

# 정보시스템 투자 전후 가치 격차 유발 장애요인: 탐색적 사례연구

## Barriers Causing the Value Gap between Expected and Realized Value in IS Investment: SCM/ERP/CRM

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### 요 약

효율적 경영활동과 경쟁우위 확보 및 고객관계 경영을 꾀하고자 하는 기업들은 정보시스템 투자 비율을 확대하고 있다. 그러나 현실적으로 볼 때 투자를 위한 의사결정 단계에서 검토되었던 정보시스템의 기대가치와 실현가치 간에는 예상치 못했던 격차가 발생하는 경우가 빈번하다. 또한 최근 e비즈니스 전략을 적극적으로 추진중인 기업들은 SCM(Supply Chain Management), ERP(Enterprise Resource Planning), CRM(Customer Relationship Management) 시스템을 상호 연동하고자 하는 요구가 증대되고 있다. 그러나 기존 연구들의 경우 개별 정보시스템 단위의 성공 요인들에 대한 연구가 대부분이고, 이들 시스템 간의 연동이나 시스템 구축이후 발생하는 조직 내외적인 장애요인 관련 연구는 미미한 실정이다.

본 연구에서는 이들 시스템을 구축하여 운영중인 기업들을 선정하여 시스템별 그리고 시스템간의 투자 전후 가치격차 유발 요인을 규명하고자 하였다. 연구결과는 기업의 정보시스템 투자 의사결정시 반드시 사전에 고려하여야 할 가치격차 유발 요인들에 대한 통찰력을 제시할 수 있을 것이며, 관련 분야 연구의 실증적 접근을 위한 토대를 제시할 것이다.

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## I. Introduction

Organizations recognize the strategic importance of IT in adapting to dynamic competitive situations (Cho, et. al., 2000). Organizations consider IT as competitive weapons and enablers of inter-firm relationship. Many of them, however, have difficulties in obtaining values they expected prior to IS investments. It is known that there are several barriers that restrict accurate IT valuation (Cho and Park, 2002). Without appropriate criteria for evaluating the values from IS investments,

companies have difficulties in assessing the realized values of IT. Because IT affects a whole organization or at least several business units, the value measurement of IT could not be clearly separated from the overall performances. In addition, values of IT can be offset by other factors such as an excessive competition and imitated IS investments.

This study explores causes of value gaps by comparing expected values with realized values from IT in three firms that adopted ERP, SCM, or CRM systems each. We visited three companies and interviewed

managers in charge of IT projects. Some secondary data such as internal reports, seminar materials, and newsletters are also collected and analyzed. The results from this study include some useful implications for managers in improving IS investment decisions.

## II. Measuring Business Values of IT

Existing research on business value from IS investments emphasized different perspectives based on specific theoretical and empirical ground (see <Table 1>).

### 2.1 Business value of IT

As for theoretical perspectives, Bakos and Kemerer proposed three views of IT: IT and organizational performance perspective, industrial organization perspec-

tive, and information economics perspectives. The three views highlight different aspects of the impact of IT on organizational profitability. Information economics view provides three types of IT values: normative value based on expected value, realist value based on observed outcomes, and perceived value based on subjective user evaluation (Bakos and Kemerer, 1992).

Davern and Kauffman divided IT values into potential values and realized values. The potential value represents the maximum potential value available from investing in IT. The realized value is the actual value obtained after implementing IT systems. They emphasized the importance of considering both types of values for both *ex ante* project selection and *ex post* investment evaluation (Davern and Kauffman, 2000).

With an empirical perspectives, Srinivasan attempted an analysis of the effects of electronic data interchange (EDI) technology on just-in-time (JIT) delive-

<Table 1> Business Value of IT

Perspectives	Researchers	Viewpoint	IT values
Theoretical perspectives	Bakos and Kemerer (1992)	IT and organizational performance	• Efficiency and profitability
		Industrial organization	• Strategic impacts
		Information Economics	• Normative value • Realist value • Perceived value
	Davern and Kauffman (2000)	<i>Ex ante</i> project selection <i>Ex post</i> investment evaluation	• Potential value • Realized value
Empirical perspectives	Srinivasan, et. al.(1994)		• Performance • Just-in-time (EDI)
	Barua, et. al.(1995)		• Capacity utilization • Inventory turnover • Quality, price, innovation
	Kauffman, et. al.(2000)		• Technology-specific value • Network-related value
	Brynjolfsson and Hitt (1998)		• Cost savings • Improvements in quality, customer service, and new product development

ry. They found that the organizational performance prior to and after IT implementation depends on the IS investment decision and emphasized the importance of measurement with a long-term perspective (Srinivasan, et. al., 1994). Barua focused on the process-driven values such as capacity utilization, inventory turnover, quality, price, and innovation under the context of EC technology investment. They showed how companies could relate the impact of IS investment for business processes with company outcomes (Barua, et. al., 1995). Kauffman observed technology-specific values and network-related values are the two different business values of electronic banking network (Kauffman, et. al., 2000). Brynjolfsson and Hitt identified the values of IT as cost savings, improvements in quality, customer service, and new product developments (Brynjolfsson and Hitt, 1998).

