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BARRIERS TO THE SUCCESSFUL EXPLOITATION OF ERP SYSTEMS IN CHINESE STATE OWNED ENTERPRISES

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ABSTRACT

Adopting a systems perspective, the research presented in this paper aims at identifying, assessing and discussing potential cultural, organisational and system barriers to the successful exploitation of Enterprise Resource Planning (ERP) systems in the context of Chinese State Owned Enterprises (SOE). The study adopted a deductive research design by using a cross-sectional questionnaire survey. The questionnaire design was based on a theoretical ontology of barriers drawn from a systematic literature review. The questionnaire was sent to 118 selected Chinese SOEs, from which 42 valid and usable responses were received and analysed. The findings of this study identified that managers in Chinese SOEs often perceived system barriers as most critical to ERP exploitation, but they seemed to overlook the fact that organisational barriers are the mainly triggers of the complicated network of ERP barriers and thus are in reality more important than the system ones.

KEYWORDS

Information Systems; Enterprise Resource Planning (ERP) Systems; ERP Post-Implementation; Barriers; Systems Perspective; China; State-Owned Enterprises.

BIOGRAPHICAL NOTES

Dr. Guo Chao Peng, BSc, PhD, is a Lecturer in Information Systems at the Department of Information Studies, University of Sheffield. Dr. Peng has published regularly in the field and presented refereed papers at a number of international conferences (e.g. HICSS, UKAIS and EMCIS) and international journals (e.g. IJBSR, IMDS and JEIM) in information systems. He also constantly conduct peer review of submissions to a range of IS journals (e.g. IJPE, IMDS and JEIM) and conferences (e.g. HICSS, ECIS, PACIS and IBIMA).

Dr. Miguel Baptista Nunes, BSc, MSc, PhD, MBCS, FHEA, FIMIS, is a Senior Lecturer in Information Management and the Head of the Knowledge and Information Management Research Group at the Department of Information Studies, University of Sheffield. Dr Nunes has been involved in research in information systems for the last 15 years. He has published widely in the field (more than 150 academic articles) and participated in a number of EU and UK funded projects.

1. INTRODUCTION AND BACKGROUND OF STUDY

From 1949 to 1978, the economic system adopted by China had been the Soviet-style central planning economic system (Shirk, 1994:9). This type of central control allowed the Chinese government to own and control the majority of resources of the country (Shirk, 1994:9). However, this feature of planning economy determined that economic activities were controlled by the state and were not influenced by market

conditions, and thus resulting in a set of crucial economic problems (e.g. low production efficiency, laggard technologies, and unmotivated work force, etc) to China in the 1970s (Shirk, 1994:10; Perkins, 1997:34; Peng and Nunes, 2007). In order to establish a stronger and more competitive economic system, China has gradually reformed its economic system from the traditional planning economy to a more competitive market-oriented economy since 1978. After an effort of three decades, China has now become the world's fourth-largest economy behind the US, Japan and Germany (Reuters, 2006).

On the other hand, most domestic enterprises in the planning economy were owned and supervised by the state and are usually denominated as State-Owned Enterprises (SOEs). These SOEs operated as social-economic entities, rather than profit making units, and mainly aimed to fulfil production quotas assigned by the government and to provide lifelong employment to citizens (Sun et al, 2005). Consequently, these features resulted in very poor performance of SOEs, which were often loss-making companies in the planning economy era (Yusuf et al., 2006). In order to prevent SOEs from loss making and enable SOEs to compete in the new market economic environment, reforming SOEs has been an essential part of China's economic reform since 1980s. Since then, thousands of SOEs have been reformed and restructured through selling or leasing to the public or employees, declaring bankruptcy, or merging with other companies (Garnaut et al., 2005:3). Although the state is still the owner or largest shareholder, the reformed SOEs are now run by their internal management organs (i.e. the board of directors) rather than the state (Garnaut et al., 2005:46; Bai and Bennington, 2007), which resulting in substantial performance improvements.

Year	SOE as % of all industrial enterprises	Non-SOE as % of all industrial enterprises	SOE assets as % of total industrial Assets	Average asset size of SOEs (RMB mn)	Average asset size of non- SOEs (RMB mn)
1999	37	63	68	134	36
2000	34	66	67	155	39
2001	28	72	65	184	39
2002	24	76	62	210	40
2003	19	81	57	260	46
2004	15	85	53	317	50
2005	10	90	48	428	52
2006	8	92	46	541	56

Table 1: Current status of SOEs and non-SOEs in the industrial sector.

(Source: data from 1999 to 2004 are obtained from table 1.1, Garnaut et al., 2005:8; data in 2005 and 2006 are obtained from the China Statistics Yearbook in recent years).

As a result of the SOE reform, the number of SOEs has rapidly decreased in recent years. As shown in table 1, the number of SOEs has reduced sharply since 1999 and they accounted for only 8% of all industrial enterprises in 2006. In contrast, the number of non-SOEs (e.g. private companies, foreign-invested companies) has been continuously increasing. However, despite this reduction in numbers, SOEs still continue to absorb more than 46% of the total industrial assets. The average asset value held by SOEs has been dramatically increasing year by year. In 2006, the assets held by SOEs were in average valued at RMB 541 million, which was almost 10 times higher than the average asset value of non-SOEs (RMB 56 million). This statistics clearly shows that SOEs still play at the present moment a crucial role in sustaining the continuous development of China's national economy, in contrast with other types of companies (e.g. private companies and foreign companies) in the country. Therefore, SOEs were selected to study in this research.

In truth, the continuous national economic reform and entrance of foreign companies to the increasingly open Chinese business market, has significantly changed China's business *status quo*. Probably the most important change introduced is the very serious competition factor raised in the domestic market. Faced with this competitive environment and economic pressure, thousands of Chinese SOEs have implemented Enterprise Resource Planning (ERP) systems in order to improve operational efficiency and enhance core competencies. However, the adoption of ERP is not a straightforward task and can always result in significant impact to all business divisions in operational, managerial and strategic level of the company. In fact, the use of ERP often presents a business dilemma to user companies as Liu Chuanzhi, former chairman and president of Lenovo, stated in China:

“Not implementing ERP means inevitable failure, while implementation could possibly contribute to one's demise.” (SAP, 2005)

This clearly shows that implementation of ERP is often fraught with risks, difficulties and problems (Loh and Koh, 2004; Hsu et al., 2008; Singla, 2009). However, even if the system is successfully implemented, the 'go-live' point of the system is not the end of the ERP journey. Very often the system post-implementation stage is where the real challenges begin (Willis and Willis-Brown, 2002; Peng and Nunes, 2009a; Peng and Nunes, 2009b). In order to maximize the potential benefits that can be received from the installed system and ensure long-term success, user companies must pay substantial attention to ERP post-implementation and be ready for the long-term fight (Willis and Willis-Brown, 2002; Yu, 2005). Nevertheless, a wide range of barriers embedded in the local business context and the system itself can often prevent user companies from successfully using, maintaining and enhancing their ERP systems in the post-implementation stage. The existence of these barriers can turn initial ERP success into a failure and may lead to system and business collapses. Although many researchers recognize the importance of ERP post-implementation and even state it is the direction of the second wave ERP research (Yu, 2005), current research which focuses on ERP post-implementation is extremely limited. In truth, current research studies on ERPs focus mostly on implementation and project management aspects (e.g. Oliver et al, 2005; Motwani et al, 2005; Ehie and Madsen, 2005; Kim et al, 2005; Loh and Koh, 2004; Gupta et al, 2004; Huang et al, 2004; Yusuf et al, 2004). No study in ERP post-implementation barrier in general or in China in particular however was identified in the literature reviewed.

This paper presents the results of an empirical study that aims at addressing this significant research gap. An extensive systematic review, which focused on theoretical papers and case studies, was conducted at the early stage of the research. As a result of the systematic review, the researchers developed a theoretical barrier ontology which consists of 25 potential ERP barriers that may prevent Chinese SOEs from achieving continuous success in ERP exploitation. A questionnaire, which was constructed based on the theoretical barrier ontology, was used to seek Chinese managers' and IT experts' perceptions of the 25 pre-defined ERP barriers as well as exploring the correlations between these barriers. This paper is organised into four main sections. A brief introduction of ERP and the Chinese ERP market is presented first, followed by a description of the research methodology and design. Subsequently, the theoretical barrier ontology is presented and discussed. Finally, results derived from the questionnaire survey are presented and discussed with conclusions drawn.

