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On IT and IS; Could IS be a source of competitive advantage, and how?

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The purpose of this study is to clarify the process by which companies realize competitive advantage through the application of information systems. We analyzed the questionnaire survey data collected from 174 Japanese manufacturing and non-manufacturing firms, and tested three hypotheses and for the most part supported ; 【Hypothesis 1】 The better the information system, strategies and organizational structure conform, the more effective the system becomes, 【Hypothesis 2】 The more complete the information infrastructure is within an entire company, the higher the effectiveness of the information system becomes, and 【Hypothesis 3】 External environments, technology, strategic orientation and organizational characteristics affect the effectiveness of information systems. In addition, models were presented concerning patterns with which the application of IS can be connected with competitive advantage by conducting path analysis. Thus, the possibility of realizing competitive advantage is suggested when a certain clear pattern is seen in the correlation among variables in the order of the external environment → strategies → top management's recognition of IS → information infrastructure and organizational characteristics → effectiveness of IS.

JEL Classification Number: M10

Key Words: Management Information System, Alignment among Information System, Organization and Strategy, Competitive Advantage

1. Introduction

The purpose of this study is to clarify the process by which companies realize competitive advantage through the application of information systems. It will also clarify the determinants of the effectiveness of information systems and present patterns for application of information systems that can lead to the realization of competitive advantage.

The second section below will present hypotheses and a framework of analysis to be verified through this study. In the third section, the operation-

alization of the constructive concepts of the hypotheses and the survey method will be explained. The fourth section will verify the aforementioned hypotheses by presenting analysis results and show the patterns with which competitive advantage can be realized through the application of information systems. The fifth section will present the conclusion and future tasks.

2. Hypotheses

As many preceding studies have pointed out, alignment between an information system and a company's strategies and organizational structure must be maintained to ensure the effectiveness of the information system¹⁾. To achieve this, it is considered necessary for the entire company to share a vision concerning the role to be played by the information system. It is also essential for the top management of the company to participate in and support the decisions made by the information system section after precisely recognizing the strategic significance of information technology and information systems.

At the same time, the information system must be adequately combined with the business structure to link the effectiveness of the system with competitive advantage. An information system itself as "hardware" and "software" may not necessarily be all that valuable or rare, simply because it can be obtained in the market in many instances. Information systems *per se* may also be relatively imitable. The effectiveness of an information system, therefore, cannot be achieved until the system is integrated into the business structure of the organizational context to which the system is applied²⁾. Hypothesis 1 below is thus presented.

[Hypothesis 1] The better the information system, strategies and organizational structure conform, the more effective the system becomes.

In this study, resources that form the basis of the application of information technology and information systems are referred to as the "information infrastructure." The accumulation of information infrastructures is thought to facilitate the application of information systems within companies and improve the effectiveness of such systems³⁾. Hypothesis 2 below is thus presented.

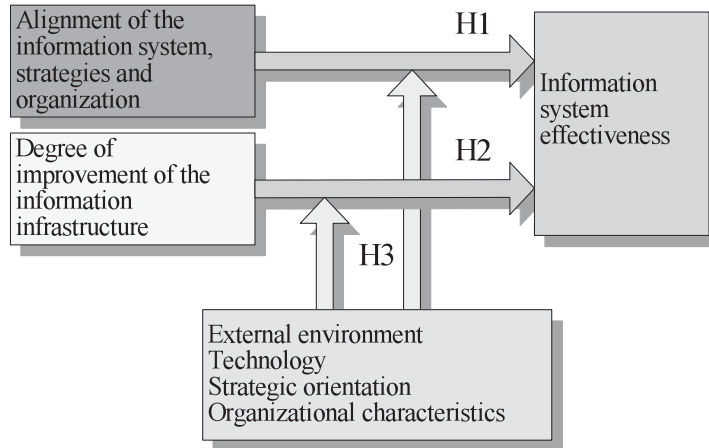
[Hypothesis 2] The more complete the information infrastructure is within an entire company, the higher the effectiveness of the infor-

1) For example, Earl (1996), Inoue (1998) and Kearns (1997)

2) For example, Barney (2001)

3) For example, Earl (1996), Inoue (1998) and Kearns (1997)

Figure 1 . Framework of analysis



mation system becomes.

