The Research on the Improvement of Internal Control Quality Through the Enterprise Informatization

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Abstract—The improvement of internal control quality is the key to the promotion of enterprises' management effectiveness. There are large amounts of related literatures about the relationship between the enterprises' informatization and internal control. Regrettably, the empirical study of this relationship is too scarce. First of all, based on the principle of sustainable development, the author did some researches on the theoretical background, which related to the concept of enterprises' informatization and internal control. Admittedly, this article used the empirical method to explore the influence of informatization on the progression of internal control quality, which is based on the data between 2009 and 2010 of the listed companies. According to the result of the study, it can be concluded that the companies disclosed informatization voluntarily would obtain the higher effectively and efficiently internal control. Moreover, this article further discusses the relationship between the capital investments of informatization and the quality of internal control. Hence, it is concluded that the quality of internal control cannot be promoted immediately through the capital investment on informatization.

Keywords—internal control; informatization disclosure; informatization capital investment

I. INTRODUCTION

With the rapid development of information technology, the progression of enterprises' informatization is inevitable and undeniable. There is little doubt that human society has already stepped into the information society and knowledge economy era. The application of modern information technology has penetrated all industries of the national economy and social advance, which is in the aspects of politics, economy and culture. In the grand goal of building a well-off society in an all-round way in 2020, Chinese government explicitly emphasize “increase informatization level greatly” and “adhere to way of the new industrialization with Chinese characteristics, informatization, urbanization and agricultural modernization” are the strategic targets of China's informatization construction and important direction guidance. Enterprises informatization is an important area of national economy informatization, which is an inevitable process of enterprises’ development and has a great extent of the effects on the enterprises' operation mode, control systems, competitiveness and even management environment. Therefore, this article would empirically test whether informatization is helpful to improve the quality of internal control by file-type research method.

II. THEORETICAL BACKGROUND

Observing the development of rules of the relevant professional organizations worldwide in the field of information systems’ application on internal control, the Institute of Internal Auditors (IIA) published “System Control and Audit” report in 1977, which is the first report on internal control framework associated with information technology in history, focusing on information technology and business process, and risks with business automation applications. The report's content provides a feasible direction to conduct control and audit by using information technology. In 2001, American Institute of Certified Public Accountants (AICPA) issued “The announcement of auditing standards no. 94 - impacts of information technology on auditors’ consideration of internal control in the audit of financial statements”. The announcement particularly analyzes the high possibility that applications of information technology in the organization are likely to have a significant impact on the COSO reports. Information technology has posed great challenge to the traditional way of business, making the internal risk control present a new content and developing trend. Brad and Vandervelde (2007) apply COBIT framework in internal control and information system auditing from practice perspective; studies have found that COBIT framework predicts the auditors’ actions in this field, and points out that the invention of a general theory of internal control so as to adapt to the information technology based on COBIT is the trend of the times. Marten and Johnson (2006) expound the advantage of using COBIT for IT governance, and state that using COBIT for IT governance is the direction of future study. Stoel and Muhanna (2011) study the IT technology’s impact on corporate profitability and enterprise value when it is applied to the internal control, and the results show that enterprises applying IT technology to implement internal control possess significantly higher profitability and enterprise value than those which did not implement the internal control informatization. The above-mentioned professional organizations and scholars’ research results paid more attention to information technology’s influence on internal auditing, information technology's effect on the internal control related to CPA financial statements auditing, IT governance and control of the COBIT framework, etc.

Chinese research on the internal control under the environment of informatization started late, but the research results are abundant, mainly reflected in the following aspects:
Some Chinese scholars devote themselves to conducting research on the problems faced by internal control under the environment of informatization. In 1992, Professor Yang published "accounting cybernetics", integrating the system theory, information theory, and cybernetics into accounting, giving rise to further development in theory and technology of accounting control. Wang (2006) states that internal control is faced with risk from three areas due to ERP application: (1) The application of ERP needs the enterprise to carry on the business process re-engineering; lack of security of computer systems will make enterprises suffer the risk of being attacked. (2) The application of ERP software is dependent on the accuracy of the information, once information errors occur, the internal control system would probably fail; (3) The ERP system puts forward higher request for enterprises' software and hardware of internal control, which is also a huge challenge in terms of technology for enterprises. Luo and Zhang (2008) argue that informatization has a significant impact on enterprises. They continue to use the COSO report to define the five elements of internal control, make concrete analysis in the five-aspect problems of internal control in the process of enterprise informatization, and present countermeasures on the construction of internal control under enterprise informatization.

