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A Principal-Agent Perspective on ERP Implementation Decisions-An Empirical Analysis Based on Chinese Listed Companies

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ABSTRACT

This study attempt to find the motivation of ERP implementation based on the principal-agent theory. From the view of information resource sharing and communication, which is a critical characteristic of ERP, this paper investigates whether the decision of ERP implementation is affected by the principal-agent mechanism.

Method study used economics technology to design an empirical study based on data from China's capital market. Findings reveal that Chinese companies try to resolve information asymmetry problems from principal-agent mechanism by implementing ERP. ERP adopters have lower shareholding proportion of managers and higher distance between concentration of ownership and managerial ownership than ERP non-adopters. State-owned companies which have serious information asymmetry problems from principle-agent mechanism are more willing to implement ERP.

Study contributes to the ERP research literatures and information system research. The study provides a new perspective on the information system research.

Keywords

ERP, principal-agent, ERP implementation

INTRODUCTION

ERP systems are defined as “information systems packages that integrate information and information-based processes within and across functional areas in an organization” (Brazel 2005, Kumar and Hillegersberg 2000, 22). It is widely reported in the literature that enterprise-wide applications promise seamless integration of all information flowing through a company: accounting and financial information, human resource information, supply chain information, and customer information (Nicolaou 2004, Davenport, 1998; Kumar and Van Hillegersberg, 2000).

Since its creation, ERP systems have become a popular choice among many corporations. Existing research have widely identified factors that contributes to the successful ERP implantation, and investigated into the impact of ERP systems on the corporate performance and the capital market. A common feature of these studies is that they unanimously consider an organization's decision to adopt ERP as an investment strategy, which is aiming at enhancing corporate performance (Cooke and Peterson 1998; Wah 2000).

The purpose of this paper is to approach the motivation of ERP adoption from the perspective of principle-agent problems. Given ERP systems' informationization advantage, it may mitigate the information asymmetry problems between shareholders and the management. In the institutional setting in China, the most conspicuous characteristics of Chinese companies lies in its ownership structure. State-owned shares account for more than 60% of the total number of shares in China's listed companies, and managerial ownership is extremely low, which gives rise to potential agent conflicts between the management and the government.. Wang&Zhang(2006) presented the percent of managerial ownership is average 0.097%, over 90% of which are non-state-owned enterprises.

In this regard, this paper explores the relationship between the decision of ERP adoption and ownership structure in China. Specifically, we investigate whether ERP adoption is related with the managerial ownership and the ownership concentration in China's institutional setting. In addition, we are interested in whether state-owned enterprises (SOEs), in relative to non-state-owned ones, have a greater tendency to implement ERP systems. The result shows that Chinese companies which have adopted ERP have lower managerial ownership and higher distance between managerial ownership and ownership concentration than non-adopters. SOEs are more willing to implement ERP systems.

We contribute to the existing research in several important ways. First, distinct from the common belief that the decision to implement ERP systems is due to pure strategic consideration, we find evidence that in China's institutional setting, ERP adoption has been used to alleviating information asymmetry, thus reducing the agent cost. Our univariate analysis based on data of listed companies in China indicates significant different ownership structure in firms with and without ERP implementation. Firms with higher potential information asymmetry and agent costs are have higher percentage of ERP adoption.

The other major contribution is that this paper enriches the literature of corporate governance by examining how ownership structure affects the decision of ERP adoption. Information asymmetry between shareholders and management give rise to considerable agent costs, and the problem is more severe in firms with lower managerial ownership. In order to reduce agent costs, management may send positive signal to investors by installing ERP, which has an important role in providing valuable information. On the other hand, a higher concentration of ownership in shareholders, other than the management, results in a greater incentive to monitor the management, and ERP implementation offers information satisfying their demand.

