

Interorganizational IT capability in China: exploring the differences between state-owned and non-state-owned enterprises

Jinnan Wu¹, Lin Liu², Nianxin Wang³, Zhining Wang⁴

¹ Department of Business Administration, Anhui University of Technology, China

² Department of Industrial Engineering, Anhui University of Technology, China

liulinahut@yahoo.cn

³ Department of Information Management, Jiangsu University of Science and Technology, China

⁴ Department of Human Resource Management, China University of Mining & Technology,
China

Abstract: Economic reform in China and the opening of the country to foreign investment have given rise to a private sector comprising foreign-owned and private domestic enterprises alongside a shrinking state sector. These changes have spawned a corresponding variation in inter-organizational IT capability. Current study identifies four common dimensions of inter organizational IT capability in Chinese context. Then, the theoretical constructs of inter-organizational IT capability are validated through empirical data from 106 traditional Chinese enterprises. It also shows that the inter-organizational IT capability varies between state-owned enterprises and non-state-owned enterprises.

Keywords: Inter-Organizational IT Capability, Dimension, Chinese Context, Ownership Structure, State-Owned

1. Introduction

Many large and traditional enterprises in Western countries invest in information technology to strengthen online connections with customers, disseminate product information, facilitate transactions, improve customer services, and manage inventory via electronic links with suppliers (Zhu, 2004). However, why enterprises with same or similar IT investment achieve different performances in e-business initiatives? Although Western scholars have increasingly emphasized the importance of IT capability, we know relatively

little about IT capability in Chinese context. While there is no doubt that other countries might have been identified with similarly different paradigms, there are good reasons to look at China because of its anticipated importance in the 21st century global economy.

We reviewed the academic literature on IT capabilities published in major IS journals during the past ten years. A systematic literature suggests that most of them address IT capabilities in Western cultural context—especially in the United State, which motivates us to identify IT capabilities in China. Moreover, IT capabilities in most studies are identified at either functional level or organizational level, suggesting little is known about IT capabilities at inter-organizational level. Further, we do not know whether IT capabilities vary among enterprises of different ownership structure. Therefore, this study attempts to reduce these gaps in the literature by exploring the dimensions of inter-organizational IT capability and how it relates to ownership structure in China.

2. Theoretical development

2.1 Resource-based view on inter-organizational IT capability

Soh and Markus's (Soh & Markus, 1995) IT process theory provide important insights into a better distinguishing of IT capabilities conceptualized and identified in existing (primary Western) literature. Combining the resource-based perspective and IT process perspective, we classify IT capabilities in existing literature into two categories, i.e., process-focused IT capability and outcome-focused IT capability. The outcome-focused IT capability refers to what functions the new e-business systems can conduct and what impacts they actually achieve, and is largely determined by "IT assets" and "IT impacts" (Soh & Markus, 1995). By contrast, the process-focused IT capability rooted in "IT conversion process" and "IT use process" (Soh & Markus, 1995) is toward two types of IT capability: (1) IS development capabilities required to obtain an applications portfolio of greater breadth and depth, and a better IT infrastructure, and (2) IS usage capabilities enabling an enterprise to use new systems to support new products/services, redesigned business processes, better decision-making and improved coordination and flexibility.

Current study pays attention to the process-focused IT capability which was mainly identified at functional or organizational level in existing literature. However, today more than ever, IS researchers face pressure to understand the nature of process-focused IT capabilities at inter-organizational level as a result

of substantial enterprise spending on e-business, because the characteristic of multi-participants creates more and larger technological and managerial challenges when developing and using inter-organizational information systems (Johnston & Vitale, 1998). Consequently, we provide an understanding of inter-organizational IT capability in e-business settings to distinguish from other levels and types of IT capability. The inter-organizational IT capability enables enterprises to create IT business value by: (1) efficiently deploying and using e-business investment to develop a successful e-business system, and (2) enabling all participant enterprises to effectively use the e-business system in order to provide IT support for business transactions and collaborations, thus improving enterprise performance. Therefore, inter-organizational IT capability here can be defined as an enterprise's capability to efficiently deploy and use e-business technology resources and complementary resources to build high-quality e-business systems, and to effectively use the systems to support business transactions and collaborations thus improving organizational performance.

