The Relationships among Orientations of IT Strategy, Directions of IT Portfolio, and IT Performance

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Abstract

Many organizations experience that the performance they gained from IT portfolio is lower than they expected values. As with any investment, executives are concerned with maximizing the performance from their investment in IT. This study focused on the relationship or fit between orientations of IT strategy and directions of IT portfolio to maximize IT performance.

A field survey of chief information officers of Korea manufacturing sector was conducted in 2003. Complete data for 147 firms was analyzed to determine relationship among the three research constructs that are orientations of IT strategy, directions of IT portfolio, and IT performance. In this study, the orientations of IT strategy have two dimensions that are operation orientation and market orientation. The directions of IT portfolio have two dimension that are internal system focused and external system focused. And the IT performance has divided into operational performance and competitive performance.

As a result of this study, the companies that are putting a focus with operation orientation were concentrated on internal information systems than external information systems. On the other hand, the other companies that are focused on market orientation were concentrated on external information systems than internal information systems. Consequently, the companies that are focused on operation orientation were operational performance higher than competitive performance and the other companies that are focused on market orientation were competitive performance higher than operational performance.

More importantly, the research results provide empirical evidence that supports the hypothesis related to closer fit between IT strategy and IT portfolio does lead to increase operational and competitive performance of IT. And the results emphasize manager's efforts to fit between orientations of IT strategy and directions of IT portfolio to be realized IT performance.

Key Words: IT Strategy, IT portfolio, IT Performance

I. Introduction

As the level of industrial competition intensifies and the scope of business activities globalizes, companies have been devoted diverse efforts to gain competitive edge via strategic use of information technologies (Clemons and Kimbrough, 1986). For the last decade or so evidence has been accumulated that an effective use of information technologies plays a crucial role both for designing and implementing business strategies and for coordinating and harmonizing every day organizational activities. Many organizations have experienced that the performance gained from IT portfolio is lower

than their expected values (Chan, Huff, Barclay, and Copeland, 1997; Henderson, Venkatraman, and Oldach, 1996).

The underlying premise in "contingency theory" is the proposition that organizational performance is the result of a "match" or "fit" between several factors (Van de Ven and Drazin, 1985; Venkatraman, 1989). Better performance is realized when there is a good fit, or congruency, between contingent factors, and not otherwise. In the context of this study, contingency theory would suggest that, while IT strategy and IT portfolio may have separate impacts on performance of IT, the two together may also affect performance significantly. In other words, the impact of IT strategy on performance is contingent on whether directions of IT portfolio were also implemented.

The strategic usages of IT can convey important competitive advantages with an operational productivity. For this reason, many firms have heavily invested in IT and computing power. However, many firms were getting expected results by IT portfolio, but some other firms had to be satisfied with poor results. The question of whether or not benefit lead to expected performance is not easy to answer. The purpose of this study is to investigate the relationship among orientations of IT strategy, directions of IT portfolio, and IT performance to resolve this problem. From this, we derive the following research questions:

1. What relationships exist between orientations of IT strategy and directions of IT portfolio?
2. What relationships exist between orientations of IT strategy and IT performance?
3. What relationships exist between directions of IT portfolio and IT performance?

2. Framework and Research Hypotheses

2.1 Framework

Most IS research on IT strategy has been theoretical and conceptual. Some studies have discussed the various mechanisms used information technologies to promote business performance (Chan, Huff, Barclay, and Copeland, 1997; Cho and Park, 2003; Davern and Kauffman, 2000; King, 1978; Venkatraman, 1989). Other studies have proposed new methods of managing information resources for gaining competitive advantages (Porter, 1996; Tallon, Kraemer, and Gurbaxani, 2000). There have also been several studies that proposed new theoretical models of strategic alignment between business and information systems sectors (Henderson and Venkatraman , 1993; Henderson, Venkatraman, and Oldach, 1996). The relationship between IT strategy and performance has been studied extensively during the past two decades.

Our approach is similar to the previous researches. However, despite the rise of studies of IT strategy as an academic discipline, few have attempted to address the unified model of IT strategy and its related factors. This study focuses on contingency approach. In contrast to the previous papers, this research takes the unified viewpoint. We expect that IT strategies be intimately linked with IT portfolio and performance. This study examines the relationship among the directions of IT strategy, IT portfolio, and performance. The model used can be seen in Figure 1.