Finally, this research is an empirical study based on Chinese listed companies. Most importantly, due to its unique

institutional setting of predominant government control, corporate governance in China is different from that in western countries. This study shed light on how the ownership structure affects corporate decision making in their operations. For another, despite the fever of ERP implementations in China, ERP-related academic research investigating Chinese firms is far from rich, and most of them are qualitative in nature. Only a few papers are based on case study or surveys (Chen, 2005; Liu, 2006). We carried out empirical analysis using publicly disclosed data from annual reports of A-share listed Chinese companies in 2003.

LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

ERP implementation

ERP systems are one of the most important information systems innovations in the business community around the globe (Davenport, 1998). They are capable of encapsulating the full spectrum of business processes such as selling, marketing, purchasing, warehousing, accounting, human resource, supply chain and customer management by utilizing a common database or data warehouse which links subsystems in all parts of an enterprise. In this manner, all information flows within and across functional areas in an organization form a seamless integration (Kumar and Van Hillegersberg, 2000).

Despite of huge costs in adopting ERP systems, companies have been warmly embracing this technology and have made enormous investment into ERP systems (Intellibusiness, 2002; Scott and Shepherd, 2002). An AMR research study (Carlino et al., 2000) projected that the enterprise applications market to be US\$79 billion in America by 2004. In China, it is reported that the annual growth rate of ERP demand is 19.32% with an estimated ERP market of US\$1.78 billion in 2004 (Xia and Jian, 2004).

In response to the popularity of ERP systems among corporations, plenty of empirical-archival accounting studies in western countries have widely approached ERP implementation. Generally speaking, they fall into two categories.

One stream of study focuses on the process of ERP development. Researchers typically aim at identifying the variety of factors that contribute to the successful implementation of ERP systems. Their results suggest that the effectiveness of ERP systems is related to the extent of user participation and involvement in system development, the extent of business process and needs assessment during the analysis stage of the systems development process, and the level of data integration designed into the system (e.g., Govindarajan and Fisher, 1990; Zaheer and Venkatraman, 1994; Nicolaou, 2000).

The other frequently addressed area is the consequences of ERP implementation. Many papers center on the market reaction to ERP systems. Positive market reaction resulted from ERP adoption announcements are documented, indicating that investors expect future positive net cash flows from ERP implementation (Hayes et al., 2001, Hunton et al., 2002). Other researchers intensively investigate into the effect of ERP systems on firm performance and find mixed results regarding the relationship between ERP implementation and firm performance (Hunton et al. 2003; Nicolaou 2004; Wier et al. 2005). Some other studies reveal that ERP implementation leads to a trade-off between accounting information reliability and relevancy (Brazel, 2005).

In China, due to the formidable challenge posed by ERP adoptions, the mainstream ERP research literature involves addressing problems encountered in the implementation process, summarizing experiences of success, or proposing suggestions. While exploratory, qualitative methods are applied by most Chinese researchers (Zhu and Cheng, 2005; Xia and Jian, 2004), a few papers utilize the empirical methodology of case study or questionnaire survey (Liu and Wei, 2006; Liu and Tong, 2006; Zhong and Min et.al, 2004). Wang&Zhang(2006) firstly investigate the relation of ERP implementation

with corporate value growth, based on the data from China listed companies.

A common feature of the previous research is that ERP adoption is unanimously deemed as a business strategic decision (Cooke and Peterson 1998; Wah 2000; Wier et al. 2005). Expected advantages from this strategy include cost reduction, improved efficiency, reduced product cycle time, improved customer service and satisfaction, the ability to change and configure business in response to changing market place, and the enabling of e-commerce (Attaway 1999; Glover et al. 1999). However, despite this popular belief, whether the purpose of the adoption itself is to enhance performance can not be taken for granted. Moreover, there is a paucity of empirical research examining underlying driving forces of ERP adoption decisions.

Given the essential characteristics of ERP systems in providing and integrating more relevant information, it is likely that ERP systems may reduce information asymmetry between management and shareholders in corporations. In this regard, firms with higher degree of principal-agent conflicts may have a greater tendency to implement ERP.

