Winter 12-9-2003

Success Factors for Implementation of Electronic Commerce by Small and Medium Enterprises

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ABSTRACT

Electronic commerce becomes an essential part of business processes for many business firms. Electronic commerce has a particularly important implication for small-to-medium-sized enterprises (SME's) because the form of competition and business process has dramatically changed in the recent years due to the internet and on-line business activities.

This paper investigates various issues about implementation of electronic commerce by surveying a group of Korean SME's as a sample. This study focuses on finding out the critical factors for successful implementation of electronic commerce by SME's. Our research model is more comprehensive than the ones used in the previous research by including moderating variables in the context.

1. INTRODUCTION

Electronic commerce (EC) is rapidly becoming an essential part of business processes for many business firms. It has a particularly important implications for small to medium-sized enterprises (SME's) because the form of competition and business process has dramatically changed in the recent years due to the internet and on-line business opportunities.

Previous research on e-commerce has mostly focused on finding out the determinants of adoption and diffusion of e-commerce. [1] [4] [5] [7] Now that the engaging in e-commerce (EC) becomes a norm for most business firms, it is necessary to decide what type of EC would be most effective for a certain situation.

This paper investigates various issues about implementation of electronic commerce by SME's. Our study has two distinctive aspects compared to the previous research. Firstly, we focus on small to medium-sized business firms because they are different from large enterprises [2] [3], and comprise a large portion of national economy in the developing countries. Secondly, we use a more comprehensive research model than the previous research by including moderating factors in the model (Figure 1.).

2. RESEARCH METHODOLOGY

2.1 Research Model and Hypotheses

While previous studies focused on the adoption issues [1] [4], this paper is to investigate a more comprehensive relationship among the factors that affect the adoption, implementation, and performance of the EC by small and medium enterprises as shown in the research model (Figure 1). For each part of the relationship indicated as H1, H2 and H3, twelve hypotheses are constructed and tested. Table 1 contains the explanations of the factors, and 36 hypotheses in total are tested as shown in Tables 2 to 4.

Figure 1. Research model for E-Commerce.

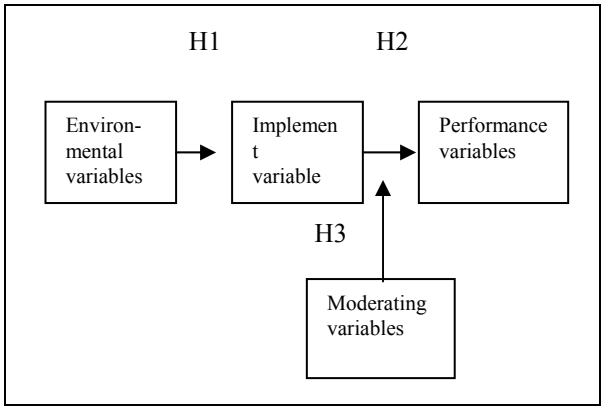

Table 1. Explanation of the variables.

Variables	Contents
Environmental variables	- Type of industry - Age of the firm - Environmental uncertainty
Implementation variables	- Type of EC (B2B, B2C, B2G) - Scope of EC - EC strategy - Characteristic of EC
Moderating variables	These are the general condition of a firm's information system (IS) measured by IS maturity.
Performance variables	These are the firm's performance measured by - Utilization of EC - Satisfaction from EC implementation - Usefulness of EC

H1: Hypotheses on firm environment and EC implementation:
The firm's decision on what type of EC to implement is

affected by the environment in which the firm operates. The external environment affects a firm's decision on EC implementation in such areas as the types, scope, strategy, and characteristics of EC. Twelve hypotheses are tested and the details are listed in Table 2.

H2: Hypotheses on EC implementation and firm performance:
The performance of a firm is affected by the type of EC which the firm implements. A firm's performance is generally improved by implementation of electronic commerce. The magnitude of improvement, however, would be different by the type of EC system implemented by a firm. The details of the hypotheses are listed in Table 3.

