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FACILITATORS AND INHIBITORS FOR DEPLOYING BUSINESS-TO-BUSINESS E-COMMERCE APPLICATIONS: A MULTI-METHOD, CROSS- CULTURAL STUDY

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Abstract

Firms are increasingly using the Web to conduct inter-organizational business transactions. This type of effort, popularly known as “business-to-business” (B2B) electronic commerce (e-commerce) has caught the attention of researchers and practitioners. Although there is a widespread adoption of B2B applications, there is very little empirical research that has attempted to investigate this phenomenon. There is no clear idea on how firms are managing the B2B initiatives and what problems they face in deploying B2B e-commerce systems. This paper describes an on-going research project that examines the facilitators and inhibitors for deploying B2B applications. The project employs both qualitative and quantitative approaches and is being conducted in the United States, Singapore, and Norway. The project is being conducted in two phases. In the first phase, an extensive literature review and iterative interviews with senior IT executives yielded a list of 46 facilitators/inhibitors. In the second phase, a survey instrument was developed based on the initial list. This survey form was pilot tested and sent to senior IT executives in the three countries. The preliminary analysis of data reveals nine categories of factors as affecting the deployment of B2B e-commerce applications in organizations. The current status of the project, preliminary findings from a partial data set, and the study’s potential contributions are discussed.

Keywords: Business-to-business e-commerce, facilitators, inhibitors, cross-cultural research.

BACKGROUND

The growth of the Internet as a business medium since the advent of the World Wide Web in 1993 has been astonishing and remarkable. The Internet has considerably lowered barriers to entry in several industries, lowered switching costs of buyers and

suppliers, paved the way for many new entrants, enhanced market reach, decreased market transaction and coordination costs, and intensified intra-industry competition. For contemporary organizations, Web presence has become more of a necessity than an additional tool to gain an edge over the competition. Organizations are increasingly trying to incorporate Web technologies in their business processes and systems, and build Web-based applications for transacting their business with consumers and suppliers. Firms are increasingly using the Web to conduct their inter-organizational business transactions. This type of effort, popularly known as “business-to-business” (B2B) electronic commerce (e-commerce) has caught the attention of several practitioners, academics, and consultants. B2B e-commerce applications are a special category of inter-organizational systems where Internet technologies are used to conduct inter-organizational business transactions. Our focus is on those business transactions that directly or indirectly result in revenue generation for the organizations involved in the transactions.

According to a recent study cited by the *Economist*, almost 80% of the total dollars transacted in global electronic commerce in 1999 was from B2B e-commerce. An estimate by Forrester Research predicts that the Web-based B2B transactions would increase to the order of \$1,300 billion by 2003. Another forecast for the size of the B2B market places the figure to be as high as \$7.3 trillion by 2004.

Although there is widespread adoption of B2B applications, there is very little empirical research that has investigated this phenomenon. Despite the exponential growth in B2B activity in the virtual market place, there is very little knowledge on the dynamics underlying the B2B initiatives. There is no clear idea on how firms are managing these initiatives and what problems they face in deploying B2B e-commerce systems. Given the distinct nature of the Internet as compared to any of the earlier information technologies, there is considerable ambiguity about the applicability of our current knowledge on conventional inter-organizational systems to the area of Web-based inter-organizational applications.

In this study, we address these important concerns by examining the issues surrounding the deployment of B2B applications in organizations. Broadly speaking, the overarching theme of this research is to understand the use of the Web in inter-organizational transactions. More specifically, the objectives of this research study are:

- (1) *To understand the facilitators and inhibitors for B2B e-commerce applications,*
- (2) *To understand the performance impacts of these facilitators and inhibitors, and,*
- (3) *To identify the managerial mechanisms required for successful deployment B2B e-commerce applications.*

The remainder of this paper is organized as follows. The next section presents the overall research design, followed by a brief review of literature and the initial research model. In the final section, we explain our ongoing efforts and present preliminary findings based on the data collected from Singapore.

RESEARCH DESIGN

In order to attain our research objectives, we use a multiple-methodology design combining both qualitative and quantitative methods. The first phase of our research is largely exploratory. We use extensive literature review and interviews with senior IT executives to identify a set of facilitators and inhibitors for deploying B2B e-commerce applications. The findings from the first phase serve as inputs into constructing a survey questionnaire. In the second phase of our research, the set of factors are empirically validated and refined through survey of firms in the United States, Norway, and Singapore. The complete research design for our project is shown in Appendix A.