As observed in previous research and their diversity of the views, the heterogeneity of corporate characteristics causes diverse assessment views and approaches and value gaps in most cases. To deal with the difference between expected value and realized value in electronic commerce technology investments, Davern and Kauffman proposed a model called limits-to-value model framework (Davern and Kauffman, 2000).

## 2.2 Expected, realized value, and value gap

The expected value can be defined as the business payoff expected from an IS investment. Also the realized value can be understood as the benefit of outcomes gained from an IS (Cho and Park, 2002; Davern and Kauffman, 2000; Chircu and Kauffman).

In general, the expected value as ex-ante value of IS investment, almost tend to be clue in order to make a firm decide whether to deploy IS or not. Once the value of IS deployment has been established, and then

managers can make an estimate of its expenditures and expected return previously. The expected value from IS consists of a number of elements in a variety of contexts and systems in organization. For example, a SCM application may offer the expected value through decreasing inventory levels and reducing costs for a production department (Davern and Kauffman, 2000). And in case of ERP, firm wish to gain the benefits such as simplified business processes, in-time settlement of accounts, higher connectivity with headquarter and local factories, and effective resource management and so on (Cho and Park, 2002b). The companies, trying to deploy CRM system, generally establish or settle the merits like real-time customer's data gathering, higher data consistency, retention of important customers, and valuable data support for marketers and sales persons for keeping relationship with customers (Thompson and Sims, 2001; Cho and Park, 2002b).

After implementation of systems, the realized value as the ex-post benefit from IS investments is the measurable value that can be identified. The maximal realized value will be obtained only if the project is completely and successfully implemented. But the unpredictable issues, barriers to valuation, in organizational context are probably to occur during implementation and operation of IS (Chircu and Kauffman, 2000). Therefore the value gap or distortion in value of IS can be defined as value difference between expected and realized value owing to the unexpected barrier factors in specific situation.

## 2.3 Barriers to valuation

Chircu and Kauffman extended the limits-to-value model and included market and process-level factors. They divided IT value into potential value and realized value, and showed how each limits-to-value variable diminished IT benefits. By way of case studies into

<Table 2> Barriers to the valuation of IT

Barriers		Remarks
Valuation process	Industry barriers Organization barriers	<ul style="list-style-type: none"> <li>• Standardization of technologies, Specificity</li> <li>• Organizational norms, culture, relationship between suppliers and customers, human resources, etc.</li> </ul>
Conversion process	Knowledge barriers Resource barriers Usage barriers	<ul style="list-style-type: none"> <li>• New technology adoption, Knowledge of new tasks</li> <li>• Lack of resources</li> <li>• Adoption and recognition of system usage</li> </ul>

internet-based travel reservation systems, they identified five barriers working during the valuation and conversion process as summarized in <Table 2> (Chircu and Kauffman, 2000). In their research, two classes of limits to value for the valuation process are identified as industry and organizational barriers. Additionally three classes of barriers in conversion contingencies are proposed as resource, knowledge, and usage barriers. The limitations of their study they explained, however, were from the use of the case study methodology, which did not readily allow for extensions to all organizations and all new IS-related systems.

In our research we used the five barriers developed by Chircu and Kauffman as a starting ground. We tried to explore the barriers leading the value gap and to classify them in SCM/ERP/CRM system, which are in most popular in many leading companies.

### III. Research Questions

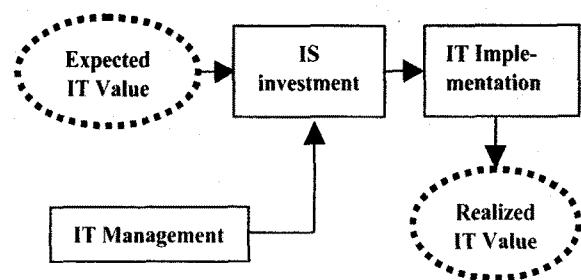
In making decisions on IS investment, defining clear purposes at the strategic level is of critical importance (Teo and King, 1997). However, even with clear and specific goals, the value gap between the expected and the realized values tends to persist. Expected value reflects organizational hope that its goal is achieved as expected and all the assumptions are kept.

Even when a value gap exist, if a company could properly measure the amount of the gap and if it could

properly analyze the causes of the gap, then the company can accumulate its own wisdom from the experience. Such an attempt will help them to make smart decisions in the future and narrow the gap (Chircu and Kauffman, 2000).

<Figure 1> depicts the process of IT value creation (Davern and Kauffman, 2000). Managers concern focuses on the accurate estimation of the value realizable from IT implementation. This estimation, in turn, becomes the basis of IS investment and eventual benefits from the investment.

Despite manager's effort to accurately judge business values they expect to gain from IS investments, unfortunately many organizations observe a wide gap between the a priori expected value and the post hoc value realized from that investment. We believe that there exists a set of barriers that trap managers in the gap.



