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Evaluating the Effect of Communication and Shared Knowledge Between IS and Line Organizations on IS Performance

Hyogun Kym

Jiehyun Pyo

Inyoung Choi

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Hyogun Kym
College of Business Administration,
Ewha Womans University,
11-1 Daehyundong, Sodaemunku,
Seoul, Korea 120-750,
TEL & FAX: 82-2-3277-2791
Email: kym@ewha.ac.kr

Jiehyun Pyo
College of Business Administration,
Pennsylvania State University
Email: jyp108@psu.edu

Inyoung Choi
College of Business Administration,
Ewha Womans University,
11-1 Daehyundong, Sodaemunku,
Seoul, Korea 120-750,
TEL & FAX: 82-2-3277-4411
Email: iychoi@ewha.ac.kr

Abstract

Intensified competition, splintered mass market, shortened product life cycles, and advanced technology and automation let companies to increase the IT investment to meet the changes. Although IT investment increased, IS did not show the visible outcome. One of the major interests of IS managers is how to demonstrate the business value of the firm's investment in information technology.

This paper proposes the revised model of Nelson & Cooprider[13] that adds communication as an antecedent of regarding shared knowledge between IS and line groups. Knowledge can be shared through mutual trust, mutual influence and communication between these two groups. The revised model including communication is tested empirically using LISREL.

The results show that shared knowledge has an effect on IS performance mediating with mutual trust, mutual influence and communication. Thus, IS managers should develop mutual trust, mutual influence and communication between these groups to achieve more shared knowledge, which proceeds higher IS performance.

1. Introduction

Intensified competition, splintered mass market, shortened product life cycles, and advanced technology and automation increase the requirement of inter-organizational and intra-organizational mutual relationship. These strategic complexities of business and diverse requirement are increasing the importance of information systems and expanding the investment for IT[22].

However, despite the rising investment on information technology, the performance from IS expenditure resulted in no measurable impact. The facing issue of IS managers has become the demonstration the business value of the firm's investment in information technology. Boynton, Jacobs and Zmud[4] said that the primary means to link IT consistently with a firm's daily core business processes is to distribute IT management responsibilities to line managers. In other words, the close relationship between IS organization and line organization is crucial for meeting the organization's particular needs. Even though IS organization may have differentiated technical knowledge, the incorporation from line organization is essential to meet the organization's particular needs. Therefore, IS architecture should be developed according

to each organization's specific requirements [4] [9] [17]. This means the IS managers are facing the pressure of satisfying the requirements of line managers. Many research studies have tried to investigate how IS organizations can understand the requirements of line organization. Churchman & Schaintblatt[6] suggested that the shared knowledge can remove the barriers of communication between IS and line organization. Henderson[10] argued that building partnership between two organizations is critical to resolve the problems, and that this partnership can be developed and maintained through inter-organizational working relationships.

Previous studies simply defined the factors employed to improve the relationship between IS and line organization. On the other hand, Nelson and Cooprider[13] proposed and empirically validated that shared knowledge is a key factor in influencing IS performance and building the relationship of mutual trust , influence and shared knowledge. The results show that shared knowledge mediates the relationship between IS performance and trust and influence, and that increasing levels of shared knowledge between IS and line groups contribute to increased IS performance. However, their model overlooked the importance of inter-group communication, even though they stressed it as an antecedent of mutual trust and influence [13]. This paper extends the research model of Nelson & Cooprider by adding inter-group communication as an antecedent of mutual trust and influence and tests the modified model empirically.

2. Literature Review

2.1 IT investment and IS performance

IT investment over the last 20 years reaches billions of dollars. While the necessity and substantiality of IT investments have been recognized, the effect of investment on performance has been negative [12].

The Byrd & Marshall's study[5], which used structural equation analysis to empirically test a theoretical model, shows that IT investment does not directly influence organizational performance. This study proposes, instead, that the organizational factors such as relationship improvement between organizational employees and improvement of organizational structure and process should be follow. Kim's study, which classifies the relationship of IT-investment and IS performance into high-medium-low level according to the amount of organization's information requirements, also shows a negative correlation.

However, these two studies only suggest a future direction without specific solutions by solely examining the relationships on the IT investment-organizational performance relationship, Mukhopadhyay et al.'s research[12] provides the solutions defined the IT investment-organizational performance relationship in EDI environment. They suggest that the improvement of communication should proceed to increase IS performance resulting from IT investment. Later study confirms that an organization's communication is a major factor for competitive advantage[20].