H3: Hypotheses on moderating effect:
The impact of the EC implementation on the firm's performance would be affected by the moderating variables that show the general condition of the firm's information system such as IS maturity. The details of the hypotheses are listed in Table 4.

Table 2. Hypotheses on firm environment and EC implementation.

Number	Hypothesis content
Hypothesis 1	Type of industry determines the type of EC that a firm implements.
Hypothesis 2	Type of industry determines the scope of EC that a firm implements.
Hypothesis 3	Type of industry determines the strategy of EC that a firm implements.
Hypothesis 4	Type of industry determines the characteristics of EC that a firm implements.
Hypothesis 5	Age of the firm affects the type of EC that a firm implements.
Hypothesis 6	Age of the firm affects the scope of EC that a firm implements.
Hypothesis 7	Age of the firm affects the strategy of EC that a firm implements.
Hypothesis 8	Age of the firm affects the characteristics of EC that a firm implements.
Hypothesis 9	Environmental uncertainty affects the type of EC that a firm implements.
Hypothesis 10	Environmental uncertainty affects the scope of EC that a firm implements.
Hypothesis 11	Environmental uncertainty affects the strategy of EC that a firm implements.
Hypothesis 12	Environmental uncertainty affects the characteristics of EC that a firm implements.

Table 3. Hypotheses on EC implementation and firm performance.

Number	Hypothesis content
Hypothesis 13	EC utilization is affected by the type of EC implemented.
Hypothesis 14	EC satisfaction is affected by the type of EC implemented.
Hypothesis 15	EC usefulness is affected by the type of EC implemented.
Hypothesis 16	EC utilization is affected by the scope of EC implemented.
Hypothesis 17	EC satisfaction is affected by the scope of EC implemented.
Hypothesis 18	EC usefulness is affected by the scope of EC implemented.
Hypothesis 19	EC utilization is affected by the strategy of EC implemented.
Hypothesis 20	EC satisfaction is affected by the strategy of EC implemented.
Hypothesis 21	EC usefulness is affected by the strategy of EC implemented.
Hypothesis 22	EC utilization is affected by the characteristics of EC implemented.
Hypothesis 23	EC satisfaction is affected by the characteristics of EC implemented.
Hypothesis 24	EC usefulness is affected by the characteristics of EC implemented.

Table 4. Hypotheses on moderating effect.

Number	Hypothesis content
Hypothesis 25	The impact of EC type on EC utilizat

	ion is affected by IS maturity.
Hypothesis 26	The impact of EC type on EC satisfaction is affected by IS maturity.
Hypothesis 27	The impact of EC type on EC usefulness is affected by IS maturity.
Hypothesis 28	The impact of EC scope on EC utilization is affected by IS maturity.
Hypothesis 29	The impact of EC scope on EC satisfaction is affected by IS maturity.
Hypothesis 30	The impact of EC scope on EC usefulness is affected by IS maturity.
Hypothesis 31	The impact of EC strategy on EC utilization is affected by IS maturity.
Hypothesis 32	The impact of EC strategy on EC satisfaction is affected by IS maturity.
Hypothesis 33	The impact of EC strategy on EC usefulness is affected by IS maturity.
Hypothesis 34	The impact of EC characteristics on EC utilization is affected by IS maturity.
Hypothesis 35	The impact of EC characteristics on EC satisfaction is affected by IS maturity.
Hypothesis 36	The impact of EC characteristics on EC usefulness is affected by IS maturity.

2.2 Data Collection and Analysis

We have circulated survey questionnaires to collect data from the SME's in Korea. A total of 74 firms returned the questionnaires, and 51 of these were used for analysis after excluding those with missing data and non-SME's. The profile of the respondents are as follows (Table 5). Statistical tests are used to analyze the data and to find out the answers for the hypotheses presented in the above.

Table 5. Profile of respondent firms.

