation area will be higher than the transmission area. And the wind power renewable energy power plant changes in the cost of such power generation is small, while coupled with high-voltage transmission lines to send out the energy consumption is abandoned wind power generation, the cost of its power generation changes can be regarded as zero, we can generate the formula 7~8.

$$b^f=0 \tag{7}$$

$$c^f=0 \tag{8}$$

Accordingly the optimization function can be easily generated as the follows.

$$\frac{\mathrm{d}\mathbf{x}}{\mathrm{d}\xi}=\mathbf{f}(\mathbf{x},\mathbf{u})=[\mathbf{I}\gamma-u_{\mathrm{M}}(\tilde{\mathbf{J}}-\mathbf{E}u_{\mathrm{H}})]^{-1}[\tilde{\mathbf{R}}(\mathbf{x},u_{\mathrm{A}})-\mathbf{E}(\mathbf{x}-\mathbf{x}_{\mathrm{w}})u_{\mathrm{H}}] \tag{9}$$

$$\tilde{\mathbf{R}}=\sigma\left(\mathbf{R}-\mathbf{x}\sum R\right) \tag{10}$$

$$\tilde{\mathbf{J}} = \sigma\left(\frac{\partial \mathbf{R}}{\partial \mathbf{x}} - \mathbf{x}\frac{\partial \sum R}{\partial \mathbf{x}}\right) \tag{11}$$

Assuming that did not participate in the cross region energy optimization by the electricity region clean energy, in the situation in not considering environmental constraint the optimal model of construction region generating cost as well as electric transmission cost as the formula 12.

$$\max_{[\sigma,\mathbf{u}(\xi)]\in U} \; J = \phi(\mathbf{z}(1)) \text{s.t.} \frac{\mathrm{d}\mathbf{z}}{\mathrm{d}\xi} = \mathbf{f}(\mathbf{z},\mathbf{u}) \tag{12}$$

In the past, the studies on the optimization of power generation plan based on environmental constraints have generally focused on the least amount of the emissions, so the model will reduce the loss of regional emission reduction benefit information. The impact of greenhouse gas and pollutant emissions is often related to regional population, per capita GDP, environmental value and other factors. Under this consideration, in the figure 3~4 we show the simulation result.

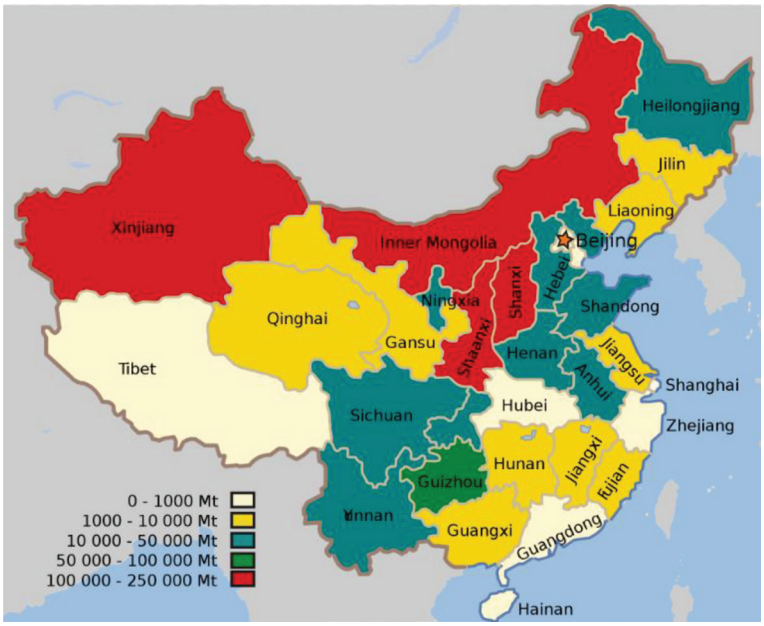


Figure 3 – The clean Energy distribution pattern in China

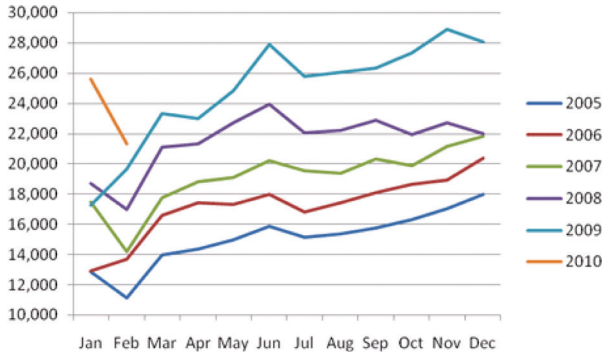


Figure 4 – The energy costs modelling and evaluation result from 2005~2010

5. Conclusion and Summary

In this paper, we conduct research on the choice of alternative technologies of coal resources and cost trend analysis under the background of coal price fluctuation. The coal industry development by the macroeconomic operation and energy policy adjustment and profession periodicity fluctuation and other factor influences, the expansion and contraction that displays alternately, recovery and decline round-trip process. To analyze choice of alternative technologies under this background, we propose our methodology. Adjust the industrial structure, control or reduce the proportion of the high energy-consuming industries, or invest in the energy-saving equipment and technology upgrades that can greatly reduce energy consumption and carbon emissions from the source; and adjust the energy structure, low carbon, clean energy alternative high-carbon energy which an directly achieve purpose of reducing carbon emissions. The simulation result proves the effectiveness of the method, in the future research, more simulation will be conducted.

Acknowledgement

Project supported by the National Natural Science Foundation of China(Grant No. 71303184)；the Humanities and Social Science Research of the Ministry of Education Youth Project of China (Grant No. 12YJC790075)；the Soft Science Foundation of Shaanxi Province(Grant No. 2013KRM05)；the Humanities and Social Science Project of Shaanxi Bureau of Education(Grant No.13JK0221)；Social Prosperity Project of Xi'an University of Science and Technology(Grant No. 2012SY02).

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 09/05/2016
Aceitação/Acceptance: 29/08/2016

Application Research of Subway Station Design based on BIM Technology

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Pages: 411–420

Abstract: Due to the concealing features of the subway, there are issues of the construction projects for subway stations like big volume of the project, complex construction environment, different coordination of each links and errors of information transfer, etc. It is easy to cause project delays and cost increases. Therefore, based on the BIM technology which is widely applied in large-scale and complex projects in the construction industry, this article is about the application study on the comprehensive information management of the subway station construction projects like 3D modeling, collision conflict detection, 4D simulated construction during the entire life cycle of the design and construction. Because of the application of BIM technology in the subway station, the construction scheme has been optimized, the engineering change notice has been reduced, a common communication platform has been set up for each specialty and participant, the information fragmentation has been effectively avoided, and an important reference for the construction management of other rail transit projects has been provided.

Keywords: BIM technology; Subway station; Information model

1. Introduction

With the continuous development of the city, characteristics of large scale and complex structure of the urban rail transit projects have been shown. And the information attached to the projects has been greatly increased. As underground concealed works, the urban traffic projects of subway station construction have the features of big volume of the project, complicated pipeline system, difficult equipment installation, complex engineering environment and external conditions, such as there are many buildings along the metro lines and complex pipelines. Even more, the projects have to cross with the current the loop line subway lines, bridges, city moats or historical sites. In addition, there are often with heavy traffic and narrow construction sites. The work of subway projects implementation, organization and coordination is heavy. The engineering quantity is huge. The project plan, organization and coordination work is also hard, especially the subway construction machinery volume is huge which needs reasonable overall arrangement. Besides, the subway engineering technologies are of great difficulty, many professionals are involved, “Isolated Information Island” among the professionals are easily formed and the construction conflicts could be created. In order to ensure the subway construction period, quality and economic benefit, this paper introduces

the building information model (BIM) to implement the comprehensive information management in the whole life cycle of the subway construction project.

The purpose of this study is that on the basis of BIM technology, on the subway station construction project in the design and construction of the entire life cycle. Research and application of comprehensive information management of 3D modeling, collision detection, 4D simulation of construction. Firstly, the meaning and application of BIM technology are introduced. Then, the specific design of the subway station project is carried out based on the BIM technology, the specific design flow chart is given and the simulation construction is carried out. Finally, the full text is summarized and prospected.

2. Application of BIM technology

Building information model (referred to as BIM) refers to a digital building model which are organically formed by the geometric data, physical characteristics, construction requirements, price information and other related information describing the basic elements as the database of the whole construction project (Fellow, 2010). Its basic elements are single components or objects of construction projects. With the advent of the information age, the continuous development and maturity of computer technology and other technologies promotes the emergence and maturity of the model technology of building information (Kang, 2009). As an important component of the transformation and upgrading of the construction industry, BIM technology has been widely used in large complex projects.

In developed countries, BIM technology has been accepted by the construction industry and had been applied in the fields of design, construction and management (Leite et al., 2014; Malsane, 2015). Its application in construction projects brings obvious increasingly value and benefits, and it will bring profound changes to the whole building industry (Barbosa, 2014). At present, in China, BIM technology has a practical application in many domestic architectural design field, and it has provided better solutions to issues of pipeline synthesis and construction process guidance. Through Revit software, BIM technology could build up full range of models for subway stations, and every specialty could synchronously join the design in the way of collaborative work to ensure the synchronization of the design and to reduce the errors of the information transfer. Each component of BIM is information which ensures the feasibility of the technology (C. Kim, 2013). We could say that, focusing on the whole life cycle of the construction, BIM provides adequate security not only for the design phase, but also for the construction and operation maintenance phase afterwards.

3. Design application of subway station based on BIM technology

BIM is the building model database which is established basing on the parameterization and visualization (Montaser, 2015). It achieves the collaboration among every specialty and every user through the data sharing and transfer. In the process of subway station construction, the introduction of BIM technology could provide help to shorten the construction period and to save massive alteration costs. In particular, for the partial complex shape which is difficult to describe, the BIM model could achieve its visualization to fully understand the internal and external structures and construction difficulties of the project (Han, 2015). In addition, adding the time dimension in 3D model could realize 4D

virtual construction. It could optimize the construction scheme and construction process, simulate the engineering construction process, and reduce the construction alteration (Gledson, 2014). By the BIM technology, a common communication platform could be built up for all of the specialties and participants to freely use the information and to avoid the fragmented information and disunity. This article is about the application study of the BIM technology in the subway station design on the four aspects of 3D modeling, collision conflict detection, model parameterization and 4D simulated construction (Pereira, 2015).

3.1. 3. D modeling

In the subway, it is extremely limited of the space to arrange the pipelines, especially for the transferring subway stations. Thus, the application of BIM technology becomes more necessary in the comprehensive design of three-dimensional pipeline arrangement. Three dimensional modeling could achieved visualization to obtain the visual design environment, automatically generate the construction drawings by the model, and to reduce the errors and omissions in the 2D drawings. The dimensional modeling is mainly divided into field modeling, construction modeling and equipment professional modeling, and then to be integrated into the formation of the whole professional model. Through the model, it becomes more convenient for all the participants to communicate with each other and to understand the shape and size of the components. Then, the cognition of the whole could be created. The analysis of 2D drawings is of partial works. However, application of BIM technology to establish a three-dimensional model could help to visually observe the overall situation of the project because the BIM model is the organic connection between each view and a linkage mechanism is formed. In BIM software, two cooperative work forms are provided. They are linking mode and working set mode. Under the linking mode, professional modeling requires the models of the construction and structure to insert into the project as external links. These external links in the model could not be edited, thus, it is not conducive to the adjustment of the pipeline. Under the working set mode, all the modeling specialties work under the same central file. It is more conducive to achieve comprehensive adjustment of pipelines. Therefore, the 3D BIM modeling of the subway station adopts the working set mode.