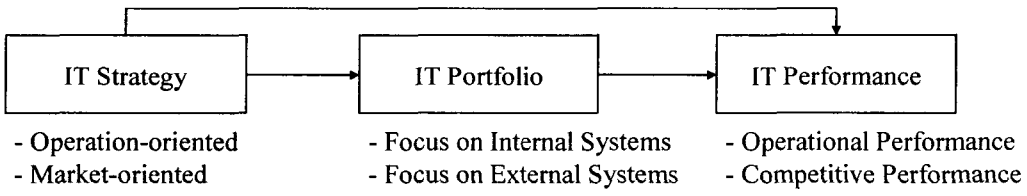

Figure 1. Model for the relationship among IT strategy, IT portfolio, and IT performance

2.2 Hypotheses

First, we hypothesized that the use of "operation-oriented IT strategy" and/or "market-oriented IT strategy" are related to the different types of IT performances (Chan and Huff, 1993; Tallon, Kraemer, and Gurbaxani, 2000). As Porter (1996) studied, strategic objectives can be classified into two types: operational effectiveness and strategic positioning. So, pursuing to maximize operational efficiency or to

deliver differentiated products and services with IT should lead to the different types of performance: operational and competitive performance. Therefore this study presented four research hypotheses in Table 1. Specially, we want to prove that results between main hypotheses (H1a and H1d) and assistance hypotheses (H1b and H1c) differ markedly.

Table 1. Hypotheses for relation between IT Strategy and IT Performance (H1)

H1	Hypotheses Statements	Role
H1a	The higher level of operation-oriented IT strategy, the higher level of operational performance.	Main
H1b	The higher level of operation-oriented IT strategy, the higher level of competitive performance.	Assistance
H1c	The higher level of market-oriented IT strategy, the higher level of operational performance.	Assistance
H1d	The higher level of market-oriented IT strategy, the higher level of competitive performance.	Main

We also hypothesized that companies, if they rely heavily on operation-oriented IT strategy, will resort to use the internal information systems more than the external (Cash, McFarlan, McKenney, and Applegate, 1992; Earl, 1989; Johnston and Carrico, 1988; Weil, 1992). For instance, companies with operation-oriented IT strategy will focus on the internal information systems – e.g. ERP, KMS, DSS, EIS, and Groupware - for improving process innovation or effective decision making. So, we proposed four research hypotheses in Table 2. Main hypotheses that we hope to prove are H2a and H2d than H2b and H2c.

Table 2. Hypotheses for relation between IT Strategy and IT Portfolio (H2)

H2	Hypotheses Statements	Role
H2a	The higher level of operation-oriented IT strategy, the higher level of focus on internal systems.	Main
H2b	The higher level of operation-oriented IT strategy, the higher level of focus on external systems.	Assistance
H2c	The higher level of market-oriented IT strategy, the higher level of focus on internal systems.	Assistance
H2d	The higher level of market-oriented IT strategy, the higher level of focus on external systems.	Main

Higher level of focus on the internal information systems will correspond to higher degree of operational effectiveness more than competitive effectiveness (Cash, McFarlan, McKenney, and Applegate, 1992; Circu and Kauffman, 2000). It is likely that the external information systems – e.g. IOS, EDI, SCM, and CRM – can serve as a way of gaining competitive advantages for organizations. We assumed that higher level of focus on internal systems should lead to higher level of operational performance in Table 3 and supposed that there is a significant disparity between main (H3a and H3d) and assistance hypotheses (H3b and H3c).

Table 3. Hypotheses for relation between IT Portfolio and IT Performance (H3)

H3	Hypotheses Statements	Role
H3a	The higher level of focus on internal systems, the higher level of operational performance.	Main
H3b	The higher level of focus on internal systems, the higher level of competitive performance.	Assistance
H3c	The higher level of focus on external systems, the higher level of operational performance.	Assistance
H3d	The higher level of focus on external systems, the higher level of competitive performance.	Main

3. Research Methods

Survey method was used to examine the research hypothesis. Survey instruments were designed based on existing research on IT strategic use of information systems. Table 4 shows operational definitions,

measurement items, and their references for our study. As it mentioned in the previous section, it generates three constructs and six variables: operation-oriented IT strategy, market-oriented IT strategy, focus on internal information systems, focus on external information systems, operational performance, and competitive performance. Each item was measured using self-designed questions in the type of 7 point Likert-type scale.

Data were collected from random samples of manufacturing industry in Korea. A total of 779 questionnaires are sent to companies by a mail or directly. Returned usable questionnaires were totally 135 and the survey response rate was 17.3%. The sample represents a variety of manufacturing areas including machine and steel (28.9%), electronic (11.9%), lumber (10.4%), petrochemical (8.1%) industry and others (59.3%). The sales of the companies included in this study vary as well: 15.1% of the companies sell less than 50 billion won, 19.3% between 50 billion and 100 billion won, 45.1% 100 billion and 200 billion won, and 21.5% of the companies sell over 200 billion won.