RESEARCH MODEL

Use of IT in inter-organizational business transactions is nothing new. Inter-organizational systems, communication networks, and electronic data interchange (EDI) systems were all quite prevalent even before the advent of the Internet. However, the increasing business uses of the Web have drastically changed the dynamics underlying IT-based inter-organizational systems in several ways. First, the Internet has considerably reduced the coordination costs involved in inter-organizational transactions. Firms no longer need to make heavy investments in establishing dedicated electronic networks among a set of business partners. Second, the ubiquitous nature of the Internet has made it possible for several partners in remote locations to come together and participate in electronic business transactions. This has blurred the geographical barriers that earlier prevented them from conducting inter-organizational transactions. Third, widespread adoption of open standards on the Web has greatly reduced the complexities involved in conducting inter-organizational transactions.

Three broad streams of research form the foundations for our study: (1) literature on inter-organizational systems (IOS) and EDI (2) innovation diffusion, and (3) buyer-supplier relationships and supply chain management. The literature on buyer-supplier relationships and supply chain management point to a number of *relationship or collaboration factors* that potentially affect the deployment of B2B applications. Research on innovation throws light on a set of *organizational factors* and *external environmental factors* that could facilitate/inhibit the use of Web technologies for inter-organizational transactions. IOS and EDI research studies have identified a number of *technological factors* as affecting technology use in organizations. It should be noted that different streams of research have focused on one or more category of factors and often overlap. Synthesizing these ideas, we propose the following preliminary research model for our study (Figure.1). It should be noted that we use the term factors to collectively represent the facilitators and inhibitors.

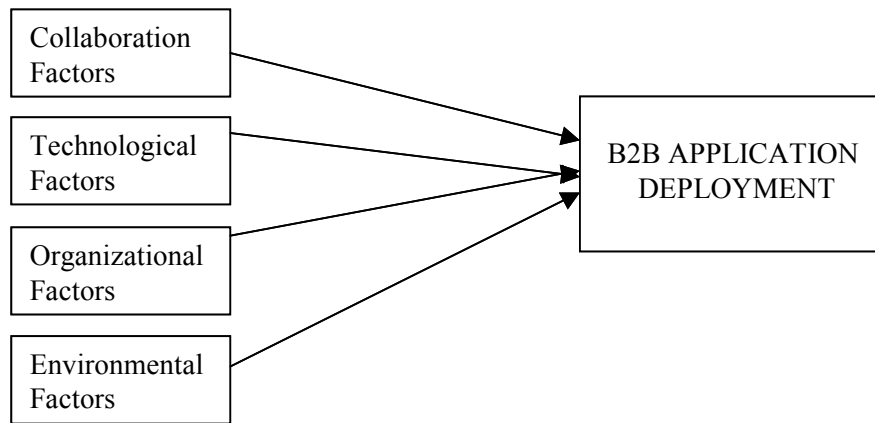


Figure 1. Preliminary Research Model

Our next task was to identify a list of facilitators and inhibitors in each of the categories identified in the model. Apart from the studies from research streams mentioned earlier, we also scanned the popular press and practitioner literature to identify a list of potential facilitators and inhibitors for B2B e-commerce applications. Our specific sources include published interviews with executives, surveys by consultants and IT market research firms, anecdotal case studies, and organizational stories of B2B e-commerce application deployment.

Based on this review, a preliminary list of facilitators/inhibitors was prepared. This list was initially tested with six academic experts and iterative refinements were made. Subsequently, interviews were conducted with eight senior IT managers to gather their opinions on the facilitators/inhibitors for B2B e-commerce application deployment. Prior to the interviews, they were provided with the list and were asked to provide feedback on the same. They were asked to delete, add, and refine the list. During the interviews, the executives were asked to relate to the factors based on their organizational experience. The list of items was expanded, refined, and iteratively validated based on the feedback of the respondents. This resulted in a final pool of 46 factors representing the facilitators/inhibitors for B2B application deployment. The list of factors is shown in Table 1. In the interest of conserving space, the complete literature support for each of these items is not provided. However, an extensive literature review as well as a complete list of references can be obtained from the authors on request.

For assessing the extent of success in B2B application deployment, we prepared a list of possible objectives for deploying B2B applications based a review of the literature. The objectives we identified included improved customer service, better inventory control, lower marketing and distribution costs, reduced cycle time, better supplier relationships, generation of competitive advantage, and reduced operations costs. We measured the success of B2B application deployment by measuring the extent to which each of these objectives were fulfilled.