At present, the method of modeling is mainly based on the two dimensional design drawings to re-establish the models. In subway station engineering, the core modeling software is of the Revit software series of Autodesk Company. There are 3 steps in establishing 3D models on the basis of 2D graphics. The 1st step is to identify the CAD drawings, to understand the general structure and layout of the architecture, structures and pipeline equipment and to understand the designing ideas of the 2D drawings. The 2nd step is to link the CAD file into the Revit software, to reasonable use the 3D model components within the Revit software according to the given info such as graphic primitives, axis nets, and elevation, and then to draw the 2D graphics into the Revit software on the basis of the distribution of 2D graphics drawings. That is to generate 3D graphics by Revit software on the basis of depicting 2D CAD construction drawings.

The 3rd step is to open the 3D view of the Revit after the depicting of all the CAD drawings. Then the 3D model could be seen based on the 2D construction drawings. By using the BIM design platform, information models of the building, structure, water supply and drainage, heating and ventilation and the electrical engineering should be established

respectively. Then, all the professional models should be fully integrated together to form up a complete architectural model. After that, the complete model should be inserted into computer analysis tools to detect the types and corresponding position of the collision conflicts and to form the analysis report. This will be able to greatly improve the coordination efficiency of equipment and pipelines, to shorten the design cycle, and to create favorable conditions for the smooth construction of the project in the design stage. The pipeline design flow of subway station based on BIM technology is shown in Figure 1.

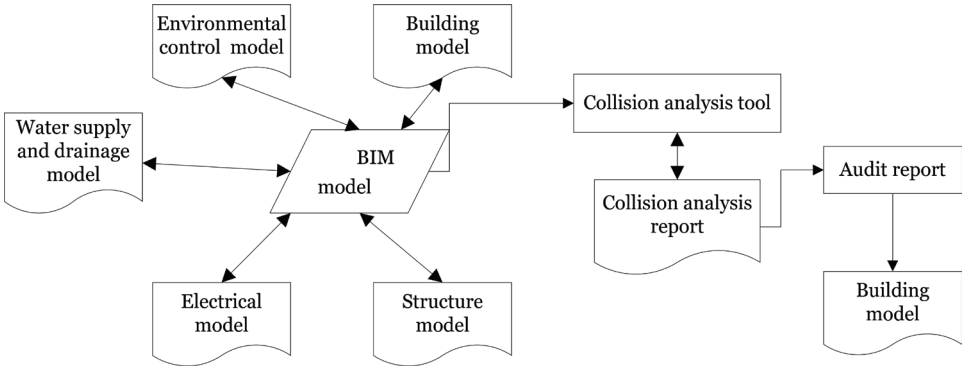


Figure 1 – Pipeline design flow of subway station based on BIM technology

Through the three-dimensional modeling of BIM technology, it can highlight the complex structure of the partial model so as to make an intuitive analysis. Through the analysis of complex structures, visual reference has been provided for the construction of important parts. The construction of the structure and layout has been most clear to be cognized and understood. For example, there are inspections on the space to ensure the normal operation of vehicles, inspections on the complex layout of the steel nodes, inspections on the concrete casting space and collision check on the pipeline arrangement. The information model of Civil Engineering is shown in Figure 2.

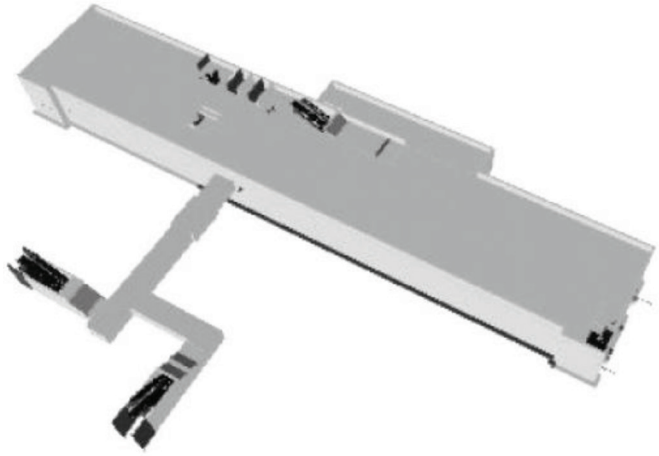


Figure 2 – Information model of Civil Engineering

3.2. Collision conflict detection

Collision detection is to check the building components, structural components, mechanical equipment and each professional pipeline of the construction model and to find out the collision or crossing points of all the components, equipment and pipelines to adjust in time. The traditional method of collision detection is that after the completion of all the specialties finishing their design drawings, they have to repaint the equipment and pipelines on the building professional base maps according to regulations of the pipeline comprehensive professional layers, colors and line widths. Then, after the unified summary of the pipeline comprehensive specialty, the inspection and comparison could be carried out in accordance with environmental control, water supply and drainage, fire protection, heavy current and weak current system. The coordination priority is from high to low levels. For instance, if there are conditions like crossover or collision, the system of relatively low priority have to be adjusted. This completely manual method is time-consuming, and it is often taking several times to complete the special coordination. Besides， the integrity and accuracy of collision detection could be influenced by the system complexity and scale, business ability of the design staff, and it is easy to cause the omission which would cause rework, cost increase and extension of the construction period. The function of collision conflict detection of BIM technology could effectively identify the conflict issues between the construction entities and pipeline entities, thus, it provides a better solution on the pipeline comprehensive design aspects for the subway projects.

Inspections of the subway projects are mainly divided into two aspects: one is the single professional of collision detection which are collision detections on construction model and integrated pipelines, the other is overall professional model collision detection. The construction model collision detection is mainly on the irrational distribution of the internal structure and constructional system of the construction model and the connection structure issues among different construction models. The 3D models are build up through the 2D drawings. The Revit software can automatically check. If the issues above are checked out, the report would be generated. The modeling staff would feedback to the design unit who would re-adjust and optimize the design plan, and then to complete tracking and modification of the models. In the collision detection of the integrated pipeline, the collision is mainly carried out among the pipelines, those are pipelines of electrics, water, heating and ventilation equipment pipelines. In the traditional 2D CAD drawing design, the design of the pipeline is of extensive style, while the design using Revit in 3D pipeline comprehensive design is of fine style. The designers not only provide schematics to the construction personnel, but also precisely designed 3D pipeline models which could meet the strict requirement of the height for the project. The construction requirements and pipeline layout could be clear. .Even in some places of complex situations with many pipelines, the construction personnel are also be able to complete the installation according to the model. Using the functions of the Revit software itself, automatic detection of pipeline model could be carried out, then the report of issues could be generated, and the reports would be filtered by the experienced engineers to select the parts in necessary adjustment. Finally, pipeline model design could be optimized again. The purpose is to satisfy the functions of building and set aside enough height and space. This will not only help the construction personnel to improve work efficiency, shorten the construction progress, but also to ensure the quality of the construction. The model collision diagram is shown in Figure 3.

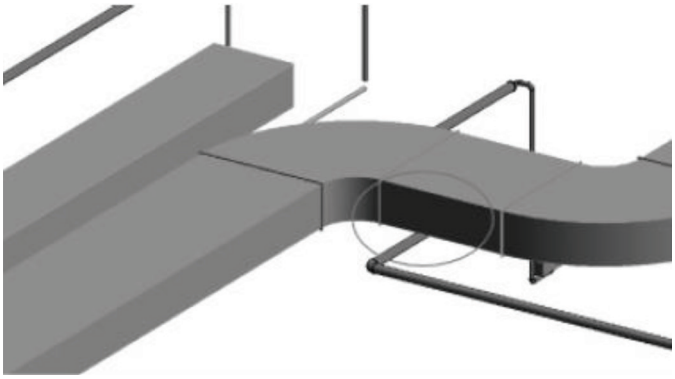


Figure 3 – Model collision diagram

3.3. Model parameterization

In comparison to the traditional technology, a prominent feature of the BIM technology is that it is parameterized design. The BIM design is not just about the graphics, but also contains data. When some data changes, other data and their relationship will be updated in time. It brings great convenience for the flexible design and it helps greatly in reducing the error rate. For the application in the figures, after the establishment of the BIM model, the construction drawing could be automatically generated. The information between the vertical profile figures is interconnected, it could not be solely changed.

Because the BIM model is based on the parametric design, the information of the 2D drawings generated could not be changed freely. The subjective design errors could be reduced to ensure the accuracy of the construction drawings. After the collision detection of the whole professional model, the design scheme could be optimized, the reserved holed figure can be automatically generated. The reserved holes generated automatically by the BIM model could offer help for subsequent construction. For example, accurate holes reserved can help reducing the engineering change, so as to speed up the construction progress and make the following construction more smoothly.

For the application in terms of the engineering quantity statistics, users could automatically extract information and more accurate data from the model to carry on the engineering quantity statistics, and to greatly help the whole life cycle cost management. In addition, at present, to get the engineering quantities statistics from the BIM model are mainly about 3 ways. They are to use the application program interface (API) to get connection between the BIM software and cost budget software, to use open database connectivity (ODBC) to directly access to the database of the BIM software, and to use the automatic calculation function of the BIM software to insert the engineering quantity into Excel tables. Then, the cost statistics could be carried out in the traditional method.

Compared with the traditional algorithm of engineering quantities, the automatic calculation function of the BIM software could be more accurate in quick calculating the engineering quantities and to feedback to the designers with the costs of design scheme in order to control the cost in the early stage of the design. The traditional calculation of

quantities is often unable to timely feedback the design impact on cost to the designers. However, the automatic calculation function of the BIM software could help in reducing the labor expending of the engineers and improving their work efficiency.