Institutional background and shareholding structure in China

Since early 1980s, the Chinese government began to embark on its long-term enterprise reform. It converted wholly-state-owned firms into corporations with share capital, which were owned by central and local State-owned Asset Supervision and Administration Commission (SASAC), and State-owned Asset Supervision and Administration Commission (SASAC) linked to the government. It separated ownership and control rights by gradually granting large amount of managerial freedom to SOEs managers.

According to transferability, shares of Chinese listed companies can generally be categorized in two types: non-transferable shares and transferable shares. There are two kinds of non-transferable shares, i.e. state shares and legal person shares. State shares have been created to designate holdings in the SOEs to SASAC which is behalf on the state, or solely government-owned enterprises. Legal person shares are shares owned by domestic institutions which are themselves partially owned by the central or local SASAC. Since these institutions are typically business agencies or enterprises of local governments that helped start up public companies, it is not appropriate to assume that legal persons would behave very differently from the government shareholders. Both state shares and legal person shares can not be traded on the two stock exchanges, and are only transferable to domestic institutions upon approval from the government (Sun, and Tong et al., 2002). Shares other than state and legal person shares are transferable shares. For most listed companies, the top 10 shareholders are normally the state and legal persons. However, individual A-share owners are typically small shareholders, institutional investors are rare. They are not likely to monitor the managers. About one-eighth of the listed firms that can meet the more stringent requirements have issued B-shares (Qian Sun, Wilson H. S. Tong and Jing Tong, 2002). Only a few companies issue stocks in stock exchanges outside mainland China, and significant state ownership is also prevalent among them.

Principal-agent conflicts in China's institutional setting

A disparity in interests and information asymmetry between shareholders and management in a corporation gives rise to agent problems (Jensen and Meckling, 1976). In China's institutional setting, government shareholders set their objectives as value preservation and value adding of state-owned assets, while managers may tend to maximize his private interests by private perquisite consumption. Furthermore, the government ownership may suffer from greater information asymmetry

than private ownership (Qian Sun, Wilson H. S. Tong and Jing Tong, 2002).

Compared with western companies, China's enterprises suffer from more severe agent problems because of the unique institutional characteristics. For one thing, managerial shareholding percentage is extremely low in China, with the lowest rate of 0.00000279% to the highest rate of 15.9% in the year 2003. For another, given that A-share owners in the capital market are typically small shareholders and there is no significant independent blockholder, Chinese capital market is not likely to oversee the managers' actions. Moreover, although about two-thirds of shares are held by the government, it is actually impossible or prohibitively costly for it to effectively monitor the management directly (Lin et al., 1998).

To align interests of managers with its own, the proper direction of the owners is through the compensation package and through the monitoring of their performance (Donnelly and Lynch, 2002). Under this system, the government sets accounting-based profit targets for the managers, and grants SOEs large amount of discretion in applying the profits in excess of the targets. Accounting information serves as important contract variables for specifying the profit-sharing rules between the SOEs and the government. (Bing Xiang, 1998). The supervision board mechanism and the independent director mechanism are also introduced in the year 2000 and 2001. It is expected that these systems can bring the management under further supervision and prevent them from opportunistic behaviors.

In relative to small shareholders who may be free-riders, a large shareholder has higher motivation to monitor the management, since the holding constitutes a significant portion of his wealth. Furthermore, they are provided with voting rights as well as other essential means in doing so. In China's market, anecdotic evidences shows that a higher degree of ownership in the government is conducive to the overseeing the management.

From the point of view of SOEs managers, they make corporate announcements and file quarterly and annual financial reports that reflect their performance. By disclosing information and sending signals to shareholders, they can reduce agent costs that they bear.

Hypothesis development

Literature has demonstrated that information asymmetry among shareholders and management translates into agent costs. More information, either financial or non-financial, plays an important role in alleviating principal-agent problems (Jensen and Meckling, 1976). Since ERP systems are capable to produce and integrate information in the full spectrum of business processes of enterprises, enterprises may utilize them in purpose of mitigating information asymmetry.