<Figure 1> IT value creation process

Because of the broad recognition of this chronic

problem, a systematic study on the barriers that affects the value gap has enormous practical importance. Such study can provide relevant criteria for accurate assessment of IS investment.

In this research, by focusing particularly on three companies that adopted SCM, ERP, and CRM systems each, we hoped to identify barriers that commonly exist in all cases and those that affect a particular case. Specifically, three research questions are explored as follows:

- **What are the barriers that cause the IT value gap?**
- **What are the common barriers across different IT projects?**
- **What are barriers that differ across specific IT projects?**

## IV. Research Methodology

### 4.1 Selection of Research Sites

#### 4.1.1 Company A (Case site for SCM)

Company A is a manufacturer and distributor of cosmetic products. While its headquarter is located in Seoul, it has five factories and a research and development center out of Seoul. Total revenue of company was about \$530 million in the year 2001. Major products of the company are classified into eight product groups. Since November 2000, they have tried to integrate previously independent information systems for manufacturing, distribution and logistics. The integration is aimed to improve the quality of customer service by implementing integrated systems that support the whole process from order acceptance to delivery. For office and administrative productivity the company uses a groupware system called 'Pilot System'.

#### 4.1.2 Company B (Case site for ERP)

Company B is a medium-sized company founded in 1969. Its business area is in organic & inorganic chemistry as well as precision chemistry. Major products from the company include AN Monomer, Acryl amide, EDTA, and cyanide soda. The company's total revenue was around \$110 million in 2000. Recently they aggressively planned and tried to integrate the whole corporate information systems in order to pursue global extension.

#### 4.1.3 Company C (Case site for CRM)

Company C started its business as a specialized distributor of passenger cars in 2000. These days they sell over 8,000 cars a month. Now they also own nine car-repair centers all around the nation. As the number of customers reaches 100,000, the company implemented a CRM system in February 2002. The system has about 40,000 records of customer's information. They have a plan to integrate their CRM system with the systems in car-repair centers for collecting various real time data.

### 4.2 Research Procedure

We first reviewed existing research on the valuation and barriers to IS investments to get an advice for determining our research approach and case sites. We determined to perform exploratory case research for two reasons. First, we hoped to collect diverse data on this relatively unstructured research issue on IT evaluation gap. Various variables at the level of industry, organization, sub-organization or project are expected to involve in this issue. Second, we hoped to observe an emergence of noble perspective on the phenomena and prescription (Davern and Kauffman, 2000; Yin, 1994; Miles and Huberman, 1994).

<Table 3> Interview Questions

Phase	Interview Questions	Concerns
Ex-ante IS investment	<ul style="list-style-type: none"> <li>• What kind of information system did you implement?</li> <li>• What are the needs in your company for those systems?</li> <li>• When did you start considering about the new investment?</li> <li>• When did you finish the system implementation?</li> <li>• What are the main reasons of IS investment?</li> <li>• How did the procedure of requirement analysis progressed? (Team or department attending, types of attendance, methods of opinion gathering, etc.)</li> <li>• What were the ultimate purposes or expected values when the investment was decided?</li> </ul>	<ul style="list-style-type: none"> <li>• Kind of information system</li> <li>• Needs of IS investment</li> <li>• Starting time of project</li> <li>• Duration and delay time</li> <li>• Identification of expected values</li> <li>• Organizational consensus on system implementation, participation of employees in system implementation, supports from CEO</li> <li>• Finding expected values</li> </ul>
Ex-post IS investment	<ul style="list-style-type: none"> <li>• What was the methodology used for information system implementation?</li> <li>• What are the realized values after IT implementation?</li> <li>• What are differences between the expected values and the realized values?</li> <li>• What are the major reasons of value gaps and problems?</li> </ul>	<ul style="list-style-type: none"> <li>• Self-made product, foreign product, or home made product</li> <li>• Finding the realized values</li> <li>• Finding the level of the value gaps</li> <li>• Finding barriers affecting the value gaps or IT valuation</li> </ul>

We contacted and interviewed relevant key people in each company. According to the interview appointments and arrangements, we have visited each company and interviewed key informants. The interviewees include IT project managers who initiated the relevant IT projects and were in charge of the system. They explained about the initial expectations and issues they encountered prior to the implementation of the projects. We also interviewed team managers assessing IT value, members of general affairs, and IT-related user group team leaders.

### 4.3 Interview Sheet

The interview followed pre-designed interview guideline (see <Table 3>), which is a modification of Davern and Kauffman (2000). The interviews were

tape-recorded and notes were taken. After interview, the record transcripts were used for accurate and clear description of interview results.

We also used telephone and e-mail for follow-up questions and used several secondary data from web sites, magazines, newsletters, seminar reports and internal reports of case companies.

### 4.4 Analysis of Interview Data

We categorized the interview contents into eight barrier groups. The description of the categories is summarized in <Table 4>. There were 22 key paragraphs, and 75 barrier factors were identified from the interview data. Then we classified the factors again to judge if which barriers are common across the three cases and which are different across cases.