3.4. 4. D simulation of the construction

4D simulation of the construction is based on the actual construction of subway project construction plan to stimulate the real construction process of the station. Through the simulation of the construction, the construction process and the construction site layout could be clearly understood. In the virtual environment, the possible issues of equipment, and pipeline layout could be solves before the construction and the risks could be reduced. In order to realize the virtual construction, the 4D information model based on BIM is needed in the subway station project. On the basis of basic information model, the 4D information model is added with the information of the engineering progress and related resources, process and management information. It is of the 4D space model. BIM could simulate the actual construction in 4D, so that the possible issues which could be jumped out during the real construction stage could be found out in the early stage, and then advanced processing could be taken to lay a solid foundation for the later work. It could be the practical guidance and feasibility guidance for the later construction to provide reasonable construction plans, personnel and materials. The utilization of resources could be rationally used in maximum. To use the structure, equipment pipeline BIM model in engineering design is the important embodiment of the application of BIM in the construction phase. There are two application methods. One is to insert the models created into the professional design software by IFC or the .Rvt files to deepen the design. The other is to adjust, refine and improve the professional design like the

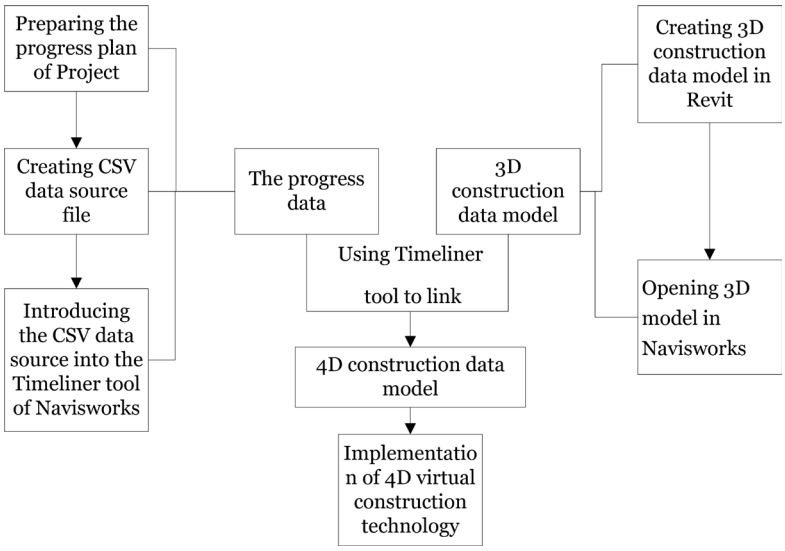


Figure 4 – Flow chart of 4D virtual construction technology implementation

structure, plumbing pipe network and equipment directly in the BIM modeling software according to the analysis results of collision detection. The model could be established by using Revit software series. Collision detection could be done by inserting relative information. The model could be adjusted according to the report on issues. The accuracy and efficiency of the subway station engineering design could be improved. In the late construction process, the installation sequence of the facilities can be clear according to the 4D construction simulation, and then the installation errors could be avoided.

4. Conclusions

For subway station projects, their social impacts are significant, the construction difficulty is relatively great, and there are often construction safety issues. At the same time, the projects themselves have the features of complex structure, high requirements on equipment installation and pipeline comprehensive arrangement, and difficult coordination and communication for all the participants of the project. Based on the BIM technology application in the subway station construction, in this article, the technical support and construction management of the subway station projects by BIM technology has been explored, the specific application of the BIM technology during the subway station design has been introduces in the aspects of 3D modeling, collision conflict detection, parameterized model and 4D simulation of construction. The BIM technology has been introduced in the whole subway engineering. The professional model has been set up. 3D visualization has been realized in all specialties. Effective connections have been set up of all the information of flat profile drawings and vertical profile drawings for all specialties. As shown in figure 4--“Flow chart of 4D virtual construction technology implementation”, by the application of BIM technology in subway station, the real-time browsing of the project and observation of engineering design model could be undertaken. The comprehension discrepancy of the engineering drawings could be reduced for the construction parties. The construction plan could be optimized. The project schedule could be shortened. The cost of the projects could be effectively controlled. The reasonable allocation of resources could be realized. The information integration could be improved by the BIM technology while the properties of the construction and equipment could be integrated.

In this study, the BIM technology has been integrated and applied in the construction management process of subway projects and the level crossing of the subway projects has been realized from the 2D document management to 3D model management and 4D virtual simulation management. In the meantime, the systematization, standardization and information of the subway construction management have been promoted. The information in the subway project construction organization model could directly guide the subway operation, maintenance and reconstruction to truly realize the whole-life management of subway engineering. It could be concluded in the study that there are very good feasibility and practicability to apply the BIM technology in solving related engineering problems in China’s construction field. Generally speaking, in this study, the application of BIM technology in subway stations could improve the design efficiency and quality, and could accurately get the volume of engineering materials required to provide powerful data support for the project cost. In addition, the function modules of

the development of this system could effectively assist the design personnel to complete part of the difficult work under the traditional design model or the work that costs a lot of time and energy. Issues like collisions or inconformity to the specification could be avoided effectively. It is of great importance for the decrease of the overall cost of construction project that the some of the construction rework phenomenon could be resolved and the operation and maintenance difficulties could be reduced. In addition, in this study, reference approaches have been provided for issues in applying the BIM technology to solve practical complex engineering problems in our country.

In practice, this study has certain limitations. The specific performance of the application of BIM technology in the integrated design of the subway in the pipeline. There are still some problems, such as collision detection after the coordination work still needs some artificial participation. In future, work can further improve the intelligence of computer, collision types in software development to further refine the construction. And increase the collision point to determine the truth conditions, in order to improve the technical level of the subway engineering design.

Acknowledgments

This paper is supported by Liaoning Province Social Sciences Planning Fund, L12CJY037 and Humanities and Social Science Foundation of China Ministry of Education, 13YJCZH018.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 11/05/2016
Aceitação/Acceptance: 18/08/2016

Research on the Optimization of Old Residential Reconstruction Project Based on BIM

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Pages: 421–429

Abstract: With the accelerated process of urbanization, old residential reconstruction has become one of the important themes of urban development in China. Old residential reconstruction also brings a series of physical environment problems while improving the city appearance. On the basis of searching the domestic and foreign old residential reconstruction physical environment evaluation indexes and related domestic policies and regulations, based on the investigation of social public visits, analyzes and summarizes the influence indexes of physical environment of old residential reconstruction projects, including sunshine and shade, light environment, wind environment, thermal environment, and acoustic environment these five evaluation aspects. Investigate the internal physical environment evaluation of old residential reconstruction and the 13 indexes that regional city physical environment project evaluation these two dimensions involved, and determine the weight of each index according to the indexes importance of scoring results in the survey statistics. In the quantitative evaluation, this paper introduces BIM technology to the old residential reconstruction planning stage, combined with the evaluation index of the physical environment to establish a quantitative evaluation model of BIM physical environment, carries out simulation and analysis of the planning scheme, make the physical environment index that the sunshine and shade, the light, wind, heat, and sound involve quantitative.

Keywords: Old residential reconstruction; BIM technology; scheme optimization

1. Introduction

Old residential reconstruction is one of the important ways to promote the process of urbanization, and it is the result of urban development to a certain stage. The land is the foundation of city development. Because of the lack of land resource, with the accelerating pace of urbanization, city land scale is continually expanding, contradiction between people and land becomes sharp. At the same time, China implements severe land constraints and land use policy, strict protection of cultivated land construction, and resource shortage and strong land demand contradiction is very prominent. In order to effectively make use of land to solve this contradiction, old residential reconstruction has become one of the important themes of urban development in China.

How to coordinate space layout in the old residential reconstruction project planning, improve the living environment, and promote the harmonious and sustainable

development of economy, society and environment, is the problem that China's Administrative Department of Planning and real estate development enterprises should work together to solve. Especially in the living environment, it can be summarized as comfort perception, which is often measured with the physical environment index, including sound, light, wind and heat perception, which greatly affects the health and comfort of life, relating to the sustainable development of construction, and it further influences the construction cost and operation cost.

This paper aims to provide a reference for China's administrative planning and real estate development enterprises to solve the problem. Based on the Evaluation of the Physical Environment Impact of Old Residential Reconstruction Project Based on BIM software, proposing relevant objectives and principles of project evaluation system, and verify the evaluation system through statistical analysis. Therefore, providing quantitative theoretical support for the transformation of the old residential project.

2. Evaluation of the Physical Environment Impact of Old Residential Reconstruction Project Based on BIM

2.1. Old Residential Reconstruction Project Physical Environment Evaluation Index Setting

2.1.1. Evaluation Index Setting Targets and Principles

In terms of the old residential reconstruction project physical environment evaluation index setting target, it can be analyzed from two aspects. On the macro level, old residential reconstruction project physical environment assessment is trying to evaluate by multi indexes from the two aspects of building physical environment and city physical environment, find out the shortcomings and deficiencies of the reconstruction project, to provide decision-making basis for city planning and environmental protection projects, so as to better achieve the goal of livable project (Chen, 2014). On the micro level, the design of the physical environment evaluation system should seek the goal, standpoint, and value orientation of meeting interests of multi subject to the maximized degree. For the government, they are supposed to be responsible for realizing the public interests, focusing on the long-term benefits of city development, paying attention to the interests of citizens and the construction of livable environment, so as to play the role of "supervisor" in the city construction and establish a good image of the government. For the public, it is necessary to provide more high-quality and livable living environment.

For the principles of the physical environment evaluation index of old residential reconstruction project setting, in order to make it have a scientific basis, the evaluation should obey the following principles.

1. The principle of people-orientation

In the assessment of the physical environment of old residential reconstruction, it is necessary to pay attention to whether the reconstruction project plan and construction is in accordance with the people-orientation. People-orientation is not meant to eliminate the importance of economic development, but to establish the subjectivity status of people on the city, so the old residential reconstruction can not only conform to the requirements

of city's social and economic development, but also make more human element integrated into the progress process of city, to provide a more livable and healthy living environment for people and promote city residents sharing the fruits of city development.

2. The principle of combining qualitative analysis and quantitative analysis

The indexes involved in physical environment evaluation of old residential reconstruction are of variety. At present, changes of many indexes are difficult to response through quantitative data. In the specific research, it is supposed to try to quantify the qualitative indicators, combine qualitative indicators and quantitative indicators, so as to comprehensively show the influence of the physical environment after old residential reconstruction.

2.1.2. Evaluation Index Classification

Through the analysis of the indicators in the above investigation, it is not difficult to classify them into two categories: indicators of the internal physical environment for evaluating old residential reconstruction projects and indicators for evaluating urban regional physical environment. It is just in conjunction with the two major impact dimensions of old residential reconstruction evaluation. The internal physical environment evaluation index includes sunshine and shade (solar radiation, indoor sunshine time, and building block), light environment (indoor building day-lighting), wind environment (wind speed), thermal environment (building energy consumption, building envelope insulation, comfort, and indoor temperature), and sound environment (indoor acoustics). The evaluation index of urban regional physical environment includes sunshine and shade (building block), wind environment (natural ventilation velocity and wind pressure), thermal environment (regional outdoor temperature), regional acoustic environment (outdoor noise control) (Gang, 2012). The evaluation index of this study can not only reflect the internal physical environment of old residential reconstruction project, but measures the external environmental quality in the area of old residential reconstruction project, which solves the defects of internal-focus in the previous evaluation method.