Since lower managerial ownership suffers from higher degree of information asymmetry, they have more incentive to alleviate this problem by implementing ERP. In China, the ownership concentration is higher and all above 50%. Then the managerial ownership reflects the conflicts about principal-agent.

H1: The percentage of the managerial ownership is negatively related to ERP adoption.

When the managerial ownership is the same, as corporate governance theory, a higher degree of ownership concentration provides shareholders with more motivation to monitor management. As a information providing system, the company with higher degree of ownership concentration will adopt the ERP compared to those of lower degrees.

H2: The percentage of the ownership concentration is positively related to ERP adoption.

Since, as before references, SOEs experiences more severe agent problems compared to non-SOEs. It is difficult for SASAC to monitor the managers of SOEs. Then SASAC would like to devote trust to the information provided by ERP.

H3: SOEs have a higher ERP adoption rate, relative to non-SOEs.**RESEARCH METHODOLOGIES****Sample selection**

The sample from this research was selected by looking through the annual financial statements of all listed companies in 2003. We selected the companies whose annual financial statements presents the information that they adopted ERP and 75 companies was found. The financial information of the sample was extracted from the database developed by China Center of Economics Research (CCER), named Sinofin DataBase. The database is the most famous academic database in China. With extracted financial information we matched 75 companies by industry and size. The total sample is 150 companies.

Variables

ERP adoption variable is nominal variable. If the company adopts ERP the variable value is zero, otherwise is 1. The sample is classified by the ERP variable. The variables about managerial ownership and ownership concentration are extracted from database. Managerial ownership value is sum of shares proportion which three the top managers owned. The ownership concentration is sum of share proportions which the top 3 stockholder owned. The research gives a new variable to present the distance between managerial ownership and ownership concentration. The variable is calculate by $(\text{ownership concentration} - \text{managerial ownership}) / \text{ownership concentration}$. It could present the ownership concentration variant with ERP adoption, as managerial is constant. If the distance is large, ownership concentration is higher as managerial is constant; otherwise is low. All variables are showed in Table 1 blow:

Variable Type	Variable	Description
Nominal Variable	ERP	ERP adoption is 0, non-adoption is 1
	State-Owned	State-owned is 0, non-state-owned is 1
Continuous Variables	M-ownership	sum of shares proportion which three the top managers owned
	Concentration	sum of share proportions which the top 3 stockholder owned.
	Distance	$(\text{Concentration} - \text{M-ownership}) / \text{Concentration}$

Table 1 Variable Description**Analysis**

The first proposition has the objective of differentiating two groups-ERP adoption and not-ERP adoption-based on managerial ownership indicator. Consistent with the objective, an appropriate statistical technique for identifying two groups is one-tailed T test between two groups. The second proposition has the objective of differentiating two groups-ERP adoption

and not-ERP adoption-based on the distance between and Concentration indicator and managerial ownership indicator. Consider the objective, one-tailed T test applied also. This checked the ownership concentration difference with ERP adoption, as the managerial ownership is constant.

The last proposition has the objective of differentiating two groups-ERP adoption and not-ERP adoption-based on ownership type indicator. One-tailed T test applied for testing the ERP adoption variant with ownership type.

