

Construction Research of Accounting Information System Based on Data Visualization Technology

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Abstract: Accounting information system collects a tremendous amount of company management data, which can help managers predict the future, improve company management and increase economic and social benefits. However, the complex accounting data often lets managers feel difficult to make decisions. Data visualization is in line with the way that human brain receives information, which is convenient for information users to make rational analysis and judgment based on the perceptual knowledge of visual graphics and images. Based on data visualization technology, this paper constructs enterprise accounting information system, including financial management information system, risk management information system, performance management information system and accounting support information system. Accounting information system based on data visualization technology can effectively improve the level of enterprise management.

Keywords: Accounting information system, System construction, Data visualization technology

1 Introduction

With the rapid development of science and technology, information management has become the important way to enhance the core competitiveness of enterprises. As the core of enterprise information management system, accounting informatization is the necessary condition to improve the level of enterprise information management. Because of the important position of small and medium-sized enterprises in China's national economy, improving the accounting informatization level of small and medium-sized enterprises will effectively improve the overall level of enterprise management informatization, which is of great practical significance to the development of national economy ^[1]. With the continuous improvement of management level, the vigorous development of information technology provides a good technical support for the organization of information activities in all walks of life. The data visualization demand of enterprises for accounting information system is not only the process of reengineering the business process and internal management of traditional enterprises, but also the only way for scientific management in the era of big data. With the continuous development of economy and society, the degree of competition between enterprises is

deepening, and enterprises have more and more requirements for fine management. At the same time, the demand for accounting information technology is also deepening. We hope that by continuously improving the quality of accounting data utilization, we can provide a more refined and powerful grasp for the business decision-making of enterprise managers. In this paper, through data visualization to understand the economic operation, release the research value of data, and provide important reference and improvement direction for enterprise management decision-making. Data visualization is in line with the way that human brain receives information, which is convenient for information users to make rational analysis and judgment based on the perceptual knowledge of visual graphics and images.

2 Accounting information system

2.1 Concept of accounting information system

Accounting information system refers to the system that the accounting personnel use the accounting system software to input, summarize, calculate and count the original bookkeeping vouchers to form accounting books and financial statements with the help of computer technology, and report the financial data obtained from the analysis to the company management personnel. The accounting mode of accounting information system replaces the original manual accounting mode and improves the efficiency of enterprise financial operation. As a separate subsystem of enterprise management information system, accounting information system provides powerful support and considerable convenience for enterprise managers' decision-making. It can also understand the financial information and status of enterprises all the time through accounting information system, so as to grasp the specific income of enterprises and improve the ability of enterprises to carry out relevant activities [2]. Accounting information system is a system composed of multiple subsystems, and the corresponding subsystems are different business cycles, such as general ledger, accounts receivable and payable, fixed assets accounting, inventory accounting, sales accounting, wage accounting, cost accounting, accounting report generation and summary, financial analysis, etc.

2.2 Stages of accounting information system

There are two important concepts of accounting information system, one is process, the other is information. Based on these two concepts, the development stages of accounting information system can be divided into two directions. Based on the process, the stages of accounting information system can be divided into "manual stage - computerization stage - informatization stage". This division is more based on the process of business cycle and its working mode in accounting information system. After entering the information stage, a remarkable feature is that the original information required by the accounting information system can be transmitted in real time by the economic information generated by the business system, and the accounting information system itself can no longer be used as the only input source of accounting information. Therefore, informatization is almost accompanied by the reengineering of the whole organization's business process. Another division of the development stage of accounting information system can explain the relationship between information system and organization more clearly. The development of accounting information system mainly comes from three stages: "information integration within

departments - information integration within enterprises - information integration among enterprises". These two kinds of division symbolize the development direction of accounting information system from traditional mode to modern mode.