2. ERP AND THE CHINESE ERP MARKET

The concept of ERP has evolved over almost 60 years "driven by the changing business requirements, new technologies and software vendors' development capabilities" (Møller, 2005). The origin of ERP can be tracked back to the 1950s when inventory control systems (ICSs) and bill of material processors (BOMPs) were developed and used in Western companies (Møller, 2005; Shehab et al, 2004; Kapp et al, 2001: 18). The early ICSs and BOMPs gradually turned into Material Requirements Planning (MRP) systems in the 1960s (Møller, 2005) and Manufacturing Resource Planning (MRP II) in the 1980s (Chen, 2001). The main focus of both MRP and MRP II is on the manufacturing side of the company (Koh et al, 2000; Chen, 2001). In the early 1990s, MRP II has further evolved into ERP, which does not just focus on the manufacturing side but also other divisions (e.g. sales, human resource and finance) of the firm.

Nowadays, researchers in the field draw slightly different definitions of ERP systems. For example, Kumar and Hillegersberg (2000) define ERP systems as "configurable information system packages that integrate information and information-based processes within and across functional areas in an organization". Gable (1998) defines ERP systems as comprehensive packages of software solutions that seek to integrate the complete range of business processes and functions in order to present a holistic view of the business from a single information and IT architecture. Shehab et al (2004) consider ERP systems as "business management system[s] that comprise integrated sets of comprehensive software, which can be used, when successfully implemented, to manage and integrate all the business functions within an organization".

The history of ERP in China started in the 1980s, when MRP, the former generation of ERP, was introduced in the country. Accompanied with the emergence of a number of prominent foreign (e.g. SAP, Oracle) and Chinese (e.g. UFIDA, Kingdee) vendors, ERP has become increasingly prevalent in China since the late 1990s. Consequently, the ERP market has achieved rapid development in recent years. Data provided by a prominent Chinese consultancy firm (CCID Consulting), quoted by Xue et al (2005), shows that the ERP market size in Mainland China was around US\$70 million in 2000 and grew to US\$289.96

million in 2004. CCID Consulting (cited by Zhang et al, 2005) reports that China's ERP sales will grow at an estimated rate of 23.5% and reach US\$652.8 million in 2008.

Despite this apparent success in ERP adoption, a set of potential barriers embedded in China's context (e.g. cultural, organisational and even political context, etc) and the system itself may prevent Chinese SOEs from achieving long-term success in the system post-implementation stage.

3. RESEARCH METHODOLOGY

3.1 Research aims and objectives

The main aim of the study reported in this paper was to identify, assess and explore potential barriers that Chinese SOEs may experience during ERP exploitation. Specifically, by adopting a systems perspective, the research aims at exploring these barriers from diverse cultural, organisational and system aspects. It also attempts to identify and investigate the causes and consequences of the identified ERP barriers by exploring potential correlations between them.

This study attempts to contribute to a research gap that is becoming increasingly important in the field, namely ERP post-implementation within China's context. It is expected to be of particular interest to ERP researchers, practitioners and user companies, and even ERP vendors and system consultants.

3.2 Research Design

It was considered that undertaking a national study of the whole of China would not be an ideal choice, because the current economic situation and context in China is complicated and fluid. Specifically, there are important changes occurring in coastal regions, whereas other parts of the country are still very traditionally led by the central government. There are also significant variances in uptake of technology and IS and specifically of ERP in diverse industry sectors. Moreover, due to geographical and political reasons, it is extremely difficult to identify a valid sample to represent all companies in China (Manion, 1994). Therefore a nationwide study of this type in China is not only unrealistic and potentially unfeasible, but may result in findings that are neither significant nor meaningful (Peng and Nunes, 2007).

Faced with the necessity of focusing the research and the need of identifying a coherent context to carry out the study, the researchers adopted a Political, Economic, Social and Technological (PEST) analysis and a set of Strength, Weakness, Opportunity and Threat (SWOT) analyses as a combination to narrow the scope of the study, as well as to identify an appropriate industry sector and a region in China to base the study on. This rigorous approach was illustrated and discussed extensively by Peng and Nunes (2007). In brief, based on the PEST analysis, the researcher identified Guangdong (a southern province in China) as an ideal context for the study of ERP post-implementation. Guangdong is one of the pioneer regions of China's economic reform and one of the most important and fast-growing economic regions in the country. Consequently, the region has achieved very high levels of IS adoption and informatization development. Guangdong thus presents itself as an ideal context where to study a phenomenon such as post-implementation of ERP. Therefore, Guangdong was selected as the region for carrying out this research. Subsequently, a set of SWOT analyses was conducted after the PEST analysis to analyse the strengths, weaknesses, opportunities and threats of SOEs operating in various key industrial sectors in Guangdong. As a result of the comparative examination of these SWOT analyses, the electronic and telecommunication manufacturing sector was selected as the most ideal sector to conduct this study. As a result of the PEST and SWOT analyses, the researchers identified a reasonable and feasible set of Chinese firms for carrying out the research, namely SOEs in the *Electronic and Telecommunication Manufacturing Sector* in the *Guangdong* province of China.

After a feasible set of companies was selected, the next step of the study was to establish explicit IS lens, in order to frame the study and generate meaningful and significant findings. As a consequence, the researchers carried out a desktop study based on a critical literature review. The process of this extensive literature review did not return any specific studies on ERP post-implementation barriers. Nevertheless, the researchers identified and retrieved, through the critical literature review, a large amount of IS and general business research studies, case studies and theoretical papers in both English and Chinese. By analysing, comparing and synthesising these articles and materials, the researchers established 25 potential ERP barriers

that Chinese companies might encounter in ERP exploitation. A barrier ontology was subsequently developed to highlight these 25 ERP barriers, as presented later in this paper.

In order to examine and explore the barrier items identified from the critical literature review in the context of selected SOEs, a deductive research design based on a cross-sectional questionnaire survey was adopted. The questionnaire was developed based on the established barrier ontology. From this ontology it became apparent that of the 25 predefined barriers, some were related with core business aspects, while the remainder focused on technical issues. This clearly indicated that two different questionnaires needed to be designed to obtain perspectives of both business managers and ICT experts (see *appendix* for further details).

In addition, respondents were asked to which extent they agree or disagree with the 25 listed barrier statements. Each item was scored using a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). All barrier items were thus scaled, so that the greater the score, the greater the extent that a barrier exists in the company.

Furthermore, both questionnaire scripts were originally developed in English and then translated into Chinese. Substantial attention had been paid during the translation process in order to ensure that both the English and Chinese versions of the questionnaire were conceptually equivalent, and thereby ensure high internal validity. In order to further improve its validity, the Chinese version of questionnaire was pilot tested with a group of Chinese postgraduate students and researchers in the authors' department as well as Chinese managers working in one Chinese SOE. A number of corrections to the questionnaires were made according to the feedback received from the pilot test.

3.3 The sample

According to statistical data provided by the Guangdong Statistical Bureau (GSB), there were 118 SOEs operating in the Electronic and Telecommunication Manufacturing Sector in Guangdong at the time of conducting this study. A complete contact list of these companies was retrieved from the GSB. The questionnaires were posted to the 118 SOEs with a cover letter, which explained the purpose of the study, provided assurances about confidentiality, stressed importance of the research and encouraged recipients to reply. In order to increase the response rate, a web-based version of questionnaire was also developed. The URL of the web-based questionnaire was embedded in the cover letter. Respondents could thus either complete the questionnaire and return it by using the pre-paid envelope, or fill in the web-based version and submit it online. One month after the original questionnaire, a reminder was sent out. Personal relationships and contacts were used wherever possible in the study in order to gain access to more companies, secure response and increase reliability and quality of the answers provided.

The questionnaires were sent to the operation managers and the IT managers of the 118 SOEs, from which 2*42 valid and usable responses were received and analysed. This survey thus achieved a response rate of 35.6%. As shown in figure 1, the vast majority of respondents of questionnaire A held managerial positions in the company, i.e. operation manager, general manager or CEO, manager in the general management team and IT manager. On the other side, respondents of questionnaire B held IT or managerial positions in the firm. Respondents of this survey thus prove to be suitable stakeholders to participate in the research.