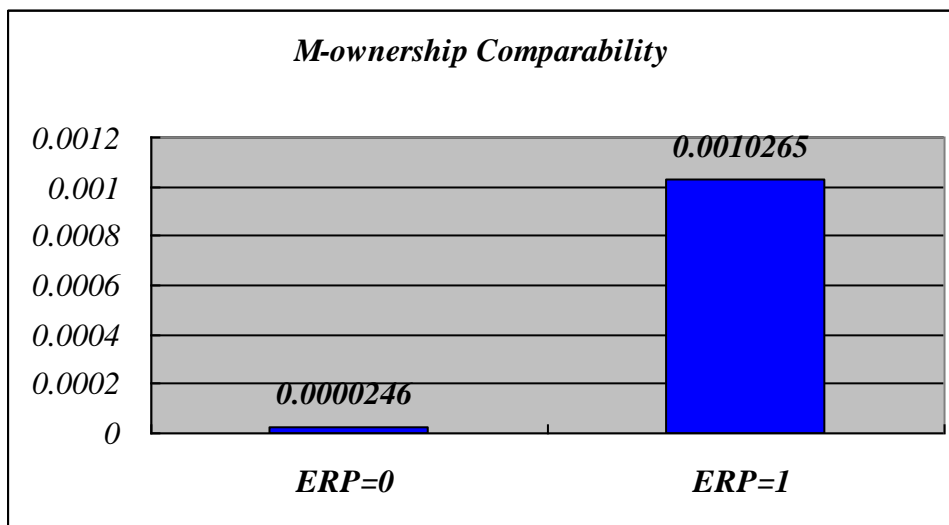
EMPRICAL RESULTS

The first stage of the first proposition is descriptive statistics analysis reported in Table 2. The mean values of managerial ownership are 0.00246% for ERP adoption group and 0.10265% for non-ERP adoption.

Variable	ERP	N	Means	Std.	Min.	Max
M-ownership	0	75	0.0000246	0.000096	0	0.0008
	1	75	0.0010265	0.005801	0.005801	0.0358

Table 2 Descriptive Statistics for Managerial ownership

As above data, the proposition of managerial ownership with ERP adoption is far lower than that with non-ERP adoption. The comparative result is showed in Graph 1 blow:



Graph 1 M-ownership Comparability between ERP adoption and non-ERP adoption

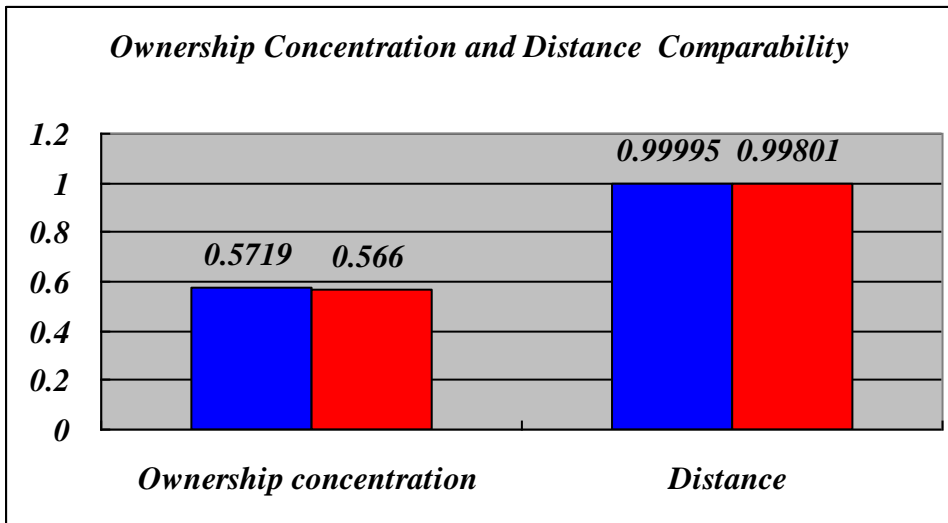
The sample was classified two independent groups by ERP adoption. One-tailed T test applied to group mean values of proportion of managerial ownership. The result shows the statistically significant at the 0.1 level (Pr=0.0685<0.1). The proportion of managerial ownership with ERP adoption is significant lower than that with non-ERP adoption.

The first stage of second proposition is descriptive statistics analysis reported in Table 3. The mean values of ownership concentration are 57.19% for ERP adoption group and 56.60% for non-ERP adoption. The mean values of distance are 0.9999557 for ERP adoption group and 0.9980135 for non-ERP adoption.