2.2 Factors influencing IS performance

Many studies suggest that a good relationship between line and IS group has a positive influence on IS performance. Henderson[10] provides a descriptive model to build partnerships between line and IS managers. According to this model, key determinants of partnerships include shared knowledge, organizational linkage, mutual benefits and commitment. In a study by Aulakh and others, trust is examined as a key contributor for improving the inter-organizational relationship and organizational performance, the relational norms and informal monitoring mechanism are considered ex ante factors for building interorganizational trust and improving marketing partnership. This research proposes

that shared knowledge is an antecedent for organizational relationship improvement, and that interorganizational trust and influence are antecedents for shared knowledge.

2.3 Communication

Previous research confirms that organizational performance has a close relationship with interorganizational relationship improvement, which has major impacts on interorganizational communication. Roger & Allbritton[18] emphasizes the importance of interorganizational communication by demonstrating that facilitated communication due to the advent of such new technology as E-mail increases flexibility and organizational control. Nelson & Cooprider[13] describes interorganizational communication as a crucial factor for building interorganizational mutual trust and influence that should precede shared knowledge.

3. Research Design

3.1 Research model

A major task facing managers of information systems organizations is to develop information systems based on effective relationship between IS and line groups. Figure 1 presents the research model of shared knowledge for increasing organizational performance. In addition, this model extends from Nelson's model by inserting the interorganizational communication as antecedents of mutual trust and mutual influence.

3.2 Research Hypothesis

3.2.1 Communication, mutual trust and influence, and shared knowledge

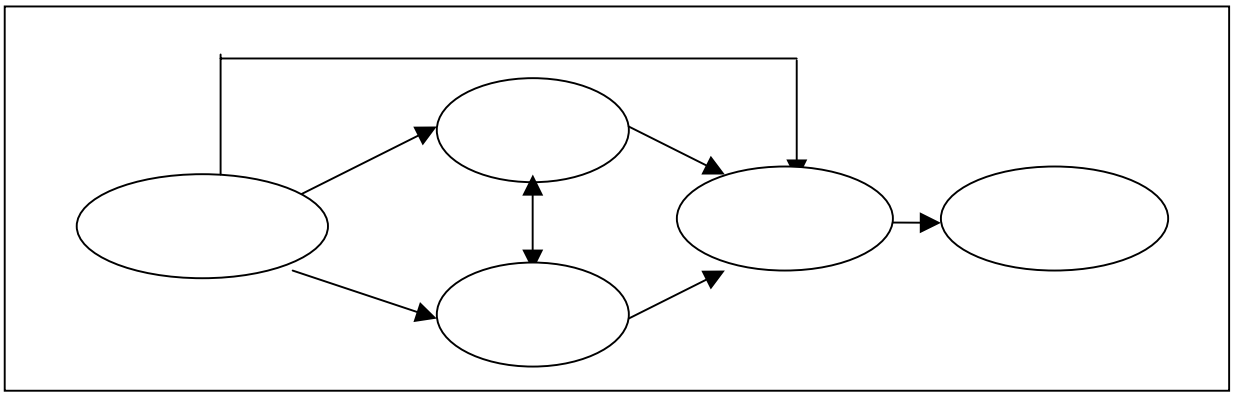
Communication is crucial not only to shared knowledge, but to the establishment of mutual trust and influence between IS and line groups [7]. Also, communication serves to supplement interorganizational shared knowledge, but not to directly influence IS performance[3].

The shared goal and frequent interaction can help build mutual trust, while the frequent communications can lead to mutual influence[19]. In other words, both mutual trust and mutual influence are affected by interorganizational communication, while they themselves somewhat influence each other [13]. Shared knowledge is developed from deeper communication using organizational information systems [20]. Therefore, communication positively influences mutual trust and influence between IS and line organization, and shared knowledge.

H1: Better communication leads to increased levels of mutual trust between IS and line groups.

H2: Better communication leads to increased levels of mutual influence between IS and line groups.

H3: Better communication leads to increased levels of shared knowledge between IS and line



<Figure 0> Research Model>

groups.

H4: Mutual trust and influence between IS and groups has positive correlation.