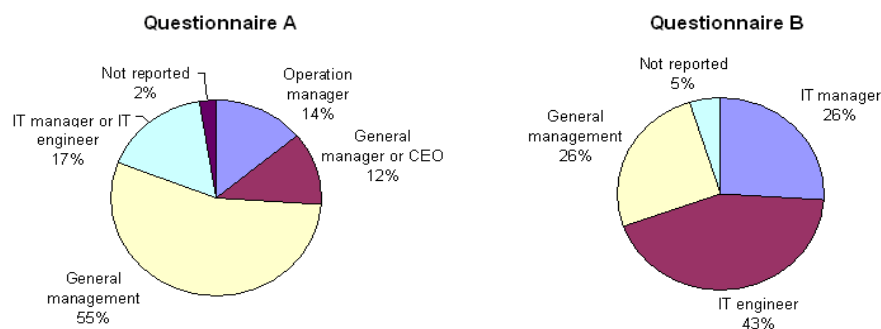


Figure 1: Positions of respondents

Furthermore ERP system seems to be of interest and importance to the vast majority of target SOEs, because 37 out of 42 respondent SOEs have adopted ERP. 3 of the 5 respondent SOEs, that had not currently adopted ERP, stated they were scheduling to implement ERP in the future. Among the 37 SOEs that have

ERP, 6 of them are using foreign ERP systems, 27 of them have adopted domestic ERP packages, and 4 of them combined the use of ERP components provided by both foreign and domestic vendors. Moreover, 73.8% of respondent SOEs have been using ERP for 2 to 6 years. These results further prove that, a research on ERP exploitation risk in Chinese SOEs at this present moment is a timely and meaningful study.

4. BARRIERS ASSOCIATED WITH ERP EXPLOITATION IN CHINA

The concept of barrier is defined differently in the literature as shown in the two examples below:

“In relation to accidents, a barrier is an obstacle, an obstruction, or a hindrance that may...prevent an action from being carried out or an event from taking place ...” (Hollnagel, 2000).

“[From the business perspective,] barrier is an obstacle within the business context that prevents business objectives from being realized” (Polikoff et al., 2005).

These two definitions point out that a barrier is an obstacle that prevents an action or event from being carried out successfully. Additionally, it should be noted that a barrier, unlike a risk, has no uncertainty associated to it. That is, a barrier is a factor that is inherent to a given context and thus has 100% probability of occurrence. Due to this characteristic, a barrier is fundamentally different from a risk. These two terms should thus not be used interchangeably. For the purpose of this research, a barrier to ERP exploitation is defined as follows:

“Any obstacle or factor that is inherent to the Chinese context or the ERP system itself; and can prevent companies from efficiently using, maintaining and improving the implemented system.”

As described above, a substantial component of the research design was a critical literature review aiming at identifying potential ERP exploitation barriers that may exist in Chinese firms. Due to the size and complexity of an ERP system, identification of barrier in ERP post-implementation could be a very complicated task. Nevertheless, it emerged from the PEST analysis conducted in this study that due to cultural differences, Chinese companies may often face diverse difficulties when using ERP systems, which are originally developed based on western culture and management philosophy. Therefore, when identifying barriers to ERP post-implementation in Chinese companies, the researchers firstly focused on potential cultural barriers that are associated with the Chinese culture. On the other hand, as pointed out by Polikoff et al. (2005), barriers to organisational activities may often exist within the organisational context. As a result, the researchers secondly looked at organisational barriers that are inherent to the internal business context of Chinese firms. Finally, it was considered that, due to technical limitations and pitfalls related to the ERP system itself, a set of system barriers may also exist. Consequently, the researchers focused on three main areas for identification of ERP exploitation barriers, namely cultural barriers, organisational barriers, and system barriers.

As discussed above, through the process of this critical literature review, the researchers identified and established a total of 25 ERP post-implementation barriers, namely 7 Cultural Barriers, 9 Organisational Barriers, and 9 System Barriers. These 25 barriers are presented and discussed briefly below.

4.1 Cultural barriers

Power centralisation and centralised decision-making due to high power distance

High power distance is one of the features embedded in the traditional Chinese culture (Hofstede, 1997). This cultural characteristic results in Chinese leaders holding autocratic and close to absolute power in the company. Organisation characterised by this type of manager, are inclined to make centralised decisions (Martinsons and Hempel, 1998). Specifically, Martinsons and Westwood (1997) point out that, Chinese leaders may symbolically consult with their subordinates, but will rarely let them make a meaningful contribution to the decision-making process. This issue proves to have an impact on ERP adoption. For example, Reimers (2002) states that Chinese leaders may make centralised decisions on important IS issues

without collecting and considering alternative ideas from a wider group of people. This issue was expected as an ERP exploitation barrier that could lead to inappropriate decisions regarding system functionality, analytical capabilities, use of these capabilities, general maintenance and system enhancement in Chinese firms.

High context and implicit form of communication

Martinsons and Westwood (1997) point out that Westerners are inclined to use low context forms of communications, which enable them to convey directly the meaning of a message into explicit and elaborate codes (e.g. words and numbers, etc). In contrast, due to cultural differences, Chinese people tend to use high context and implicit forms of communications (Hall, 1976; Martinsons and Martinsons, 1996). Specifically, Martinsons and Westwood (1997) argue that “Chinese messages are comparatively terse in words but rich in meaning...tone, dynamics and any hesitation in response, together with facial expressions and body language must be perceived and interpreted in order to fully understand the words being communicated”. As a consequence, Chinese messages may be difficult to be conveyed into codes and to be stored in information systems (IS). This factor was thus expected as an ERP post-implementation barrier, which can impact the effective use of ERP within Chinese companies.

Unwilling to disclose problems, faults and failures in order to ‘save face’

Chinese people consider *mianzi* (literally ‘face’ or personal image) as an important measure of a person’s place and social worth in the society (Graham and Lam, 2004:48). They are thus traditionally less inclined to disclose problems and failures, which are within their remit, to the others; and tend to be reticent on the mistakes and faults that may be associated with them, in order to preserve *mianzi* (Shu, 2001). This traditional attitude of Chinese staff was expected to become an ERP barrier. This could result in delays in reporting potential IS usage and maintenance problems in Chinese firms and ultimately end in disaster.

Chinese employees do not use their critical thinking skills

Martinsons and Hempel (1998) argue that, Chinese staff traditionally tend to receive and follow explicit instructions and directives from their superiors, rather than to critically question the suitability of decisions made by them. Pei (2005) reinforces that Chinese employees may be inclined to accept works as assignments from their managers without knowing or thinking the reasons of doing so. These authors conclude by stating that Chinese employees may often not have the habit of making use of critical thinking. Lack of critical thinking skills can be a barrier that may prevent Chinese managers and in-house IT experts from efficiently reviewing and enhancing the ERP system.

Less inclined to use systematic procedures and explicit information to tailor forecasts and plans

Low uncertainty avoidance is a feature embedded in the Chinese culture (Hofstede, 1997). As a result of this cultural feature, Chinese managers are more tolerant of uncertainty and unclear information than their Western counterparts. Therefore, they are traditionally less inclined to use systematic procedures and explicit information to tailor plans and forecasts to predict an uncertain future (Martinsons and Westwood, 1997; Martinsons and Hempel, 1998; Xue et al., 2005). This traditional behaviour of Chinese managers was expected as an ERP exploitation barrier that might prevent Chinese managers from fully utilising the data generated by the ERP system.

Trust personal common sense/intuition rather than system data to make decisions

Chinese managers are traditionally inclined to make decisions based on subjective experience, common sense and intuition (Martinsons and Westwood, 1997; Zhang et al., 2005). As such, Reimers (2002) points out that, Chinese managers may not trust the data provided and the suggestions made by ERP systems, and may even modify the (e.g. production and purchasing) quantities recommended by the system based on their own experiences. Lack of trust in system data was anticipated as an ERP post-implementation barrier, which can reduce utilisation and return of the ERP system and may even lead to serious human decision mistakes.