Variable	ERP	N	Means	Std.	Min.	Max
Concentration	0	75	0.5719	0.1556	0.1038	0.9370
	1	75	0.5660	0.1319	0.2752	0.9390
Distance	0	75	0.9999557	0.0001705	0.9985848	1.0000
	1	75	0.9980135	0.0112164	0.9307681	1.0000

Table 3 Descriptive Statistics for Shares Concentration and Distance

From above table results, the stock concentration value with ERP adoption is higher than that without ERP adoption. The distance between the proportion of stock concentration and the proportion of managerial ownership with ERP adoption is larger than that without ERP adoption. The comparative result is showed in Graph 2 below:



Graph 2 Stock Concentration and Distance Comparability between ERP adoption and non-ERP adoption

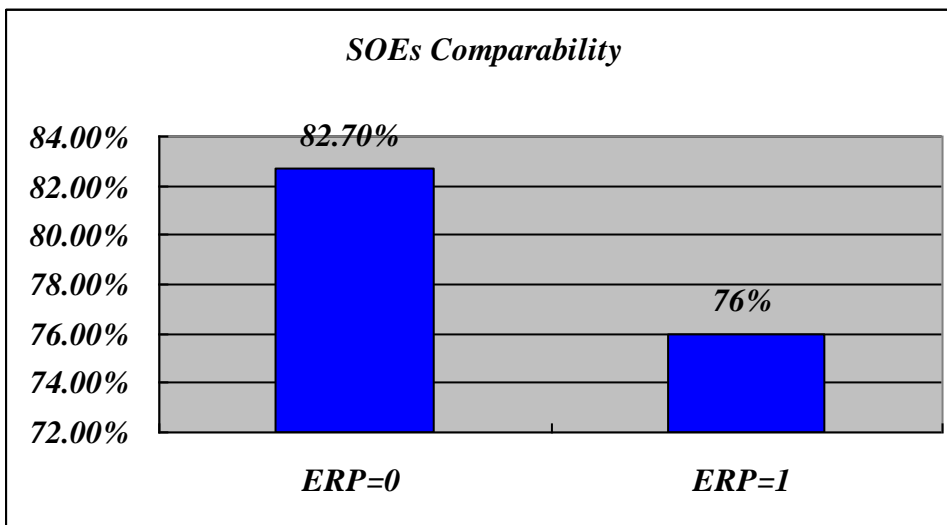
The sample was classified two independent groups by ERP adoption. One-tailed T test applied to group mean values of proportion of ownership concentration. The result shows no significant (Pr=0.400). For it is not significant, sensitive analysis does. One-tailed T test applied to group mean values of distance variable. The result shows significant at the 0.1 level (Pr=0.07 < 0.1). It means that the proportion of managerial ownership moderate ownership concentration effects on ERP adoption.

The first stage of third proposition is descriptive statistics analysis reported in Table 4. The percent of state-owned enterprises is 82.7% in ERP adoption group and 76% in non-ERP adoption group.

Variable	ERP	N	Number of SOEs	Number of non-SOEs.	Percentage of SOEs.	Percentage of non-SOEs
State-owned	0	75	62	13	82.7%	17.3%
	1	75	57	18	76%	24%

Table 4 Descriptive Statistics for State-owned Enterprises (SOEs)

As the data in the table 4, most of SOEs would like to make decision to adopt ERP. The descriptive result supported proposition three. The comparative result is showed in Graph 3 blow:



Graph 3 SOEs Comparability between ERP adoption and non-ERP adoption

The sample was classified two independent groups by ERP adoption. One-tailed T test applied to percentage of SOEs. The result shows the statistically significant at the 0.05 level ($Pr=0.03 < 0.05$). The percentage of SOEs with ERP adoption is significantly higher than that without ERP adoption.

DISCUSSIONS

The findings indicate that for the enterprises with server principal-agent conflict, ERP are adopted as strategy decision by shareholders or managers. The results offer considerable support for the importance of ability of ERP as a kind of information system providing timely and accurate information and solving the information asymmetry. The implied conclusion is that, in China Mainland with undeveloped information economics, the ability to solving the information asymmetry of ERP is much more important for enterprises than the ability to profitability for enterprises.