〈Table 4〉 Barrier categorization scheme

Category	Coding (Key phrases)
Industry Barrier	<ul style="list-style-type: none"> <li>• Non-industrial standardization</li> <li>• Irrational distribution channel</li> <li>• Legacy processes</li> </ul>
Organizational Barrier	<ul style="list-style-type: none"> <li>• Lack of Sponsorship</li> <li>• Lack of strategic mind-set</li> <li>• Inadequate organizational structures</li> <li>• Discrete support</li> <li>• No evaluation system</li> </ul>
Knowledge Barrier	<ul style="list-style-type: none"> <li>• Knowledge of new technologies</li> <li>• Skill for new technology</li> </ul>
Resource Barrier	<ul style="list-style-type: none"> <li>• Lack of human resources (Frequently moving of human resources, difficulties in HR outsourcing)</li> </ul>
Usage Barrier	<ul style="list-style-type: none"> <li>• Difficult-to-use</li> <li>• Weakness of sharing the perception</li> <li>• Lack of information mind-set</li> <li>• Low involvement of employees</li> </ul>
Competence Barrier	<ul style="list-style-type: none"> <li>• Lack of planning skill</li> <li>• Low skill for evaluating vendors</li> <li>• Weakness of decision-making skill (Hyped-up IT as panacea and imitated IS investment)</li> </ul>
Product Barrier	<ul style="list-style-type: none"> <li>• Improper system specifications</li> <li>• Difficulties in upgrade</li> <li>• Weakness of software features</li> </ul>
Safety Barrier	<ul style="list-style-type: none"> <li>• Worry about efflux of firm's information (Outflow of transaction data or customer data, concerns of unsafe payment and security system)</li> </ul>

## V. Research Results

### 5.1 Expected and realized value

First, we outlined system situations and expected value from new technologies case companies expected as depicted in <Table 5>.

Company A implemented a supply chain management system in August 2001. Previously different modules of their legacy system were running on different platforms. The problems they faced included data in-

consistency, complex DB schema, mixed application interfaces, and non-integrated system configuration. They hoped to implement a new system called 'New Information System' in order to integrate the whole systems into a unified operating system environment. Investment into the new system was expected to increase their productivity throughout the whole organization. After the SCM system was deployed, company A experienced 30% increase in the productivity of the whole organization, and its major information systems were considerably integrated together enabling consistent data management based on a single DB schema.

Company B adopted an ERP system in July 2000 in replacement of their old computing systems. The old systems were not fully integrated with business process, and the result was duplicated work or manual back-up process. The managers found that lack of data consistency and low level of process connectivity has become a serious barrier to get organizational performance. Their expectation from IS investment targeted to simplified business processes, just-in-time settlement of accounts, improved connectivity between headquarter and local factories, reduced total costs, and finally a move toward the paperless office.

After implementing the new system, company B could speed up their tasks by simplifying business processes, over 90% of the settlement task could be done in a 'paperless' mode. And the system that connected headquarter's office with local factories also provided an opportunity to reduce costs. But the paperless office, one of company's expected values, faced some of traditional habits, for example paper-oriented documentation or reporting, as barrier-to-valuation.

February 2002, Company C implemented a CRM system as a cure to such problems as fragmented customer information, inconsistent data and data loss, lack

<Table 5> System situations and expected value prior to IS investment

Company	System	Situations	Expected value & Innovation
Company A	SCM (2001. 8)	<ul style="list-style-type: none"> <li>• Various/Multiple system architectures</li> <li>• Data inconsistency &amp; Complex DB schema</li> <li>• Mixed application program interface system environments</li> <li>• Non-integrated system configuration</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation of 'New Information System'</li> <li>• Integrating the whole systems into single operating system (DB, etc.)</li> <li>• Increasing the productivity not only of IT-related section but also of whole units of organization</li> </ul>
Company B	ERP (2000. 7)	<ul style="list-style-type: none"> <li>• Time-worn computing systems</li> <li>• Separated with business processes</li> <li>• Duplicated job and manually processed tasks</li> <li>• Data inconsistency and low connectivity among whole processes</li> </ul>	<ul style="list-style-type: none"> <li>• Simplified business processes</li> <li>• In-time settlement of accounts</li> <li>• Higher connectivity with headquarter and local factories</li> <li>• Decreasing the cost elements</li> <li>• Successful paperless office</li> </ul>
Company C	CRM (2002. 2)	<ul style="list-style-type: none"> <li>• Sparsely stored customer's data</li> <li>• High data inconsistency and data loss</li> <li>• Lack of data-collection mind</li> <li>• Relationship with car-repairing center</li> </ul>	<ul style="list-style-type: none"> <li>• Real-time data gathering</li> <li>• Higher data consistency</li> <li>• Changing mind for importance customer's data</li> <li>• Helpful data support for marketers and sales persons</li> </ul>

( ) point of deployment.

of recognition of the importance of data-collection, and loose relationship with car-repairing centers.