2.3 Features of accounting information system

In the past, manual summary calculation not only required a lot of manpower and time, but also resulted in errors, which were not easy to find. Through the application of computer, it can also do things that are difficult to be done manually in the past, such as the double declining balance method of fixed assets. The use of computer technology can better calculate the depreciation data of enterprise fixed assets, which provides great help for the accuracy of enterprise financial data. For large listed group enterprises, the corresponding data process is large scale, various and complex, and the requirements of data processing are more unified. In the accounting information system, the only purpose of the computer is to complete all kinds of tasks and instructions issued by enterprise users. And because many enterprises internal accounting data is not unified, the traditional manual statistics is difficult to complete the unified collation of data, with the help of the computer processing function characteristics of scattered data, in the current Internet age, a large number of accounting data with the help of computer processing at the same time, the accounting data to be calculated by the enterprise accounting staff constantly input to the computer, the accounting data is very important. The information system will carry out the corresponding calculation, classification and management according to the set program, and finally generate the required enterprise report. In this way, the accounting information system also has automatic and unified display mode, which can create more accurate and efficient performance for enterprises. For the current accounting field, the degree of compliance with accounting standards is very important^[3]. All enterprises are gradually following the accounting standards to improve the internal financial system, and the operation of computer accounting information system and manual operation together, will be able to make enterprises more adapt to the development of the market and the actual needs.

3 Relative theory of data visualization technology

3.1 Visual thinking

Visual thinking is a common feature of human beings, which runs through human life. All perception contains thinking, all reasoning contains intuition, and all observation contains creation. It basically reflects the main idea of the concept of visual thinking. Any art is realized by intuition, so perception is the starting point of art. Arnheim believes that visual thinking is the most active in human cognitive activities. Visual thinking also has the function of rational thinking, which is closely related to all thinking activities. From the perspective of the relationship between visual perception, art and aesthetics, in the perceptual experiment and art practice, in fact, vision is not operated alone. It and psychological activities exist as an organic whole. Visual thinking is caused by image projection in the psychological structure of information processing, rather than simple feedback. Information visualization makes use of the close relationship between vision and thinking in visual thinking to visually decode, arrange, transform and regenerate the abstract information, so that the original data can be

visualized and symbolized, and new information can be easily interpreted. Information visualization is the specific practice and application of visual thinking theory. The presentation of information is often scattered and irregular. The process of information visualization is not only the simple translation of readable and visible information, but also the method of organizing all information into valuable information and then filtering, induction, summary and presentation ^[4].

3.2 Data visualization

Information visualization is an analysis tool based on the mature communication technology, Internet and database technology, aiming at the development of intelligent tools, and using graphics and image processing technology to show boring data in a more intuitive form. It can carry out information mining, data mining and data mining for markets, organizations, enterprises and even individuals in today's growing data scale Information utilization, information recycling, and provide more effective information transfer mode. It transfers the information of different dimensions of the research object to the integrated database, forming a large-scale and structured information network system. By analysing the output data of the business system, it is transformed into graphics and images, which can more vividly show the data form, greatly improve the management efficiency of the enterprise, and also change the way of information dissemination. It is a form of deep processing of information resources. Information visualization can integrate complex data, use computer language to display the observation indicators personalized, and realize the cognitive process of things by perceiving information through human visual thinking. As a very important tool for human beings in the new century, visualization can improve the efficiency of management and analysis in geometric progression. The difference between visualization and all productivity in the past is that visualization is a process of integrating information, which cannot be divided and dispersed, and it is an organized and regular information structure.

3.3 Decision based on data visualization

The business activities, financial activities and management activities of enterprises will produce all kinds of data continuously. If the information is not mined and processed effectively, it is not only a waste of enterprise resources, but also not conducive to the scientific development of enterprise management. Therefore, information visualization based on management is to integrate the data carried in all aspects of the enterprise according to certain logic, excavate the "intelligence" hidden in the enterprise, intuitively display the multidimensional data of the enterprise in the form of graphical display of observation indicators, and let the managers understand the information behind the data in a more friendly form to track and observe the development of enterprises, and provide objective basis for further analysis and decision-making. For an enterprise, the direction of decision-making affects the result of development. If managers adjust their business strategies in the development trend, the rate of development will be very fast, but this trend is in the data. It is difficult for us to find the mystery from the massive data. Data visualization can make this trend obvious.

4 Construction of enterprise accounting information system

In recent years, enterprise accounting information system has been developing and improving, mainly including financial management information system, risk management information system, performance management information system and accounting support information system.