The current study analyzes inter-organizational IT capability in China, a context where enterprises exist with differences in management systems, style and institutions. There is little doubt that IT diffusion has been as rapid in China as anywhere in the Western countries, but Chinese enterprises are obviously behind Western rivals in efficiency and effectiveness of IS development and utilization. Recently, cultural differences are often cited as an important reason that IS development in Asian context may differ from the strategies that have been found to be successful in the Western countries (Zhang, 2005). Main Western countries like the U.S. demonstrate individualistic culture. By contrast, China is a good representative of collective culture. We expect that the inter-organizational IT capability in individualistic culture might not be perceived the same way in China. Thus, one purpose of current study is to identify inter-organizational IT capability dimensions in China context.

2.2 Influence of ownership structure on inter-organizational IT capability

The economic and market reforms in China have given rise to enterprises with three distinct types of ownership: state-owned enterprises (SOEs), private domestic enterprises (PDEs), and foreign-invested enterprises (FIEs). Scholars have described the management structures, processes and managerial behaviour in SOEs, joint ventures, and PDEs. Beyond cross-cultural differences, we also expect that the ownership structure may influence inter-organizational IT capability in China. The purpose of current study is to explore whether the inter-

organizational IT capability varies across these three types of enterprises and to investigate the relationship between inter-organizational IT capability and enterprise performance.

The principle characteristic of a planned economy is the comprehensive use of central economic planning and bureaucratic control. Chinese SOEs have an absolutely dominant position in the national economy, and often obtains official policy support in controlling and allocating critical resources, indicating that non-price mechanism plays a larger role in business. This leads to SOEs less concern with innovation, customers and outcomes than maintaining better Guanxi with government officials. Parallel to these changes in SOEs, China is witnessing an unprecedented growth of PDEs, along with a continuing influx of FIEs. Especially since 1997, the central government has focused on the development of new ownership structures as a key component in the reform of 'public sector' enterprises. These non-SOEs) largely follow the rules of market economy, use price mechanism to efficiently allocate resources, and focus on competition and efficiency. Even though many SOEs have been expected to change themselves to be more efficient in new environment, they are significantly different from non-SOE.

In addition, the legacy of tradition makes it difficult for SOEs to adopt new management and practices (Ding et al., 2000) for IT implementation. By contrast, the inherent disadvantages over the SOEs force the PDEs and FIEs to create business value by improving internal competence and competitiveness. In PDEs, owners or managers have the autonomy to control and restructure their enterprises to improve operation efficiency and effectiveness, as they should be responsible for their own profit and loss, operation system and management. They also should face challenges of high implementation costs, technical complexity, lack of IT infrastructure, and lack of well-trained employees. Unlike both SOEs and PDEs, the FIEs not only have to compete in relatively unknown terrain, they also face changing institutional rules and ambiguous regulations. Tsui et al. (Tsui et al., 2006) suggested that FIEs managers have to manage a workforce that differs from their home countries in many dimensions such as language and tradition, and that they also differ in their experiences and perspectives in managing business and in their relationships inside and outside the enterprise. Despite stronger IS development and collaboration experience and skill of parent enterprises in home countries, a good strategy for the FIEs is considered to be emphasizing on and motivating intra- and inter-organizational learning from Chinese enterprises.

Because this study made an inductive analysis of the relationship between ownership structure and inter-organizational IT capability, we did not develop explicit research hypothesis; however, as discussed earlier, we well expect significant differences in values of four inter-organizational IT capability dimensions among Chinese enterprises with three types of ownership structure.

3. Methodology

3.1 Measures

To identify the major dimensions of inter-organizational IT capability in China, we used an inductive approach, which is similar to the generation of organizational citizenship behavior (OCB) (Farh, 1997). This approach asks a sample of respondents to provide descriptions of their feelings about their organizations or to describe some behavioral incidents, and then classifies them into a number of categories by content analysis (Hinkin, 1998). To improve validity, we firstly reviewed literature on IT/IS/e-business capability/competency, and then gave an operational definition of inter-organizational IT capability. Secondly, we invited two Ph. D. candidates in MIS to collect various incidents and items relevant to inter-organizational IT capability observed in practice, starting with presenting them with the definition of inter-organizational IT capability and several examples. We obtained and coded a total of 125 statements describing inter-organizational IT capability incidents and items, and proceeded with an item selection and classification process, which classified these 125 statements into 8 categories. Next, we selected 35 representative statements using the most frequently mentioned items in these categories. Given that similar statements in content exist, the authors further independently decided how these statements could be combined and reached a consensus in combining 9 statements and collapsing the remaining 26 statements into 4 broader categories. At the end of our inductive analysis, 11 open interviews with IT managers, business managers/engineers, or IT and business employees from five firms, the purpose of which is to deleted and added some items according to their observation and experience. At last, 6 items not frequently emerging in these firms were removed, and the remaining 20 items were categorized in 4 dimensions of inter-organizational IT capability in China context.