When they launched the new project, managers expected to obtain real-time data gathering, high level of data consistency, enhanced use of customer data, and improved data support for marketing and sales.

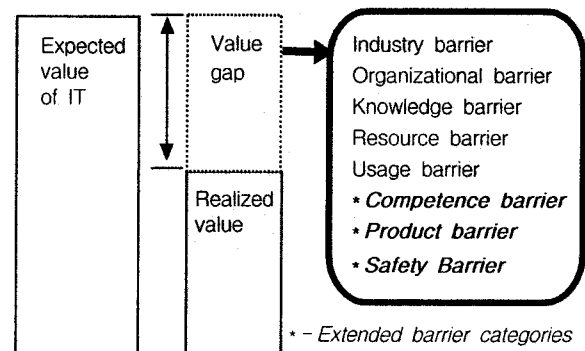
Company C benefited from the new CRM system. They could gather real-time data and the failure rate in accessing customers decreased from 8% to 5%. They could show the importance of customer data to all employees and improved data consistency.

### 5.2 Barriers in Evaluation and Realization

Through case study concerning internet-based travel reservation systems, Chircu and Kauffman identified five barrier categories in the valuation and conversion process of IT investment. But the limitations of their study they described were from the use of the case

study methodology. Therefore those cannot be readily allowed for extensions to all organizations and all IS-related systems.

Due to these reasons, from the analysis of barriers in this paper, we could identify three additional types of barriers such as competence barrier, product barrier, and safety barrier in addition to predetermined five barriers (see <Figure 2>). <Table 6> also summarizes



<Figure 2> Barriers causing value gap in IS valuation



<Table 6> Number of identified factors

Category	Key phrases	SCM	ERP	CRM	Remarks
Competence Barrier	Lack of planning skill	1	5	5	Low skill of system planning, design, acquisition of user's requirement, project planning, and lack of initial consensus
	Low skill for evaluating vendors	1	2		Discontinuous support, educational support, and low consulting skills
	Weakness of decision-making skill	1		4	Over-credulity of IS during decision-making, belief of IT as panacea, and imitated IS investment
Industry Barrier	Non-industrial standardization	2			Non-standardized payment system, trading forms in industry
	Irrational distribution channel	1			Different distribution channel in same industry
	Legacy processes	1			Non-standardized documentation for taxes, etc.
Knowledge Barrier	Low technical understandability	2	1		Lack of system knowledge, dependency of technologies
	Low acceptance of new technology	1	2	2	Low level of understanding system, quality of human resources, and system analysis know-how
Organizational Barrier	Lack of Sponsorship		1	2	Lack of sponsorship in system operating, top manager's and project manager's leadership
	Lack of strategic mind-set	1	2	2	Inapt marketing strategy (paradigm shift), low level of system integration of design and strategy
	Inadequate organization structures	1	1	5	Non-relationship between core process and IT transformation of business process, organizational structure
	Discrete support	1	2		Lack of strategic support in organization
	No evaluation system	1	1	1	No metrics in evaluating effectiveness, analysis of economy and profit, criteria of value assessment
Product Barrier	Improper system			1	Inadequate system for domestic firms
	Difficulties in upgrade			1	Difficult-to-upgrade of customized features
	Weakness of software features		2		Improper features for company
Resource Barrier	Lack of human resources	2	2	1	Non-additional human resources, frequent transfer of human resources, difficult resource outsourcing
Safety Barrier	Worry about efflux of information and security	4			Worry about the outflow of transaction data, drain of company's secret, unsafe payment and security system
Usage Barrier	Difficult-to-use			1	Not easy-to-use of system
	Weakness of sharing the perception		1	2	Differences or gaps in information required, Perceptions of goal and purpose of IT
	Lack of information mind-set	1		4	Not awareness of customer's information, real time data gathering, inactive usage of team leader or managers
	Low involvement of employees		1		Unconsciousness-to-participation as users

For more details, see the appendix A.

results of the analysis and more detailed descriptions are included in Appendix A.

Comparing with knowledge barrier, competence barrier includes lack of planning skill, low skill for evaluating the quality of vendor, lack of competence in decision-making by the hype or over-estimated of IS, and imitated IS investment. Knowledge barrier, on the other hand, covers low level of understandability, low maintenance skill based on the new technologies (specifically IT-related staffs), and inexperience of newly implemented system.

While in decision-making process of SCM and CRM, the hype or over expected outcomes of managers, classified as lack of competence in decision-making, negatively affect the result of system implementation. The pessimistic and quick-tempered conclusion of top manager might bring about the failure of IS (Kalakota and Robinson, 2000). Safety barrier was specifically emphasized in the case of SCM because of their concern for the uncontrollable efflux of corporate information via open network. In non-permitted outflow of company data, managers seriously feel concerns about the transaction data, draining away company's internal secret data to external organizations such as suppliers, and unsafe payment and security system.

In case of safety barrier, the company adopted SCM consider comparatively as more serious barrier than that in another companies implemented ERP or CRM system.