Besides, some other Chinese scholars introduce the idea of IT governance, trying to discuss the internal control problems in the informatization process from the perspective of corporate governance. Rao (2003) expounds the reasons why enough attentions should be paid on information technology governance, and provides the framework of IT governance referred to the COBIT. Meng (2007) analyzes the three challenges Chinese enterprises must face to implement IT governance: (1) the CIO (chief information officer) lacks the knowledge and experience of internal control; (2) the lack of systematic IT control system; (3) the existing IT control system does not have the auditability. Zhou and Chen (2008) analyze the problems arising in the informatization of Chinese accounting enterprises must face to implement IT governance: (1) the CIO (chief information officer) lacks the knowledge and experience of internal control; (2) the lack of systematic IT control system; (3) the existing IT control system does not have the auditability. Zhou and Chen (2008) analyze the problems arising in the informatization of Chinese accounting enterprises must face to implement IT governance: (1) the CIO (chief information officer) lacks the knowledge and experience of internal control; (2) the lack of systematic IT control system; (3) the existing IT control system does not have the auditability. Zhou and Chen (2008) analyze the problems arising in the informatization of Chinese accounting enterprises must face to implement IT governance: (1) the CIO (chief information officer) lacks the knowledge and experience of internal control; (2) the lack of systematic IT control system; (3) the existing IT control system does not have the auditability. Zhou and Chen (2008) analyze the problems arising in the informatization of Chinese accounting enterprises must face to implement IT governance: (1) the CIO (chief information officer) lacks the knowledge and experience of internal control; (2) the lack of systematic IT control system; (3) the existing IT control system does not have the auditability. Zhou and Chen (2008) analyze the problems arising in the informatization of Chinese accounting enterprises must face to implement IT governance: (1) the CIO (chief information officer) lacks the knowledge and experience of internal control; (2) the lack of systematic IT control system; (3) the existing IT control system does not have the auditability. Zhou and Chen (2008) analyze the problems arising in the informatization of Chinese accounting enterprises must face to implement IT governance: (1) the CIO (chief information officer) lacks the knowledge and experience of internal control; (2) the lack of systematic IT control system; (3) the existing IT control system does not have the auditability.

To sum up, the existing literature of this filed in China is mainly focused on the internal control and auditing issues under the information technology environment, and the research methods used in the existing literature stay more on normative studies and discussions and less on the tests with empirical data. For this reason, this article focuses on the empirical tests of impacts of enterprise informatization on internal control quality, and reveals that under the current ownership structure, enterprise informatization is helpful to improve the quality of internal control.

III. THEORETICAL ANALYSIS AND HYPOTHESIS

A. Information Technological Determinism and the Quality of Internal Control

Technological determinism was the most influential genre of technological development theories until 1970s. Human society has turned into an information society. One of public information society theories namely "Information Technology Determinism" believes that information technology as a driving force promotes the development of society, and all aspects of the society should make adjustments in order to adapt to information technology. From the enterprise level, Lin and Li (2003) argue that enterprise informatization is the process that enterprises use information and communication technology to transform their business. Wang (2001) argues that information technology application in enterprise informatization mainly reflects in the production process informatization, management process informatization, office automation, and the integration system. Accordingly, enterprise informatization also motivates the adjustments of internal control system, and promotes the quality of internal control. Depending on information technology, the management structure in the enterprise internal control gets flatter, and the levels of the internal control becomes less, allowing decision makers and executors to have quicker communication and leading to clearer responsibility and higher efficiency. As a tool of risk prevention, information technology should effectively combine with business activities. A qualified information system has a greater potential to reduce errors and fraud, ensuring that enterprises' business processes are strictly in accordance with business rules. The introduction of information technology enhances the objectivity, diversity, flexibility, efficiency of enterprises' internal control and strengthens the preventing, checking and correcting function of internal control. The information system with the characteristics of opening, timeliness and electronization, prompt information demanders to communicate timely and effectively and realize continuous real-time monitoring. Therefore, on the surface, the influence of informatization on the internal control is the influence on the means and methods; the deeper influence is on the targets of enterprises. Moreover, the degree of the achievement of internal control goals reflects the quality of the internal control. Therefore hypothesized:

III: In the case of other conditions unchanged, the companies with disclosure of informatization have higher quality of the internal control.

B. The Scale of Enterprise Information Investment and the Quality of Internal Control

Promoting enterprises' independent innovations and technological upgrading is one of "China's national innovation strategies", research and development ability not only decides the survival and core competitiveness of enterprises, but also is an important reflection of a country's comprehensive economic power and development potential. R&D investments and construction in enterprise informatization determine the degree of informatization; Chinese government encourages enterprises informatization construction by the government subsidy and other supportive policies. Therefore, whether an enterprise is using the government subsidy policies, how much the government subsidies are used and the investment scale of its own funds in informatization, affect the enterprise's informatization process and the informatization degree of each element of internal control, which finally impacts the quality of internal control. Considering the time delay, informatization inputs would not improve the quality of internal control of the same year, even would lower the internal control quality when the informatization projects fail. Therefore hypothesized:
H2: In the case of other conditions unchanged, the enterprise informatization project investment amount is not positively to the quality of internal control.

IV. RESEARCH DESIGN

A. Research Samples and Data Sources

Based on the data of 2422 listed companies in 2009, after deleting data-missing samples, the article keeps 995 samples as the empirical test samples. The internal control indexes of 2009 and 2010 are chosen from “DiBo・China's listed company internal control index”. The design of “DiBo・China's listed company internal control index” is mainly based on related Chinese norms of internal control such as “Basic internal control norms for enterprises”, “The guidance for enterprises internal control” and other international internal control systems. Index design also draws lessons from existing research results of internal control index at home and abroad, and follow the construction method of an economic index. On the basis of above systems and methods, the design of DiBo index depends on the completion degree of the five major goals which are legal compliance, adequacy of internal control reports, asset security, operational efficiency and strategic realization, and the actual situation of implementing the internal control in listed companies in China, which makes DiBo index the most authoritative indexes to comprehensively reflect the levels of the internal control and the risk management capacity of listed companies. The informatization disclosure of these 1002 sample enterprises is mainly through manual collection and reading the annual internal control reports and other relevant information extracted from the board of directors, which is measured by 0-1 variable. Other variable data, such as the proportion of the first largest shareholder and the firm size, mainly come from the Guotaian CSMAR database.

B. Variables Design

1) Dependent variable: Quality of Internal Control

Internal control quality reflects the process quality and implementation effectiveness of internal control, ultimately reflecting the extent to achieve the goal of internal control. High internal control quality means that realization degree of the internal control goal is high, and vice versa. DiBo index is a measuring tool reflecting the degree of realization of internal control internal control goal, and can be used as a substitution variable for the quality of internal control. DiBo China's listed companies internal control index system originated from a Chinese key accounting research subject “index of listed Chinese internal control research”. The design of DiBo China’s listed company internal control index system is based on “Enterprises internal control basic norms” published by Chinese government. The design of index draws lessons from the related domestic and foreign research achievements, and follows the general procedures and methods of index construction, which can comprehensively reflect the quality of the enterprises’ internal control.

Since DiBo internal control index is the most authoritative and the most comprehensive data to reflect the implementation of the norms of the internal control in the listed companies in China, it is reasonable for this paper to choose DiBo internal control index as a dependent variable.