Building inter-organisational relationships based on personal guanxi

It is widely acknowledged that, formal business contracts and legal agreements may play a less important role when doing business in China. Instead, personal *guanxi* or relationship networks present to be a more critical factor to ensure success in doing business there (Fan, 2002). Specifically, personal *guanxi* networks are frequently used by Chinese managers to find business solutions and acquire additional resources for their companies (Fan, 2002; Lowe, 2003:12). Chinese leaders also often utilise personal connections as the fundamental to establish and maintain inter-organisational relationships with business partners (Fan, 2002). As a consequence, the quality of communication and collaboration between a Chinese firm and its business partners may often depend on personal *guanxi* of corresponding managers working on both sites. It is however apparent that a business relationship, which is established based on personal connection and oral agreements rather than legitimate business contracts, can always be informal, insecure and unstable. In the ERP exploitation stage, user companies should strive to set up formal and stable business relationships with their system vendors or consultants. If such important inter-organisational relationship is built up based on personal *guanxi* of managers from both sides, then a number of problems related with ERP may emerge as important barriers for its exploitation. Firstly, changes in top management may either sever or substantially weaken the *guanxi* relationship. This may put ERP maintenance contracts at risk. That is, unnecessary communication hazards and collaboration difficulties in maintaining the implemented ERP system in the long run. This type of problem may also sever relationships with suppliers and therefore change variables that were entered in analytical forecasting by the ERP. In this case, the ERP may be held responsible while in fact forecasting was exact under previous conditions. Secondly, negotiations made through *guanxi* networks are often driven by the need to meet the interests of the all parts involved. Therefore, these negotiations may go against the forecasts and calculations made by the ERP. This may put top managers in very vulnerable positions, if these contradictions are audited or inspected.

4.2 Organisational barriers

Inefficient collaboration and communication between functional departments

Lack of collaboration and communication between functional departments has been identified as a crucial barrier to successful introduction of ISs in western companies (Beatty and Gordon, 1988; Fletcher and Wright, 1995). In Chinese firms, strong competition may exist between diverse functional departments, thus discouraging staff in different divisions to collaborate and communicate with each other (Bond, 1991; Shu, 2001). In addition, Chinese people may consider information as a major personal asset, and thus may be less willing to make important information accessible across the whole company (Martinsons and Hempel, 1998; Martinsons and Westwood, 1997). Inefficient collaboration and communication between departments was thus expected as a potential ERP post-implementation barrier that may prevent efficient use and maintenance of ERP in Chinese firms.

Fear of loss of power and loss of job

Staff may consider information as a key indicator of power within the company (Damodaran and Olphert, 2000). This may be particularly true in Chinese firms, as important organisational information is traditionally kept by company leaders and the amount of information that employees can receive reflects the degree to which they are trusted by their superiors (Martinsons and Westwood, 1997). Chinese staff may thus worry that the use of ERP to facilitate information sharing across the company can result in a loss of power (Martinsons and Westwood, 1997). On the other hand, ERP system can automate dozens of traditional manual processes and thus may often result in job substitution (Shehab et al., 2004). Staff thus may also fear that labour substitution resulted by the use of ERP may make them lose jobs (Martinsons and Westwood, 1997). This is a crucial issue at implementation stages, but one that must also be considered at post-implementation. In fact, the more organisations gain awareness of ERP capabilities, the more obvious redundancies become. Thus, creating increasing psychological anxieties in employees that may result in resistance to use ERP systems.

Short-term behaviour and lack of top management support

'Short-term behaviour' refers to the phenomenon that companies act to achieve short-term benefits, while neglecting the associated impacts and problems that may arise in the long-term (Liu, 2004). Since China is currently at its rapid development stage, political, economic, social and market environments of the country have changed quickly and constantly. In order to survive and compete in such fluid national environment, Chinese managers have to react fast to emergent market needs and changes. They may also often need to achieve short-term results and immediate benefits desperately, in order to secure the company's market position under the current economic pressure and the very hard business environments (Zhang, 2004). Short-term behaviour has thus been frequently reported (e.g. Zhang, 2004) as a prevalent problem in Chinese firms. From the IS perspective, it can be argued that due to short-term behaviour, Chinese senior managers may fail to provide sufficient long-term support to ERP exploitation. Short term thinking leads these managers to perceive the end of the implementation of ERPs, as the end of their involvement with the system. This may result in overlooking risks and problems that the firm may encounter in ERP exploitation. Moreover, lack of continued support by top management may discourage the actual use of the system and prevent users and IT experts to proactively contribute to continuous system planning, review and improvement.

Lack of explicit IS development plan and insufficient ERP post-implementation funds

A deficient IS development plan, which does not reflect the reality of the organisation, is identified as a barrier to the use of IT in general (Wright and Donaldson, 2002). In China, SOEs are often accused of having short-term thinking and thus spending too little efforts on devising clear and detailed development plans and strategies (Zhang, 2004; Xie, 2005). Jiang (2003) reinforces that lack of explicit development plan and strategy has been one of the most crucial factors obstructing continuous development of SOEs. It was thus expected that Chinese SOEs may often lack an explicit IS/ERP plan to guide implementation in a first instance and further ERP enhancement in the long-term. In addition, lack of an efficient IS plan may often lead to insufficient ERP maintenance funding. Without sufficient funds and resources, user companies may not be able to carry out system maintenance, upgrade and improvement properly in the ERP post-implementation stage.

Lack of in-house IT specialists

Success in ERP implementation and post-implementation relies on the collaboration and cooperation of various types of in-house experts, e.g. project leaders, IT experts, and specialists in different functional divisions. Lack of in-house specialists, especially IT experts, however is reported as a problem in western companies (Namjæ and Kiho, 2003; Wright and Donaldson, 2002). This issue may also exist in Chinese companies, because of insufficient investment in human resources and high employee turnover (Zhang, 2004; Jiang, 2003). Lack of in-house specialists was thus expected as an ERP exploitation barrier that may prevent Chinese firms from effectively maintaining, monitoring and improving the system in the long-term.

Low-quality and ill-trained staff and low involvement of employees

Low-skilled and low-educated staff may be less inclined to use advanced IS (e.g. ERP) and can be less willing to change ways in which they do their job. This group of users should be carefully guided and trained during and after the cycle of ERP implementation. Otherwise, they may either be reluctant to use ERP or do not have sufficient skill to use the system properly at work. Low-skilled and ill-trained staff represent a crucial barrier to the use of ERP systems (Wright and Donaldson, 2002; Sherer and Alter, 2004). Moreover, when users receive insufficient system training, they may have low involvement in using and improving the implemented ERP system (Wright and Donaldson, 2002).

4.3 System barriers

Insufficient support and services from system vendors

Insufficient support and services from system vendors is a common barrier to the use of IS in western companies (Namjæ and Kiho, 2003; Wright and Donaldson, 2002). In China, both domestic ERP vendors

(e.g. UFIDA and Kingdee, etc) and foreign ERP vendors (e.g. SAP and Oracle, etc) are crucial players in the Chinese ERP market. However, researchers (e.g. Liang et al, 2004) argue that, foreign ERP vendors are less familiar with the unique business context in Chinese firms, while consultant teams of domestic ERP vendors typically do not possess as much expertise and experience as their foreign rivals. Due to this reason, Chinese firms may not be able to receive sufficient support and after-sale services from their ERP vendors. Insufficient support and service from system vendor was thus expected as an ERP exploitation barrier to Chinese firms, leading to difficulties for in-house staff to maintain and revise the system.

Inexperienced and low-qualified system consultants

Management consultants recruited from external consulting firms can often help user companies to fill their internal technical and knowledge gaps. This type of professional often plays a crucial role to enable succeed in introducing and maintaining IS (Bloomfield and Danieli, 1995; Tsai et al., 2007). Nonetheless, it may currently be very difficult for companies to recruit highly qualified management consultants in China. Specifically, foreign consultants who used to locate in western countries may have less experience to deal with the unique issues inherent to the Chinese context, while domestic consultants that are fostered by either foreign or Chinese consulting firms in recent years still lack sufficient practical expertises and experience to provide critical advices to client companies (Ma et al., 2003). Inexperienced or low-qualified system consultants can result in the same maintenance difficulty discussed above.

System inflexibility and incompatibility

ERP systems are complicated IS packages that are traditionally difficult to customise and modify. System inflexibility is often identified as a problem in successful introduction of ERP in companies (Namjae and Kiho, 2003). In addition, due to its inherent pitfalls of low flexibility, ERP systems also often have low compatibility with legacy IS applications in the firm (Namjae and Kiho, 2003). These inherent pitfalls of ERPs were expected as barriers that can prevent user companies from enhancing their system and integrating it with other IS applications.

