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Online Collaborative Capability from Formal Governance Perspective

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Abstract: On the base of e-business process view and transaction cost economics, we propose the formation model of online collaborative capability, explore the creation process of online collaborative capability, and examine the complex role of formal governance. We adopt an empirical research method with structural equation modeling to verify the underlying hypotheses of the research model in a study of 202 manufacturing firms. The findings suggest that the creation process of online collaborative capability is online collaboration needs→online collaborative resources→online collaborative capability, and formal governance not only positively affects online collaborative capability, but also positively moderates the impact of online collaborative resources on online collaborative capability. This study has important theoretical and practical implications for enhancing e-business implementation, and reveals the complex role of formal governance in the creation process of online collaborative capability.

Key words: online collaborative capability, e-business process view, transaction cost economics, formal governance, moderating effect

1. INTRODUCTION

As the rapid development of e-business, more and more firms carry out e-collaboration with partners through e-business platforms and micro-applications to gain competitive advantage [1]. Formal governance, as a kind of managerial factor, plays an important role in the process of e-collaboration. It provides safeguards for e-collaboration by reducing opportunism. In summary, how to establish online collaborative capability and how to effectively use formal governance to promote the creation of this capability become a new management challenge.

In the IS field, previous studies on IT capability mainly investigated the differential effects of different IT resources on IT capabilities from the resource-based view (RBV) [2, 3]. Bharadwaj (2000) divided IT resources into IT infrastructures, IT human resources and IT enabled resources, and examined the relationships between these resources and IT capabilities [4]. Melville et al. (2004) divided resources into two categories (IT resources and complementary organizational resources) [5]. However, with the emergence of e-collaboration, many researchers turned their attentions to the establishment of inter-organizational IT capabilities. Barua et al. (2004) investigated the relationship between resources and IT capabilities in an inter-organizational environment [6]. Klein and Rai (2009) argued that relation-specific assets could promote the creation of information sharing capabilities and achieve the cocreation of value [7]. In summary, previous studies help researchers understand the relationship between resources and IT capabilities. However, current studies are still limited regarding the "resource-capability-value" research paradigm. This research paradigm scarcely highlights the crucial role of online collaboration needs in the creation of online collaborative capability, hindering researchers from deeply probing into the process of that creation [8]. In addition, the typical model of this paradigm is too simple to

explicitly illustrate the impacts of managerial factors (i.e. formal governance) on the creation of online collaborative capability.

In this research, we seek to explore how to create online collaborative capability and examine the complex role of formal governance in this creation process through the lens of the e-business process view and transaction cost economics (TCE). With the survey data from 202 manufacturing firms, we firstly used LISREL8.72 to analyze the model paths and found that online collaboration needs (OCN), through online collaborative resources (OCR), played a driving role in the creation of online collaborative capability (OCC). Secondly, we verified the direct effect and the moderating effect of formal governance (FG) on online collaborative capability by using SPSS18.0. This study has important theoretical and practical implications for enhancing e-business implementation, and reveals the complex role of formal governance in the creation process of online collaborative capability.

2. THEORY AND HYPOTHESES

2.1 The e-business process view and online collaborative capability

The e-business process view (Zhao et al., 2008) [9] defines e-business process as the integration of participants, interactive information flow and activities. In addition, the e-business process view regards e-business activities (at the organization level, the group level and the individual level) as the interaction between participants and network information flow [11, 13].

Based on the e-business process view, online collaborative capability (OCC) is defined as a capability of enterprises which, using interactive information flow as a carrier, achieves process collaboration and knowledge sharing by the way of information sharing [8]. OCC is difficult to be transferred among organizations because of its firm-specific embeddability. Firms, thus, seek to establish this capability to leverage other existing resources. However, before creating OCC, a firm should identify its OCN and determine what kind of collaboration it needs to create OCC. The e-business process view has substantially contributed to comprehending the key role of OCN, providing an appropriate theoretical foundation for this study to explore the creation process of OCC.