3.2.2 Mutual trust and shared knowledge

Mutual trust can be defined as shared expectations or interorganizational promises between IS and line groups[1] [8]. Repeated communications develop mutual trust which subsequently leads to sharing of shared knowledge. Mutual understanding gained by interorganizational mutual trust enables the establishment of shared knowledge. Therefore, interorganizational mutual trust has a positive effect on shared knowledge across IS and line groups.

H5: Higher level of mutual trust between IS and line groups leads to increased levels of shared knowledge between IS and line groups.

3.2.3 Mutual influence and shared knowledge

Understanding common goals and forming close working relationship generate mutual influence. Mutual influence is defined as the ability of organizations affecting key policies and decisions of each other [13]. Mutual influence is critical for mutual interests between organizations. Interorganizational mutual influence develops mutual understanding and unity between organizations in different environments by affecting organizational key policies and decisions, and such mutual is pivotal to shared knowledge. Shared knowledge is related to mutual influence derived from frequent and in-depth decision making processes beyond simple information exchange. Therefore, mutual influence between groups will have a positive effect on shared knowledge between IS and line groups.

H6 : Higher level of mutual influence between IS and line groups leads to increased levels of shared knowledge between IS and line groups.

3.2.4 Shared knowledge and IS performance

Communication has an important role for management [16]. But, communication itself cannot fully explain the organizational performance. Sharing knowledge, different from managerial communication in nature, moves beyond the level of simple information sharing. Shared knowledge is built with common language and symbol across groups, and has a positive effect on the level of organizational performance. Shared knowledge is derived from close communication between IS and line groups, and leads to positive organizational performance. For, without sufficient shared knowledge between IS and line groups, IS organization cannot define the business requirements of line groups. Therefore, insufficient share knowledge is negatively related to IS performance [11]. Conversely, shared knowledge between groups will lead to positive IS performance.

H7: Higher levels of shared knowledge between IS and line groups leads to increased levels of IS performance.

4. Methodology

4.1 Respondents

Respondents of the survey research are IS managers from domestic companies registered in public stock markets. They are chosen because of their responsibility for IS performance and their overall understanding and decision-making authority. For internal validity, the broad range of organizations and industry types are considered. In data collection, 200 companies are chosen and distributed for this study according to the proportion of industry. Surveys are provided to the selected companies that agree to participate. Complete surveys went received from a total of 94 peoples for a 47% of respondents rate. <Table 1> shows the industry distribution of firms in the sample.

<Table 1> Industry distribution of participants

Industry	Total	Received
Food & Beverage	13(6.5%)	2(2.3%)
Textile & Cloths	19(9.5%)	10(10.1%)
Chemical & Pharmacy	33(16.5%)	22(22.1%)
Mechanical, Auto, Electronics	67(33.5%)	24(26.2%)
Wood & Paper	8(4%)	4(4.5%)
Construction	13(6.5%)	12(13.1%)
Transportation & Telecommunication	4(2%)	2(2.3%)
Finance & Insurance	30(15%)	14(14.9%)
Others	13(6.5%)	4(4.5%)
Total	200(100%)	94(47%)

4.2 Reliability

Reliability test for each of the constructs measured in the study are performed before testing hypothesis. Reliability assesses the internal consistency of scale items. Cronbach's alphas are used to assess the internal consistency of the scales. As shown in Table 3, the reliability coefficients ranged from 0.65 to 0.84, which is significantly higher than the acceptable level of 0.6 [15]. We therefore conclude that the measures are reliable.

5. Results

The analysis of the model in Figure 1 is performed with a structural equation modeling technique using LISREL. LISREL is an appropriate method for specifying, estimating, and testing hypothesized correlations among a set of substantively meaningful variables. It can evaluate the fitness of the research model as well as the causal relationship among measurement constructs. Data analysis consists of two phases. The first phase is to check the fitness of the research model; the second phase is to verify whether hypotheses are supported in data set.

<Table 2> Reliability Estimates

Construct	Scales	Cronbach's alpha
Communication	6	0.6550
Mutual Trust	4	0.7301
Mutual Influence	4	0.7750
Shared Knowledge	6	0.7470
IS Performance	6	0.8439

While multiple regression, factor analysis or multivariate analysis techniques merely explain the relationship between dependent and independent variables, structural equation analysis technique can extend researcher's explainability and statistical efficiency by examining a set of related variables simultaneously. Therefore, this technique is appropriate in a case where dependent variables later become independent variables later. The correlational matrix for LISREL is presented as Table 4. Using this matrix, the fitness of the model is tested first.