4.1 Financial management information system

Financial management information system, mainly through the account book database, at the same time with the help of monetary measurement and accounting rules, according to certain rules to convert the real world data into account books. After processing, it is reflected in the form of a report. When establishing the financial management system, we should rely on the delivery, summary and analysis of financial data of various business functions, and closely integrate all business data with the business processing system to obtain detailed information immediately. Accounting information processing subsystem is a subsystem that processes accounting data into accounting information^[5]. Its composition should not be limited to the original accounting information system. Different processing subsystems should be set up according to different information demanders to meet the different requirements of information demanders. For example, internal managers pay more attention to the information related to business operation, shareholders pay more attention to the information related to stock value, creditors pay more attention to the ability of enterprises to pay off debts, and the government pay more attention to the tax payment and social responsibility performance of enterprises^[6]. Different information needs determine that enterprises should build diversified accounting processing subsystems. And a large number of empirical studies have proved that the single accounting information cannot meet the diversified needs of people, and the traditional single accounting information cannot provide the relevant information needed by different groups of people. The accounting information needed by enterprise managers can be provided by internal related personnel. The information needed by the public is best provided by professional institutions, because as an independent third party, intermediary institutions can provide more objective and authentic information for the majority of shareholders. If creditors and the government have the ability to obtain the relevant accounting data and information of enterprises, and then form the required accounting information after certain processing, of course, they can also use the information provided by intermediaries^[7].

Due to the need of management, the data it collects is more diversified than the traditional financial accounting, and the information interaction between various underlying data is also more and more. Big data technology can help to collect more effective data and store them in the form of topics, which is conducive to the application of various models. The key of designing financial management system is to integrate some non-financial data and financial data organically, and process the data further^[8]. With the development of computer technology, the idea of human-computer interaction has also been widely concerned. In the idea of human-computer interaction, computers and people are regarded as a whole, and in line with human thinking and habits. Accounting information visualization subsystem mainly uses information technology to obtain, store and process relevant accounting information. It can quickly capture the basic characteristics of business events, and ultimately meet the personalized and diversified needs of users with the help of interactive and financial reporting.

Accounting information visualization display subsystem uses human-computer interaction visualization technology to collect, store and process information technology from various information databases. It records business operations according to certain steps and methods and generates accounting information needed by enterprises. In addition, it also supports different stereoscopic and dynamic views, such as pie chart, line chart, column chart, etc. The company income and expense distribution charts are shown in Figure 1.