Table 4. Operational definitions and measurement items of variable

Constructs	Variables	Measurement Items		References
IT strategy	Operation-oriented IT strategy	Improvement of task productivity	X1	Berger(1988); Chan, Huff, Barclay, and Copeland (1997); Porter(1996); Tallon, Kraemer, and Gurbaxani (2000)
		Information support for decision-making	X2	
		Internal process innovation	X6	
	Market-oriented IT strategy	Reinforcement of customer relationship	X7	Benjamin and Wigand(1995); Berger(1988); Bloch, Pigneur, and Segev(1996); Chan, Huff, Barclay, and Copeland (1997); Porter(1996); Tallon, Kraemer, and Gurbaxani (2000)
		Distribution process innovation	X9	
		Increase of sales or market share	X10	
		Reinforcement of product or service differentiation	X11	
IT portfolio	Focus on internal systems	Focus on the internal transaction systems	X13	Carter(1990); Diamond(1994)
		Focus on the decision-support systems	X14	
		Focus on the knowledge management systems	X18	
	Focus on external systems	Focus on the external transaction systems	X19	Bloch, Pigneur, and Segev(1996); Clark and Stoddard(1997); Reggins and Mukhopadhyay(1994)
		Focus on the inbound logistic systems	X23	
		Focus on the outbound logistic systems	X24	
IT performance	Operational performance	Task standardization	X26	Berger(1998); Sethi and King(1994); Grover, Kettinger, and Teng(1995); Tallon, Kraemer, and Gurbaxani (2000); Kwon(2003)
		Reduction of process time	X27	
		Cooperation and coordination	X28	
		Decision-making capability	X29	
		Information and knowledge sharing	X30	
	Competitive performance	Competitive price	X31	Berger(1998); Sethi and King(1994); Grover, Kettinger, and Teng(1995); Tallon, Kraemer, and Gurbaxani (2000); Kwon(2003)
		Distribution process innovation	X33	
		Differentiation	X34	
		Customer acquisition and retention	X35	
		Sales or market share	X37	

4. Hypotheses Test and Results

4.1 Reliability and Validity Analysis

Through the internal consistency reliability, we know that six factors with eigenvalues greater than one were extracted from all the measures in this study. Since all of Cronbach's alpha about six factors are above 0.7 and confirmatory factor analysis using AMOS 4.0 was executed for unidimensionality, we

confirm reliability and validity for our research (see Table 5). Table 5 shows the Chi-square values and other fit indices along with reported guidelines for good model fit (Arbuckle and Wothke, 1999).

Table 5. Fit indices and guidelines for confirmatory factor analysis models

Constructs	Variables	Cronbach's alpha	Fit Indices	Guidelines
IT strategy	Operation-oriented IT strategy	.8631	GFI=0.968 AGFI=0.918 χ^2=16.323 RMR=0.123 NFI=0.963 p=0.130	GFI ≥ 0.9 AGFI ≥ 0.8 RMR ≤ 1.0 NFI ≥ 0.9
	Market-oriented IT strategy	.8510		
IT portfolio	Focus on internal systems	.8686	GFI=0.967 AGFI=0.906 χ^2=17.993 RMR=0.131 NFI=0.968 p=0.055	
	Focus on external systems	.8837		
IT performance	Operational performance	.8932	GFI=0.944 AGFI=0.903 χ^2=43.051 RMR=0.116 NFI=0.948 p=0.092	
	Competitive performance	.9010		

4.2 Results of hypothesis test

We tested the correctness of our model using Structural Equation Modeling techniques with AMOS 4.0. The Chi-square statistic of the model was 309.011 with 171 degrees of freedom ($p<0.01$) that would indicate a good fit of the model in Table 6.

Table 6. Fit indices and guidelines for model analysis

Fit Index	Guidelines	Model Values
χ^2		309.011, d.f.= 171 ($p<0.01$)
GFI	≥ 0.9	0.852
AGFI	≥ 0.8	0.761
NFI	≥ 0.9	0.896
CFI	≥ 0.9	0.949
RMR	≤ 1.0	0.2
TLI	≥ 0.9	0.925
RMSEA	≤ 0.08	0.078

The standardized path coefficients for this model and results of hypothesis are presented in Figure 2 and Table 7. These results indicate that proactive operation-oriented IT strategies such as BPR and process innovation are positively related to the focus on the internal and external information systems and investment efforts on the internal information systems is expected to show positive relationship with operational and competitive performance.