2.1.3. Determination of Weight of Evaluation Indexes

For the commonly-used weight system at present, the methods of weighted assessment are investigation statistics method, expert scoring method, target distance method, monetary method and so on. Investigation statistics method refers to use the form of conversation, questionnaire, data access and other statistical methods to deal with data and get the weight. Expert scoring method is that a small number of experts give the weight directly based on the experience. For the determination of weight by the investigation statistics method, it requires all the persons who are involved in the investigation to score according to their own understanding of the importance of each evaluation factor, and the specific steps are as follows. First of all, clearly explain the unified requirements for the respondents, and give the score range, usually 1~5 or 1~100. Secondly, let the investigated score. Eventually, collect all the questionnaires and statistics, and give the comprehensive weight. The results of this study are as shown in Table 1:

		Importance evaluation					
	Index factors	1	2	3	4	5	Weight
Sunshine and shade	*Indoor sunshine time*	0	0.20	0.30	0.40	0.20	0.06
	Solar radiation	0	0.06	0.30	0.30	0.40	0.07
	Building block	0	0	0.08	0.50	0.50	0.08
Light environment	*Building lighting*	0	0	0.05	0.30	0.60	0.08
	Building energy consumption	0	0	0.07	0..30	0.60	0.08
	Insulation	0.01	0.02	0.10	0.30	0.50	0.08
	Comfort	0	0	0.10	0.30	0.50	0.08
Thermal environment	*Indoor temperature*	0	0	0.10	0.30	0.50	0.08
	Outdoor temperature	0	0	0.09	0.40	0.50	0.08
Wind environment	*Wind speed*	0	0	0.01	0.50	0.50	0.08
	Wind pressure	0	0.02	0.05	0.40	0.50	0.08
Sound environment	*Room acoustics*	0.04	0.07	0.10	0.40	0.30	0.07
	Outdoor noise control	0	0	0.30	0.50	0.10	0.07

Table 1 – Evaluation results of the importance of index factor

The very unimportant is assigned 1, the comparatively unimportant of 2, the general important of 3, the important of 4, the very important of 5. Only select the data that is above the general important into the statistics, then the weight of these three options can be obtained as follows (Lin, 2013):

$$M1 = 3/(3+4+5) = 0.25 \quad (2.1)$$

$$M2 = 4/(3+4+5) = 0.33 \quad (2.2)$$

$$M3 = 5/(3+4+5) = 0.42 \quad (2.3)$$

Calculate the weight of each index factor. The weight of indoor day-lighting time is a^* .

$$= \left| AN \left\| \left[1....1\right]_{1\times 13} TN \right| \right|^{-1} = \left| \left[a_1 \quad a_2 \quad a_3 \right] \begin{bmatrix} n_1 \\ n_2 \\ n_3 \end{bmatrix} \right\| \left[1....1\right]_{1\times 13} \begin{bmatrix} a_1 & a_2 & a_3 \\ m_1 & m_2 & m_3 \end{bmatrix}_{13\times 3} \begin{bmatrix} n_1 \\ n_2 \\ n_3 \end{bmatrix}^{-1} = 0.06$$

A = $\left[a_1 \quad a_2 \quad a_3 \right]$ is the special matrix for the importance evaluation of indoor lighting time;

N = $\left[n_1 \quad n_2 \quad n_3 \right]^T$ is the weight matrix;

T = $\begin{bmatrix} a_1 & a_2 & a_3 \\ m_1 & m_2 & m3 \end{bmatrix}_{13\times 3}$ is the special matrix for the importance evaluation of index factors.

2.2. The Physical Environment Evaluation Model of Old Residential Reconstruction Project Based on BIM

2.2.1. Evaluation Model Construction Based on BIM

This paper, with reference to the relevant literature and index method that norms involved at home and abroad, combined with China's current situation and the connotation of old residential reconstruction, on the basis of investigating the opinion of city construction manager, scholars, and the public, determines the importance of each index according to the degree of public evaluation, the key index factors of physical environment evaluation of old residential reconstruction are selected including sunshine time and block time, indoor lighting, natural ventilation and so on 13 factors. In conjunction with the two influencing dimensions of evaluation of old residential reconstruction project, 13 key factors can be classified into two classifications: indexes for the evaluation of internal physical environment of old residential reconstruction projects and indexes for the evaluation of urban physical environment. Then find out the BIM technology evaluation method for the evaluation method of the key indexes, and carry out the construction of old residential reconstruction project physical environment evaluation model, as shown in Figure 1 (Murgul, 2015).

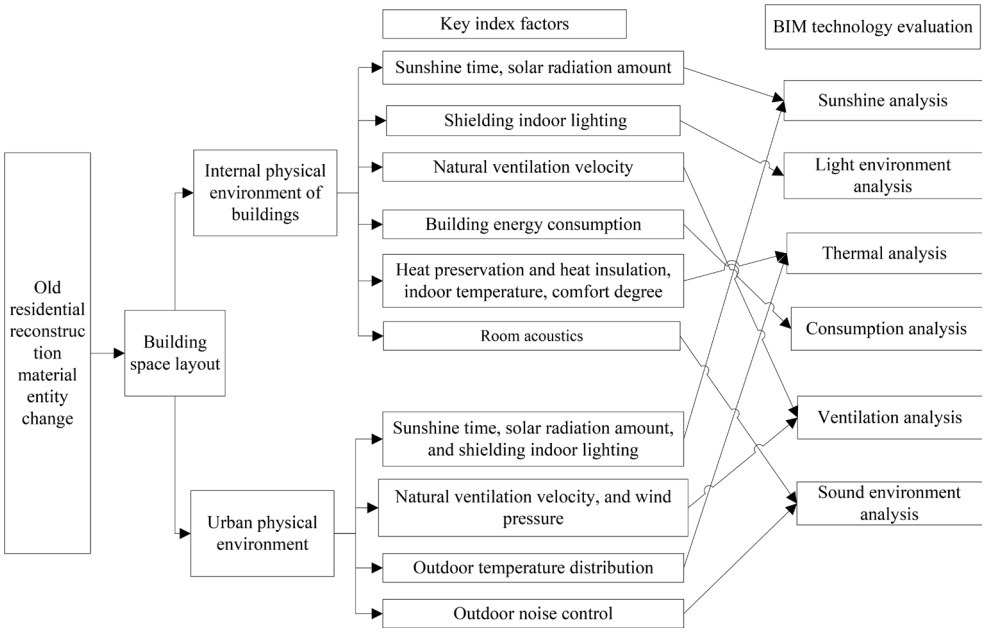


Figure 1 – Physical environment assessment model based on BIM

The application software of BIM technology evaluation takes the data exchange between Revit Architecture and Ecotect Analysis. The output of the results has three kinds of forms: the output of drawing ways, the output of the three dimensional browse ways, the output of the data statistics. Specifically, the software involved in the technical evaluation and the result form is shown in Table 2 (Oliynyk, 2016).

Technical evaluation	Software	Outputs
Sunshine analysis	Revit Architecture, Ecotect Analysis, AutoCAD, and Microsoft Excel	Sunshine time, solar radiation amount, and shielding indoor lighting data
Light environment analysis	Revit Architecture, Ecotect Analysis, Radiance, and Microsoft Excel	Indoor natural lighting
Thermal analysis	Revit Architecture, Ecotect Analysis, Microsoft Excel, and CFD (Computational Fluid Dynamics)	The outdoor temperature, the heat gains and loss data, the total time of monthly uncomfortable temperature, comfortable temperature time percentage
Consumption analysis	Revit Architecture, Ecotect Analysis, and Microsoft Excel	The monthly consumption data and the total annual consumption
Ventilation analysis	Revit Architecture, Ecotect Analysis, and CFD (Computational Fluid Dynamics)	Wind speed and wind pressure
Sound environment analysis	Revit Architecture and Ecotect Analysis	Indoor reverberation time, geometric acoustics analysis, and outdoor noise value

Table 2 – The software used in the evaluation method and the outputs

2.2.2. Scheme Optimization and Selection Based on BIM Evaluation Model

For the city management department, since that the proportion of environmental complaint letters and visits of sunshine and building lighting caused by old residential reconstruction in the total amount of letters and calls gradually increased, physical environment disputes of housing that takes sunshine as major part cannot be ignored. In practical operation, the commonly seen method in the scheme decision-making stage is multi scheme comparison and selection. Because each of them requires a lot of time, so it is impossible to do to many scheme comparisons, and in most cases, the physical environment evaluation for each project depends on the experience to subjectively measure, so it is difficult to make a conclusion by comprehensive analysis of each index of physical environment, while BIM technology provide strong technical supporting forces in the scheme optimization and selection (Wang, 2013). Scheme selection should also combine with the actual situation of economy, society, environment pollution and project evaluation, overall score with qualitative indicators and quantitative indicators, and then give feedback and optimization for the recommended scheme that has the highest score (Pereira, 2015; Leite et al., 2016).

3. Scheme Evaluation Analysis

3.1. Evaluation Methods and Results

Specific problem solving steps are as follows.

The first step: the index factors that each scheme corresponds to are scored by expert, and the evaluation uses ten points scoring.

Scheme		Index factors 1	2	3	4	5	6	7	8	9	10	11	12	13
The internal	*a*	8	8	8	10	8	7	7	7		7			10
	b	7	7	6	10	7	7	6	7		6			10
The external	*a*	6	7	7						7	6	5	10	
	b	8	7	5						8	5	6	10	
The average	*a*	7	7.5	7.5	10	8	7	7	7	7	6.5	5	10	10
	b	7	7	5.5	10	7	7	6	7	8	5.5	6	10	10

Table 3 – The result of the evaluation

Second step: due to the mutual independence of each index factor, the index factors weight and evaluation value is known, the score is shown as follows.

The score of scheme a is $S_{a.}$

$S_a = BI = \left\| \left[b_1 \ldots b_{13} \right]_{1\times13} \begin{bmatrix} i_1 \\ i_{13} \end{bmatrix}_{13\times1} \right\| = 7.62$; $B = \left[b_1 \ldots b_{13} \right]_{1\times13}$ is the special matrix for experts evaluation; $I = \begin{bmatrix} i_1 \\ i_{13} \end{bmatrix}_{13\times1}$ is the special matrix for index factors. Similarly, the score for scheme b is S_b = 7.37. Comprehensively analyze the internal and regional physical environment influence evaluation of old residential reconstruction, scheme a is superior to scheme b.

3.2. Interpretation of Evaluation Results

From the overall results, it is seen that the total score of scheme a is slightly higher than that of scheme b, but from the evaluation of each index factor, scheme a remains to be improved.

In the analysis of regional physical environment, the sunshine time in the area around the reconstruction building of scheme a is significantly lower than that of the scheme b, and the reconstruction of the dense buildings greatly influences the sunshine blocking of the lower buildings in the surrounding area.

Applying the BIM technology to evaluate the planning scheme, it not only realizes the quantification of evaluation indexes and provides a scientific basis for the ecological livability evaluation scheme, at the same time, it analyzes the results of the output graph,

continuous optimize schemes, test in the core software of BIM after modification, and finally realizes the optimal scheme under fixed input. The optimized evaluation index system links the existing evaluation indicators and ecological indicators, which can help real estate enterprises evaluate the design scheme from the ecological livable level, to improve the project added value.

4. Conclusion

In this study, an overall physical environment evaluation model based on old residential reconstruction project is established, and the main conclusions are as follows. Based on the analytical tools provided by BIM, the physical environment of old residential reconstruction project can be analyzed quantitatively. This model eventually determines 13 indexes including sunshine and shade, light environment, thermal environment, wind environment, and sound environment these five aspects, and it realize the evaluation results output through the BIM application software (Zhang, 2013). The case study shows that the model can not only analyze the different performance of different schemes in the aspects of the physical environment, the visual chart data output provides quantitative decision basis for selection of the existing scheme. The feasibility and application value of the model are verified by the results analysis.

This study aims to evaluate from the physical point of view, based on the physical data to provide quantitative basis for decision-making. However, the study did not take the humanities, history, culture and other soft factors into consideration. In future research, based on the specific case, the evaluation system of the soft factors of the project will be contained, and the BIM application software and other statistical analysis software are combined to obtain a more comprehensive result analysis report.