The first dimension is inter-organizational relationship management (IORM): capabilities enabling a firm to efficiently develop maintain and consolidate its partnership with other information systems participants to successfully delivery

and use an e-business system. The second dimension, inter-organizational task coordination (IOTC), refers to capabilities enabling a firm to efficiently coordinate and manage conflicts arising from inter-organizational tasks and procedures with other systems participants to successfully delivery and use an e-business system. The third dimension is inter-organizational technology usage (IOTU): IT technological capabilities enabling all information systems participants to efficiently plan, develop, integrate and implement an e-business system. The fourth dimension is inter-organizational knowledge learning (IOLR), which refers to capabilities enabling all information systems participants to actively acquire, transfer, create and apply IT knowledge and business knowledge to successfully deliver and use an e-business system. The respondents indicated on a seven-point scale the extent to which the item described the current inter-organizational IT capability of their enterprises. The scale ranged from 1 (strongly disagree) to 7 (strongly agree). When measuring the Ownership structure, the respondents indicated whether their firms were SOE (OWNE=1), PDE (OWNE=2), or FIE (OWNE=3).

3.2 Data Collection

Data collection for this study was targeted traditional enterprises mainly in Chinese manufacturing and service industries with a mix of ownership structure. We distributed 380 questionnaires via e-mail and postal mail. The data collection process resulted in 196 responses (response rate of 51.6%). After accounting for 90 invalid and incomplete responses because of significant data missing and incompleteness, we finally obtained 106 usable responses, yielding a useable response rate of 27.9%. Among this sample, about 49.1% of the responses come from small and medium enterprises, and 50.9% from large enterprises. In terms of ownership structure, about 31.1% of the responses are from the SOEs, 34.0% are from the PDEs, and the remaining 34.9% are from the FIEs. Moreover, the title of respondents are CEOs, CIOs, CFOs, IS managers/directors, or business managers/ directors. In addition, 64.2% respondents are from IS department, and 35.8% are from non-IS department. 71.7% respondents are middle or top management in their organizations, suggesting a good understanding of how to achieve inter-organizational IT business value.

As a test of non-respondent bias, we compared the responses of early and late respondents to test for their significant differences. The first 26 responses were classified as “early respondents”. The last 26 of them were classified as “late respondents” and were deemed representative of firms that did not respond to

the survey (Newman & Robey, 1992). A statistical test of the comparison between the two groups for all constructs was conducted, and there were no statistical differences between the early and late responses, suggesting that non-response bias was not a problem with regard to the data collected in this study.

4. Results

4.1 Reliability and validity

Before assessing the scale reliability, an exploratory factor analysis (EFA) was used to empirically identify inter-organizational IT capability dimensions. We deleted three items because of low loadings (less than 0.50), and removed another three items as a result of similar loadings (more than 0.60) on two factors. Next, we measured the reliability of the newly defined inter-organizational IT capability scale. Our result shows that the Cronbach alphas range from 0.755 to 0.907 (F is significant at 5% level). Next, a conenterpriseatory factor analysis of the final 14-item inter-organizational IT capability scale was made to assess construct validity. The χ^2/df of the model was less than 3.0 ($p > 0.05$). The GFI was 0.903, AGFI 0.850, NFI 0.904, IFI 0.983, CFI 0.982, and RMSEA 0.043. All estimated standardized loadings are significant ($p < 0.001$), and these standardized loadings are of acceptable magnitude (0.55-0.93), indicating each scale has a good validity. Table 1 shows the results.

Table1. Exploratory factor analysis, confirmatory factor analysis and reliability assessment of ACEB

Variables	EFA(CFA)				Standardized α coefficient	F value
	Factor 1	Factor 2	Factor 3	Factor 4		
IORM4	0.783(0.71)					
IORM2	0.747(0.83)					
IORM3	0.737(0.82)				0.839	9.825**
IORM1	0.661(0.65)					
IOTU3		0.853(0.93)				
IOTU2		0.777(0.87)			0.907	4.002*
IOTU1		0.759(0.82)				
IOTC1			0.786(0.55)			
IOTC2			0.714(0.87)			
IOTC3			0.698(0.86)		0.811	4.432**
IOTC4			0.675(0.57)			
IOLR3				0.840(0.79)		
IOLR1				0.805(0.70)	0.755	4.882**

IOLR2				0.716(0.65)
Eigenvalue	3.035	2.468	2.456	2.157
Percent variance explained	21.678	17.631	17.544	15.405
Cumulative percent variance explained	21.678	39.308	56.852	72.257

Note: ** $p < 0.01$; * $p < 0.05$; variables in the first column are sorted according to the size of EFA factor loadings; all values in parentheses are CFA factor loadings.