2.2 Transaction cost economics and formal governance

Transaction cost economics (TCE) mainly studies the change of transaction cost under different governance mechanisms, which is a major theoretical perspective for analyzing inter-organizational governance [10], including safeguarding specific investments (Jap & Anderson, 2003; Subramani & Venkatraman, 2003) and structuring purchasing relationships (Noordewier et al., 1990). TCE employs governance mechanisms to control opportunistic behaviors of transacting partners for safeguarding specific investment in transactions [10]. Governance mechanisms are divided into two parts [10] (i.e., formal governance and relational governance). However, we only focus on formal governance in this paper. Williamson (1985) proved that formal governance played an important role in inhibiting opportunism [11]. Macneil argued that formal governance was a management mechanism that could guide behaviors toward the desired goals. According to Goo and Hoetker [16, 17], we define formal governance (FG) as using contracts and rules to guide and coordinate e-business cooperative activities among firms and their partners.

In the cooperation process, opportunism often undermines the cooperative relationship and consequently impedes the formation of capabilities and performance [14]. However, FG can effectively inhibit opportunistic behaviors to promote the formation of capabilities and performance [11]. Besides, under the e-collaborative environment, researchers have proved that performance does not emanate from IT investments directly, but through the value created by the interaction of IT assets with managerial factors of the firm [15]. In summary, researchers have adopted TCE to explain the important role played by formal governance in the cooperation process [15, 20], which provides a theoretical basis for us to study the complex role of FG in the creation process

of OCC.

2.3 The driving role of OCN in the creation of OCC

Online collaboration needs (OCN) are defined as the capability that drives firms and their partners to adopt emergent technologies, in order to promote the management of online information interaction and technological changes [21, 22]. Based on the e-business process view, we suggest that a firm should identify its OCN before establishing the OCC. After confirming the OCN, the firm can conduct the planning and configuration of the advantageous resources, namely, using IS integration to help firm integrate the advantageous resources into process and then form the OCR. Thus, we propose:

H1: OCN will have a positive effect on the formation of OCR.

Online collaborative resources (OCR) are defined as hard-to-imitate organizational resources that can be gained and utilized by firms in the process of e-business operation, which can support firms' e-business activities [8]. The formation of OCR is the central premise of the OCC creation. Furthermore, RBV argues that valuable, rare, and costly-to-imitate resources are conducive to the establishment of core competencies [18]. Similarly, as a kind of resource that is irreplaceable and costly-to-imitate, OCR helps create OCC [16]. Therefore, we propose:

H2: The formation of OCR will have a positive effect on the creation of OCC.

2.4 The complex role played by FG in the creation process of OCC

From the perspective of TCE, FG can effectively control opportunistic behaviors of transacting partners and promote the formation of capabilities and performance [11]. In the traditional collaborative environment, the breakup of cooperation will lead to a huge loss. Therefore, as an indispensable part of traditional cooperation, FG itself has a significant positive effect on the formation of capabilities and performance [19]. Although the emergence of e-business platforms and micro-applications has reduced the cost of cooperation in the e-collaborative environment, FG still plays an important role in the creation of OCC due to firms' intention to maximize benefits. Thus:

H3: FG will have a positive effect on the creation of OCC.

Previous TCE-based studies mainly examined the impact of FG on OCC in traditional collaborative environment. However, under the e-collaborative environment, E.K. Clemons suggested that the managerial factors typically influenced collaborative capability by interacting with collaborative resources. He found that better management could promote the utilization of collaborative resources and make firms establish collaborative capabilities more efficiently [15]. Therefore, under the e-collaborative environment, we argue that the interaction between FG and OCR will positively affect the creation of OCC. Thus:

H4: FG will positively moderate the relationship between OCR and OCC.

The research model developed in the previous discussion is presented in Fig. 1.
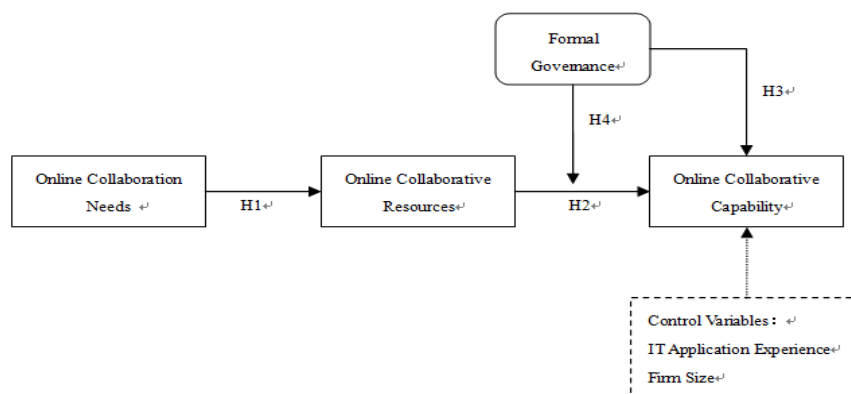