Table 1. Descriptive Statistics and Factor Loadings for Facilitators/Inhibitors

Factors and Items (n = 108)	Factor loading	Mean	Std. Deviation
1. Top Management Factors ($\alpha = 0.96$)*			
Lack of top management support for e-commerce efforts	0.812	3.64	1.98
Lack of senior management leadership for e-commerce efforts	0.778	3.81	1.85
Lack of senior management understanding about potential benefits and issues related to e-commerce	0.767	3.9	1.84
2. Organizational Change Factors ($\alpha = 0.93$)			
Difficulties in making organizational and management changes required for e-commerce efforts	0.761	4.4	1.6
Difficulties in making changes to current corporate culture	0.867	4.68	1.55
Difficulties in making changes to existing organizational structure	0.858	4.31	1.44
Difficulties in redesigning the business processes for e-commerce	0.625	4.67	1.5
Lack of a champion for e-commerce efforts	0.647	4.16	1.62
Difficulties in gaining cross-functional cooperation for e-commerce efforts	0.721	4.27	1.5
Inadequate support from other departments for the e-commerce efforts	0.777	4.24	1.47
3. Strategy-related Factors ($\alpha = 0.93$)			
Lack of strategic vision for e-commerce	0.733	4.18	1.67
Lack of strategic plan for e-commerce	0.769	4.22	1.64
Lack of alignment of e-commerce plans and corporate plans	0.778	4.34	1.58
Lack of proven, accepted business models for e-commerce	0.746	4.6	1.43
4. Project Management Factors ($\alpha = 0.91$)			
Lack of adequate commitment of resources (finance, human resources etc) for e-commerce efforts	0.566	4.64	1.51
Lack of appropriate methodologies for carrying out e-commerce efforts	0.544	4.66	1.38
Inadequate training on e-commerce for organizational staff	0.748	4.42	1.38
Not enough time to develop new skills for e-commerce efforts	0.716	4.68	1.41
Lack of external consultant support for e-commerce projects	0.783	3.96	1.42
Lack of a dedicated team/group, or decision maker for e-commerce efforts	0.638	4.35	1.59
Lack of communication among the organizational members on e-commerce	0.735	4.13	1.4
Too much time involved in e-commerce efforts	0.781	4.26	1.43
5. Valuation Factors ($\alpha = 0.79$)			
Difficulties in financially justifying e-commerce investments and benefits	0.839	4.77	1.59
Problems in measuring benefits of w-commerce efforts	0.765	5.12	1.4
6. Internal IT Environmental Factors ($\alpha = 0.88$)			
Lack of adequate IT/e-commerce expertise in the firm	0.817	4.59	1.52
Lack of adequate IT infrastructure (applications, databases, telecommunications, etc.) in the firm	0.784	4.28	1.56
Limitations posed by existing database infrastructure	0.754	4.47	1.51
Lack of inter-operability between new e-commerce applications and legacy systems	0.804	4.45	1.64
Difficulties in integrating e-commerce applications with existing applications and systems	0.853	4.75	1.58
Lack of inter-operability between e-commerce applications and those of business partners (suppliers, customers, etc.)	0.747	4.85	1.41

Factors and Items (n = 108)	Factor loading	Mean	Std. Deviation
7. Collaboration Factors ($\alpha = 0.89$)			
Internal fear of opening corporate systems to suppliers and customers	0.614	4.67	1.53
Uncertain response of customers toward e-commerce	0.932	4.73	1.54
Uncertain response of suppliers toward e-commerce	0.956	4.52	1.51
Uncertain response of other business partners toward e-commerce	0.954	4.56	1.51
8. External IT Environmental Factors ($\alpha = 0.89$)			
Unresolved security, encryption and authentication issues	0.881	4.63	1.68
Inadequate mechanisms for protecting data and information in e-commerce transactions	0.928	4.5	1.7
Lack of adequate payment systems for conducting financial transactions with business customers and suppliers	0.752	4.49	1.69
Lack of robust and stable infrastructure for e-commerce	0.769	4.43	1.59
9. External Business Environmental Factors ($\alpha = 0.91$)			
Complex legal issues (liability, contracts) involved in conducting electronic transactions with business partners	0.804	4.82	1.53
Lack of international access and trade barriers to do e-commerce across national borders	0.850	4.7	1.44
Inconsistent taxation laws related to e-commerce	0.900	4.52	1.42
Lack of clear legal environment for conducting e-commerce	0.878	4.6	1.44