High cost for ERP add-ons and further enhancement

In order to enable the implemented system to achieve better performance, it is often necessary for user companies to purchase add-ons or further components to enhance functionality of their ERP systems during post-implementation. Nonetheless, because ERP systems are potentially complicated and inflexible, the cost for ERP add-ons can be very high and thus may be unaffordable to many user companies. High enhancement cost was thus expected as a barrier that may prevent companies from continuously improving the implemented system. As a consequence, the ERP system may gradually become less efficient to support user needs, which may impact business operational efficiency and ERP acceptance

Deficient system design, slow system response time and poor data quality

These three system issues are common barriers to IS adoption. Firstly, the world's leading ERP vendors (e.g. Sage, 2005) stress that the design of an IS should be rational and flexible enough in order to enable it to cope with any situation that may come up in its daily use. It is however patently obvious that not all IS packages in the industry can achieve this requirement. Secondly, although system users always want the IS to have fast response time, this may not always the case due to inappropriate ICT infrastructures, overcomplicated system relationships or inadequate database designs (Damodaran and Olphert, 2000). Thirdly, it is common for user companies to encounter a wide range of data quality issues that are concerned with the accuracy, relevancy, consistency, currency, completeness or presentation of the data stored in their ISs (Redman, 1998). The existence of these system barriers may lead to reduction of system acceptance and satisfaction.

4.4 Ontology of ERP exploitation barriers

The barrier ontology shown in Figure 2 highlights the 25 ERP exploitation barriers presented and discussed above. This barrier ontology consists of two hierarchical levels ranging from general barrier categories (e.g. organizational barrier) to specific barrier items (e.g. lack of top management support). As discussed above,

the suitability of this barrier ontology in the context of selected Chinese SOEs was examined through a questionnaire survey. The findings derived from the survey are presented and discussed in the next section.

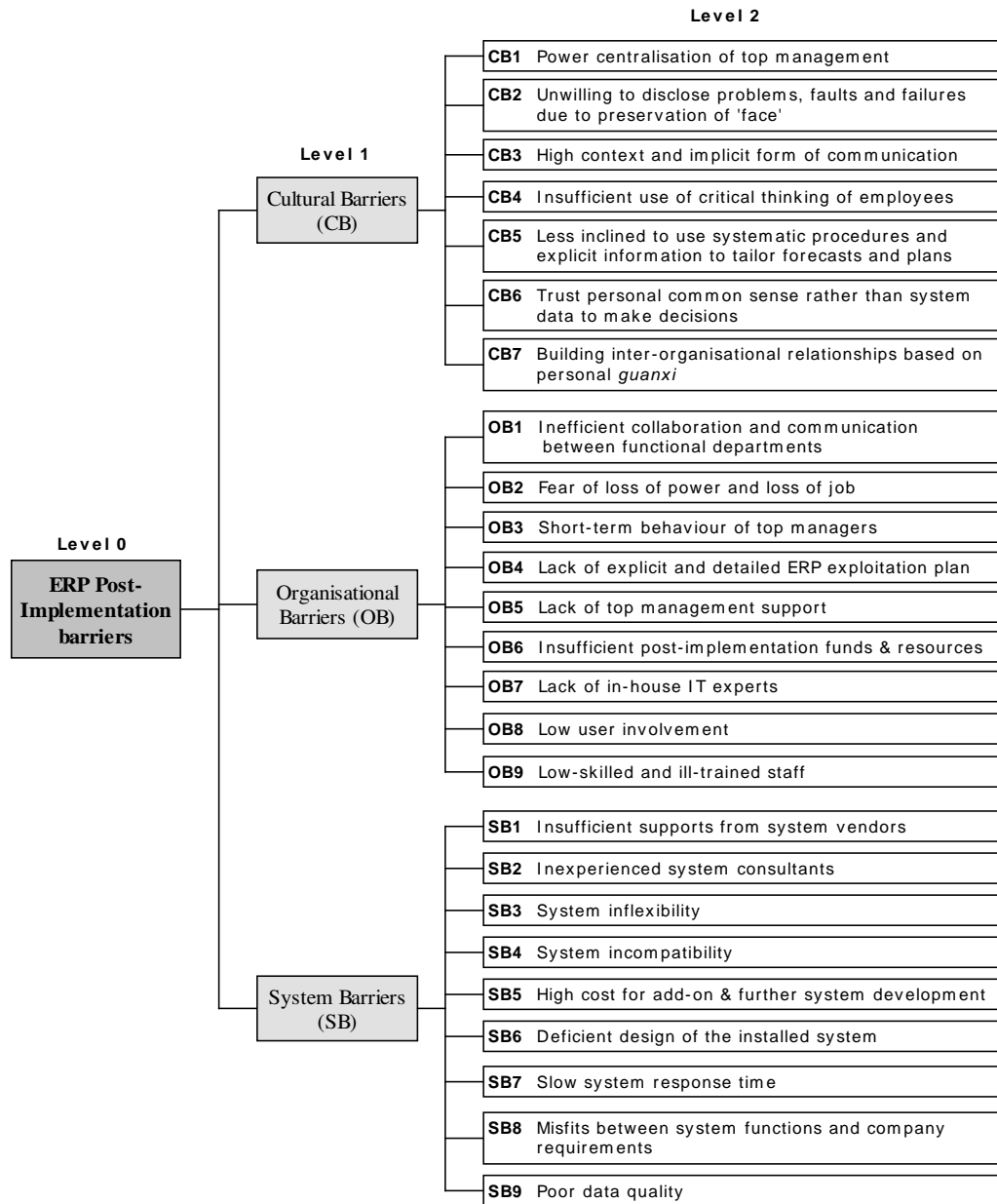


Figure 2: Theoretical ontology of the 25 predefined ERP barriers

5. DATA ANALYSIS AND FINDINGS

5.1 The identified ERP exploitation barriers

The means of the 25 barrier variables examined in the questionnaire were calculated by using SPSS to provide a summary of responses regarding the 25 barrier statements (as shown in Table 2). The standard deviation was also shown in the table to reflect the degree to which the values of each barrier variable differed from the mean.

Category	Barrier	N=42	Mean	S.D.
Cultural Barrier (CB)	CB1	Power centralisation of top management	2.55	1.31
	CB2	Unwilling to disclose problems, faults and failures in order to 'save face'	1.86	.683
	CB3	High context and implicit form of communication	1.88	.832
	CB4	Chinese employees do not use their critical thinking skills	1.93	1.045
	CB5	Less inclined to use explicit procedures & information to tailor forecasts/plans	2.14	.751
	CB6	Trust personal common sense rather than system data to make decisions	2.29	.995
	CB7	Building inter-organisational relationships based on personal <i>guanxi</i>	1.64	.932
Organisational Barrier (OB)	OB1	Inefficient collaboration and communication between functional departments	2.00	1.104
	OB2	Fear of loss of power and loss of job	1.79	.813
	OB3	Short-term behaviour of top management	1.81	1.131
	OB4	Lack of explicit and detailed ERP exploitation plan	2.29	1.019
	OB5	Lack of top management support	1.67	.902
	OB6	Insufficient ERP post-implementation funds and resources	2.31	1
	OB7	Lack of in-house IT specialists	2.50	1.174
	OB8	Low involvement of employees	2.24	.932
	OB9	Low-skilled and ill-trained staff	2.07	.921
System Barrier (SB)	SB1	Insufficient supports and services from system vendors	2.95	1.081
	SB2	Inexperienced and low-qualified system consultants	2.69	.950
	SB3	System inflexibility	2.81	.969
	SB4	System incompatibility	2.86	.977
	SB5	High cost for add-ons and further system development	2.50	1.018
	SB6	Deficient design of the system	2.76	1.008
	SB7	Slow system response time	2.81	.862
	SB8	Misfits between system functions and company requirements	2.36	.759
	SB9	Poor data quality	2.31	.811

Table 2: Summary of responses to the barrier items (scale from 1 = strongly disagree to 5 = strongly agree)

The researchers then prioritised the 25 barrier variables based on their means, and then identified a set of 9 ERP exploitation barriers that were identified by the participants as particularly important for SOE firms (Table 3). A significant amount (24%-38%) of respondents perceived these 9 barriers as critical issues to ERP exploitation in their firms.