Fig. 1. Formation model of online collaborative capability

3. RESEARCH METHODOLOGY

3.1 Instrument

Based on the previous theoretical and empirical results of the project team, we designed a questionnaire. The questionnaire consisted of two parts. The first part measured the basic information of responding firms. The second part used four variables to measure online collaboration needs, online collaborative resources, online collaborative capability and formal governance. The indicators were all measured using a five-point Likert scale, where higher values indicated "more" degrees of each variable. Measurement items of variables are as shown in Table 1. For the control variables, we employed "number of employees" to measure the firm size (FS) [19], and used "the time length that IT has been introduced" to measure IT application experience (IAE).

Table 1. Items of variables

Variable	Item	Literature basis
Online collaboration needs	My firm has planned a e-business related strategy (OCN1) The executive of my firm has recognized the value of e-business (OCN2) The executive of my firm is responsible for the formulation and implementation of e-business strategy (OCN3) My firm has a capital investment program to support e-business development (OCN4)	Sarkar M et al. [16] Dahui L et al. [17]
Online collaborative resources	My firm supports the business information sharing through system integration (OCR1) My firm has formed an unified digital platform to support the internal business process (OCR2) The information system of my firm can be connected with the system of partners (COR3)	Zhao et al. [8]
Online collaborative capability	My firm shares business information with partners through network (OCC1) My firm shares dynamic market information with partners through network (OCC2) On the base of information sharing, my firm provides online customer service (OCC3)	Zhao et al. [8]
Formal governance	My firm has established effective collaboration mechanisms to encourage suppliers to join its network (FG1) My firm has established effective collaboration mechanisms to encourage agents to join its network (FG2) My firm uses contracts to promote suppliers to share information with it (FG3) My firm uses contracts to promote agents to share information with it (FG4) My firm has established credit mechanisms to ensure the normal trading (FG5)	Rai A, Tang X. [20]

3.2 Sample

With the help of China International E-Commerce Association (CIECA) and Economic & Trade Commission of Wuhan, we used typical sampling method to conduct a large-scale survey. Manufacturing enterprises, which had already begun to implement e-business, were the subjects of the questionnaire survey. Our survey questionnaires were distributed through phone calls, facsimiles, e-mails and interviews between February 2007 and June 2008. During the whole process, we sent out 600 questionnaires and received 240 back. After screening the questionnaires, 202 valid questionnaires were received, showing an effective rate of 84%.

In our questionnaire survey, respondents that had more than two years work experience accounted for more than70%, and more than 80% of respondents had a bachelor degree or above. In addition, 57% of the respondents were executives or department managers of the firms and 17% of them were project managers of e-business. These managers had a good understanding about the e-business strategies and regulation systems of their firms. As a result, we believe that the data can truly reflect the reality of firm's resources and IT-related capabilities.

Our sample covered both Chinese developed regions and less developed regions, its structure represented the development level of e-business in the manufacturing industry of China. What's more, the investigated manufacturing enterprises were widely distributed in the industries of food, tobacco, electronic equipment, communications, petroleum processing, etc., all of which are important areas of manufacturing industry.

4. DATA ANALYSIS

4.1 Instrument validity and reliability

We conducted exploratory factor analysis (EFA) using SPSS18.0. The results showed that the Kaiser-Meyer-Olkin (KMO) was 0.90 and the Bartlett's ball test was significant at the 0.001 level. Through varimax rotation, we extracted four factors (see Table 2) with 78.29% of total variance being explained. The factor structure was clear and met the basic criterion of validity. Secondly, we used LISREL8.72 to conduct confirmatory factor analysis (CFA) to test convergent validity and discriminant validity (See Table 3). We found the model fit indices were $\chi^2/$ df=2.07, RMSEA=0.07, GFI=0.91, NFI=0.97, CFI=0.98. Thus, the model was acceptable, indicating convergent (O'Leary-Kelly and Vokurka, 1998). Further, factor loadings were greater than 0.60 and significant ($p<0.05$), and the estimates for the average variance extracted (AVE) were higher than 0.50 for all constructs [21]. Therefore, our constructs have convergent validity. Meanwhile, the square root of AVE for each variable was greater than the correlation between that construct and other constructs, providing evidence for discriminant validity [22].