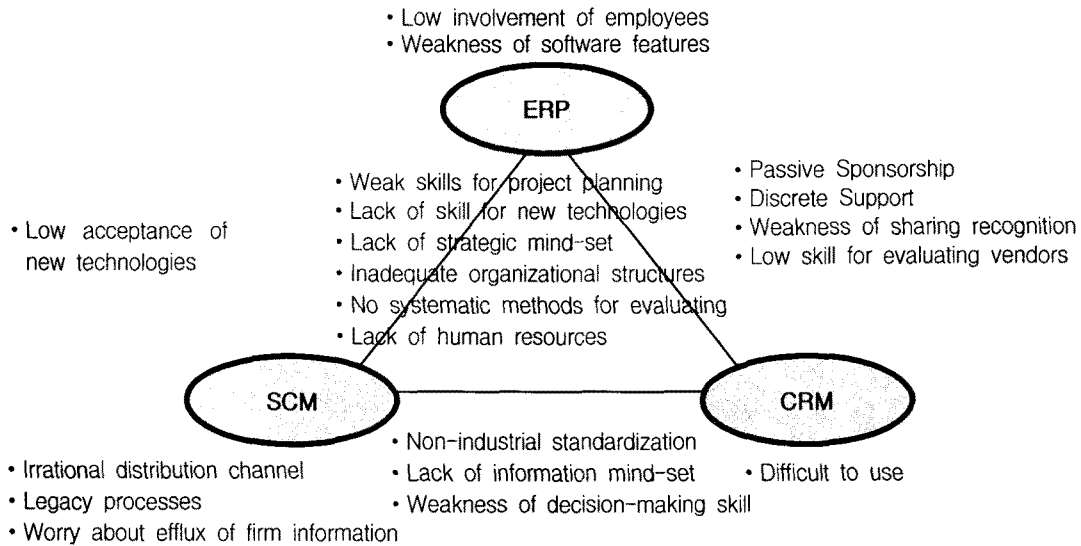
We found out that the safety barrier can affect the performance or valuation of IS owing to low level of data transparency or inconsistency resulted from over-concern of informational safety. Differently from SCM, this barrier in ERP and CRM system as internal system is not emphasized. But there might be a little ambiguous judgment in classification step between organization and safety barrier. Organizational barrier com-

paring with safety barrier embraces such barrier factors as lack of strategic mind-set, non-supportive IT policy of managers, inadequate organizational structure, no metrics for system evaluation and so forth. In this study there exists the conceptual difference between the two originated from the intrinsic characteristics of domestic companies. Therefore we separate safety barrier from organization barrier.

Product barrier was sorted out such as improper system with insufficient features for organization itself, difficulties in upgrade for additional features, and weakness of software features in case of domestic products. Almost all of factors are from the deployment of application package of foreign solution provider, which are occasionally inapt in domestic company environment. As a result of deployment of foreign products, the discrepancy in workflow and typical process increase the difficulties in determining system specifications and make a customization in various part of system, which diminish the advantages of package software. Also in case of domestically developed system, the lack of features required by each part of organization became barrier factors in the process of system. Resource barrier, on the other hand, mostly include the lack of human resource, for example, non-additional human resources for new technology, frequent transfer of human resources, difficult outsourcing of capable resource, and so on.

With comparing with ERP and CRM, company A using the SCM system de-emphasized the importance of product barrier. During the interview, informant of company largely stressed the reengineering of manufacturing process, organizational strategic mind-set, and collaborative issues with supplier as the crucial points.

The barriers commonly mentioned in three cases are identified as lack of project planning skills, low competence in new technology, lack of strategic under-



(Figure 3) Comparison of barriers in IT valuation among each system

standing and mind-set, inappropriate organizational structure, no preparation of appropriate criteria for assessment, and lack of human resources (see <Figure 3>).

Particularly at the early stages of system implementation process, the shortage of project planning skill was also mentioned as one of critical factors that affect the value distinction.

As depicted in <Table 6>, in low skill of project planning, we identified the barrier factors such as lack of system planning, design, acquisition of user's requirement, project planning, and initial consensus, etc.

The lack of skill for new technologies in knowledge barrier are related to system analysis know-how, understanding of new system, and quality of human-resource in engineering side and so forth. Overcoming these barriers requires extensive training and education regarding new technologies.

Common barriers among three systems in organizational barrier, are lack of strategic mind-set, inappropriate organizational structures, and no preparation of performance evaluation criteria. In case of lack strategic mind-set, it might be taken somewhat long time to overcome for the sake of paradigm shifting to new marke-

ting strategy and perceiving necessity of integration of system and whole business strategy. For successful implementation of IS, although business process should be transformed into appropriate organizational structure, yet these companies have commonly some of difficulties in reestablishing it.

The importance of investing in all the required resources is also highlighted by three companies. Without the exact commitment of required human resources and serious consideration of a separation rate of employees, all three of the companies we interviewed have difficulties in operation of newly implemented systems.