Acknowledgments

This paper is supported by Liaoning Province Social Sciences Planning Fund, L12CJY037 and Liaoning Province National Natural Science Foundation, 201602152.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 16/05/2016
Aceitação/Acceptance: 25/08/2016

Research on Rail Temperature Measuring Meter Based on DS18B20 and STC12C Series MCU

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Pages: 430–439

Abstract: The thermometer is a measuring instrument for measuring the surface temperature of the rail. At present, the widely used measuring instrument of each department to measure the surface temperature of rail is a double metal thermometer and Digital Thermometer, abbreviated as thermometer. Since that the corresponding verification means and the value of the transmission system are not perfect, the application of rail temperature meter is increasingly wide, but most of them remain long-term state of loss. This paper, through the research on the special temperature measurement system composed of STC12C series MCU and single line digital temperature sensor DS18B20, a new type of intelligent thermometer controlled by MCU. Thermometer of DS18B20-based STC12C series MCU changes the temperature measuring method of the original thermometer. It adopts a wide voltage digital temperature sensor for high speed sampling of temperature, completes control of the sensor by using 51 series core MCU and its peripheral circuit, proceeds the temperature error processing and display of data, and utilizes C language to compile temperature measurement, rail preparation and display program. The results of this study have some guiding significance to solve the high precision measurement of rail temperature.

Keywords: Rail temperature measuring instrument; STC12C Series MCU; temperature sensor DS18B20; SCM control; temperature sampling; C language programming

1. Introduction

A high-precision measuring instrument for measuring the rail temperature of rail is developed in this paper. The research content of this paper is to use the single line digital temperature sensor DS18B20 as a temperature sensing element of temperature, so as to take high speed sample, with A/D conversion of STC12C Series MCU and its peripheral circuit to complete the control of sensor and display of temperature data.

In recent years, with the rapid development of railway modernization, especially the full expansion of the railway speed and heavy load, the railway operation in China has been greatly changed. In order to meet the needs of the development of railway transportation and ensure the line quality, Railway Departments carry out construction and maintenance

of railway, rail lines and replace the ordinary rail slot reservation operation, laying long rail in a large area on the lines and three protections of Maintenance Department, namely protection against swelling, protection against breaking, protection against sunstroke and so on prevention work. These work must take the rail temperature as the main calculation basis (Choi, 2015). From the rail temperature expansion coefficient, the effect of the change of temperature on the long rail is more sensitive than that of the short rail. In order to ensure the railway transportation and traffic safety, ensure the smoothness of speed-improving work and the monitoring of rail temperature, to prevent broken rail or rail running up road accidents caused by the temperature change is more important (Cárdenas, 2016; Causse, 2015).

The Ministry of Railways issued Tieyun [2006] No. 146 Railway Repair Rules clearly pointed out that the thermometer measurement of rail temperature shall be annually checked, so as to ensure measurement accuracy. At the same time, the contact part of the verification regulation of rail temperature measurement by the Ministry of Railways in 2008 add the requirement that in rail temperature sensor and detector timing examination source, it is forbidden to use thermal grease, to ensure that it is inconsistent with the state of the actual measurement of rail temperature, which puts forward higher accuracy requirements on the rail thermometer (Goyal, 2014). It is inevitable that the error of 0.1˚C to 0.3˚C exists when rail temperature meter sensor touches detector temperature heat source or rail, which accounted for a large proportion of the largest allowed error 1% between the measurement range of -40 to +70 DEG stipulated by rules. When making use of thermal grease test, double metal rail temperature meter and digital rail temperature meter has almost been close to the allowable error edge of 1%, therefore it is necessary to develop a more accurate rail temperature meter.

2. Design Principle of Rail Thermometer

This paper firstly analyze the intelligent rail thermometer design framework, STC12C Series MCU and the characteristics of the structure of temperature sensor DS18B20. Then, the implementation of the host DS18B20, which is able to control the temperature conversion was realized by the C programming language. And the system existing rail temperature meter error is controlled by increase or decrease the number of digit of MCU.

When the rail temperature meter is being calibrating, if each calibration point has either positive deviation or negative deviation, the verification personnel can timely correct the rail temperature meter, as much as possible to make the measurement value close to the true value, not only within the error range, so as to ensure the measurement accuracy of rail temperature meter.

In order to improve the quality and reliability of rail temperature meter, increase the function, reduce power consumption, meet the requirements of real-time measurement of temperature of Maintenance Departments in line operation process, special intelligent rail temperature measurement system composed of STC12C MCU and single wire digital temperature sensor DS18B20 is applied. With its simple structure, reliable work, low price, fully ensuring the requirements of the new regulations in technology and other advantages, it has been widely used in the field of intelligent test and control (Hu, 2016; Lewis, 2013; Liu, 2014).

The design framework of intelligent rail thermometer is the utilization of wide voltage digital temperature sensor as the sensing element, using STC12C Series MCU with A/D

conversion, to meet the needs of 3.7V generally-used lithium battery, with small current devices to reduce power consumption; the use of C language programming makes the logic of the program become strong and quick in adjustment; use DS18B20 single bus digital temperature sensor for high speed sampling, complete control of the sensor with STC12C Series MCU and its peripheral circuit, and the temperature data display and error processing (Abreu et al., 2015; Abreu et al., 2016).

3. Design of DS18B20 Temperature Measurement System Based on STC12C Series MCU

3.1. Performance Analysis of STC12C Series MCU

STC12C Series MCU is an enhanced function of 8051 MCU proposed by STC company in the United States with the considerable improvement of 8051 MCU core based on the standard core structure of 8051 MCU. It is a high speed and low consumption new MCU that has completely new pipe-line and reduced instruction set architecture (RISC). In the instruction system, the hardware structure and the on-chip resources, it is fully compatible with the standard 8051 microcomputer, with single clock / machine cycle mode, with EEPROM function and user space program in the chip, having fast A/D function (10 accuracy, 8 channels) with ISP and IAP programming method, with 4 PWM/PCA (programmable count array) internal expansion RAM, a total of 512 bytes of RAM, double DPTR data pointer, and integrated MAX810 special reset circuit and hardware watchdog circuit.

STC12C Series MCU has an internal oscillator, low power idle and power down chip wake-up function, and has a SPI synchronous communication port, and it is a dual port that can set the main mode / sub-mode of high speed synchronous communication bus. In addition, the STC12C series MCU, through the serial port (P3.0/P3.1), can directly download the user program, so as to make it suitable for in system programmable (ISP) and in the application programmable (IAP), without specialized programmer and simulator (Powell, 2014), which can provide a powerful, flexible and cost-effective solutions for many intensive calculations embedded control applications, and has strong competitiveness in product application market.

3.2. Structural Characteristics of DS18B20

DS18B20 is a single bus digital temperature measurement chip produced by DALLAS company in the United States, using 3 pin TO-92 package or 8 pin SOIC package, as shown in Figure 1, DQ for digital signal input / output end; GND for the power; VDD is the external power supply input end. For DS18B20 converting the non-electric analog temperature value to the digital signal output, it only needs 1 bit I/O port, which can directly read the temperature value of the measured object, improving the anti-interference ability and measurement accuracy. The utility model has the advantages of small size and wide voltage range (3.0V ~ 5.5V), and it can not only make use of external power supply, but also applies a parasitic power source, which means to obtain power from the data line. The measuring temperature range of DS18B20 single bus digital temperature sensor is -55 to 125 DEG C, programmable 9 bit to 12 bit A/D conversion accuracy, resolution temperature reaching 0.0625 DEG C, the measured temperature sign extension can be output with 16-bit digital serial (Sivathanu, 2013), which is widely used in temperature measurement, alarm, record and so on.

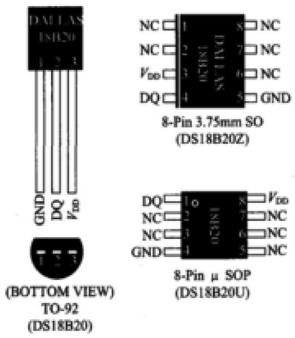


Figure 1 – DS18B20 pin diagram

The internal structure of DS18B20 is mainly composed of 4 parts: 64-bit lithography ROM, temperature sensor, non-volatile temperature alarm trigger TH and TL, and configuration register. The 64-bit serial number in ROM is produced well before being lithography and each of them is not identical. It can be seen as the address sequence code of the DS18B20, and there are several DS18B20 on a bus line, which can be convenient for realizing the multi-point temperature measurement system (Squicciarini, 2015). Users can also, according to the actual situation, set the non-volatile temperature alarm value of TH and TL (After power down, it is still saved). After the temperature value detected by DS18B20 being converted to digital value, it will automatically store in memory, and compare with the set value of TH or TL. When the measured temperature exceeds a given range, it will output alarm signal, and automatically recognize it is high temperature overrun or low temperature overrun.

The temperature sensor in DS18B20 can complete the measurement of temperature, with 12 conversions as the case: provide binary code forms of reading extended with the use of 16 symbols, to express in 0.0625 degrees /LSB form, where S is the sign bit. Use the 16 code forms to express, the first five bit of binary is the sign bit, and 12-bit data is stored in DS18B20 RAM, and take different measures of the temperature conversion method on positive temperature and negative temperature. If the temperature is positive, then the value got is multiplied by 0.0625 to determine the actual temperature; if the temperature is negative, then take back and add 1, and then multiplied by 0.0625 to obtain the actual temperature.

DS18B20 uses the 1-Wire bus protocol, that is, to achieve two-way serial transmission of data on a data line, so the hardware interface circuit is very simple. What needs to pay attention to is that DQ data lines need to pick up the pull resistance. Total digital display module consists of two positive digital tubes and two 9012. The upper and lower limit values of the alarm can be set by the key, and the buzzer and the light emitting diode simultaneously alarm when the measured temperature is over-limited. The system program is divided into sensor control program, upper and lower limits of the alarm value setting program and display program these three parts. The sensor control program, in accordance with the communication protocol for DS18B20 system, under the control of the program, completes the read and write of sensor and temperature display. Figure 2 shows interface circuit of DS18B20 and MCU.

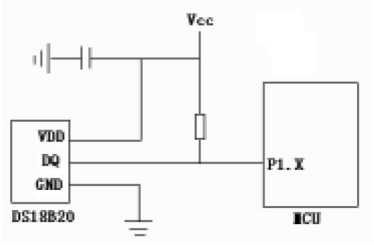


Figure 2 – Interface circuit of DS18B20 and MCU

4. Software Design of Control System

4.1. DS18B20 Single Bus Protocol

According to the communication protocol of DS18B20, the host controlling DS18B20 to complete the temperature conversion needs 3 steps, as shown in Figure 3. The temperature data is sent to the microcomputer: reset on the DS18B20, send a ROM instruction after successfully reset, and finally send the RAM command, so as to proceed the scheduled operation for DS18B20. Reset requires the host CPU to pull the data line to 500μs, and then release. After DS18B20 receiving the signal, wait for L6 ~ 60μs or so, and then issue 6O ~ 240μs existing low pulse, and if the main CPU receive this signal, it indicates the success of reset. The host detects the presence of DS18B20, then it can issue a ROM or RAM operating instruction. The transmission protocol process is: initialization, sending ROM operation instruction, memorizer operation instruction, and data transmission (Tomita, 2013).