2) Independent Variable: Status of Enterprise Informatization

Qiu (2006) argues that enterprise informatization involves personnel of every level in an enterprise, including senior managers, middle managers, and other staff members; their skills and awareness of informatization will affect the investment of enterprise informatization. Generally speaking, the stronger the awareness of enterprise informatization they have, the higher the level of enterprise informatization will be. The construction of Chinese enterprises’ informatization started relatively late and the speed of the construction is slow, therefore it needs to go through a few years or even decades of expansion and integration to form a complete system. If the managers of an enterprise have strong consciousness of enterprise informatization and take enterprise informatization into their future enterprise strategic planning, the enterprise informatization investment and the related information of informatization construction will be disclosed in time in the annual reports, leading to an efficiency improvement of internal control and management. Consequently, this article will take the disclosure status of informatization as an explanatory variable to measure the managers’ attention on informatization.

The informatization status of an enterprise can also be measured by the subsidies from the government. Chinese government encourages the construction of enterprise informatization and enterprises’ independent research on informatization by the form of government subsidies to realize the promotion of enterprise’s automation, hence improving the efficiency of internal control and management. Therefore, this article uses the scale of government subsidies as a substitution variable of the degree of enterprises’ informatization investment.

3) Control Variables: Ownership Structure, Enterprise Scale etc.

Enterprise internal control system originates from the principal-agent problem due to the separation of management and ownership in the modern enterprise system. Within the framework of the principal-agent relationship, internal control aims to reduce the agency costs. Therefore, equity structure affects the quality of the enterprise internal control (Wuet al., 2009). This paper takes the proportion of the largest shareholder’s shareholding as the substitution variable of ownership structure. The scale of the enterprises is presented by the scale of their static assets and dynamic operating income, and the net increment of the intangible assets also has an impact on the quality of internal control. Therefore, this article will use these control variables.
C. Model Design

This paper makes adjustments to the models used in the previous research, thus establishing a new regression model as follows:

$$DIB = \beta_0 + \beta_1 \text{Infor10} + \beta_2 \text{Xxhrte} + \beta_3 \text{Bigshare} + \beta_4 \text{Lsize} + \beta_5 \text{Income} + \beta_6 \text{Netinv} + \epsilon$$

V. THE EMPIRICAL TEST AND ANALYSIS RESULTS

A. Descriptive Statistics

According to table II, among 995 sample companies, 476 companies’ annual reports have disclosed the information of informatization construction, including 114 companies clearly disclosing their investment scale of company informatization construction, while other ones out of 476 companies have made qualitative description about their informatization construction. In 2009, 48% of the sample companies disclosed information of informatization, with an average of 180,000 RMB. In 2010, it published that the mean value of the samples’ company internal control indexes is 702.03; the maximum value is 958.99, and the minimum value of 255.53. Moreover, the proportion of the first largest shareholder’s shareholding averages out at 37% in 2009. All these results illustrate that the ownership of the sample companies are concentrated, and the average quality of internal control is relatively high.

B. Correlation Test and Analysis

Correlation test in table II shows that the information disclosure of informatization construction and the asset size have a significant positive correlation with the company's internal control at 1% level, and they also have a significant positive correlation with the proportion of company’s largest shareholder holding at 5% level. Except that intangible asset increment and 2010 DIB are not correlated significantly, information disclosure, asset scale, the proportion of the largest shareholder’s shareholding and operating income are all significantly and positively correlated with the internal control quality at 1% level in 2009. This is consistent with our hypothesis. The correlation coefficients between explain variables and control variables are less than 0.50, and the results of multicollinearity test testing show that collinearity does not exist between the variables.

C. Multiple Regression Results and Analysis

In table III, model 1 regression results show that the adjusted $$R^2 = 0.248$$, indicating that model 1 has a relatively good fitting effect. In model 1, $$F = 66.824$$, and the overall model 1 passes the F test; besides, variance inflation factors of each variable are less than 2, which shows that there is no serious collinearity between variables. These statistics show that the analytical basis of the regression results is credible. So the results of model 1 can be summarized as follows: without considering the informatization input amount, the disclosure of enterprises’ informatization construction has a positive impact on the quality of internal control, and the correlation between them is significant at 1% level. In conclusion, the development of informatization construction in enterprises will promote improvement of the internal control quality. So hypothesis 1 has passed the validation.