The effectiveness of an information system is naturally affected by a wide variety of context factors⁴⁾. When a company constructs an information system, there is no guarantee that the system can achieve brilliant results all of the time. It is therefore important to clarify the conditions necessary for a specific information system to be effective. The conditions mentioned here are the external environment surrounding the company, technology, strategic orientation and organizational characteristics. Analysis taking situational factors like these into account is essential in considering the effectiveness of information systems. The following hypothesis is thus presented:

[Hypothesis 3] External environments, technology, strategic orientation and organizational characteristics affect the effectiveness of information systems.

Figure 1 shows the relationship between the above three hypotheses as a framework of analysis.

3. Operationalization of Concepts and the Survey Method

3.1 Operationalization of concepts

The process of the operationalization of concepts consists of four stages – 1) selection of dimensions, 2) selection of dimension indicators, 3) selec-

4) Research results from such a standpoint have been accumulated through a series of studies of the contingency theory. This study does not advocate the contingency approach. It is, however, considered important to clarify under what types of conditions “an information system can be effective” or “application of an information system can be connected with competitive advantage.”

tion of measuring instruments for the indicators and 4) formation of an index⁵⁾.

The following section explains the operationalization of the constructive concepts in this study:

(1) Explanatory variable: information system

An information system (IS) consists of six dimensions— 1) the top management's recognition of IT and IS, 2) the degree of influence of IS on the business structure, 3) the type of IS, 4) the degree of improvement of the information infrastructure, 5) the degree of introduction of IS and 6) the degree of everyday application of IS.

In this study, measurements were made by roughly dividing IS into internal and external IS. More specifically, internal IS includes 1) in-house LAN, intranet and BBS; 2) systems to integrate in-house LAN into business management (e.g., ERP); 3) design, production and processing using computers (e.g., CAD/CAM); and 4) knowledge management systems to integrate and utilize internal knowledge. External IS, on the other hand, refers to the computerization of distribution-related business activities (exchange of electronic data / distribution EDI), computerization of customer management (e.g., POS system, CRM), sharing of information on acceptance / placement of orders, stocks and sales (e.g., CALS, SCM) and electronic commerce (B-to-B EC and information exchange among companies using the Internet).

“Top management's recognition of IT and IS,” which is the first dimension of IS, consists of two indicators—the top management's commitment to IT and IS and the alignment of IT and IS with competitive strategies. Three and five items were measured and aggregated for the respective indicators using the seven-point Likert scale.

The indicator of the second dimension, “the degree of IS influence on the business structure” refers to the compatibility of IS with the business activities. The compatibility of internal IS (4 items) and external IS (4 items), respectively, with the business activities was measured using the seven-point Likert scale. The “strength of the connection with the business structure” was simultaneously measured using the seven-point Likert scale with “direct” and “indirect” at the two poles.

For the third dimension, the “type of IS,” namely the “degree of high-tech application” of the company was used as an indicator and measured using the seven-point SD scale with “low-tech” and “high-tech” at the two poles.

The “degree of improvement of the information infrastructure,” which is the fourth dimension, consisted of two indicators—the “degree of introduction of

5) Nonaka (1974), Hage (1972)

IT equipment” and “IT skills” within the company. The degree of introduction of IT-related equipment in the production, sales and management sections (5 items) and the IT skills of employees (7 items) were measured using the five-point Likert scale.

For the fifth dimension of IS, the “degree of introduction of IS,” the “introduction conditions of IS” was used as an indicator. The introduction conditions of IS for internal (4 items) and external (4 items) application were measured using the seven-point Likert scale.

For the “degree of application of IS,” which is the final dimension of IS, the “degree of everyday application of IS” was used as an indicator. The degree of everyday application of internal (4 items) and external (4 items) IS was measured using the seven-point Likert scale.

(2) Control variables

In this study, the external environment, technology, competitive strategies and organizational characteristics are taken into consideration as four constructive concepts.

The “external environment” consists of two dimensions— 1) instability and 2) heterogeneity of the environment. Employing the “degree of instability” and the “degree of heterogeneity” as indicators, six items were measured using the seven-point Likert scale.

This study covers a broad range of companies in various types of industries. When analysis is conducted, it is necessary to measure the level of technology used by a company in some way or another to consider the effects of differences in the type of business activities carried out by the company. Task uncertainty was therefore adopted as a dimension of technology, with the “duration of performance evaluation” and “difficulty of performance evaluation of business” as indicators. Three items from the former were measured using the seven-point Likert scale, and the latter was measured using the seven-point SD scale with “extremely difficult” and “extremely easy” (to evaluate business achievements) at the two poles.