Contrary to western studied, the results supported the conclusion that ERP is applied to the enterprises management as a kind of information system solving the information transferring at first. Such differences have also been noted in the ERP implementation with corporate performance literature about China Mainland (Wang&Zhang, 2006). Wang&Zhang(2006) has argued that though ERP implementation may mandate changes in corporate performance in China Mainland, the results

shows many Chinese characters. In other words, performance change with ERP adoption may be reflected through different indicators with that presented in previous western literatures and the changes with ERP adoption leads to the direction that was not expected.

For ERP adoption group, the principal-agent problem reflected by proportion of managerial ownership and ownership concentration is better than that without ERP adoption. As corporate governance literature, the proportion of managerial ownership could resolve the principal-agent problem and reduce the agent costs. The proportion of managerial ownership with ERP adoption is much lower than that with ERP-non adoption. It implied that the enterprises with lower the proportion of managerial ownership would like to apply ERP to solving principal-agent problem for the reason that there are severe conflicts of principal-agent. As before references of the study, ownership concentration is very high in China Mainland. Ownership concentration motivates the shareholders to monitor the managers. The incentive to implementing ERP must be stronger for ERP provides accurate and timely information to resolving the information asymmetry. However, ownership concentration is not significant. The study investigates the ownership concentration. The findings indicate average of ownership concentration is near 56% and standard dev. is small. The study set a variable, *Distance*, to present the effect of ownership concentration on ERP adoption. The variable is calculated by $(\text{proportion of ownership concentration} - \text{proportion of managerial ownership}) / \text{proportion of ownership concentration}$. The result could reflect the ownership concentration effect on ERP adoption as the proportion of managerial ownership is constant. It implied that when the proportion of managerial ownership is constant is constant the enterprises with higher proportion of ownership concentration would like to adopt ERP to enforcing monitoring ability.

Significant differences were also apparent between the ERP adoption group and non-ERP adoption group in term of ownership type. The ERP adoption group consists of many SOEs . More specifically, the proportion of SOEs in ERP adoption group is significant higher than that in non-ERP adoption group. The result supports the previous studies that find SOEs exist severe information asymmetry and corporate governance problems. The result also explains the phenomenon that central SASAC and ministry of information industry requires SOEs to implement ERP in future years. It is the main objective to enforce monitor of managers and protect the state-owned wealthy through the decision of ERP adoption.

CONCLUSIONS

A review of the ERP adoption literature indicates little conclusions about the role ERP plays in solving the problems of corporate governance. Accounting research has often been based on the assumption that ERP improves the corporate performance. In the other, management science research has been based on the assumption that ERP provides the accurate and timely information to influence the organization design and management mechanism. This article was based on the assumption that ERP as a kind of information system providing accurate and timely information could resolving the principal-agent problems in the enterprise and reduce the agent cost in accounting research. The evidence presented in this article supports our assumption.

This study found the enterprises which have severe principal-agent problems and information asymmetry problems would like to make the ERP adoption decision. This finding suggests that ERP is not profitable strategy decision but improving monitor ability decision. The finding also has considerable support, given the constant of proportion of managerial ownership, the higher proportion of ownership concentration could motivate enterprises to preferring to adopting ERP. In the same, the finding has still support, given the constant of proportion of ownership concentration, the lower proportion of managerial

ownership motivates enterprises to preferring to adopting ERP. The specifically finding is that ownership type is relative to ERP adoption. In China Mainland SOEs prefer to adopting ERP for requirements of enforcing state monitor from the ministries and SASAC. We caution however, that this finding may be china-specific and year specific limited by samples. In China Mainland information system application is developing and management theory does not match the application. Then the objective of bias has appeared in the process of ERP application. Furthermore, the samples come from the capital market in 2003. Future design selecting more samples in several years would certainly strengthen the validity of the research results.

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