In opposition to the previous cases, companies pursuing market-oriented IT strategy may have a tendency to invest in external information systems for competitive advantages.

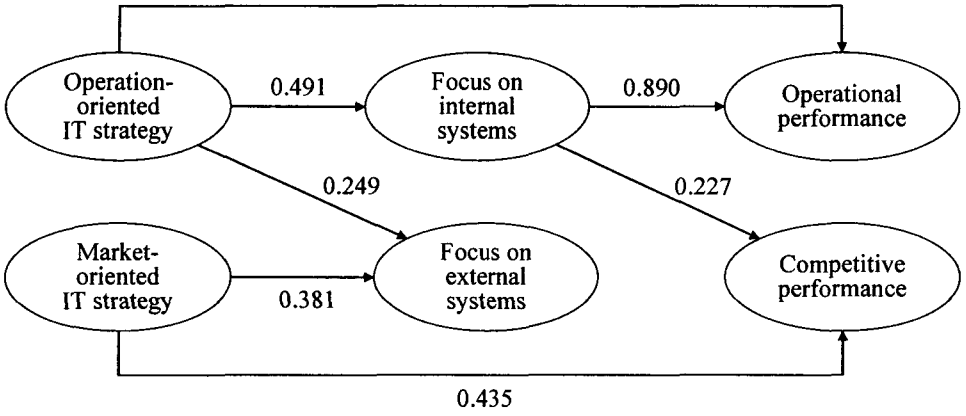

Figure 2. Path coefficients for the model

Table 7. Results of hypothesis

Hypothesis	Variable Path		Path Coefficients	t-value	Sig.	Decision*
	Independent Variable	Dependent Variable				
H1: Relation between IT Strategy and IT Performance						
H1a	Operation-oriented IT strategy	Operational performance	0.207	3.777	0.000	Supported
H1b		Competitive performance	0.020	0.333	0.739	Not supported
H1c	Market-oriented IT strategy	Operational performance	0.004	0.097	0.923	Not supported
H1d		Competitive performance	0.435	7.618	0.000	Supported
H2: Relation between IT Strategy and IT Portfolio						
H2a	Operation-oriented IT Strategy	Focus on internal systems	0.491	8.208	0.000	Supported
H2b		Focus on external systems	0.249	4.640	0.000	Supported
H2c	Market-oriented IT strategy	Focus on internal systems	0.079	1.881	0.060	Not supported
H2d		Focus on external systems	0.381	6.030	0.000	Supported
H3: Relation between IT Portfolio and IT Performance						
H3a	Focus on internal systems	Operational performance	0.890	9.301	0.000	Supported
H3b		Competitive performance	0.227	3.506	0.000	Supported
H3c	Focus on external systems	Operational performance	0.058	0.823	0.411	Not supported
H3d		Competitive performance	0.130	1.385	0.166	Not supported

** All coefficients are significant at the $p<0.01$ level.*

5. Conclusions

This study shows that IT strategies affect the types of IT portfolios performed and IT performances. The IT strategy was related to the IT performance positively. The companies that are focused on operational orientation were operational performance higher than competitive performance. The companies that are focused on market orientation were competitive performance higher than operational performance. The companies that are putting a focus with operational orientation were concentrated on an internal information system than an external information system. On the other hand, the companies that

are putting a focus with market orientation were concentrated on external information systems than internal information systems. The companies that are concentrated on internal information systems were operational performance higher than competitive performance. The results emphasize manager's efforts to fit between IT strategy and IT portfolio to be realized IT performance.

For this reason, a homogeneous enforcement of IT strategy does not often result in improvements in performance in proportion to the investments in technologies. So, companies with a hope to improve performance through the use of information systems should take into consideration business contexts such as the nature of IT strategies and priority of technology investments.