We measured the instrument reliability by the value of Cronbach α and composite reliability (CR). The Cronbach α ranged from 0.80 to 0.89 for the four constructs, indicating a high internal consistency. In addition, the CR for each construct was greater than 0.84. Therefore, the instrument is reliable.

Table 2. Exploratory factor analysis

	Factor			
	1	2	3	4
FG5	0.878	0.118	0.078	0.183
FG2	0.818	0.179	0.058	0.253
FG4	0.808	0.259	0.073	0.236
FG3	0.654	0.323	0.334	0.071
FG1	0.652	0.199	0.365	0.143
OCN3	0.253	0.782	0.146	0.262
OCN2	0.167	0.741	0.264	0.210
OCN4	0.311	0.731	0.309	0.024
OCN1	0.189	0.726	0.246	0.343
OCR1	0.100	0.206	0.861	0.206
OCR2	0.119	0.272	0.830	0.196
OCR3	0.427	0.384	0.656	0.086
OCC2	0.202	0.163	0.288	0.823
OCC3	0.319	0.276	0.008	0.667
OCC1	0.234	0.292	0.464	0,649

4.2 Structural model assessment

In this study, we first used LISREL8.72 to verify the overall structure of the model, through which we gained the path coefficients and R^2 values (see Figure 2). Path coefficients reflect the relationships and the degree of influence between latent variables. R^2 values represent the level that dependent variables can be explained by independent variables. Furthermore, we found that the model fit indices were $\chi^2/$ df=2.33, RMSEA=0.07, GFI=0.94, NFI=0.97, CFI=0.98. Thus, the model was acceptable.

Table 3. Descriptive statistics, reliability analysis and the square root of AVE

	OCN	OCR	OCC	FG	IAE	FS
OCN	**0.788**					
OCR	0.65***	**0.90**				
OCC	0.62***	0.58***	**0.80**			
FG	0.59***	0.52***	0.59***	**0.81**		
IAE	0.28***	0.25***	0.13***	0.26***	—	—
FS	0.24***	0.27***	0.04***	0.22***	0.40***	—
Cronbach α	0.86	0.87	0.80	0.89	—	—
CR	0.86	0.93	0.84	0.90	—	—
Mean (SD)	3.51 (0.89)	3.39 (1.04)	3.20 (0.94)	3.18 (0.94)	2.89 (1.40)	3.30 (1.69)

Notes: *p < 0.05; **p < 0.01; ***p<0.001; the italic diagonal elements represent the square roots of average variance extracted.
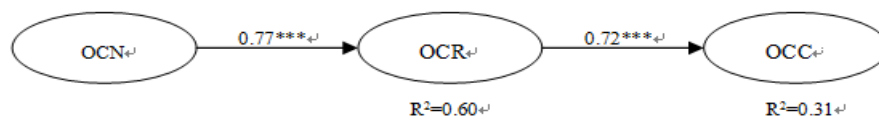

Fig. 2. Path diagram of LISREL structural equation

4.3 Regression model analysis

On the basis of the model path analysis, we used SPSS18.0 to analyze the direct effect and moderating effect of formal governance. All of the multivariate variables (OCN, OCR, OCC, FG) were estimated by averaging the item scores for the variable. Interaction terms were formed by first centering the main variables (OCR and FG), and then multiplying the (centered) OCR with the (centered) FG. Centering can reduce multicollinearity between the interaction term and its component multipliers without affecting the coefficient of the interaction term itself [23]. Ordinary least squares (OLS) regression was used to test the complex role of FG. First, we put the independent variable (OCR) into the regression model (Model 1). Second, we added the moderator (FG) (Model 2). Finally, we added the interaction term (OCR×FG) into the regression model (model 3) [24].