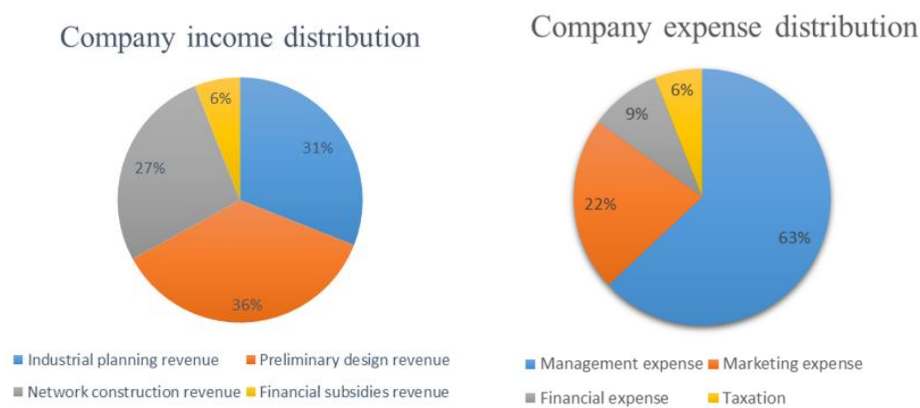


Figure 1. Company income and expense distribution charts

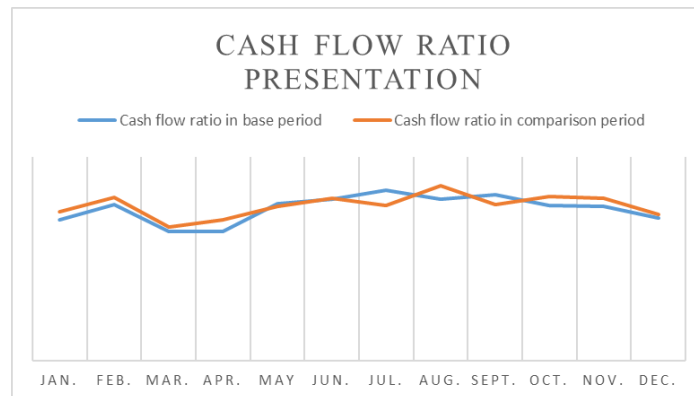
4.2 Risk management information system

Risk is the uncertainty that can be identified. In other words, risk can be identified through internal and external data analysis. Any risk of the enterprise will not happen without signs, and the risks that break out in the enterprise now are the consequences of not doing a good job in risk management. Therefore, it is very important to carry out risk management. The board of directors and management of an enterprise can implement the risk management process in all aspects of operation and management with the help of risk management information system around the strategic objectives of the enterprise to help the enterprise minimize the risk and achieve its strategic objectives. As far as the current trend is concerned, the overall risk management of enterprises is mainly the integration of internal and external data and resources, the analysis of big data, the formation of industry wide risk management, and the prevention of internal and external risks. The risk management information system is based on data, which mainly comes from the data in the internal system of the enterprise and the external related data obtained by crawling technology. Through the analysis of the data, the relevant personnel can find out the problems and defects of the company, so as to find out the corresponding risks. In addition, through the analysis of the company's illegal losses, identify the company's risk events, and finally form the company's risk database. Based on the risk database, control measures are formulated for the company's operational risk. The effect of control measures will return to the company's overall data in the form of data flow, forming a closed-loop risk management system ^[9].

Risk identification is a dynamic process. Enterprises should carry out real-time risk identification activities, identify risks, summarize risks and form a real-time risk database. The specific work of risk identification consists of data collection and summary, risk identification

and risk database formation. Risk assessment means that after risk identification, through the analysis of the collected data, the identified risks and their characteristics are described, and the probability of risk occurrence and its possible adverse impact on the realization of the company's strategic objectives are analysed and evaluated ^[10]. Enterprises should formulate risk assessment standards according to the risks that enterprises may face in the risk database, and score the identified risks according to the assessment scheme. Finally, the system will score the risks according to the freely set user weight and the corresponding calculation formula. After the risk scoring, the system will automatically generate the risk assessment table and risk map. Risk response refers to the process that the company determines the risk preference, risk tolerance and risk management effectiveness standards according to its own conditions and external environment, and formulates the risk management strategy in line with its actual situation. After the completion of the risk assessment, the company shall prepare relevant response plans according to the risk response process, and distribute them to the relevant responsible departments. After receiving the plan, each responsible department shall organize to formulate and report the specific implementation plan, including control measures, implementation period, implementation responsible person, etc. Big data retrieval technology, big data-based risk identification model and big data risk early warning mechanism can more effectively serve the risk management of enterprises. The system can effectively help enterprises to identify risks comprehensively, monitor risks in real time, deal with risks accurately, and provide effective guarantee for enterprise decision-making ^[11].

The cash flow ratio and the liability ratio are the important risk management indexes. We can present them by the data visualization technology in figure2.