Rank	Barrier	N = 42	Mean	S.D.
1	SB1	Insufficient supports and services from system vendors	2.95	1.081
2	SB4	System incompatibility	2.86	.977
3	SB7	Slow system response time	2.81	.862
3	SB3	System inflexibility	2.81	.969
5	SB6	Deficient design of the system	2.76	1.008
6	SB2	Inexperienced and low-qualified system consultants	2.69	.950
7	CB1	Power centralisation of top management	2.55	1.31
8	OB7	Lack of in-house IT specialists	2.50	1.174
8	SB5	High cost for add-ons and further system development	2.50	1.018

Table 3: The 9 critical ERP exploitation barriers

It should be noted that the most critical barriers were found around one category, namely the system category. Therefore, it was apparent from the analysis of the questionnaire that the respondents of the survey identified organisational and cultural barriers as less important in their companies. A possible explanation to these findings is that, as a result of China's economic reform and corresponding very recent changes in SOE structures, management and culture, the organisational mechanism of modern SOEs has been gradually but surely transformed from the traditional Chinese centralised style to a more modern and flexible Western management style (Garnaut, et al., 2005). As a consequence, reformed SOEs, which had to adopt a modern management system, will have a more appropriate environment for ERP adoption than traditional Chinese firms (Reimers, 2002; Zhang et al., 2005). Furthermore, statistical evidence was found in this study's data, which proves that the use of ERP could actually help SOEs to improve a set of inherent organisational and cultural issues (e.g. power centralisation). As a result of these organisational improvements, many cultural and organisational barriers, that were expected to exist in traditional Chinese firms, might have been substantially resolved in SOEs.

Nevertheless, Fletcher and Wright (1995) point out that in IS studies, despite other types of barriers (e.g. organisational barriers) are in fact more important than systems barriers, respondents may not often perceive this to be the case. These types of barriers may often be understated by respondents, who may not fully recognise the existence and importance of these barriers (Fletcher and Wright, 1995). It is therefore possible that the cultural and organisational barriers studied in the survey may be, to a certain degree, underestimated by respondents due to a lack of understanding and awareness. In fact, the findings presented below confirm that organisational barriers are in reality as important as system barriers.

5.2 Correlations between the identified ERP barriers

The study also aimed at investigating if the existence of a particular ERP barrier in SOEs was related to the existence of other barriers. In order to explore potential correlations between the identified ERP barriers, a bivariate analysis was conducted. As illustrated earlier, Likert scales were used in the survey to find out to what extent each barrier existed in a respondent's company, data variables generated were therefore ordinal data sets. According to Field (2005:130-131), Spearman's rho (r_s) is the most common and appropriate approach to use to measure bivariate correlations between ordinal variables. As a consequence, Spearman's rho was adopted for this study. In addition, bivariate correlations identified must be further tested for statistical significance (i.e. P value) by using either one-tailed or two-tailed test (Bryman and Cramer, 2005:225). As pointed by Field (2005:29), one-tailed test should be used if the correlation being examined is directional (e.g. the higher the education level, the higher the income level), while two-tailed test should be used if the correlation being examined is non-directional (e.g. higher education level will affect income level, but we do not know whether the income level will increase or decrease). Because the correlations of ERP barriers exploring in this study were directional (e.g. when barrier A is more likely to exist in the company, barrier B is more likely to exist), one-tailed test was selected to use.

By following this approach, the researchers identified 17 significant relationships between the 25 identified barriers. Figure 3 presents a correlation map to summarise and represent these correlations. A full description for each of these correlations is presented in table 4. It is important to note that the direction of the identified correlations was actually pre-defined before conducting the analysis, based on the findings of the critical literature review. However, in order to avoid duplicated discussion and contents, the details of these correlations are only summarised in table 4 below but are not given in above sections.

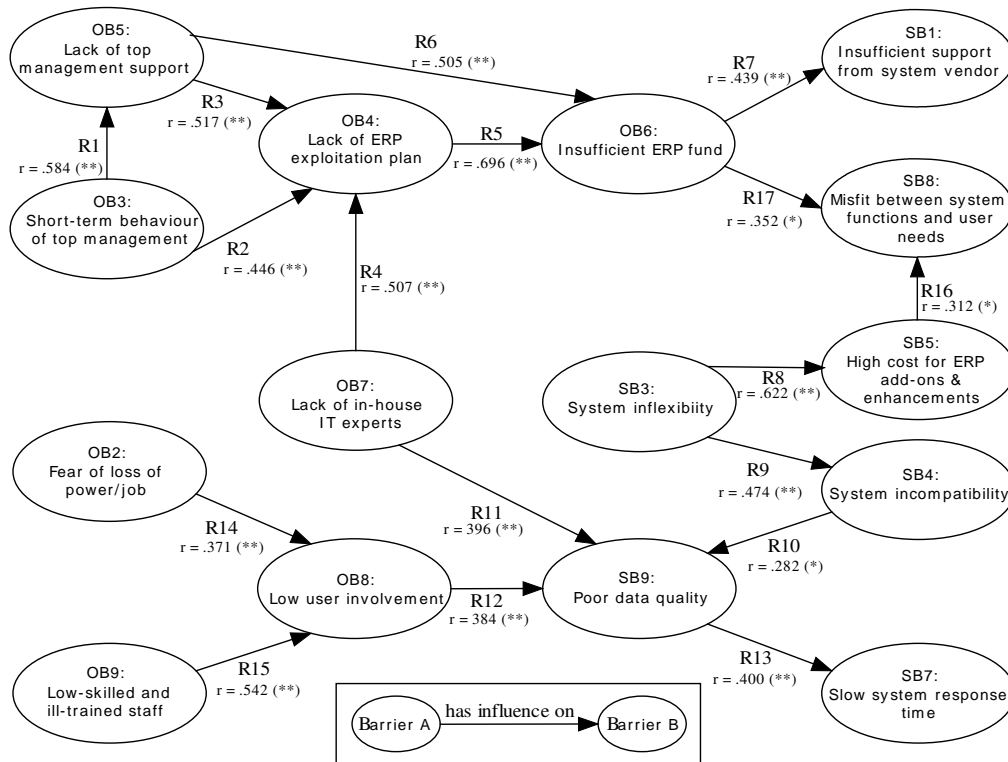


Figure 3: Correlations between the identified ERP barriers

	Correlation	Coefficient
R1	When top managers are more inclined to achieve short-term results, it is more likely for them to fail to provide sufficient and long-term support to ERP exploitation.	.584 (**)
R2	When top managers are more likely to focus on short-term results, it is more likely for the firm to lack a detailed plan to guide long-term ERP development and exploitation.	.446 (**)
R3	As top management support to ERP is more likely to be insufficient, the firm is more likely to lack an explicit ERP exploitation plan.	.517 (**)
R4	As the company are more likely to have insufficient in-house IT experts, a detailed and feasible ERP exploitation plan is more likely to be missing	.507 (**)
R5	As the firm is more likely to lack an appropriate ERP plan, the fund assigned to ERP exploitation is more likely to be insufficient.	.696 (**)
R6	As top management support to ERP is more likely to be insufficient, the fund assigned to ERP exploitation is more likely to be insufficient.	.505 (**)
R7	As ERP exploitation fund is more likely to be insufficient, support provided by system vendors in ERP exploitation is more likely to be insufficient.	.439 (**)
R8	As the ERP system is more likely to be inflexible, cost for ERP add-ons and enhancements will be correspondingly high.	.622 (**)
R9	As ERP is more likely to be inflexible and difficult to customise, the system is more likely to have low compatibility with other IS application.	.474 (**)
R10	When ERP is more likely to have low compatibility with other IS applications, data quality of the system is more likely to be affected.	.282 (*)
R11	As the company is more likely to lack sufficient in-house IT experts to maintain the system, data quality of ERP is more likely to be affected.	.396 (**)
R12	As user involvement to ERP is low, data quality of the system is more likely to be low.	.384 (**)
R13	As data quality of the system is poor, system response time of ERP is more likely to be slow.	.400 (**)
R14	As system users are more likely to fear that ERP can result in power or job losing, user involvement towards ERP is correspondingly low.	.371 (**)
R15	As system users are more likely to be low-qualified and receive insufficient ERP training, user involvement is more likely to be low.	.542 (**)
R16	As cost for ERP enhancements is more likely to be high, it is more likely that functions of the installed ERP may not be continuously enhanced to meet emergent user needs.	.312 (*)
R17	As ERP exploitation fund is more likely to be insufficient, it is more likely that functions of the installed ERP may not be continuously enhanced to meet emergent user needs.	.352 (*)

* Correlation is significant at the 0.05 level (1-tailed).

** Correlation is significant at the 0.01 level (1-tailed).

Table 4: Correlations between the identified ERP barriers

The findings of the bivariate analysis were quite illuminating. Investigating both the list of significant correlations and the correlation map, it becomes apparent that the correlations occurred not only between system barriers but also between organisational barriers in the context of Chinese SOEs studied. Actually, from the correlation map it is immediately apparent that the organisational barriers are the main triggers for other ERP barriers. In particular, many system barriers, even some of those (e.g. slow system response time) that were identified as critical to SOEs, were found to be originated by organisational issues. Moreover, the study clearly shows that it is exactly because these organisational and system barriers seem to be interwoven and closely related with each other, that they are so difficult to manage and remove. As a consequence, it became clearly that other types of ERP barriers (e.g. organisational barriers) should in reality be as important as the technical ones.