*Cronbach alpha values

Table 2. Descriptive Statistics for Success of B2B Application Deployment

Items ($\alpha = 0.96$)	Factor loading	Mean	Std. Deviation
Extended market reach	0.835	3.15	1.82
Easy extension of services	0.858	3.37	1.82
Better Co-ordination of customer activities	0.828	3.28	1.76
Lower marketing and distribution costs	0.861	3.18	1.77
Easier customer and market analysis	0.854	2.98	1.63
Generate competitive advantage	0.886	3.50	1.78
Improved customer service	0.873	3.05	1.69
Better Inventory control	0.900	3.28	1.84
Reduced operations costs	0.861	3.33	1.84
Reduced cycle time	0.873	3.36	1.92
Better relationship with suppliers	0.880	3.25	1.77

CURRENT STATUS OF THE PROJECT AND PRELIMINARY RESULTS

The project is funded and supported by research centers and CIO associations in the United States, Norway, and Singapore. Preliminary interviews, questionnaire preparation, and cross-cultural validation of the survey instrument have been completed. The survey questionnaires were mailed to firms in the United States and Singapore in February and March, 2001. We expect to commence the mailing of the survey questionnaires for firms in Norway in Summer, 2001. We have already received over 100

responses from Singapore and over 120 responses from firms in the United States. For the firms in the United States, a mailing of reminders is currently under way.

We now present some preliminary findings based on data from 108 firms in Singapore. Table 1 presents the descriptive statistics on facilitators/inhibitors. Table 2 presents the statistics for the success of B2B application deployment. Exploratory factor analysis was performed to identify the factor structure underlying the data. After dropping two items with high cross-loadings, we obtained a set of nine factors from the exploratory factor analysis. Table.1 presents the results of exploratory factor analysis with factor loadings and Cronbach's alpha. These nine factors are briefly described below:

1. **Top management factors:** This group represents the extent to which the senior management in an organization recognize the potential benefits of EC applications. It reflects the degree of support and leadership of top management executives in e-commerce initiatives of an organization.
2. **Organizational change factors:** These represent changes in organizational structure, culture, and business processes that are necessary for successfully deploying B2B applications. They also include the extent of cross-functional cooperation required across different business functions in order to deploy B2B e-commerce applications.
3. **Strategy-related factors:** Firms require an active e-commerce strategy, detailed plan and operational tactics for realizing its e-commerce objectives. This factor represents the extent to which a firm has a strategic vision for utilizing Internet technologies and use of appropriate business models for e-commerce.
4. **Project management factors:** An organization needs a dedicated team, communication structures, appropriate skills, adequate training, methods, resources and sometimes, external consultant expertise in order to successfully deploy B2B applications. Altogether, these items constitute the project management factors.
5. **Valuation factors:** With increasing investments in e-commerce, a firm needs to have appropriate measures to justify the huge investments and methods for valuing the benefits from its e-commerce efforts. These form the valuation factors.
6. **Collaboration factors:** For successfully deploying a B2B application, a firm needs active support from its suppliers, consumers, and other external agents with whom it interacts.
7. **Internal IT environmental factors:** Factors relating to the IT infrastructure, database infrastructure, application integration across e-commerce and other IS applications, integration of organizational applications with those of other business partners and existence of IT expertise for successful deployment of e-commerce applications fall under this category.
8. **External IT environmental factors:** Issues regarding reliable payment mechanisms for inter-organizational transactions, security and encryption problems, and data protection in inter-organizational data transfer collectively form the dimension of external IT environment.
9. **External business environmental factors:** This category includes the taxation issues concerning online payments and sales, legal issues in electronic document transfer across organizations, and international trade barriers for conducting global e-commerce.

The preliminary research model has been modified to reflect the findings from the exploratory factor analysis as shown in Figure 2.

CONTRIBUTIONS AND CONCLUSIONS

This is one of the first large-scale empirical studies in the area of electronic commerce. Given the increasing amount of organizational activities on business-to-business applications, we hope to find some interesting results on the facilitators and inhibitors for deploying B2B applications. Preliminary results have identified several key dimensions of facilitators and inhibitors which will enhance our understanding of how B2B adoption may be similar or different from previous adoption studies. We will perform multivariate regression as well as structural equation modeling to compare results from three countries. The use of qualitative and quantitative approaches and cross-cultural data collection will help us in achieving larger validity and generalization of results.