The dimension of the third control variable, “competitive strategies,” is competition orientation. Two indicators, namely “Porter’s generic strategies⁶⁾” and “factors that are emphasized in competition,” were adopted. The former was measured using the self-type (a method in which respondents identify the type of strategy employed by their company), and the latter was measured using the seven-point Likert scale concerning the cost and price factors (2 items) and individual customer service, quality orientation and individuality-seeking factors (3 items).

6) Porter (1980, 1985)

The concept of “organizational characteristics” consists of two dimensions – 1) organizational structure and 2) organizational process. The dimension of organizational structure consists of three indicators – “centrality,” “formality” and “complexity,” each of which was measured using the seven-point Likert scale. The dimension of the organizational process consists of three indicators – “elimination of conflicts,” “organizational culture” and “leadership.” The seven-point Likert scale was used to measure the degree of elimination of conflicts when facing problems (1 item) for “elimination of conflicts,” the degree of variation adaptive organizational culture (2 items) for “organizational culture” and value infiltration activities (2 items), considerate behavior (1 item) and information behavior (2 items) for “leadership.”

(3) Explained variables: effectiveness of IS

The dimension of “performance,” which is an explained variable, is the “effectiveness of IS.” The indicator of this dimension is the degree of contribution to the introduction of IS and IT management in general. “Improvement of organizational strength through the introduction of IS” (6 items) and “improvement of competitiveness through the introduction of IS” (6 items) were both measured using the seven-point Likert scale.

Table 1 summarizes the operationalization of the above-mentioned concepts⁷⁾.

This study utilizes the Likert scale to determine the average of measured values obtained from multiple measurement instruments and create one aggregate variable. In this case, the reliability of measurement instruments for the indicator must be confirmed. In other words, it is necessary to confirm that internal conformity (or internal reliability) is maintained among multiple measurement instruments (Bohnstedt & Knoke, 1988).

Cronbach’s alpha coefficient, which is generally used as a confidence coefficient to confirm internal conformity among multiple variables, was therefore calculated. In general, it is said that internal conformity among multiple measuring instruments is maintained if the alpha coefficient is 0.7 or higher (Nunnally, 1978). All of the variables met this standard. It was therefore confirmed in advance that there would be no problem even if the mean value of responses measured with multiple measurement instruments was used as both an indicator and a variable for a conceptual dimension.

3.2 Survey method

A mail questionnaire survey method was adopted for data collection. A pi-

⁷⁾ The questionnaire used for data collection is shown in Appendix B. The numbers of questions in the “measurement instrument” column of Table 1 correspond to the numbers in the questionnaire.