For DS18B20 read timing, it is divided into zero sequence read and one sequence read these two processes. After pulling down the single bus from the host, you have to release a single bus in 15 seconds to allow the DS18B20 to transfer data to a single bus. For DS18B20 write timing, it is still divided into zero sequence and one sequence these two processes. When you want to write 0 sequence, single bus is supposed to be pulled down at least 60μs, to ensure DS18B20 correctly sample the 0 level on IO bus between 15μs ~ 45μs. When you want to write 1 sequence, after a single bus is pulled down, the single bus is released within 15μs.

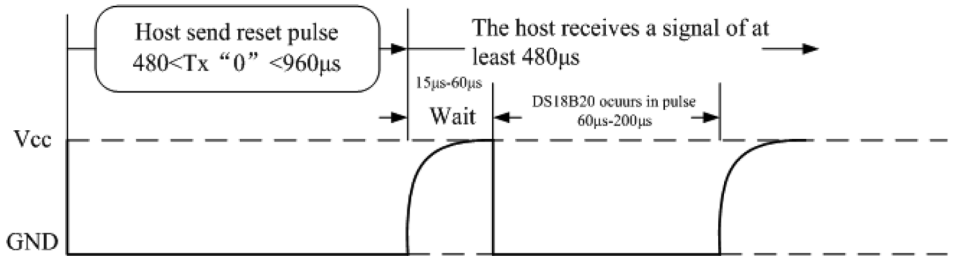


Figure 3 – (a) Reset sequence of DS18B20

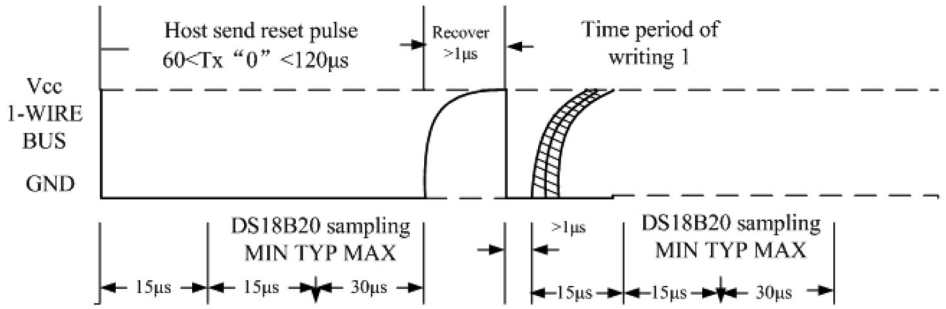


Figure 3 – (b) Write sequence of DS18B20

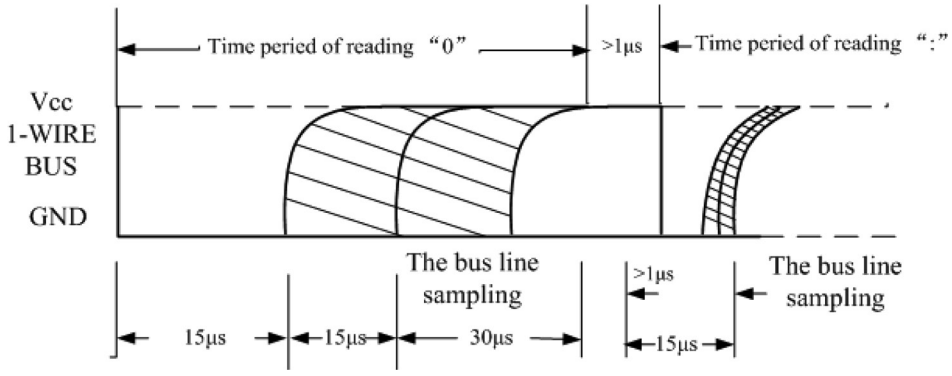


Figure 3 – (c) Read sequence of DS18B20

4.2. Analysis of C Program of MCU

Control program uses C language to compile. C language is a structural language, and compared to other programming languages, this structured approach can make the program level clear, easy to use, maintain and debug. Control module, according to the DS18B20 initialization sequence, write sequence and read sequence, respectively compile three subroutines: initialization subroutine, write (command or data) subroutine, and read data subroutine. In the design of the DS18B20 bus operation of the program, usually use the time delay to ensure the time accuracy of each read and write cycle, in order to meet the requirements of the sequence of DS18B20. According to the sequence requirements of DS18B20, make use of the performance analyzer in Keil software to calculate the phase delay time, using manual algorithm to do comparative analysis of specific execution time of the MCU, to provide the basis for the delay time of STC12C programming (Tomita, 2013).

```
/ / initialize DS18B20
Void DS18B20Reset
{uchar flag;
DS18B20=0;     //Send a reset pulse
```

```
  Delayus(90);        //Delay 598μs in time
DS18B20=1;     //Release the bus line
  Delayus(12);        //Delay 80μs in time
if(DS18B20==0)
      flag=1;        //Bus reset succeeded
else
      flag=0;        //Bus reset failed
    Delayus (20);   //Delay about 140μs in time
DS18B20=1;       //To pull the bus again so that the bus is idle
}
//Write sequence
uchar DS18B20Write(uchar chrdata)
{ uchar j;
 for(j=1;j<=8;j++)
{
   chrdata = chrdata >>1;
 if(chrdata&0x01)
 {
DS18B20=0;              //Pull the bus line down
        Delayus(14);              //Delay 8μs in time
       DS18B20=1;            //Allows to pull data lines to high level within 15μs after the
write sequence starts
       Delayus(108);           //Delay 55μs in time
 }
      else
{
DS18B20=0;
       Delayus(8);           //Pull down the data line to low level and maintain 64μs
DS18B20=1;           //Release the bus line
}
}
}
//Read sequence
uchar DS18B20ReadBit(void) //Read one
{ uchar data;
DS18B20=0;              //Pull down the bus line
   Delayus(1);               //Delay 1μs in time
  DS18B20=1;           //Release the bus line and output effective data
  Delayus(1);
  Delayus(1);             //Delay 2μs in time
data = DS18B20;
Delayus (10);           //Delay 77μs in time
return  data;           //Go back to effective data
}
uchar DS18B20ReadByte (void ) //Read one byte
{uchar value,i,j;
 value=0;                  //Assignment the initial value
```

```
for(i=0;i<8;i++)
{
   value=value>>1;
    if(DS18B20ReadBit())
 data |= 0x80;          //Read the data bit of the bus line
Delayus (7);          //All the read sequence lasts at least 60μs
 }
return value;            //Go back to the data of a byte
}
```

5. Innovation

The measurement error and consumption is great, function is simple, and the battery life is short between MCU of intelligent rail temperature meter designed early and circuit board plug connection. It has no indication for quantity of electricity, and it is unable to grasp how much the capacity of the battery is. When the battery is low, it will influence operation because of being unable to display the rail temperature. STC12C series microcomputer rail temperature measurement based on DS18B20 changes the original rail temperature gauge temperature measurement method from the working principle. It uses a wide voltage digital temperature sensor for high speed sampling of temperature, using 51 series core MCU and its peripheral circuit to complete the control of the sensor, to proceed the error processing and display of the temperature data. Its innovation is to meet the requirements of new rules that the hot source contacting part of the sensor and the tester cannot use thermal grease when the thermometer is testing temperature. In the specified measuring range of -40 to +70 DEG C, the measurement error is less than ±0.6%, guaranteeing in the measurement range, the measurement error that is superior to that in the testing rules is less than + 1%; make use of C language to compile measurement, digital processing, measurement control, and error correction procedures, so as to make the logic of the program strong and adjustment be quick; apply Keil software to realize microcomputer serial of rail temperature meter program writing, and directly modify the measurement error in microcomputer through the serial.

6. Conclusion

Although DS18B20 has the advantages of simple temperature measurement system, high accuracy, convenient connection, fewer lines and so on, in the actual application, we should also pay attention to the following aspects: it needs a certain converting time for DS18B20 from the end of the measurement of the temperature value to convert the temperature value to digital value; the electric source voltage should be maintained at about 5V or so; if the power supply voltage is too low, the measured temperature and the actual temperature are high; and the serial data transfer mode is adopted between DS18B20 and microprocessor; in programming to read and write DS18B20, we must strictly ensure the read and write sequence, otherwise the measurement result will not be able to read.

With the usage of high quality sensor and single chip microcomputer, eliminating the undesirable phenomenon of primary instrument and the secondary instrument ,such as the short circuit and open circuit, due to excessive plug or line oxidation. More importantly, the instruments mentioned above has reasonable circuit layout and all devices are patch welding. However, with the increase of voltage deviation, such as the inaccurate results due to the low battery voltage, the error of the rail temperature meter will certainly exceeds the maximum error range; and the traditional rail temperature monitor adopts magnetic adsorption technology. Therefore, the rail temperature displays through the monitor adhering on the rail measurement site.

For further study, the temperature stress detection method based on the principle of and Barkhausen noise can be applied. On the one hand, due to the electromagnetic excitation of the rail surface, the Barkhausen noise signal was magnified, allowing a certain lifting distance exists between the detection of the probe and the rail surface. On the other hand, using the signal voltage amplitude extraction method to find out the corresponding relationship between the signal characteristic value and the rail temperature stress, and make the appropriate calibration. So as to meet the fast, accurate and real-time temperature detection requirements.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies

Recebido/Submission: 07/05/2016
Aceitação/Acceptance: 25/08/2016

Research on the Display of Manchu Architectural Accessories Based on Kinect Technology

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Pages: 440–454

Abstract: Manchu is one of the minority nationalities that has the long history in China. Machu, once as the rulers of the Qing Dynasty, is the second minority nationality that establish unified national regime of ethnic minorities in the history of China, leaving deep impression and influence in Chinese politics, history, culture, architecture and folk art. Manchu culture has experienced a long history and formed its own unique characteristics in the development process of a variety of cultural integration. In this cultural state, Manchu traditional architectural forms experienced periodical development and it will fuse a variety of construction artistic techniques and forge a leap in the ancient architectural history, and it also has left behind the precious cultural heritage for future generations. The research on Manchu architectural accessories art has strong representation and practical value. Architecture accessory is a wide and universal phenomenon of art and culture. History and culture of different times all left profound "stamp" in the architecture, which are retained in the structure of the building and a large number of message aggregated in architectural accessories. Architectural patterns, colors, etc., will be the important information for our analysis and understanding of the architectural style, type and cultural heritage. In this paper, with the help of Kinect technology, a representative Manchu building in Liaoning area is taken as the main line and related Manchu folk houses and other data collection as an auxiliary, to do a field research. Through a large number of literature and picture information collection and on-the-spot investigation, analyze Manchu architecture accessories art, so as to understand the history and culture borne and provide complete data for deeper research.

Keywords: Kinect technology; Machu; architectural accessories.

1. Introduction to Kinect Technology

Kinect is a XBOX360 somatosensory external equipment launched by Microsoft Corp in 2010, which is currently the world's only one comparatively mature commercial human body motion sensing device, widely applied in the somatosensory game. Microsoft cooperated with Iranian Prime Sense Company, realized depth camera function

with cheap cost. With the information provided by the depth camera and RGB color information and phased array microphones, the Xbox perceive and recognize the players and their movement, and then manipulate the game, thus improve the game playability. Kinect as a sensor, in essence, is just an input (Mora & Fonseca, 2014; Lopes, 2015). It can provide three kinds of original data information, including deep data flow, colorful video stream, and original audio data, and it is respectively corresponding to skeletal tracking, identity recognition, and speech recognition three kinds of functions. Skeletal tracking is the basis of the Kinect somatosensory operation, which requires the system to quickly build a player's torso, limbs, head, and even fingers in the area of the skeleton.