4.2 Hypothesis testing

To investigate whether inter-organizational IT capability in China varies among three types of firms, an MANOVA using three ownership structures (OWNE) as a grouping variable was conducted, and F-test was used to test relationships between OWNE and four inter-organizational IT capability dimensions. As shown in Table 2, the results of Multivariate Tests show that the value of Wilks' Lambda is 0.704, with $F=4.795$ and $p<0.001$; univariate F-test demonstrates that the F values, indicating the impact of OWNE on each inter-organizational IT capability dimension, are 3.506, 18.022, 2.017 and 4.591, with $p<0.05$ at least except IOTU ($p>0.05$). These results indicate that different ownership structures have significant impact on overall inter-organizational IT capability.

In order to make further analysis of these differences, we conducted Post Hoc Multiple Comparisons for Observed Means using Scheffe to assume equal variance and presented only significant results in Table 3. The information in Table 3 suggests that means of IORM and IOLR are larger in PDEs than in SOEs and the differences are significant at 0.05 levels. Similarly, both PDEs and FIEs have larger means compared to SOEs on IOTC with a p-value less than 0.01. However, no between-cluster difference between PDEs and FIEs was found. These results suggest that three dimensions of inter-organizational IT capability significantly vary between SOEs and non-SOEs.

Table2. ANOVA of ownership structure (OWNE)

Dimensions	Mean Square			F	P
	SOEs (N=33)	FIEs (N=36)	PDEs (N=37)		
IORM	4.394	4.819	5.014	3.506	<0.05
IOTC	3.970	4.847	5.230	18.022	<0.01

IOTU	4.162	4.537	4.730	2.017	>0.05
IOLR	3.970	4.218	4.545	4.591	<0.05

The value of Wilks' Lambda is 0.704($p < 0.001$), and exact F-statistic is 4.795.

Note: SOEs=state-owned enterprises; FIEs= foreign-invested enterprises; PDEs= private domestic enterprises.

Table3. Multiple comparisons

Dependent variable	(I) Ownership	(J) Ownership	Mean Difference (I-J)
IORM	SOEs	PDEs	-.620*
IOTC	SOEs	FIEs	-.878**
	SOEs	PDEs	-1.260**
IOLR	SOEs	PDEs	-.575*

Note: ** $p < 0.01$; * $p < 0.05$; those results which have no statistical significance are not shown in this table.

5. Discussion and Conclusion

Since each culture has unique values to guide human behavior, national culture strongly affects IT management practices including policy making and management of information technology (Garfield & Watson, 1998). Yet we know relatively little about IT capability in a context (e.g., China) different from Western countries (e.g., the U.S.). Even less is known about inter-organizational IT capability in Chinese context. Our study contributes to IT literature in two ways.

We identified four common inter-organizational IT capability dimensions in Chinese context. Saeed, et al. (Saeed, et al., 2005), Zhu (Zhu, 2004), and Eikebrokk and Olsen (Eikebrokk & Olsen, 2007) have made important work, but they do not distinguish different capabilities reflected by IT process and IT outcome. This study proposed the concept of inter-organizational IT capability to emphasize on the inter-organizational process-focused IT capability. Thus, the original value of this study is not only to expand the horizon of a firm's IT capability, but also to understand and identify its dimensions and contents from a process-focused perspective in e-business context. Followed this, we inductively explored and empirically identified four common dimensions of inter-organizational IT capability. In this sense, we contribute to IT capability research by a conceptualization and operationalization of inter-organizational IT capability, emphasizing on inter-organizational process-focused IT capability in an extended cultural context.