Table 1 . Summary of operationalization of concepts

Constructive concept	Dimension	Indicators	Instruments of measurement	
IS	Top management's recognition of IT and IS	Top management's commitment to IT and IS	Top management has taken the lead in directing the improvement of IT within the company. Q10(4): 7 -point Likert scale Top management has correct recognition of the strategic significance of IT. Q10(5): 7 -point Likert scale Top management pays attention to the decisions made by the information system section. Q10(6): 7 -point Likert scale	
		Alignment of IT and IS with competitive strategies	IT-related planning of our company is in conformity with the business plan. Q10(2): 7 -point Likert scale It is difficult for the information system section to correctly understand the business structure. Q10(7): 7 -point Likert scale The IS section is constantly improving systems based on on-site requirements. Q10(8): 7 -point Likert scale Information systems have changed in the past in line with changes in competitive strategies. Q10(9): 7 -point Likert scale Competitive strategies have changed in the past in line with changes in information systems. Q10(10): 7 -point Likert scale	
	Degree of influence of IS on the business structure	Compatibility of internal IS with the business activities	Compatibility of internal IS and the business activities (4 items): internal of Q 7(2): 7 -point Likert scale Compatibility of external IS and the business activities (4 items): external of Q 7(2): 7 -point Likert scale Strength of the connection of IS with the business structure: lower column of Q 9: 7 -point SD scale	
	Type of IS	Degree of high-tech IS application	Is it low-tech or high-tech?: upper column of Q 9: 7 -point SD scale	
	Degree of improvement of the information infrastructure	Degree of introduction of IT equipment	Introduction conditions of IT equipment in the production section (5 items): Q 5 (1): 5 -point Likert scale Introduction conditions of IT equipment in the sales section (5 items): Q 5 (2): 5 -point Likert scale Introduction conditions of IT equipment in the management section (5 items): Q 5(3): 5 -point Likert scale	
		IT skills	IT skills of employees in the production section (7 items): Q 6 (1): 5 -point Likert scale IT skills of employees in the sales section (7 items): Q 6 (2): 5 -point Likert scale IT skills of employees in the management section (7 items): Q 6 (3): 5 -point Likert scale	
	Degree of introduction of IS	Introduction conditions of IS	Introduction conditions of internal IS (4 items): Q 7 (1): 7 -point Likert scale Introduction conditions of external IS (4 items): Q 7 (1): 7 -point Likert scale	
	Degree of application of IS	Degree of everyday application of IS	Degree of application of internal IS (4 items): Q 8 (1): 7 -point Likert scale Degree of application of external IS (4 items): Q 8 (1): 7 -point Likert scale	
	External Environment	Instability	Degree of instability	Instability (6 items): Q12 (7 -12): 7 -point Likert scale
		Heterogeneity	Degree of heterogeneity	Heterogeneity (6 items): Q12(1-6): 7 -point Likert scale
Technology	Task uncertainty	Duration of feedback	Time required to provide feedback on performance (4 items): Q13(1-3): 7 -point Likert scale	
		Difficulty of evaluating business performance	Is it difficult or easy?: Q14(4): 7 -point SD scale	
Competitive strategies	Strategic orientation	Porter's generic strategies Factors that are emphasized in competition	Choose one from cost leadership, differentiation, cost focus or differentiation focus (Q 2) Cost/price factors (2 items): Q11(6,7): 7 -point Likert scale Individual customer service, quality, uniqueness (3 items): Q11(8-10): 7 -point Likert scale	
Organizational Characteristics	Organizational structure	Centralization	Change into a decentralized organization (4 items): Q 4 (1-4): 7 -point Likert scale Centralization (3 items): Q14(1-3): 7 -point Likert scale	
		Formalization	Formalization (3 items): Q14(5), Q11 (11, 12): 7 -point Likert scale	
		Complexity	Complexity: Q11(20): 7 -point Likert scale	
	Organizational process	Conflict resolution	Conflicts resolution by confrontation: Q11(5): 7 -point Likert scale	
		Organizational culture	Variation adaptive culture: Q11(14, 15): 7 -point Likert scale Value infiltration activities: Q11(13, 18): 7 -point Likert scale Considerate behavior: Q11(9): 7 -point Likert scale Information behavior: Q11(16, 17): 7 -point Likert scale	
Performance	Effectiveness of IS	Degree of contribution to management in general through the introduction of IS	Improvement of organizational strength through the introduction of IS (6 items): Q 3 (1-6): 7 -point Likert scale	
		Degree of contribution to management in general through the introduction of IS	Improvement of competitiveness through the introduction of IS (6 items): Q 3 (7 - 13): 7 -point Likert scale	

lot survey was first conducted between May and October 2001 before the main survey to confirm that the content of the questionnaire precisely reflected our intentions.

The subjects of the pilot survey were five companies — a major electric appliance manufacturer (a director in charge of the information system section and a person in charge of the management and planning office) and a major data communication company (a staff member of the management and planning section of the head office) that are headquartered in Tokyo, a major pottery manufacturer (a staff member in charge of the management and planning section of the head office) headquartered in Aichi Prefecture, as well as an information system company (the manager and a person in charge of the information system section) and an information service company (the manager and a person in charge of the information system section) that are headquartered in Hokkaido. In addition, another pilot survey was conducted for the assistant director in charge of information security and information policies at the Ministry of Economy, Trade and Industry.

The questionnaire was sent to the respondents in advance to obtain responses to the questions and comments on survey items and wording, and each respondent was interviewed for one or two hours. Items and wording for the questionnaire were improved by referring to the comments obtained from this pilot survey. The main survey was conducted using the questionnaire that was finalized by repeating such improvements.