The application of Kinect technology is also very extensive. When the traditional modeling methods are not feasible or poor in cost benefit, the Kinect is used to do 3D scanning for the parts in different sizes and materials in the real world, and then proceed modification and concatenation according to the need, and realize real 3D digital (Nasir, 2015). In the architecture, engineering, industrial design and even interactive games, it has a very high value. With the emergence of Kinect, the construction of the 3D model of cultural relics also has a new solution. That is, the Kinect infrared camera 3D scanning function provide the possibility for the archaeological report, building mapping and formation. Using Kinect infrared camera to do human body 3D scanning, and with the 3D printer, it is possible to quickly generate a portrait of a souvenir in the street for visitors.

In this paper, with the help of Kinect technology, a large number of literature and picture information collection and on-the-spot investigations were done to analyze the Manchu traditional architectural from the perspective of Animal Accessories Patterns, Plant Accessories Patterns, Words and Numbers, so as to undertake the Design and Implementation of the Manchu Architectural Accessories Display System. More importantly, a survey was done to study the User Experience of Manchu Architectural Accessories Display System and the improvement approach is proposed.

2. Manchu Architectural Accessories Patterns

Totem later evolved into accessories patterns as it developed. Accessories patterns mainly convey a meaning of reflecting cultural content of a certain period in the history, which can't be simply understood as attractiveness or unattractiveness. Symbolic patterns need to have a clear symbolic meaning. "Totem concept in the northern belief in the Shaman culture of the various nationalities, there are still similar totem worship in the ancient". There are different the epitome of totem culture in Manchu myths, such as willow, like crane, crows, fish, wolf, deer, leopards, pythons and so on. The development of Manchu culture can be divided into before entering and after entering the two stages. The development feature of Manchu culture before entering is Manchu culture based, and Han culture fused in Manchu culture, from content to form clearly reflecting the development of Manchu culture and strong national characteristics. Manchu architecture represents the highest achievement of Manchu architecture accessories art, which is the main basis for the study of this chapter.

2.1. Animal Accessories Patterns

Animal accessories patterns occupy a large proportion in the entire Shenyang Imperial Palace architecture accessories patterns in terms of the subject matter. They are mainly dragon, lion, animal face, sheep, dogs, etc.

1. Dragon

The dragon is the symbol of the Chinese nation in ancient China, and it is a miraculous animal, long body, line, angular, able to walk, fly, swim, and rain. Before Han Dynasty, dragon accessories have not been specially used for the emperor, instead, the general nobles can also use them to decorate the house. Han to Tang and Song Yuan, dragon gradually becomes a symbol of the emperor, till the Ming and Qing Dynasties, dragon accessories have become the main accessory of the Royal palace. Dragon is not only an important part of the building, but also it is a symbol of architecture (Bhowmick, 2014; Gonçalves et al., 2015). Dragon accessories of Shenyang Manchu building accounted for a large proportion in accessories that it can be said to be met everywhere, such as the railing on the stigma stone dragon, wooden dragon column on the porch, and the eaves of the dragon shaped head beam. Early buildings in the outer eave decorating pays special attention to the dragon decoration of architectural rendering with vivid modeling, fine carving, and covered with gold, as shown in figure 1 and figure 2.



Figure 1 – Copper sitting dragon

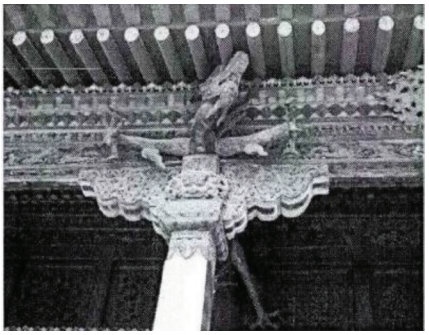


Figure 2 – Dragon head beam

2. Animal face

Animal face accessory is the humanoid of beast and God by ancients, attempting to fabricate gods with the image of the beast. Gods have effective appeal, can set power, and assist the tribe to fight against natural disasters and other tribes. Combining the human form and the beast face, form the figure of the gods, which is the transition from primitive ignorance to civilization. The main hall, Chongzhengdian hall building, and Phoenix all have animal accessories, which can be seen in figure 3 and figure 4.



Figure 3 – Animal head ridge decoration



Figure 4 – Animal face stigma

3. Lion

In the architectural accessories taking animal as the content, except for the dragon and beast, the lion also occupies a certain position. The lion has mighty power and symbolic meaning, so in the palace doors on both sides, there are lion as guard animals and its ferocious image is borrowed to display pomp. Lions are not only lighted on both sides of the front door as a patron saint, it is also widely used in architecture accessories, as shown in figure 5 and figure 6.



Figure 5 – Stigma of stone lion



Figure 6 – Stone lion

2.2. Plant Accessories Patterns

The symbolic meaning of plant image is also widely used in architectural accessories. Lotus, for example, is widely used in architectural accessories, not only because of the beauty of its image, but also its expression of ideological connotation. Shenyang plant architecture theme accessories are also considerable, plum, orchid, chrysanthemum, and lotus and so on. The themes to a certain degree have some thought connotation, always with a certain analogy and symbolic significance.

1. Lotus flower pattern

The lotus accessory is widely used in the Buddhist architecture, the palace and the residential building. There are many buildings accessorized with lotus in Shenyang the Imperial Palace, such as lotus door clasp, as shown in figure 7.

2. Branch accessories, flower accessories, and volume grass grain

Taking various leaves and all kinds of flowers fruit as the theme, branch accessories form in curse shape, S shape, and wavy. Volume grass grain is made up by the flowers and leaves of the lotus, extending in the form of the curve, waveform, or form to the surrounding, which can be a single pattern or a continuous pattern. At the same time, influenced by Han culture, floral patterns have also been widely used. For example, flowers having auspicious meaning include the lotus, plum blossom, chrysanthemum, orchid, lotus, and peony and so on. In the building glass carving of the roof in early architecture, these plant patterns are easily seen in stone balustrade, column, and paintings of large wooden, as shown in figure 8.



Figure 7 – Lotus door clasp

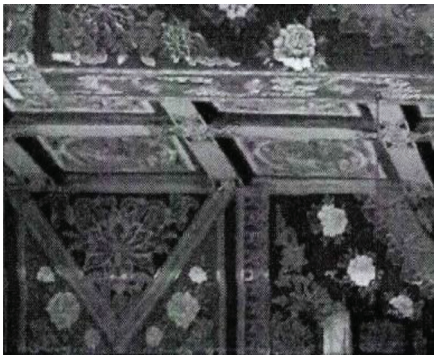


Figure 8 – Seven frame painting flowers

2.3. Words and Numbers

1. Words

The words this paper studied on as decorative elements are not the decoration painting inscription nor couplets, but refer to the accessory combined by meaning and form that words represented. The main hall of the caisson outer ring is subjected to eight “GOI” smallpox, for double dragons and double phoenixes, and in the intermediate is Sanskrit smallpox. In the Middle Temple center ring is eight word smallpox, write “Fortune”, which is learned from the Chinese architectural art.

2. Numbers

Numbers as accessory content do not mean one, two, three these specific numbers in the accessory patterns, but refer to the accessory of the meaning expressed by a motif and an individual. Door nail is the part to reinforce the door, which is also a kind of special accessory. Before the Ming Dynasty, the number of nails are not restricted. The door is accessorized with four lines and eight nails in each line, the accessory style is very simple, which pays attention to its function.

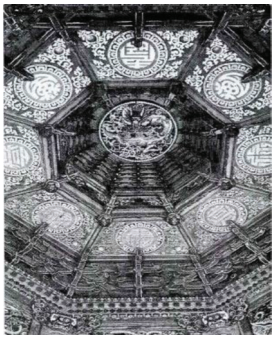


Figure 9 – caisson

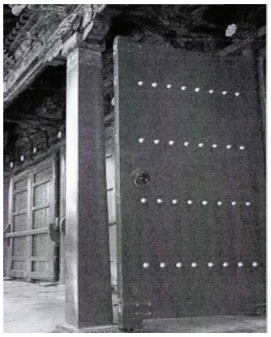


Figure 10 – Great Qing Gate

3. Design and Implementation of the Manchu Architectural Accessories Display System

In this chapter, we will mainly discuss the design and implementation of the Manchu architectural accessories display system. As mentioning the system, it is necessary to emphasize the two words: interaction and presentation. This chapter collects historical data through various researches, and provides important data for the design of the system, through the collection of data and analysis of the field survey, take it as the main content of digital design. Also through the establishment of virtual in scenes, the collected information is restored to virtual space, improve the model accuracy, lay foundation for subsequent increasing engine, and eventually combine the technology of man-machine interaction, use visual or experience form to reconstruct and integrate it, and transform the “invisible” into “visible”.

3.1. Design Principles of the Manchu Architectural Accessories Display System

3.1.1. Immersion Principles for Architectural Scenarios and Architectural Accessories

As a kind of cultural symbol with a strong sense of visual perception, Manchu architectural accessories contain the cultural heritage of an era, which is the symbol of the changes of the times. At the beginning of the system design, we must first consider the authenticity of the architectural accessories, including the authenticity of the architectural scene and architectural accessories, which will produce the effect of immersion. Because Manchu architectural accessories display system design original intention is the Manchu accessories digital reduction, even for the construction accessories need nuanced portrait (Larson, 2012). Only in this way can it be possible to spread the most essence and profound culture in architectural accessories culture to the public.

First, in scene construction and architecture accessories, since it is necessary to do reduction of traditional culture, we must respect the tradition. Taking history as example,

model through the collection of Manchu ancestors to the period of the Republic of China Building Decoration graphic data, and each corresponding architectural scene should be highly matched to building accessories, and 3D model with the kind of agreement is maximal. Secondly, the immersion of the audience experience is another important aspect of the authenticity principle of the system. Imagine we are on a visit of a deep palace in the Qianlong period, all kinds of architecture printed with dragon, animal face, stone lion, and words are seen. The content shown is consistent with history, the true virtual image matched to reality perfectly. In the process of appreciation, it greatly improves the immersion of audience participation, but also stimulates the thinking of the Manchu building accessories culture. This way more real, three-dimensional, and deeply protect and spread the cultural heritage.

3.1.2. Interaction Principle of Interactive System

Design psychology emphasizes the "human factors", that is, adhering to the principle of "people-oriented" in the design process, to enhance the user's subjective experience to obtain the best results. And in the whole process of "interactive", also known as the "interaction", it is an essential part, because only the audience actively participate in activities, and not blindly passive acceptance, only in this way can it be possible to increase the use of audience satisfaction of the system, so as to get the best experience (Jia, 2012; Freixo & Rocha 2014). In the Manchu architectural accessories display system design, also used the principle of interaction. By adding body sense interactive device to capture a user action on the screen, understand users behavior and expectations in the use of the system and be recognized by computer, system to complete the corresponding instruction, and thus to see the final results.