Table 4. Results of regression analysis

	Model 1（β）	Model 2（β）	Model 3（β）
The effect of independent variable			
OCR	0.58***	0.38***	0.39***
The effect of moderator			
FG		0.39***	0.39***
The effect of interaction term			
OCR×FG			0.13*
Statistical parameters			
Max VIF	1.00	1.36	1.37
Durbin-Watson	1.73	1.80	1.76
R^2	0.34	0.44	0.46
F-Model	100.86***	80.28***	56.93***

Notes: * p < 0.05; ** p < 0.01; *** p<0.001.

Table 4 summarizes the regression results. We found that all the R^2 values were greater than 0.30. Furthermore, the D-W values were close to 2, indicating that there was no autocorrelation among the residuals. The maximum VIF was 1.37, indicating that there was no multicollinearity. Therefore, all of the regression models had a high explanation level. Model 3 in Table 4 showed that both FG (β=0.39, p<0.001) and the interaction term (β=0.13, p<0.05) had significant positive effects on the OCC. Therefore, the moderating effect of FG is significant.

5. DISCUSSION

5.1 Key findings

From Fig. 2 we found that OCN had a positive effect on OCR (β=0.77, p<0.001) and OCR had a positive effect on OCC (β=0.72, p<0.001). Meanwhile, the R^2 values were 0.60 and 0.31 respectively, indicating a high explanation level [25]. Further, the results in Table 4 showed that both FG (β=0.39, p<0.001) and the interaction term (β=0.13, p<0.05) had significant positive effects on the OCC. Therefore, all of our hypotheses were supported. In summary, the study has two key findings. First, OCN play a driving role in the creation of OCC. Second, FG not only positively affects the OCC, but also positively moderates the impact of OCR on OCC.

5.2 Contributions and implications for research and practice

This study makes several theoretical and practical contributions. First, it fills the void of the

"resource-capability-value" research paradigm by considering the important role of OCN in the creation process of OCC. The results of this study explain the process where OCN drives the creation of OCC. Specifically, OCN promotes the integration and configuration of related resources in the e-business process to form OCR, and the formation of OCR is conducive to the creation of OCC. This finding can help researchers conduct more in-depth studies on the creation process of OCC. For managers, considering the creation of OCC from OCN can help them identify the development strategy of e-business and the ways of optimizing organizational resources [2], thereby avoiding blind IT investment. According to the key findings above, in order to create the OCC more effectively, a firm should first identify its actual OCN, and then invest in related IT resources in accordance with its OCN.

The second contribution of this paper is that it expands the "resource-capability-value" study paradigm, helping researchers recognize complex role of managerial factors and thus study the creation process of OCC more comprehensively. Furthermore, previous TCE-based studies only considered the effect of FG on the OCC [7]. However, under today's e-collaborative environment, we further proved that OCR could interact with FG to promote the creation of OCC. This finding allows researchers to have more comprehensive understanding of the role of FG and to better analyze the effects of managerial factors in the creation process of OCC. Previous TCE-based studies have helped managers recognize the important role of FG [16, 21], but managers are not clear about which stage they should strengthen FG to promote the creation of OCC more effectively. Our results show that FG positively moderates the relationship between OCR and OCC. Thus, managers should focus on strengthening and improving the contracts related to the utilization of OCR to improve the level of FG. Doing so can reduce the possibility of unexpected resource depreciation due to imitation and opportunism in the process of cooperation, and promote the utilization of OCR, thereby facilitating the creation of OCC.

CONCLUSIONS

According to the results of data analysis, we found (1) OCN played a driving role in the creation of OCC, and (2) FG not only positively affected the OCC, but also positively moderated the impact of OCR on OCC. Our research breaks through the "resource-capability-value" research paradigm, revealing the driving role of OCN and the complex role of FG in the creation process of OCC. We hope our study will help researchers probe into the creation process of OCC more deeply and help firms improve the success rate of e-business implementation and has great guiding significance for firms to effectively use FG to promote the creation of OCC.

Limitations of this study are as follows. First, it may be noted that all the firms in the sample are from the same industry, whether the results of this research can be used in other industries needs further validation. Second, OCR in this study mainly refers to IS integration, but there are still other resources that impact OCC, such as IT human resources. Further research in this area should proceed to improve this research.

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REFERENCES

[1] Grover V, Kohli R. (2012).Cocreating IT value: New capabilities and metrics for multi-firm environments. MIS Quarterly, 36(1): 225-232.