The main survey was conducted between May and July 2002. The questionnaire was sent⁸⁾ to the persons in charge of the management and planning sections of 898 companies with management and planning sections (e.g., management and planning office, management and planning department or management planning office of the general affairs department) out of those listed in the First and Second Sections of the Tokyo Stock Exchange. Out of the total of 181 companies who responded, those with non-valid responses were removed, and the responses from 174 companies were eventually used as subjects for the analysis (effective response rate: 19.4%). Out of the 174 companies, 106 were manufacturers and 66 were non-manufacturers (2 did not spec-

8) Items of the questionnaire include both questions regarding the information systems of companies and those regarding company management in general. It is therefore necessary to send the questionnaire to sections from which appropriate responses can be obtained for these questions. After comments about the most appropriate section to send the questionnaire to were obtained through the pilot survey, it was decided to send it to those in charge of management and planning sections. First, companies with management and planning sections were selected using the "Diamond List of Company Workers 2001-edition with all listed companies" (as a result, the number of companies subject to the questionnaire was limited to 898). After that, the questionnaire was sent, in principle, to the highest-ranking people in the management and planning sections.

Table 2 . Distribution of subject companies by type of business

	n	%		n	%
Manufacturing	106	60.9%	Electrical machinery and equipment manufacturing	17	9.8%
Mining	1	0.6%	Transport machinery and equipment manufacturing	9	5.2%
Construction	14	8.0%	Precision machinery and equipment manufacturing	4	2.3%
Food manufacturing	9	5.2%	Other	9	5.2%
Textile industry	4	2.3%			
Pulp/paper/paper product manufacturing	3	1.7%	Non-manufacturing	66	37.9%
Chemical engineering	13	7.5%			
Petroleum/coal product manufacturing	1	0.6%	Electricity/gas/heat/water supply	4	2.3%
Rubber product manufacturing	1	0.6%	Land/sea/air transport	6	3.4%
Ceramic engineering/stone and clay product manufacturing	1	0.6%	Wholesaling	9	5.2%
Steel industry	4	2.3%	Retailing	17	9.8%
			Food service	2	1.1%
			Finance/insurance	19	10.9%
Nonferrous metal manufacturing	5	2.9%	Service	9	5.2%
Metal product manufacturing	4	2.3%	No answer	2	1.1%
Non-electrical machinery and equipment manufacturing	7	4.0%	Total	174	100.0%

ify whether they were manufacturers or non-manufacturers). Table 2 shows the distribution of subject companies by type of industry.

4. Analysis Results

4.1 Verification of hypotheses

To verify the hypotheses presented in Section 2, multiple regression analysis was carried out using the effectiveness of IS as the explained variable, IS as the explanatory variable and the external environment, technology, competitive strategies and organizational characteristics as the control variables⁹⁾.

“Effectiveness of IS,” which is the explained variable, consists of “improvement of organizational strength through the introduction of IS” and “improvement of competitiveness through the introduction of IS.” Analysis was

9) SPSS 11.0J for Windows and Amos 4.0.2 for Windows, which are both multivariate analysis package software, were used for the following analysis.

therefore conducted by employing multiple regression models that utilized the improvement of 1) organizational strength and 2) improvement of competitiveness as explained variables, respectively¹⁰⁾. Tables 3 and 4 present the analysis results.

According to Tables 3 and 4, both models were significant (the F value was 2.915 and 4.345, respectively). Also, the coefficient of determination of the models adjusted for the degrees of freedom was .298 and .426, respectively, and was thought to be adequately interpretable for this type of data.

The analysis results related to **[Hypothesis 1]** “The better the information system, strategies and organizational structure conform, the more effective the system becomes” will be discussed first.

First of all, it can be seen that the “top management’s commitment to IT and IS” has significant and considerable positive interpretability (β is .259 and .380, respectively) in each of the two models. This suggests that alignment with strategies must be fully taken into consideration when introducing IS and IT to make IS effective. At the same time, the effectiveness of IS is ensured when the top management of the company correctly recognizes the strategic significance of IT and takes the lead in improving IT and IS.

Second, according to Table 3, “strength of connection between IS and the business structure,” which is a variable related to the “degree of influence of IS on the business structure,” has significant and positive interpretability ($\beta = .217$) concerning the improvement of organizational strength through the introduction of IS. As mentioned before, IS itself can easily be obtained or imitated. IS is therefore unlikely to become a source of competitive advantage. The analysis results suggest, however, that the difficulty of imitation and rarity of the system itself increase and make it a source of competitive advantage since IS is ingeniously integrated into the business structure through business activities.