References

1. Arbuckle, J.L. and W. Wothke(1999), *AMOS 4.0 User's Guide*, Smallwaters Corp.
2. Benjamin, R.I. and R. Wigand(1995), Electronic Markets and Virtual Value Chains on the Information Superhighway, *Sloan Management Review*, Winter, pp.62-72.
3. Berger, P., Kobielus, J. G. and Sutherland, D. E.(1988), *Measuring Business Value of Information Technologies*, ICIT Press, Washington DC.
4. Bloch, M., Y. Pigneur and A. Segev(1996), On the Road of Electronic Commerce-a Business Value Framework, Gaining Competitive Advantage and Some Research Issues, Working Paper, *http://is-2.stern.nyu.edu/~mbloch/docs/roadtoec/ec.htm*.
5. Carter, J.R.(1990), The Dollars and Sense of Electronic Data Interchange, *Production & Inventory Management Journal*, 31(2), pp.22-26.
6. Cash, J. I., McFarlan, F. W., McKenney, J. L. and Applegate, L. M.(1992), *Corporate Information Systems Management: Text and Cases*, 3rd eds., Homewood, IL: Richard D. Irwin.
7. Chan, Y.E. and Huff, S.L.(1993), Strategic Information Systems Alignment, *Business Quarterly*, 58(1), pp.51-55.
8. Chan, Y.E., Huff, S.L., Barclay, D.W. and Copeland, D.G.(1997), Business Strategy Orientation, Information Systems Orientation and Strategic Alignment, *Information Systems Research*, 8(2), pp.125-150.
9. Chircu, A. M. and Kauffman, R. J.(2000), Limits to Value an Electronic Commerce-Related IS Investment, *Journal of Management Information Systems*, 17(2), pp.59-80.
10. Cho, N.J. and Park, K.H.(2003), "Barriers Causing the Value Gap between Expected and Realized Value in IS Investment: SCM/ERP/CRM", *Information Systems Review*, 5(1), pp.1-13.
11. Clark, T.H., and Stoddard, D.B.(1996), Interorganizational Business Process Redesign: Merging Technological and Process Innovation, *Journal of Management Information Systems*, 13(2), pp.9-28.
12. Clemons, E.K. and Kimbrough, S.O.(1986), Information Systems, Telecommunications and Their Effects on Industrial Organizations, *Proceedings of the 7th ICIS*, San Diego, pp.99-108.
13. Davenport, T.H.(1993), *Process Innovation: Reengineering Work Through Information Technology*, Ernst & Young.
14. Davern, M.J. and Kauffman, R.J.(2000), Discovering Potential and Realizing Value from Information Technology Investment, *Journal Management Information Systems*, 16(4), pp.121-143.
15. Diamond, G.(1994), Good Old Phone and Fax Stifle Growth of "New" Electronic Data Interchange. *Computing Canada*, pp.38-39.
16. Earl, M.J.(1989), *Management Strategies for Information Technology*, Prentice Hall.
17. Grover, V., Jeong, S. R., Kettinger, W. J. and Teng, J. T. C.(1995), The Implementation of Business Process Reengineering, *Journal of Management Information Systems*, 12(1), pp.109-144.
18. Henderson, J.C. and Venkatraman, N.(1993), Strategic Alignment: Leveraging Information Technology for Transforming Organization, *IBM System Journal*, 38(2-3), pp.472-488.
19. Henderson, J.C., Venkatraman, N., and Oldach, S.(1996), *Aligning Business and IT Strategies, Competing in the Information Age*, Oxford University Press.
20. Johnston, H. R. and Carrico, S. R.(1988), Developing Capabilities to Use Information Strategically, *MIS Quarterly*, pp.37-50.
21. King, W.R.(1978), Strategic Planning for Management Information Systems, *MIS Quarterly*, 2(1), pp.27-37.
22. Kwon, D.(2003), The Effect of Valuation Logics of Information Technology on the Company Performance: Pluralistic Assessment of Paradox, Ph.D., *Dissertation, Case Western Reserve University*.
23. Porter, M.E.(1996), What is Strategy?, *Harvard Business Review*, 74(6), pp.61-77.

24. Reggins, F.J., and Mukhopadhyay, T.(1994), Interdependent benefits from interorganizational systems: opportunities for business partner reengineering, *Journal of Management Information Systems*, Vol.11, No.2, pp.37-57.
25. Sethi, V. and King, W. R.(1994), Development of Measures to Assess the Extent to Which an Information Technology Application Provides Competitive Advantage, *Management Science*, 40(12), pp. 1601-1627.
26. Tallon, P.P., Kraemer, K.L., and Gurbaxani, V.(2000), Executives' Perceptions of the Business Value of Information Technology: A Process-oriented Approach, *Journal of Management Information Systems*, 16, 4, pp.145-173.
27. Venkatraman, N.(1989), Strategic Orientation of Business Enterprise, *Management Science*, 35(8), pp.942-962.
28. Weill, P.(1992), The Relationship between Investments in Information Technology and Firm Performance: A Study of the Valve Manufacturing Sector", *Information Systems Research*, pp.307-333.

논문발표 II

정보통신 II/DB

- **SCOR 모델을 이용한 자동차 부품산업의 공급망 관리시스템 설계 및 구현**
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  우원택(대구한의대)

- **웹서비스와 ebxml을 위한 xml 데이터베이스**
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