6. FURTHER DISCUSSION AND CONCLUSIONS

This paper reported on an exploratory study, which adopted a systems perspective to investigate potential ERP exploitation barriers in the context of Chinese SOEs. While some of the findings have confirmed initial expectations, others have been contrary to the initial assumptions deduced from the literature. Specifically, the findings show that most predefined system barriers were perceived by respondents of SOEs as major problems to ERP exploitation. In contrast, many cultural and organisational ERP barriers, that were expected

to exist in traditional Chinese firms, were not identified as critical issues in the SOEs studied. It however seems that these later barriers were understated by respondents, who may have minimized the existence and impact of these barriers. This understatement was confirmed by a bivariate analysis, which showed that organisational barriers are often the triggers for complex networks of barriers, including the system ones, in SOEs. This suggests that potential ERP exploitation failure in Chinese SOEs may not just be conveniently related to system and technical barriers, but can surely also be attributed to various organisational barriers, such as short-term thinking of top management, lack of top management involvement and support in ERP maintenance and enhancement, internal political issues, or lack of IT expert support, etc.

The most important finding of this paper is the identification that managers in Chinese SOEs often perceived system barriers as most critical, but they seemed to overlook the fact that the complicated network of ERP barriers in their companies is mainly originated by organisational barriers, which thus are in reality more important than system problems. In truth, it is usually recognised in the IS field that technical (e.g. software, hardware and network) problems are 'hard' problems that may often be addressed explicitly. In contrast, organisational and human problems that are always ill-defined 'soft' problems may often be difficult to identify and manage (Checkland, 1990:17-18). The findings of this study prove that this IS standpoint seems to be particularly relevant in the context of Chinese SOEs studied.

Additionally, the apparent contradiction in the data collected, shows that SOEs may at the moment and due to recent reforms be taking a rather self-congratulatory and somewhat complacent view of their own management practices and organisational structures. Their perception of technical and system barriers as being more critical, may blind them to the complexity of organisational barriers, which maybe less obvious, but as shown in the correlation map in Figure 3, much more complex and difficult to resolve. Consequently, critical organisational barriers may often not be identified and handled efficiently in SOEs. This is extremely dangerous, and may lead to significant system and business collapse in these companies in the long-term. Therefore, and in order to ensure continuous success in ERP exploitation, there may be a need for managers in Chinese SOEs to raise awareness and understanding on the complexity and networked nature of organisational barriers.

The results of this study have implications for both practitioners and researchers. Specifically, the established barrier items may be used by practitioners as a checklist to identify and assess ERP post-implementation barriers in their workplace. More importantly, it is hoped that the findings of this study can raise consciousness of SOE managers on the importance and critical impact of organisational barriers, and thus preventing them from potential ERP post-implementation failure. Finally, and on the other hand, it is hoped that the established barrier ontology may be used as a starting point for researchers to carry out further research in this increasingly important research area. It will be interesting if other researchers can reuse and extend this barrier ontology through their studies, and test the suitability of this ontology within their own research contexts.

Moreover, it should be acknowledged that, since the research reported in this paper focused on a very specific set of Chinese firms (i.e. the 118 SOEs in the electronic and telecommunication manufacturing sector in Guangdong) to study ERP exploitation, the findings derived from this questionnaire may only be generalisable to similar regions, company types and sectors in China as the ones studied. Further research work in this area is therefore strongly recommended. Further studies may strive to explore potential ERP exploitation barriers in an alternative type of company, region and sector in China. The results derived from further research studies can then be compared with the findings of this research, and thus providing a more holistic picture on ERP exploitation barriers in the Chinese context.

REFERENCES

- Bai, X. and Bennington, L. (2007). "Modern enterprise system and the role of the party and government in Chinese SOEs". *International Journal of Business and Systems Research*, 1 (3), pp. 354-366.
- Beatty, C. A. and Gordon, J. R. M. (1988). "Barriers to the implementation of CAD/CAM systems". *Sloan Management Review*, 29 (4), pp. 25-34.
- Bloomfield, B.P. and Danieli, A. (1995). "The role of management consultants in the development of information technology: the indissoluble nature of socio-political and technical skills". *Journal of Management Studies*, 32 (1), pp. 23-46.
- Bond, M. H. (1991). *Beyond the Chinese face: insights from psychology*. Hong Kong: Oxford University Press.

- Búrca, S., Fynes, B. and Marshall, D. (2005). "Strategic technology adoption: extending ERP across the supply chain". *The Journal of Enterprise Information Management*, 18 (4), pp. 427-440
- Chen, I.J. (2001). "Planning for ERP systems: analysis and future trend". *Business Process Management Journal*, 7 (5), pp. 374-386.
- Davenport, T.H. and Brooks, J. D. (2004). "Enterprise systems and the supply chain". *Journal of Enterprise Information Management*, 17 (1), pp. 8-19.
- Damodaran, L. and Olphert, W. (2000). "Barriers and facilitators to the use of knowledge management systems". *Behaviour and Information Technology*, 19 (6), pp. 405-413
- Ehie, I.C. and Madsen, M. (2005). "Identifying critical issues in enterprise resource planning (ERP) implementation". *Computers in Industry*, 56, pp. 545-557.
- Fan, Y. (2002). "Guanxi's consequences: personal gains at social cost". *Journal of Business Ethics*, 38, pp. 371-380.
- Field, A. (2005). *Discovering statistics using SPSS: and sex, drugs and rock'n'roll, 2nd ed.* London: SAGE.
- Fletcher, K. and Wright, G. (1995). "Organisational, strategic and technical barriers to successful implementation of database marketing". *International Journal of Information Management*, 15 (2), pp. 115-126.
- Gable, G. (1998). "Large package software: a neglected technology?", *Journal of Global Information Management*, 6 (3), pp.3-4.
- Garnaut, R., Song, L., Tenev, S. and Yao, Y. (2005). *China's ownership transformation: process, outcomes and prospects.* Washington, D.C: International Finance Corporation (World Bank Group).
- Graham, J. L. and Lam, N. M. (2004). "The Chinese negotiation". In: Harvard Business School (eds), *Harvard business review on doing business in China*, 31-56. Boston: Harvard Business School Publishing.
- Gupta, O., Priyadarshini, K., Massoud, S. and Agrawal, S.K. (2004). "Enterprise resource planning: a case of a blood bank". *Industrial Management & Data Systems*, 104 (7), pp. 589-603
- Hall, E.T. (1976). *Beyond culture.* New York: Doubleday.
- Hofstede, G. (1997). *Culture's consequences: comparing values, behaviours, institutions, and organisations across nations.* London: Sage.
- Hollnagel, E., 2000. "Barrier analysis and accident prevention" [Online]. NASA Human Systems Integration Division, Washington D.C. http://human-factors.arc.nasa.gov/april01-workshop/EH_barrier_analysis.pdf [Accessed 25/01/07]
- Hsu, L., Lin, P., Ho, C. and Pan, J. (2008). "Factors that impact on the acceptance and performance of ERP system: multiple case studies in Taiwan". *International Journal of Business and Systems Research*, 2 (1), pp. 16-33.
- Huang, S., Chang, I., Li, S. and Lin, M. (2004). "Assessing risk in ERP projects: identify and prioritize the factors". *Industrial Management & Data Systems*, 104 (8), pp. 681-688.
- Jiang, K. G. (2003). "以人为本整合国有及国有控股企业的人力资源" (Put human as the root: integrate human resources of state-owned and state-holding enterprises). *Shanghai Party History and Party development*, Aug. 2003, pp. 22-25.
- Kim, Y., Lee, Z. and Gosain, S. (2005). "Impediments to successful ERP implementation process". *Business Process Management Journal*, 11 (2), pp.158-170.
- Koh, S. C., Jones, M. H., Saad, S. M., Arunachalam, S. and Gunasekaram, A. (2000). "Measuring uncertainties in MRP environments". *Journal of Logistics Information Management*, 13 (3), pp177-183.
- Kumar, K. and Hillegersberg, J. (2000). "ERP experiences and evolution". *Communications of the ACM*, 43 (4), pp. 23-26.
- Liang, H., Xue, Y., Boulton, W. R. and Byrd, T. A. (2004). "Why western vendors don't dominate China's ERP market". *Communication of the ACM*, 47 (7), pp. 69-72
- Liu, C. B. (2004). "私营企业短期行为与青年需求" (Short-term behaviour of private enterprises and the needs of teenagers) [Online]. Beijing: China Youth and Children Studies. http://www.cysol.org/cnarticle_detail.asp?id=568 [Accessed 02/02/07]
- Loh, T. C. and Koh, S. C. L. (2004). "Critical elements for a successful enterprise resource planning implementation in small-and medium-sized enterprises". *International Journal of Production Research*, 42 (17), pp. 3433-3455.
- Lowe, S (2003). "Chinese culture and management theory". In: Alon, I (eds.), *Chinese culture, organisational behaviour, and international business management*, pp. 3-26. Connecticut: Praeger Publishers.
- Ma, F., Zhang, Y. L. and Yang, Y. F. (2003). "中国管理咨询业的需求现状与发展" (The development of management consultation in China). *Commercial Research*, 270, pp. 28-30
- Manion, M. (1994). "Survey research in the study of contemporary China: learning from local samples". *The China Quarterly*, 139, pp. 741-765.