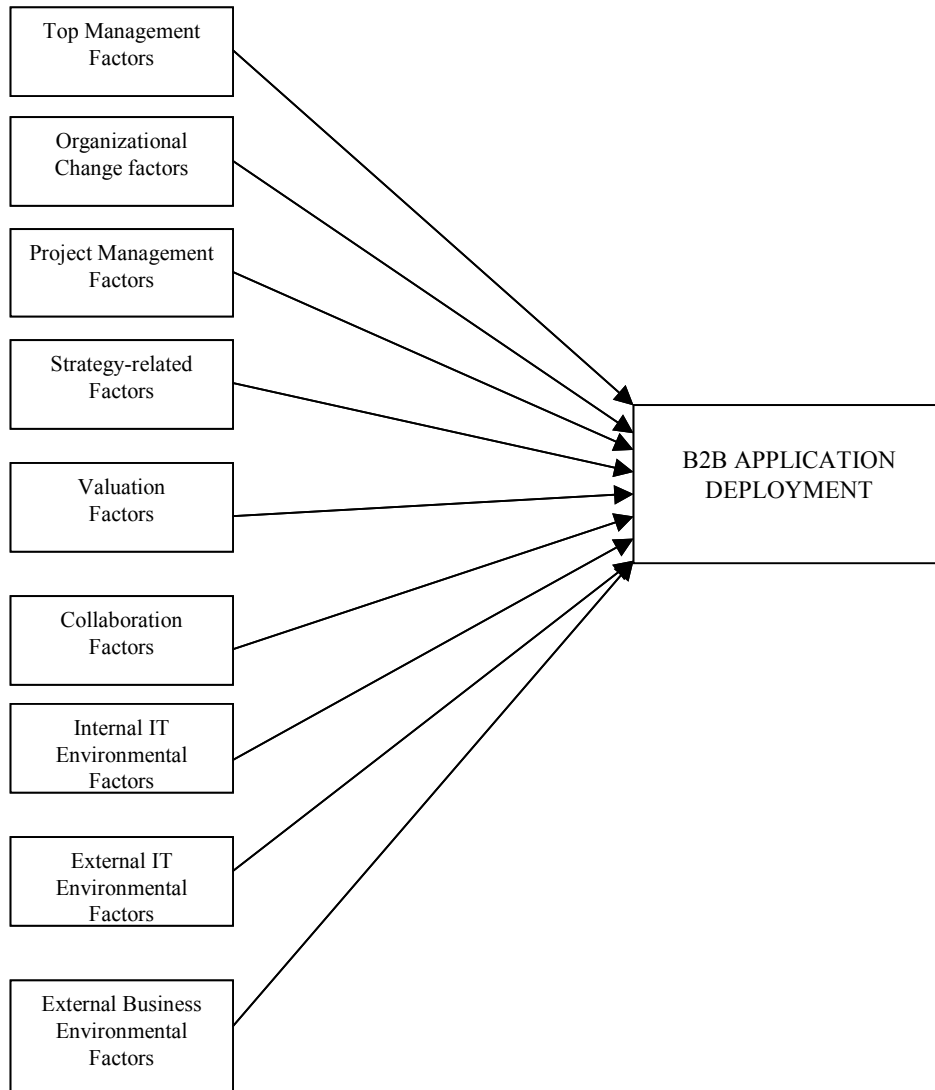


Figure 2. Refined Research Model

References

- Chircu, A., and Kauffman, R. "Reintermediation Strategies in Business-to-Business Electronic Commerce," *International Journal of Electronic Commerce* (4:4), Summer 2000.
- Johnston, R. B., and Mak, H. C. "An Emerging Vision of Internet enabled Supply-Chain E-commerce," *International Journal of Electronic Commerce* (4:4), Summer 2000.
- Khazanchi, D., and Sutton, S. G. "Assurance Services for Business-to-Business Electronic Commerce: A Framework and Implications," *Journal of the AIS* (1:11), January 2001.
- Koushik, S. "Understanding B2B E-business Solutions," IBM White Paper, 2000.
- Subramani, M., and Walden, E. "Economic Returns to Firms from Business-to-Business Electronic Commerce Initiatives : An Empirical Investigation," in *Proceedings of the 21st International Conference on Information Systems*, W. J. Orlikowski, S. Ang, P. Weill, H. Krcmar, and J. I. DeGross (eds.), Brisbane, Australia, December 2000.
- Tumolo, M. "Business-to-Business Exchanges," *Information Systems Management* (18:2), Spring 2001, pp. 54-62.
- Timmers, P. *Electronic Commerce: Strategies and Models for Business-to-Business Trading*, John Wiley & Son, Ltd., New York, 1999.
- Wise, R., and Morrison, D. "Beyond the Exchange: The Future of B2B," *Harvard Business Review* (78:6), November/December 2000.

Appendix A. Research Design