Type of industry	**Number of firms**	**Proportion**
Manufacturing	25	49%
Sales/Distribution	6	11.8%
Service/IT/Technology	14	27.5%
Others	6	11.8%
Total	51	100%

3. ANALYSES AND RESULTS

Tables 6 through 8 show the results of the tests to find out the relationship among the variables and to determine the acceptance of the hypotheses presented in the above.

3.1 Business Environment and EC Implementation

The hypotheses about the effect of the business environment on the firm's decision on EC implementation are tested. Three variables are selected to define the firm's business environment: type of industry, age of the firm, and environmental uncertainty. Four dimensions of the firm's decisions are analyzed: the types of EC, the scope of EC implementation, EC strategy, and EC characteristics. The types of EC for firm's selection include Business-to-Business (B2B), Business-to-Customer (B2C), and Business-to-Government (B2G).

The results in Table 6 show that among the three environmental variables only the industry type affected two aspects, EC type and EC scope, of a firm's implementation decision. The other two environmental variables are found to have no effect on the firm's decision on the various EC implementation issues such as type, scope, strategy, and characteristics of electronic commerce.

Table 6. Impact of business environment on EC implementation.

Environ-mental variable	Implem-entation variable	Test	Result (p-value)
Type of industry	EC type	X^2 test (Cross tabulation)	**accept (0.025)**
	EC scope	ANOVA	**accept (0.028)**
	EC strategy	X^2 test (Cross tabulation)	reject (0.119)
	EC chara-cteristics	X^2 test (Cross tabulation)	reject (0.554)
Age of the firm	EC type	X^2 test (Cross tabulation)	reject (0.310)
	EC scope	ANOVA	reject (0.438)
	EC strategy	X^2 test (Cross tabulation)	reject (0.410)
	EC chara-cteristics	X^2 test (Cross tabulation)	reject (0.406)
Environ-mental uncertain-ty	EC type	X^2 test (Cross tabulation)	reject (0.731)
	EC scope	ANOVA	reject (0.826)
	EC strategy	X^2 test (Cross tabulation)	reject (0.256)
	EC chara-cteristics	X^2 test (Cross tabulation)	reject (0.164)

* Results indicate whether the hypothesis is accepted at the significance level of $\alpha = 0.05$.

3.2 EC Implementation and EC Performance

We tested the relationship between the four EC implementation variables discussed above, EC type, EC scope, EC strategy and EC characteristics, and the EC performance experienced by the firm measured in utilization, satisfaction and usefulness. The average

performance is compared between the groups of firms implementing the same type of EC and with the same degree of scope, etc..

Among the hypotheses tested, three turned out to have significant results as shown in Table 7. EC scope is found to have significant effect on EC utilization and on EC usefulness. That is, those firms that use EC on a wide range of business activities show a higher level of EC utilization and usefulness. Also, EC strategy has significant effect on EC utilization. Firms that adopt differentiation strategy, i.e., using EC for differentiating themselves from the competitors, show a higher EC utilization than the other two groups adopting either cost-leadership or niche-market strategies.

Table 7. Impact of EC implementation on EC performance.

Implement-ation variable	Performance variable	Test	Result (p-value)
EC type	EC utilization	ANOVA	reject (0.207)
	EC satisfaction	ANOVA	reject (0.743)
	EC usefulness	ANOVA	reject (0.924)
EC scope	EC utilization	Correlation test	**accept (0.001)**
	EC satisfaction	Correlation test	reject (0.359)
	EC usefulness	Correlation test	**accept (0.041)**
EC strategy	EC utilization	ANOVA	**accept (0.051)**
	EC satisfaction	ANOVA	reject (0.584)
	EC usefulness	ANOVA	reject (0.471)
EC characteris tics	EC utilization	t-test	reject (0.406)
	EC satisfaction	t-test	reject (0.117)
	EC usefulness	t-test	reject (0.192)

* Results indicate whether the hypothesis is accepted at the significance level of $\alpha = 0.05$.