## VI. Implications and Conclusions

In this study, we proposed a number of barrier factors that create limits to value, which affect achievement of maximal realized value after successful implementation in each of three case systems such IS system as SCM, ERP, and CRM. In addition, we identified the common barriers among those systems.

From the perspective of research, the results help us develop models for the valuation of information technology and theoretical framework for the management of IT deployment. Researchers can explore each phase of decision-making and system implementation to sort out barriers in each stage. Future research can also focus on the development of appropriate criteria and measurement that are adjustable or resistant to fit into specific situation. The causal relationships between the impacts of IT and barrier factors can also be further analyzed.

Managerial implication of the research is that the barrier factors be carefully taken into account considered both in estimating future benefits and in implementing new information technology in order to determine the true expected value of IS systems. On the one hand awareness of barriers can help them to improve accuracy of estimation. On the other, it provides opportunities to avoid obstacles by using the knowledge as early warning (Chircu and Kauffman, 2000; Davern and Kauffman, 2000).

Manager can also redefine or reassign the roles of IT managers, employees, and partners. For integrating business strategies into IS investment, existing IT assets should be adaptable to new technological environment (Bakos and Treacy, 1986; Davern and Kauffman, 2000).

We identified eight categories of valuation barriers: competence, industry, knowledge, organizational, product, resource, security and usage barriers. Among these barriers, three categories-competence, product, and safety barriers-are newly suggested. In addition six specific barriers commonly existed across the three cases were identified. Those are lack of strategic view, inadequate organizational structure, inappropriate assessment system, and lack of technological skill, shortage of human resources, and low skills for project

planning.

All the three companies mentioned in common the difficulty in making the metrics or criteria for quantifying the impacts of IS investments. In addition, as the effects of IS investment can only be realized in lengthy process, a longitudinal study on this topic can explore this time-lag issue systematically (Clemons and Row, 1991).

The limitations of this research come from the use of case study and qualitative methodology, which cannot be applicable for all companies and all new technologies owing to weakness in generalization (Wolcott, 1994). Also in analysis stage, there was somewhat an ambiguous judgment when we classify the key factors into appropriate barrier category.

In order to generalize our results and verify reliability and validity of the classification of barrier factors, further study needs to extend the outcomes by a structured empirical research. And an in-depth exploration into factors within each phases of IT project evolution will provide us with additional wisdom regarding a successful implementation and overcoming lots of issues during and after system implementation.

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<Appendix A> Categorization of barriers, key phrases and factors

Category	Key phrases	Factors	System
Competence Barrier	Lack of planning skill	<ul style="list-style-type: none"> <li>• Not enough features from users in system design</li> <li>• Lack of skills in collecting customer's data from distributed channels</li> <li>• Lack of requirement analysis in project planning</li> <li>• Not detailed preparation of how to fully use the CRM system</li> <li>• Weakness of skills of analysis from customers reactions</li> <li>• Lack of application skill for existing data</li> <li>• Time consuming for feasibility of whole system</li> <li>• Management-oriented in System design</li> <li>• Over specification from initial step</li> <li>• Schedule delay by extension of scope of customized development</li> <li>• Failure in initial consensus within each unit due to top-down approach</li> </ul>	SCM CRM CRM CRM CRM CRM ERP ERP ERP ERP
	Low skill for evaluating vendors	<ul style="list-style-type: none"> <li>• Not continuous support from developers or solution providers</li> <li>• No continuous educational support about application of new system</li> <li>• Not enough consulting from outside for restructuring</li> </ul>	ERP SCM ERP
	Weakness of decision-making skill	<ul style="list-style-type: none"> <li>• Uncertainty in decision-making (Over-expected)</li> <li>• Belief of CRM as panacea</li> <li>• Overconfidence in CRM solution providers</li> <li>• Imitated IS investment with competitors in industry</li> <li>• Shortage about trust in non-quantifiable evaluation</li> </ul>	CRM CRM CRM CRM SCM
Industry Barrier	Non-industrial standardization	<ul style="list-style-type: none"> <li>• No standardized payment system with law material suppliers</li> <li>• Duplicated tasks and no standardized forms among cooperative companies</li> </ul>	SCM SCM
	Irrational distribution channel	<ul style="list-style-type: none"> <li>• Irrational distribution channel in similar industry</li> </ul>	SCM
	Legacy processes	<ul style="list-style-type: none"> <li>• Inconsistency of documentation for governmental organizations</li> </ul>	SCM
Knowledge Barrier	Low technical understandability	<ul style="list-style-type: none"> <li>• Low level of knowledge about system operating</li> <li>• Not easy-to-maintain due to high dependency on outside technologies</li> <li>• Renewing the skills for new technologies and system environment</li> </ul>	SCM SCM ERP
	Low acceptance of new technology	<ul style="list-style-type: none"> <li>• Low understanding system in working place</li> <li>• Low understanding of employees about IT system</li> <li>• Low performance by human resources joined TFT with low quality</li> <li>• Failure by self-developed system (Necessity of consulting from outside)</li> <li>• Lack of competence in analysis and application of customer's information</li> </ul>	SCM ERP ERP CRM CRM
Organizational Barrier	Lack of Sponsorship	<ul style="list-style-type: none"> <li>• Absence of sponsorship in system operating</li> <li>• Absence of strong leadership of top management</li> <li>• Absence of strong leadership of project managing team</li> </ul>	CRM CRM ERP
	Lack of strategic mind-set	<ul style="list-style-type: none"> <li>• No marketing strategy in Internet age (No paradigm shift)</li> <li>• Focus on only developing the model</li> <li>• Long-term planning without practices</li> <li>• No matching with system design and company's strategy</li> <li>• Failure in making the whole organizational climate for IT</li> </ul>	CRM CRM SCM ERP ERP