Third, Table 4 shows that the “degree of compatibility of internal IS and the business activities” has significant and positive interpretability ($\beta = .297$) in terms of “improvement of competitiveness through the introduction of IS.” This suggests that it is necessary to at least construct internal IS in alignment with the business structure and process to improve competitiveness through the application of IS.

10) To avoid the problem of multicollinearity, the correlation matrix of explanatory variables was examined and the variance inflation factor (VIF) of the regression coefficient was calculated and examined in advance. As a result, it was judged that there was almost no multicollinearity with a serious influence on the accuracy of regression analysis. Also, variables consisting of multiple questions were consolidated, and forced entry multiple regression analysis was conducted. Figures and tables that show the results of multiple regression analysis only contain variables for which the standardized partial regression coefficient (β) was significant at 5 %.

The above discussion supports the validity of Hypothesis 1.

Analysis results related to [Hypothesis 2] “The more complete the information infrastructure is within an entire company, the higher the effectiveness of the information system becomes” will now be discussed.

Table 3 indicates that two variables – “IT skills of the production section” and “IT skills of the sales section” – for “IT skills,” which is an indicator of the improvement of the information infrastructure, have significant and positive interpretability ($\beta = .248$ and $.258$, respectively) in terms of the “improvement of competitiveness through the introduction of IS.” This means that the effectiveness of IS (improvement of competitiveness through the introduction of IS) improves when the IT skills of employees in the production and sales sections are higher.

On the other hand, the “degree of introduction of IT equipment,” which is another variable of the degree of improvement of the information infrastructure, was not found to have significant interpretability in both of the models. There are two ways to explain this finding. One is the possibility that these variables may not necessarily be effective since the necessary information equipment is already commonly used in each section of the company. The other is the possibility that there may be a problem with the “degree of introduction” (percentage of a section that has introduced IT equipment), which is a quantitative index. It may be more appropriate to make measurements by using qualitative indexes such as “To what degree is IT equipment applied in the section?” or “To what degree can the members of the section utilize the IT equipment?”

The above discussion partially supports the validity of Hypothesis 2.

Table 3 . Determinants of the “improvement of organizational strength through the introduction of IS”

	β
Top management’s commitment to IT and IS	.259*
Strength of the IS connection with the business structure	.217*
Complexity of the organizational structure	-.239*
F value	2.915***
Adjusted R ²	.298

* $p < .05$; *** $p < .001$

This table only indicates statistically significant variables.

Table 4 . Determinants of the “improvement of competitiveness through the introduction of IS”

	β
Top management’s commitment to IT and IS	.380**
Compatibility of internal IS and the business activities	.297*
IT skills in the production section	.248*
IT skills in the sales section	.258*
Individual customer service, quality orientation and seeking individuality	.247**
Variation adaptive organizational culture	.289*
F value	4.345***
Adjusted R ²	.426

*p<.05 ; **p<.01 ; ***p<.001

This table only indicates statistically significant variables.

Finally, the analysis results related to **[Hypothesis 3]** “External environments, technology, strategy orientation and organizational characteristics affect the effectiveness of information systems” will be discussed.

First, Table 3 shows that “complexity,” which is one of the indicators for organizational structure, is a variable that is significant and has negative interpretability for “improvement of organizational strength through the introduction of IS” ($\beta = -.239$). This result means that the performance of IS becomes higher when the complexity of the organization is lower.

Next, Table 4 shows that “improvement of competitiveness through the introduction of IS” is likely to be realized in organizations that are strategy oriented, which means that they are oriented toward “individual customers, quality and originality” ($\beta = .247$). This suggests that companies that handle customers individually by CRM or direct marketing and pursue differentiation factors are applying IS more effectively. In other words, the introduction of appropriate IS is essential for realizing improvement of competitiveness through the improvement of end-customer satisfaction by collecting and accumulating individual customer data, analyzing the data using data mining and other methods and responding to the needs of individual customers.

Table 4 also shows that “improvement of competitiveness through the introduction of IS” is likely to be realized in organizations in which an “organizational culture that tolerates changes” is firmly established ($\beta = .289$). The introduction or updating of IS and information technology may somehow involve changes in the existing work processes and structure of the organization. The low psychological barrier of the members of organizations against such changes may accelerate the effective application of IS.

In this analysis, however, the results concerning the influence of the exter-

nal environment and technology on the performance of IS were not necessarily clear.

The above discussion can be said to partially support the validity of Hypothesis 3.