- Martinsons, M.G. and Hempel, P.S. (1998). "Chinese business process re-engineering". *International Journal of Information Management*, 18 (6), 393-407.
- Martinsons, M.G. and Martinsons, A.G.B. (1996). "Conquering cultural constraints to cultivate Chinese management creativity and innovation". *Journal of Management Development*, 15 (9), pp. 18-36.
- Martinsons, M.G. and Westwood, R.I. (1997). "Management information system in the Chinese business culture: an explanatory theory". *Information & Management*, 32, 215-228.
- Møller, C. (2005). "ERP II: a conceptual framework for next-generation enterprise systems". *Journal of Enterprise Information Management*, 18 (4), pp. 483-497.
- Motwani, J., Subramanian, R. and Gopalakrishna, P. (2005). "Critical factors for successful ERP implementation: Exploratory findings from four case studies". *Computers in Industry*, 56, pp. 529-544.
- Namjae, C. and Kiho, P. (2003). "Exploring a priori and posteriori IS Valuation Distortion: Comparing cases in SCM, ERP, and CRM". *International Journal of Digital Management* [Online], <http://digital.re.kr/ijdm/past.html> [Accessed 15/01/07]
- Oliver, D., Whymark, G. and Romm, C (2005). "Researching ERP adoption: an internet-based grounded theory approach". *Online Information Review*, 29 (6), pp. 585-603.
- Pei, Z.S. (2005). *Organisational culture impact in ERP implementation in China*. M.Sc., Swedish School of Economics and Business Administration
- Peng, G.C. and Nunes, J.M.B. (2007). "Using PEST Analysis as a Tool for Refining and Focusing Contexts for Information Systems Research". Proceedings of the 6th European Conference on Research Methodology for Business and Management Studies, Lisbon, Portugal, pp. 229-237.
- Peng, G.C. and Nunes, J.M.B. (2009a). "Surfacing ERP exploitation risks through a risk ontology". *Industrial Management & Data Systems*, 109 (7), pp. 926-942.
- Peng, G.C. and Nunes, J.M.B. (2009b). "Identification and assessment of risks associated with ERP post-implementation in China". *Journal of Enterprise Information Management*, 22 (5), pp. 587-614.
- Perkins, D.H. (1997). "History, politics, and the sources of economic growth: China and the East Asian way of growth". In: Itoh, F. (eds.), *China in the twenty-first century: politics, economy, and society*, pp. 25-47. Tokyo: United Nations University Press.
- Polikoff, I., Coyne, R. and Hodgson, R. (2005). *Capability cases: a solution envisioning approach*. California: Wesley.
- Redman, T. C. (1998). "The impact of poor data quality on the typical enterprise". *Communication of the ACM*, 41 (2), pp. 79-82
- Reimers, K. (2002). "Implementing ERP systems in China". Proceedings of the 35th Annual Hawaii International Conference on System Sciences. Hawaii, USA.
- Reuters (2006). "China is world's 4th largest economy – World Bank" [Online]. Reuters, London, UK. <http://today.reuters.com/news/articleinvesting.aspx?type=economicNews&story> [Accessed 12/0706]
- SAP (2005). "SAP customer success story high tech" [Online]. SAP, Germany. http://www.sap.com/solutions/busines suite/crm/pdf/CS_Lenovo.pdf [Accessed 12/09/07]
- Shehab, E.M., Sharp, M.W., Supramaniam, L. and Spedding, T.A. (2004). "Enterprise resource planning: An integrative review". *Business Process Management Journal*, 10 (4), pp. 359-386.
- Shirk, S.L. (1994). *How China opened its door: the political success of the PRC's foreign trade and investment reform*. Washington, D.C.: Brookings Institution
- Shu, Y. (2001). *The barriers to crisis management in China: a cultural perspective*. MBA, University of Sheffield.
- Singla, A.R. (2009). "Enterprise resource planning systems implementation: a literature analysis". *International Journal of Business and Systems Research*, 3 (2), pp. 170-185.
- Sun, Q., Zhang, A. and Li, J. (2005). "A study of optimal state shares in mixed oligopoly: implications for SOE reform and foreign competition". *China Economic Review*, 16, pp. 1-27.
- Tsai, W., Lin, T.W., Chen, S. and Hung, S. (2007). "Users' service quality satisfaction and performance improvement of ERP consultant selections". *International Journal of Business and Systems Research*, 1 (3), pp. 280-301.
- Willis, T. H. and Willis-Brown, A. H. (2002). "Extending the value of ERP". *Industrial Management & Data Systems*, 102 (1), pp. 35-38.
- Wright, G. and Donaldson, B. (2002). "Sales information systems in the UK financial services industry: an analysis of sophistication of use and perceived barriers to adoption". *International Journal of Information Management*, 22, pp. 405-419.
- Xie, Y.N. (2005). "加强国有控股企业生产经营管理与监督检查" (Strengthen operational management and monitoring in state holding enterprises). *Liaoning Economy*, vol. 7, pp. 84-85.

- Xue, Y., Liang, H., Boulton, W.R. and Snyder, C.A. (2005). "ERP implementation failures in China: case studies with implications for ERP vendors". *International Journal of Production Economic*, 97 (3), pp. 279-295.
- Yu, C.S. (2005). "Causes influencing the effectiveness of the post-implementation ERP system". *Industrial Management & Data systems*, 105 (1), pp. 115-132.
- Yusuf, S., Nabeshima, K. and Perkins, D.H. (2006). *Under new ownership: privatizing China's state-owned enterprises*. California: Stanford University Press and Washington: The World Bank.
- Yusuf, Y., Gunasekaranb, A. and Abthorpe, M.S. (2004). "Enterprise information systems project implementation: A case study of ERP in Rolls-Royce". *International Journal of Production Economics*, 87, pp. 251-266.
- Zhang, H. S. (2004). "国有及国有控股企业短期行为的制度经济学分析" (Economics analysis on the short-term behaviours of state-owned and state-holding enterprises). MSc. Political Economy, Shandong University, China
- Zhang, Z., Lee, M. K. O., Huang P., Zhang, L. and Huang, X. (2005). "A framework of ERP systems implementation success in China: An empirical study". *International Journal of Production Economic*, 98 (1), pp. 56-80.

APPENDIX:

Barriers that are assigned for business managers in the questionnaire

- Power centralisation of top management
- Lack of critical thinking of employees
- High context and implicit form of communication
- Unwilling to disclose problems, faults and failures
- Less inclined to use explicit procedures and information to tailor forecasts and plans
- Trust personal common sense/intuition rather than system data to make decisions
- Building inter-organisational relationships based on personal *guanxi*
- Inefficient collaboration and communication between functional departments
- Fear of power and job loss
- Short-term behaviour of top management

Barriers that are assigned for ICT experts in the questionnaire

- Lack of explicit and detailed ERP exploitation plan and strategy
- Lack of top management support to ERP
- Insufficient ERP exploitation funds and resources
- Lack of in-house IT specialists
- Low involvement of employees
- Low-skilled and ill-trained staff
- Insufficient support & service from ERP vendors
- Inexperienced and low-qualified system consultants
- System inflexibility
- System incompatibility
- High cost for add-ons and further system development
- Irrational and inflexible design of the system
- Slow system response time
- Misfits between system functions and company requirements
- Poor data quality