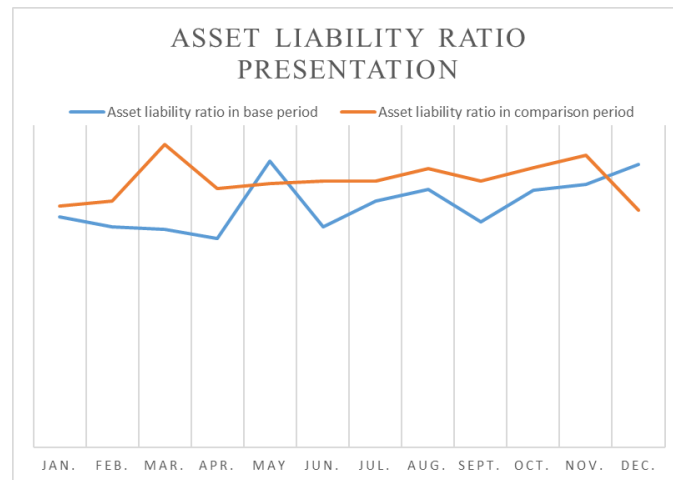


Figure 2. The cash flow ratio and the liability ratio presentations

4.3 Performance management information system

Based on the contemporary enterprise system and financial market environment, the separation of ownership and management rights is a common phenomenon in enterprises, which leads to the problem of performance management. Traditional performance management relies too much on financial indicators, which can only reflect limited information and cannot evaluate the future prospects of enterprises. Therefore, various new performance management information systems emerge as the times require. With the development of information technology, enterprises should establish a set of performance management information system in line with the strategic objectives of the enterprise. Through the application of Bi technology, the system should include an integrated database that can be shared, realize automatic data processing, and be able to deeply analyse and mine the information behind the data. The intelligent performance management system integrates data query, report analysis and business process management. It can provide effective and integrated management information for managers and realize the change of modern financial management from the traditional financial accounting mode to the management accounting mode focusing on internal management. The data acquisition and storage layer is located at the bottom of the framework, and the data sources are mainly accounting analysis management system data, ERP data, CRM data, etc. at the same time, the performance management information system based on business intelligence needs to integrate comprehensive data sources, such as the data of risk management information system, the original data. Due to the large amount of data and the inconsistent format, ETL is needed for the data ETL provides a mode to capture and transfer information in massive data, which effectively improves the application ability of business system. The data processed by ETL Technology is stored uniformly ^[12].

Enterprises can decompose the objectives of different responsible departments through balanced scorecard and other methods to form different subject areas, which lays the foundation for later data analysis. The analysis application layer is mainly to further process the relevant performance data from the data warehouse to provide the basis for the enterprise

performance management. OLAP is good at analysing data from different angles. OLAP's multi-dimensional analysis mainly analyses the subject data in the data warehouse represented by dimension measurement through slicing, slicing, drilling, rolling and rotation, so that managers can analyse data from different levels and understand the rules behind the data. Data mining is based on artificial intelligence, machine learning, statistics and other technologies, highly automated analysis of data, inductive reasoning, from large data sources to extract reliable, novel, effective, people are interested in, can make people understand the advanced processing process of knowledge. Through DM, managers can detect the information behind the data and improve the competitiveness of enterprises in the market. We link the performance management of enterprises with the strategic development of enterprises, and design a set of index system that can make managers quickly and comprehensively understand the business situation of enterprises, which is used to express the goals that enterprises must achieve in their strategic development, and transform tasks and decisions into goals and indicators. The key to design the balanced scorecard system is to collect and integrate the key performance indicators and other data information, and form the evaluation standard ^[13].

As shown in Figure 3, the average annual personal income and the average project cycle are the important performance management indexes.