3.1.3. Innovative Principles of Architectural Accessories Culture Display

In the past, most of the architectural accessories show is carried out through the solid exhibition. As a bridge between the international exchanges, the exhibition is an important embodiment of the national cultural soft power. Compared to the developed countries, our country in this aspect still started late. But with the rapid development of digital technology, solid architectural exhibition, by contrast, already revealed some of the shortcomings that cannot be changed, such as venue construction cycle is long, the management mechanism is not perfect, manpower, material and financial resources are spent a lot, but also affected by the limitation of site factors and other issues, which increase the difficulty for exhibition. The advent of Internet era makes human communication use a new way and go into the new areas. Nowadays, it is in the stage of innovation and development of virtual reality technology, the traditional Manchu building accessories and virtual reality technology are combined to create a both national sense and fashion sense of virtual somatosensory architecture accessories display system.

3.2. Digital Realization of Display System of Manchu Architectural Accessories

At present, the domestic and foreign attach great importance to the use of virtual reality technology to recover some of the valuable traditional cultural heritage, including

architecture, clothing and so on. Because of the need of more and more realistic virtual scene, the hardware and software equipment needed to design are constantly updated. For modeling of virtual scene, it is able to achieve a higher degree of realism, but for details of construction, there will be a large number of data being processed by computer, t. While the general configuration of the computer may affect the operation of the system's speed and effect, so the system requirements of computer configuration is high. Based on the above natural conditions, the design flow of this paper are as follows: first of all, the use of 3DMAX software to build a virtual scene, including architectural modeling, patterns and textures and rendering; virtual scene is introduced into unity3d engine to complete a virtual roaming; finally access Kinect body feeling device interaction, realize the Manchu building accessories display system interaction.

3.2.1. Establishment and Optimization of Virtual Architecture

In the system, the virtual architecture is the main role, which has an important promoting and display role for users to experience the Manchu architectural accessories culture. Take the Manchu architecture of the Qing Dynasty as an example, the production method of the virtual construction accessories is specifically shown. First, create a cuboid in 3DMAX software, add new commands in the modify panel, make the shape similar to a construction; then according to the general position of architectural accessory, use "adding lines" commands to create architectural graphics with animal or plant patterns. And then convert all the models into editable polygon, and proceed UV expansion according to the production model of the wiring and construction of the model, then UV export as image format and lead into Photoshop, drawing construction accessories. By referring to the historical material, shape, color proofing to ensure the authenticity of the model; lead the PS drawing map back to the max, add light to test renders, with storage format of FBX. The purpose of this is to put the building model in the software test to ensure its accuracy (Brown, 2013).

3.2.2. Establishment and Optimization of Virtual Space Time

In the production of time-space scenario, it is necessary to refer to the historical data, so as to furthest proceed virtual restoration of the history of ancient architecture. The scene below, for example, is the most representative of the Manchu Qing Dynasty palace. The operation of the points and surfaces are worthy of attention. The roof of the palace of Qing Dynasty is yellow glazed tile, which has the characteristics of traditional nomadic tribes in the north. There are more details about the roof, so in the production process, it is necessary to repeatedly adjust the position, and do proofreads with reference to pictures of history, which can relatively reduce the workload of computer so as to avoid system problems because of the over-large CPU run amount. Taking the house of the Republic of China as the main scene, all of the scene are led into a unified format as object to facilitate software identification, and provide convenience for the next operation. After the establishment of the model UV, all the map material are displayed into a complete large image (size set to 8192 pixels), the overall texture of the map to facilitate the Unity3d software for accurate mapping. As shown in figure 11, it is the three dimensional scene of the palace of the Qing Dynasty.

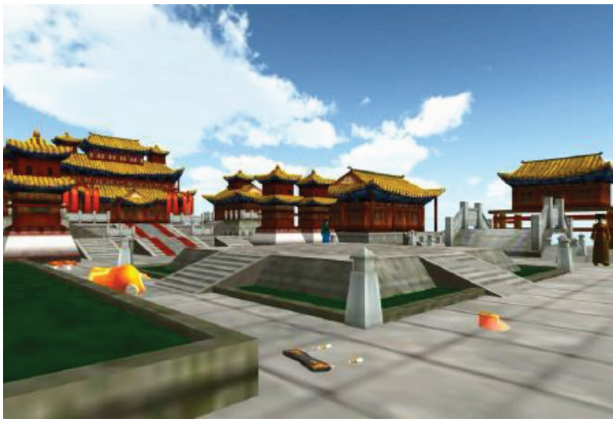


Figure 11 – Three dimensional scene of the palace of the Qing Dynasty

3.2.3. System Interface Design and Optimization

Interface is the bridge between man and machine to transfer and exchange information. A good system should include the complete content design and humanized interface design, referred to as we often say UI, namely user interface. In recent years, the importance of interface design in the operation of the software system is becoming more prominent. A good interface design cannot only strengthen the system's appearance, but also make the operation become more comfortable, simple, and more humane. The characteristics of immersion that system itself has can meet the users' experience requirements. If appropriate interface design is used, it will improve the user experience satisfaction and enhance the overall value of the system. Therefore, in the design of the system interface, function realization, the emotion expression as well as the environment factor three angles are rather important in the research on the detailed inquiry interface design content and the optimization method. The perfect combination of technology and culture will always bring us with unusual results. Manchu architectural accessories display system brings the completely new virtual experience, also let us have more comprehensive knowledge and more profound understanding for the connotation of the Manchu traditional building accessories.

4. User Experience of Manchu Architectural Accessories Display System

4.1. Test Content Interpretation

In this test, experimentation and questionnaire are used. The design of the questionnaire is divided into different modules. The whole process is shown in table 4-1. This method is simple and easy to sum up, and it is convenient for quickly and efficiently deal with the experimental data.

Sequence	People be tested
1	Be familiar with the process of the system and test purpose
2	Fill in personal information
3	Enter into the virtual architecture accessories display system
4	Answer the questions in the that and score for the system
5	The end

Table 1 – User test experience process

4.2. User Experience Test

In order to obtain more objective data and ensure the accuracy of test results, randomly selected 10 College students as subjects to test, including the people of different genders, different grades and majors. Because the range of the selected objects are more widely, the obtained data are more realistic and objective. Questionnaire is the main means to obtain accurate test results, first of all do preliminary investigation of the basic situation of the tested, which is the first step for ensure the identity of the tested, which has subsequent testing effect to the foreshadowing.

The second module is to do a deep investigation for the user testing results. The investigation level changes from shallow to deep and it is wide, from the operation of the system, attractiveness and traditional exhibition and other aspects to obtain the feedback, which is helpful in summarizing the value of the system; specific statistics are as shown in Table 2.

No.	Actively know about architectural accessories culture	Participate in the physical exhibition	Get to similar virtual products	Preference
1	Yes	Yes	Yes	Somatosensory
2	*No*	*No*	*Yes*	*Somatosensory*
3	*Just so so*	*No*	*No*	*Exhibition*
4	*Just so so*	*Yes*	*Have heard*	*Somatosensory*
5	*Just so so*	No	Yes	Somatosensory
6	Yes	Yes	No	Somatosensory
7	Yes	Yes	Have heard	Somatosensory
8	No	No	Have heard	Exhibition
9	No	Yes	Yes	Somatosensory
10	Yes	No	Have heard	Somatosensory

Table 2 – Experimental data statistics

Recycling the questionnaire to do data statistics, and draw the following conclusion, as shown in Figure 12 and Figure 13.

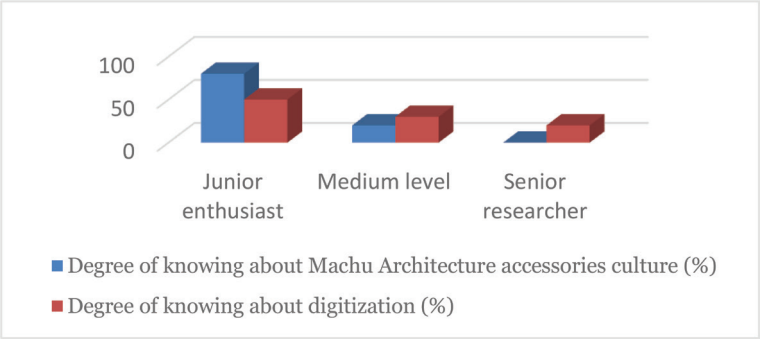


Figure 12 – User experience 1

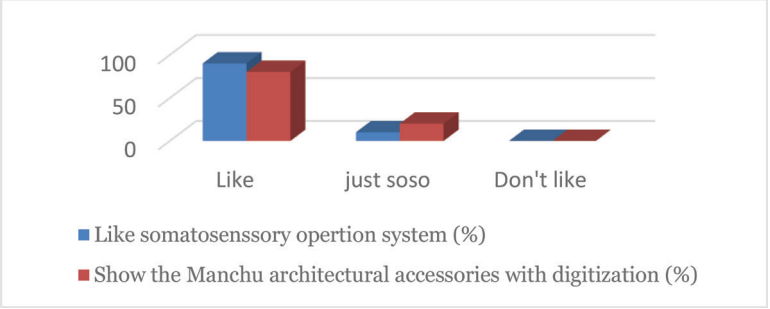


Figure 13 – User experience 2

Through the above analysis, we can draw the conclusion that Manchu architectural accessories display system as a whole can completely implement virtual display, including scene virtual roaming and somatosensory interaction module. It can basically realize effective display of Manchu architectural accessories through virtual reality means, and achieve the user experience satisfaction in appearance, interaction and innovation, etc., which promotes the role of Manchu traditional architectural accessories culture communication, and has certain help to the protection of traditional culture.

5. Conclusion

Combined with technology of Kinect, in allusion to the present situation of Manchu architectural accessories development, this paper proposes the idea of implementing digitization to the Manchu architectural accessories, and from the angle of dissemination of the traditional Manchu architectural accessories culture, design the Manchu architectural accessories display system (Dauriac, 2013). This paper, firstly, understand the Kinect technology, then collect the principles need to follow in the Manchu architectural accessories display system design, finally through 3DMAX, unity3d and Kinect motion sensing technology to implement virtual display Manchu building accessories. Eventually, draw the following conclusion: taking immersion, interactivity

and innovation as the design principles, after analyzing the advantage of combining unity3d and Kinect, achieve the desired effect of Manchu architectural accessories display system. It provides a more intuitive, real, new forms of experience, promotes public awareness of the Manchu traditional architectural ornament, also has certain practical value for spread of Manchu traditional architectural a characteristics and connotation, and provides the reference for the traditional Manchu building accessories and cultural connotation of the dissemination.

As for the aspect of scene setup, as many investigations as possible had been done to analyze the Manchu traditional architectural due to the limited material. And as for the application of equipment, the latest VR could be used to improve the users' satisfaction. For further work, the range of the collection of material should be expanded. Additionally, the range of the selection of scene should be extended to promote the culture communication.

Acknowledgments

This paper is supported by 2014 Liaoning Province Social Sciences Planning Fund, L14DWJ015 and 2015 Science & Technology Project Planning from Ministry of Housing & Urban-Rural Development -- Soft Science Research Project, 2015-R2-003.

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Revista Ibérica de Sistemas e Tecnologias de Informação
Iberian Journal of Information Systems and Technologies
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