[2] Kohli R, Grover V. (2008).Business value of IT: An essay on expanding research directions to keep up with the times. Journal of the Association for Information Systems, 9(1): 23-39.

[3] Stoel M D, Muhanna W A. (2009).IT Capabilities and Firm Performance: A Contingency Analysis of the Role of Industry and IT Capability Type. Information & Management, 46(3): 181-189.

[4] Bharadwaj, A., S. (2000).A resourced-based perspective on information technology capability and firm performance: An empirical investigation. MIS Quarterly, 24 (1): 169-196.

[5] Melville, N., K. Krarmer, V. Gurbxani. (2004).Review: information technology and organizational performance: An integrative model of IT business value. MIS Quarterly, 28 (2): 283-322.

[6] Barua A, Konana P, Whinston A B, et al. (2004).An empirical investigation of net-enabled business value. MIS Quarterly, 28(4): 585-620.

[7] Klein, R., and Rai, A. (2009).Interfirm Strategic Information Flows in Logistics Supply Chain Relationships. MIS Quarterly, 33 (4): 735-762.

[8] Zhao J, Zhu Z. (2010).Model of e-business value creation process for enterprises. JOURNAL OF MANAGEMENT SCIENCES IN CHINA, 13(12): 47-60 (in Chinese).

[9] Zhao J, Huang W V, Zhu Z. (2008).An Empirical Investigation of E-Business Implementation Process in China. IEEE Transactions on Engineering Management, 55(1): 54-65.

[10] Eric T. G. Wang, Hsiao-Lan Wei. (2007).Interorganizational Governance Value Creation: Coordinating for Information Visibility and Flexibility in Supply Chains. Decision Sciences, 38 (4): 647-674.

[11] Williamson OE. (1991).Comparative economic organization: the analysis of discrete structural alternatives. Administrative Science Quarterly, 36(2): 269-296.

[12] Goo J, Kishore R, Rao H R, et al. (2009).The Role of Service Level Agreements in Relational Management of Information Technology Outsourcing: an Empirical Study. MIS Quarterly, 33(1): 119-145.

[13] Hoetker G, Mellewigt T. (2009).Choice and performance of governance mechanisms: matching alliance governance to asset type. Strategic Management Journal, 30(10): 1025-1044.

[14] Dyer J H, Singh H. (1998).The relational view Cooperative strategy and sources of interorganizational competitive advantage. Academy of Management Review, 23(4): 660-679.

[15] E.K. Clemons, M.C. Row. (1991).Sustaining IT advantage: the role of structural differences, MIS Quarterly 15 (3):275-293.

[16] Sarkar M, Aulakh P S, Madhok A. (2009).Process Capabilities and Value Generation in Alliance Portfolios. Organization Science, 20(3): 583-600.

[17] Dahui L, Chau P Y K, Lai F. (2010).Market Orientation, Ownership Type, and E-Business Assimilation: Evidence from Chinese Firms. Decision Sciences, 41(1): 115-145.

[18] QI Xianfeng, LAN Boxiong. (2006). IT resources and sustainable competitive advantage: From the firm resource-based view. J Tsinghua Univ (Sci &Tech), 41(S1): 930-935

[19] Kuo-chung Chang, Joyce Jackson, Varun Grover. (2003).E-commerce and corporate strategy: an executive perspective. Information & Management, (40): 663-675.

[20] Rai A, Tang X. (2010).Leveraging IT Capabilities and Competitive Process Capabilities for the Management of Inter organizational Relationship Portfolios. Information Systems Research, 21(3): 516-542.

[21] Fornell C R, Larcker D F. (1981).Structural equation models with unobservable variables and measurement error. Journal of Marketing Research, (18): 55-67.

[22] W C W. (1998).Issues and opinion on structural equation modeling. MIS Quarterly, 22(1): vii-xvi.

[23] Aiken, L. S., and West, S. G. Multiple Regression: Testing and Interpreting Interactions, Sage Publications, Newbury Park, CA, 1991.

[24] Chin W W, Marcolin B L, Newsted P R. (2003).A partial least squares latent variable modeling approach for measuring interaction effects: Results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study. Information Systems Research, 14(2): 189-217.

[25] Saraf N, Langdon C S, Gosain S. (2007).IS application capabilities and relational value in interfirm partnerships. Information Systems Research, 18 (3): 320-339.