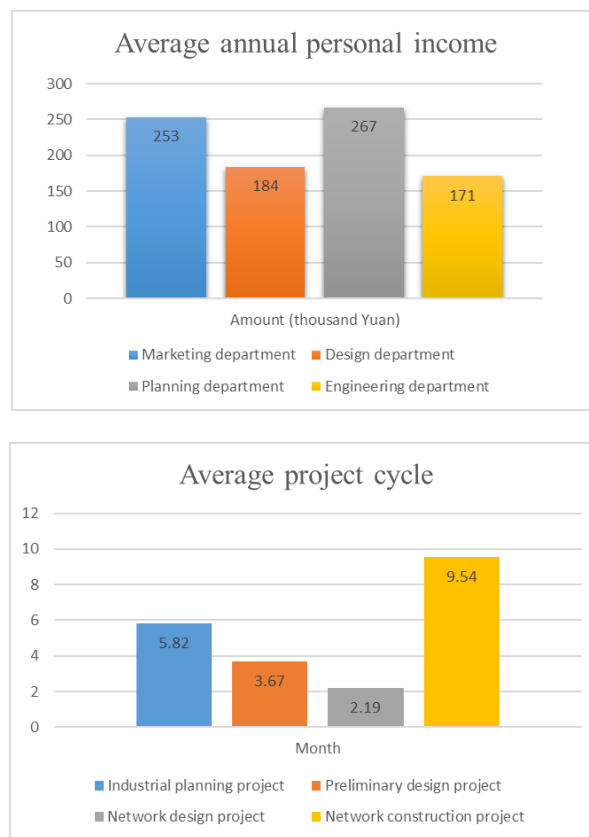


Figure 3. The performance management presentations

4.4 Accounting support information system

In the daily operation and management of enterprises, decision-making is everywhere. For example, purchasing managers need to make decisions on the quantity and price of purchased products, financial managers need to make decisions on how to invest and raise funds, and executives such as CEOs need to make decisions on the strategic objectives of enterprises. Decision making can not only rely on experience, but also need to spend a lot of time and money to measure the benefits of different schemes. With the help of information technology, the cost of decision-making can be saved and the effect of decision-making can be improved. The ultimate goal of management accounting is to provide information support for decision-making, so it is very necessary to establish accounting decision support system. The key of accounting decision support system is to establish topic oriented DW. Before a large number of source data enter the data warehouse of accounting decision support system, the system will transform the data structure into the target format through automatic processing technology to meet the data needs of decision makers^[14]. A large number of decision-making related models are stored in the model base, such as investment model, financing model and so on. The method library describes how to use the model in detail, and also includes various accounting standards and cost calculation methods, such as standard costing, activity-based costing, etc.

All kinds of data, models and methods can be processed by OLAP, DM and other technologies to generate information needed for decision-making and assist managers in decision-making. A correct decision must be supported by a large number of data, which can be used to build various models and analyze from different angles. Therefore, in the accounting decision support system, data processing is the foundation, and the data processing layer is at the bottom of the whole architecture. The data storage layer is located on the top of the data processing layer, which is a platform to integrate and store the ETL processed data. After the source data is processed by ETL Technology, it is stored in the data warehouse with different themes. At the same time, based on the data warehouse, the model base, method base and knowledge base are established in the data storage layer to store the corresponding models, methods and knowledge. To meet the needs of the model manager, the model manager can create a new model and delete the model. The method library stores various methods of using the model library, such as statistical methods, forecasting methods, planning methods, etc., and also includes some specific accounting standards, enterprise internal control system and other information. Through the learning of the method library, the operation efficiency of the model can be improved. Similarly, users can delete, add, and so on. The knowledge base stores the knowledge related to decision-making. Through the knowledge base, knowledge sharing can be effectively realized and the decision-making ability of enterprise personnel can be improved. When decision-making needs a lot of external data, crawler technology is undoubtedly the best helper. Through the setting of relevant information, crawler technology can quickly find the required data. After DM process, the information behind big data can be effectively explored to help managers make better decisions. Through the computer, mobile phone and other tools, the accounting information formed by the analysis can be displayed in front of the enterprise personnel, so that the relevant personnel can timely grasp the company's financial information and understand the enterprise's management level. The system also provides search and query functions, managers can get the latest financial data and financial statements, understand the latest financial situation, business level and find the risks that enterprises may face. Accounting decision support system provides a large number of

financial indicators and business indicators. Users can analyse the indicators from different angles according to their choice to meet the needs of decision-making ^[15].

For example, we can make use of the accounting support information system to know about the sustainable development capability of the enterprise in figure 4.

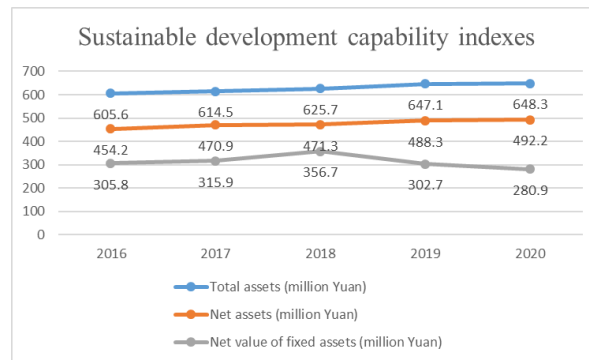


Figure 4. Sustainable development capability indexes

5 Conclusions

Accounting information system based on data visualization technology includes financial management information system, risk management information system, performance management information system and accounting support information system. The subsystems are independent and connected with each other, and the synergy effect of subsystems can effectively improve the management ability of enterprises. This paper designs an accounting information system based on data visualization technology, and studies the data visualization effect of accounting information system to provide timely, comprehensive, complete and effective data support for enterprise management decision-making.

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