<Table 3> Corelation among constructs

	Communication	Mutual trust	Mutual influence	Shared knowledge	IS performance
Communication	1.00				
Mutual trust	0.6923	1.0000			
Mutual influence	0.6417	0.4155	1.0000		
Shared knowledge	0.6659	0.7954	0.6501	1.0000	
IS performance	0.3071	0.2030	0.2472	0.7871	1.0000

5.1 Model Fitness

The proposed model should be evaluated to determine the fitness of the model. For evaluating the model fitness, the most typical index includes chi-square, GFI(Goodness on Fit Index), AGFI(Asjusted GFI :AGFI), RMSR(Root Mean Square Residual). For the null hypothesis to be true, the model should fit the data well and the probability value should exceed a standard value in the chi-square distribution(such as 0.05 or 0.01). Thus, in a model with good fitting model, the chi-square statistic will have a p-value of at least greater than 0.05 or ideally, above 0.01 [2]. The chi-square for this model with 10 degrees of freedom is significant (chi-square = 12.20, p = 0.067). GFI and AGFI are the next goodness-of-fit measures to be considered. The values for these indices should greater than 0.90 and 0.80 respectively [2]. Table 5 shows that the values of GFI and AGFI for the model are 0.95 and 0.84, which are over the recommended values.

<Table 4> Model fitness

Model fitness	value	
χ^2	12.20(P=0.067)	DF: 10
GFI	0.95	
AGFI	0.84	

5.2 Results and analysis

5.2.1 Communication, mutual trust and mutual influence, and shared knowledge

First 4 hypotheses are established to explain the relationship between communication and mutual trust and influence. The coefficient for the path from communication to mutual trust is 0.66(t=5.77) and has a positive correlation with the significance of 95%. Thus, H1 is directly supported, and this finding indicates that better communication leads to increased levels of mutual trust between IS and line groups.

The coefficient for the path from communication to mutual influence is 0.61(t=5.42) and has a positive correlation with the significance of 95%. Thus, H2 is directly supported, and this finding indicates that better communication leads to increased levels of mutual influence between IS and line groups.

The coefficient for the path from communication to shared knowledge is 0.209(t=1.98) and has a positive relationship with the significance of 95%. Thus, H3 is directly supported, and this finding indicates that better communication leads to increased levels of shared knowledge between IS and line groups.

H4 is established to examine the relationship between IS and line groups. The coefficient for the path from mutual trust to mutual influence is 0.19(t=1.44) and the coefficient for the path from mutual influence and mutual trust is 0.14(t=1.31). This value does not have a positive relationship with the significance of 95%. Thus, H4 is refused.

5.2.2 Mutual trust and shared knowledge

H5 is designed to examine the relationship between mutual trust and shared knowledge between IS and line groups. The coefficient for the path from mutual trust to shared knowledge is 0.31(t=2.02) and has a positive relationship with the significance of 95%. Thus, H5 is directly supported, and this finding indicates that higher level of mutual trust between IS and line groups leads to increased levels of shared knowledge between IS and line groups.

5.2.3 Mutual influence and shared knowledge

H6 is designed to examine the relationship between mutual influence and shared knowledge between IS and line groups. The coefficient for the path from mutual trust to shared knowledge is 0.35(t=2.34) and has a positive relationship with the significance of 95%. Thus, H6 is directly supported, and this finding indicates that higher level of mutual influence between IS and line groups leads to increased levels of shared knowledge between IS and line groups.