<Appendix A> Categorization of barriers, key phrases and factors (계속)

Category	Key phrases	Factors	System
Organizational Barrier	Inadequate organization structures	<ul style="list-style-type: none"> <li>Poor relationship between core process and IT systems</li> <li>Pre-investment without the change of business process</li> <li>Poor relationship in process innovation related to IT systems</li> <li>No customer-centered organization structure and compensation system</li> <li>Shortage of stored data of customers</li> <li>Disapproval from responsible authority</li> <li>Inadequate business and task process for new system</li> </ul>	SCM CRM CRM CRM CRM CRM ERP
	Discrete support	<ul style="list-style-type: none"> <li>Weak of strategic support in stabilizing the operation of systems</li> <li>Lack of educational support after IS investment from in/outside</li> <li>No continuous support of CEO or directors</li> </ul>	SCM ERP ERP
	No evaluation system	<ul style="list-style-type: none"> <li>No methodology in evaluating effectiveness (realized values)</li> <li>Failure in analysis of economy and profit</li> <li>No criteria in evaluating and quantifying the results</li> </ul>	SCM CRM ERP
Product Barrier	Improper system	<ul style="list-style-type: none"> <li>Inadequate system for domestic firms environment owing to the foreign products</li> </ul>	CRM
	Difficulties in upgrade	<ul style="list-style-type: none"> <li>Not easy-to-upgrade into customized features (because of foreign software packages)</li> </ul>	CRM
	Weakness of software features	<ul style="list-style-type: none"> <li>Weak features of home made product</li> <li>Without considering the users preferences and work habits</li> </ul>	ERP ERP
Resource Barrier	Lack of human resources	<ul style="list-style-type: none"> <li>Difficult cooperative activities due to the lack of workers</li> <li>Due to the operating cost, no additional human resources</li> <li>Difficulties in system operation due to frequent employee transfer</li> <li>Necessity of additional human resource</li> <li>Difficulties in outsourcing of human resource</li> </ul>	SCM SCM CRM ERP ERP
Safety Barrier	Worry about efflux of information and security	<ul style="list-style-type: none"> <li>Worry about the outflow of transaction data</li> <li>Worry about the drain of company's secret and operating information</li> <li>Worry about the unsafe payment and security system</li> <li>Worry about the drain of customer's information</li> </ul>	SCM SCM SCM SCM
Usage Barrier	Difficult-to-use	<ul style="list-style-type: none"> <li>Difficulties to use because of complex features</li> </ul>	CRM
	Weakness of sharing the perception	<ul style="list-style-type: none"> <li>More focus on price than service of system</li> <li>Differences or gaps in information required by management and worker</li> <li>Shortage of consciousness about the goal and purpose of IS investment</li> </ul>	CRM CRM ERP
	Lack of information mind-set	<ul style="list-style-type: none"> <li>Shortage of awareness of the importance of customer's information</li> <li>Difficulties in real time data gathering at car service center</li> <li>Lack of awareness of customer data input at the actual spot</li> <li>Lack of skills collecting customer's data at contact point of customer</li> <li>Inactive usage of team leader or managers</li> </ul>	CRM CRM CRM CRM SCM
	Low involvement of employees	<ul style="list-style-type: none"> <li>Lack of consciousness-to-participation of system users in working level</li> </ul>	ERP



## **Barriers Causing the Value Gap between Expected and Realized Value in IS Investment: SCM/ERP/CRM**

Namjae Cho\* · Kiho Park\*

### **Abstract**

Many organizations experience that the value they gained from IT (information technology) investment is lower than they expected prior to the actual implementation of a system - the value gap between expected value and realized value from IT. Research on the barriers to the expectation and realization is of high importance both in practice and in IS research. This study analyzed such barriers observed in three companies that have adopted such IT systems as Enterprise Resource Planning (ERP), Supply Chain Management (SCM), and Customer Relationship Management (CRM) systems each. From analyses of the three companies we specifically identified eight types of barriers: barriers related to industry, organization, knowledge, resource, usage, competence, product, and safety. Common barriers among the three cases were classified into six types, e.g. lack of strategic mind-set, improper organizational structure, lack of human resource, etc. We expect that the results help managers in IS investment to minimize the valuation gap and maximize realized values.

***Keywords: Information systems investments, Barriers, Potential value, Realized value, Value distinction***

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