Our inductive study, along with the findings by Wu and Zhong (Wu & Zhong, 2009), also suggests that the inter-organizational IT capabilities vary among firms with different ownership structures. Four dimensions of inter-organizational IT capability were found in all three types of firms, but they varied significantly between the SOEs and the non-SOEs. Results showed that SOEs tended to report less IORM, IOTC, and IOLR than non-SOEs. These differences can be explained by the fact that the SOEs participate more in maintaining good Guanxi with government officials to obtain critical resources. Rather, both PDEs and FIEs sharing some characteristics with Western firms paid more attention to a strategic use of IT, and had to be more dependent on coordination and collaboration to gain IT competitive advantage with business partners (Wu & Zhong, 2009). As expected, the SOEs were less concerned about innovation and change, which made them a relative low level of IORM, IOTC, and IOLR with other peers or rivals. These findings provides evidence from Chinese firms for Westwood's (Westwood, 1995) conclusion that cultural difference might lead to difference in efficiency and effectiveness of IS development and utilization.

We acknowledge several limitations of this study that limit the generalizability of our findings. First, although we obtained a diverse sample of respondents from 106 firms with three types, our sample may not be representative of the population. Thus, our findings are exploratory in nature and need to be confirmed in future research. Second, we did not make a cross-culture empirical comparison of inter-organizational IT capability indicators between China and Western countries. Thus, future research should collect cross-cultural sample to provide statistical validation. Third, future research should include other potentially relevant contextual factors (e.g., industry, IT intensity, strategic orientation, and geographical regions) in a single study so that the effects of context on inter-organizational IT capability can be more fully examined.

Acknowledgments

The authors wish to express their appreciation to the National Natural Science Foundation of China (71101065 and 70971056), the Anhui Provincial Natural Science Foundation (1208085QG128), the Anhui Provincial Key Research Base of Humanity & Society Science Important Foundation (SK2012A155), the Chinese Education Ministry Foundation of Humanities and Social Sciences for Young Scholar (10YJC630242 and 11YJC630218), and Fundamental Research

Funds for the Central Universities (JGJ 110761), for their financial support to this project.

References

Zhu, K. (2004). The Complementarity of Information Technology Infrastructure and E-Commerce Capability: A Resource-Based Assessment of Their Business Value. *Journal of Management Information Systems*, 21(1), 167-202.

Soh, C., & Markus, M. L. (1995). How IT Creates Business Value: A Process Theory Synthesis. *Sixteenth International Conference on Information Systems. Amsterdam, (Year) of Conference*, 29-41.

Johnston, R. H., & Vitale, M. R. (1988). Creating Competitive Advantage with Inter-organizational Information Systems. *MIS Quarterly*, 12(1), 153-165.

Zhang, M. (2005). Information technology capability, organizational culture, and export performance. Washington State University.

Ding, D. Z., & Goodall, K., & Warner, M. (2000). The end of the "iron rice-bowl": Whither Chinese human resource management. *International Journal of Human Resource Management*, 11, 217-236.

Tsui, A. S., & Wang, H., & Xin, K. R. (2006). Organizational Culture in China: An Analysis of Culture Dimensions and Culture Types. *Management and Organization Review*, 2, 345-376.

Farh, J. L. L., & Earley, P. C., & Lin, S. C. (1997). Impetus for Action: A Cultural Analysis of Justice and Organizational Citizenship Behaviour in Chinese Society. *Administrative Science Quarterly*, 42(3), 421-444.

Hinkin, T. R. (1998). A brief tutorial on the development of measures for use in survey questionnaires. *Organizational Research Methods*, 1(1), 104-121.

Newman, M., & Robey, D. (1992). A Social Process Model of User-Analyst Relationships. *MIS Quarterly*, 16(2), 249-266.

Garfield, M. J., & Watson, R. T. (1998). Differences in national information infrastructure: the reflection of national cultures. *Journal of Strategic Information Systems*, 6, 313-337.

Saeed, K. A., & Grover, V., & Hwang, Y. (2005). The Relationship of E-Commerce Competence to Customer Value and Firm Performance: An Empirical Investigation. *Journal of Management Information Systems*, 22(1): 223-256.

Eikebrokk, T. R., & Olsen, D. H. (2007). An Empirical Investigation of Competency Factors Affecting e-Business Success in European SMEs. *Information & Management*, 44, 364-383.

Wu, J., & Zhong, W. (2009). Application capability of e-business and enterprise competitiveness: a case study of the iron and steel industry in China. *Technology in Society*, 31, 198-206.

Koh, S. C. L., & Chung, W. W. C., & Gunasekaran, A. (2005). Extended enterprises in changing business environments. *Production Planning & Control*, 16(6), 527-530.

Westwood, R. I. (1995). Culture, information and MIS: The United States and East Asia compared. *Journal of Management Systems*, 7(1), 29-44.