3.3 Moderating Effect of IS Maturity

From the preliminary tests, we found that only information system (IS) maturity has a sizable impact among the three moderating variables, IS maturity, IS intensity and organizational capability. The IS maturity of a firm is measured by the firm's knowledge and attention for the EC system. The moderating effect of IS maturity on the relationship between EC implementation and EC performance is examined.

As shown in Table 8, IS maturity is found to have a significant impact on the some aspects of the relationship between EC implementation and EC performance. Firstly, IS maturity has affected the relationship between EC scope and EC utilization in that the effect of EC scope on EC utilization increases as the IS maturity gets higher. Secondly, firms tend to show significant difference in satisfaction from the EC implementation depending on what EC strategy they adopt when their IS maturity level is low. However, when the IS maturity level is high, EC strategy does not cause difference in satisfaction among the firms. They tend to experience same level of satisfaction from the EC implementation regardless of the EC strategy adopted.

Table 8. Moderating effect of IS maturity on the relationship between EC implementation and EC performance.

Implem-entation variable	Perform-ance variable	IS maturity	Test	Result (p-value)
EC type	EC utilization	High	ANOVA	reject (0.695)
		Med	ANOVA	reject (0.516)
		Low	ANOVA	reject (0.258)
	EC satisfaction	H	ANOVA	reject (0.890)
		M	ANOVA	reject (0.417)
		L	ANOVA	reject (0.177)
	EC usefulness	H	ANOVA	reject (0.522)
		M	ANOVA	reject (0.593)
		L	ANOVA	reject (0.592)
EC type	EC utilization	H	Correlatio n test	reject (0.858)
		M	Correlatio n test	**accept (0.007)* ****
		L	Correlatio n test	**reject (0.071)***
	EC satisfaction	H	Correlatio n test	reject (0.874)
		M	Correlatio n test	reject (0.868)
		L	Correlatio n test	reject (0.376)
	EC usefulness	H	Correlatio n test	reject (0.416)
		M	Correlatio n test	**reject (0.100)***
		L	Correlatio n test	reject (0.293)
EC strategy	EC utilization	H	ANOVA	reject (0.175)
		M	ANOVA	reject (0.656)
		L	ANOVA	reject (0.468)
	EC satisfaction	H	ANOVA	**accept (0.016)* ***
		M	ANOVA	**reject (0.083)***
		L	ANOVA	reject (0.656)

	EC usefulness	H	ANOVA	**accept (0.020)****
		M	ANOVA	reject (0.756)
		L	ANOVA	reject (0.677)
EC characteristics	EC utilization	H	t-test	reject (0.473)
		M	t-test	reject (0.535)
		L	t-test	**accept (0.038)****
	EC satisfaction	H	t-test	reject (0.450)
		M	t-test	reject (0.259)
		L	t-test	**reject (0.077)***
	EC usefulness	H	t-test	reject (0.492)
		M	t-test	reject (0.196)
		L	t-test	**accept (0.024)****

Note: Results indicate whether the hypothesis is accepted at the significance level of $\alpha = 0.05$.
*: $p < 0.1$; **: $p < 0.05$; ***: $p < 0.01$

4. CONCLUSION

We have found several factors important for successful implementation of electronic commerce (EC). They are the type of industry for environmental factor, the scope of EC and the EC strategy that firms adopt for implementation factors. Lastly, IS maturity is found to be important as moderating factor for certain combinations of implementation and performance variables.

From the results, we could find that EC becomes more effective when firms use it for a longer period of time and for a wider range of business activities. In other words, the longer and larger the investment in EC, the better result a firm can expect. Electronic commerce are said to help small-and-medium enterprises (SME's) compete against large firms on a more level ground by moving the competition from the physical market place to cyber market space and thus reducing the marketing and distribution cost. It seems, however, that firms need a substantial and sustained investment in EC to enjoy the benefits from its use. SME's need to understand that EC is not a cheap solution to increase its competitive power as it seems.

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