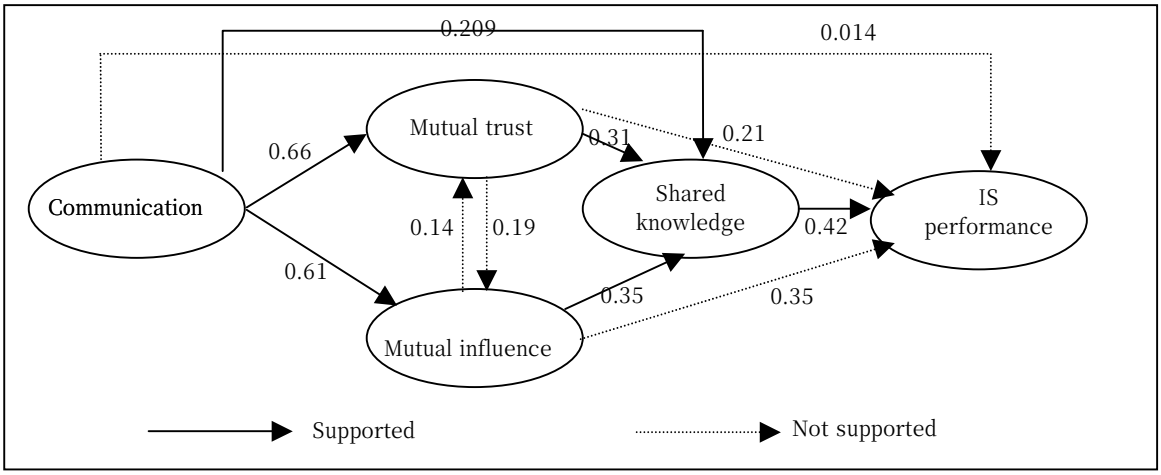
5.2.4 Shared knowledge and IS performance

H7 is examine the relationship between shared knowledge and IS performance. The coefficient for this path from shared knowledge to IS performance is 0.42(t=3.22) and has a positive relationship with the significance of 95%. Thus, H7 is directly supported, and this finding indicates that higher level of shared knowledge between IS and line groups leads to increased levels of IS performance.

The coefficient for the path from communication to IS performance, the path from mutual trust to IS performance, and the path from mutual influence to IS performance is 0.012(t=0.12), 0.21(t=0.23), -0.055(-0.422) respectively. This finding indicates that communication, mutual trust and mutual influence do not have a direct effect on IS performance, although they affect IS performance indirectly through shared knowledge. Above results are summarized in table 6 and figure 2.

<Table 5> Summary of Results

Hypothesis	Path		path coefficient	T value	Hypothesis Support
	From	To			
1	communication	mutual trust	0.66	5.77	support
2	communication	mutual inf.	0.61	5.42	support
3	communication	shred know.	0.21	1.98	support
4_1	mutual trust	mutual inf.	0.19	1.44	Not support
4_2	mutual inf.	mutual trust	0.14	1.31	Not support
5	mutual trust	shred know.	0.31	2.02	support
6	mutual inf.	shred know.	0.35	2.34	support
7	shared know.	IS performance	0.42	3.22	support



<Figure 2> Path Coefficient

6. Conclusion

Demonstrating the business value of information systems is a major issue facing managers of information systems because the performance of information systems is still low compared to increasing IS investment.

This model has implications for both researchers and managers. We propose that good relationship between IS and line organization increases IS performance through shared knowledge, which is affected by mutual trust and mutual influence. Our research model extendeds from Neson & Cooprider's model[13] by empirically testing the relationships among communication, mutual trust, mutual influence and shared knowledge between IS and line groups. In particular this study includes communication, which is an antecedent of both mutual trust and mutual influence. Communication was excluded in Nelson & Cooprider's model even though their model suggested the importance of that variable. The results support our hypotheses in the following: First, good working communication leads to higher levels of interorganizational mutual trust, mutual influence and shared knowledge. Second, higher levels of mutual trust and mutual influence between IS and line groups increase shared knowledge between two groups. Third, higher levels of shared knowledge between IS and line groups leads to better of IS performance. These results suggest that shared knowledge directly affect IS performance, while communication, mutual trust and mutual influence affect IS performance indirectly.

The findings in this study have contributed to the issue of whether IT investment can bring positive outcomes to Korean firms. Through repeated communications, IS and line groups have the opportunity to develop mutual trust and influence. This interaction generates shared information regarding business and IS opportunity. Still, the current study has several limitations that can be cleared by future studies. First, bias of the respondents is not fully excluded since only one person per firm has responded to the survey. Thus, future studies should include a more comprehensive stakeholders including employees of IS group and user groups. Second, IS performance is measured by the cognition of the respondents. However, the respondents are IS managers who are responsible for IS performance evaluation and strategic decision-making in overall IS processes. IS managers are producers rather than consumers. Thus, the subjectivity of the response can undermine the explanatory power, and the future research has to consider complementary measures for IS performance.

Third, sample size is not large enough for analysis with LISREL, even though this method proposes at least 50 as an absolute minimal value. Future research should examine a larger sample including at least above 200 firms, which is more recommendable range.

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