In table III, model 2 regression results show that the adjusted $$R^2 = 0.268$$, indicating that the model 2 has a relatively good fitting effect. In model 2, $$F = 73.878$$, and the overall model 2 passes the F test; besides, variance inflation factors of each variable are less than 2, which shows that there is no serious collinearity between variables. These statistics show that the analytical basis of the regression results is credible. So the results of model 2 can be summarized as follows: the investment of enterprises’ informatization has a negative impact on the quality of internal control, and the correlation between them is significant at 1% level. In conclusion, more investment in enterprises’ informatization construction does not mean higher quality of internal control. So hypothesis 2 has passed the validation.

In table III, model 3 regression results show that the adjusted $$R^2 = 0.144$$, indicating that model 3 has a relatively good fitting effect. In model 3, $$F = 34.587$$, and the overall model 3 passes the F test; besides, variance inflation factors of each variable are less than 2, which shows that there is no serious collinearity between variables. These statistics show
that the analytical basis of the regression results is credible. So the results of model 3 can be summarized as follows: without considering the informatization input amount, the disclosure of enterprises’ informatization construction has a positive impact on the quality of internal control of the next year, but the correlation between them is not significant. In conclusion, the disclosure of enterprises’ informatization has a limited promotion on enterprises’ internal control quality of the next year. So hypothesis 1 has passed the validation.

In table III, model 4 regression results show that the adjusted R² = 0.174, indicating that model 4 has a relatively good fitting effect. In model 4, F = 42.978, and the overall model 4 passes the F test; besides, variance inflation factors of each variable are less than 2, which shows that there is no serious collinearity between variables. These statistics show that the analytical basis of the regression results is credible. So the result of model 4 can be summarized as follows: the investment of enterprises’ informatization has a negative impact on the quality of internal control of the following year, and the correlation between them is significant at 1% level. In conclusion, more investment in enterprises’ informatization construction does not mean higher quality of internal control. The failure of informatization projects in the current year may have a negative effect on the internal control of the following year. So hypothesis 2 has passed the validation.

D. Robustness Test

In the regression model, the average DIB of 2010 and 2011 is taken as a substitution variable of the dependent variable. In

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Note: * means at the 10% level, description statistics are significantly correlated (double side).
** means at the 5% level, description statistics are significantly correlated (double side).
*** means at the 1% level, description statistics are significantly correlated (double side).

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Note: The numbers in the brackets represent standard deviations. *, ** and *** mean the correlation is significant at the level of 10%, 5% and 1% respectively.
table 3, the model 5 regression results show that the model has good robustness. At the same time, regression results show that the model is still robust when taking the company’s operating income as a substitution variable of company’s scale.

VI. CONCLUSIONS AND RECOMMENDATIONS

The internal control quality is the crux of the internal control system construction, which means the higher of internal control quality could assist the achievement of the internal control purpose. This paper points out that the informatization environment could affect the internal environment and the communication effectiveness; thus, affects the quality of internal control. The empirical data of the listed companies in China between 2009 and 2010 was selected as the research sample. According to the empirical test results of the three hypotheses, the companies that make a disclosure of informatization would have a higher quality of internal control when the other conditions do not change. However, the investment amount of informatization could not improve the internal control quality directly in this year and the next year, which indicates the negative relationship between the internal control quality and the informatization investment. In addition, it can be conclude that the largest shareholder’s security amounts of the firm that had informatization disclosure have positive impact on the internal control quality particularly significant at the 1% level.

Based on the above conclusion, the promotion of internal control quality can be done through the recommendations from three levels: In the macro, Chinese government should encourage and support enterprises’ informatization construction by increasing in allocating fund. In the meso, the enterprises should accelerate the evolution of the informatization and enlarge the scale of its construction to obtain the strength of industry competition. In the micro, the auditors should boost the supervision and instruction of enterprises’ informatization disclosure. Only after the thorough implementation of these three levels’ suggestion can enterprises’ internal control quality be enhanced continuously.

REFERENCES