4.2 Clarification of patterns in which competitive advantage can be realized through the application of IS

Through the above verification of hypotheses, the determinants for the effectiveness of IS, or factors that determine the improvement of organizational strength and competitiveness through the introduction of IS, were clarified. Nevertheless, it may be difficult to say that the company has achieved its final goal simply through the introduction of IS unless the effectiveness of IS is connected with competitive advantage in some way, be it direct or indirect, even if effectiveness is realized. Thus, the patterns through which introduction and application of IS can be connected with the competitive advantage of companies will now be discussed¹¹⁾.

Correlation analysis between the effectiveness of IS and management performance was conducted before carrying out the actual analysis. The indexes of management performance used here are 1) the sales volume, 2) (amount of) ordinary profit, 3) ROI, 4) growth rate of sales volume and 5) growth rate of ordinary profit. The “performance (satisfaction) level for the last three years compared with other companies in the same industry” was measured for these five indexes using the seven-point Likert scale, and the mean value was calculated.

Table 5 shows that there is a significant and strong positive correlation (correlation coefficient = .617) between the “improvement of organizational strength through the introduction of IS” and “improvement of competitiveness through the introduction of IS,” which are two variables for the effectiveness of IS. On the other hand, there is absolutely no correlation between the effectiveness of IS (“improvement of organizational strength through the introduction of IS” and “improvement of competitiveness through the introduction of IS”) and financial performance (the correlation coefficients were .001 and .006, respectively). This means that the effectiveness of IS does not necessarily lead to improved management performance.

11) Competitive advantage generally refers to the state in which a company achieves a profit rate higher than the average profit rate of other companies within the same industry or market (for example, Barney (2001) : pp. 8-11 ; Grant (1998) : pp. 174-184 ; Porter (1995) : pp. 9-11).

Table 5 . Correlation between the effectiveness of IS and management performance

	Improvement of organizational strength	Improvement of competitiveness	Management performance
Improvement of organizational strength	1		
Improvement of competitiveness	.617**	1	
Management performance	.001	-.006	1

**p<.01

Also, assuming that there is a difference in the application of IS between companies with high and low management performance, the type of application of IS within companies with high management performance must be a requirement for realizing competitive advantage. It is of course essential to not only examine ideal application of IS, but also consider the external environment, technology, competitive strategies, organizational characteristics and other control variables.

The sample companies were therefore divided into low-performance (n=78) and high-performance (n=79) groups, and multiple regression analysis was conducted using the effectiveness of IS as the explained variable, IS as the explanatory variable and the external environment, technology, competitive strategies and organizational characteristics as control variables. Table 6 present the analysis results.

Table 6 indicates the deference of the determinants of the “effectiveness of IS” between high-and low-performers. The “effectiveness of IS” consists of the “improvement of the organizational strength” and the “improvement of the competitiveness,” and there are both high-and low-group for each, in total, there are four regression models shown in the table.

According to Table 6 all four models are significant (the F value is 3.279, 2.222, 2.324 and 2.666, respectively). The coefficients of determination of the models adjusted for the degrees of freedom were also .491, .341, .362 and .417, respectively, and were thought to be adequately interpretable for this type of data.

Analysis results revealed that the number of explanatory and control variables for which the standardized partial regression coefficient (β) was significant was apparently larger in the high-performance group than in the low-performance group. In the low-performance group, as shown in Table 6, only the coefficient of “strength of connection of IS with the business structure” (.450) was significant. In the high-performance group, however, three coefficients-the “top management’s commitment to IT and IS (.633),” “strength of connection between IS and the business structure (.447)” and

Table 6 . Determinants of the effectiveness of IS; High-and Low-performers

	High-performers (n = 79)		Low-performers (n = 78)	
	Improvement of organizational strength	Improvement of competitive- ness	Improvement of organizational strength	Improvement of competitive- ness
Top management's commitment to IT and IS	.633***	.403*	.001	.101
Compatibility of internal IS and the business activities		-.436		.506*
Strength of the IS connection with the business structure	.024		.405**	
Compatibility of external IS and the business activities		.385*		-.106
IT skills of employee in the production section	.447**	.511**	-.070	.042
Difficulty of evaluating business performance		-.329*		-.005
Information behavior of the leader	.531**		-.166	
Degree of decentralization		.324*		.231*
F value	3.279***	2.222**	2.324**	2.666**
Adjusted R ²	.491	.341	.362	.417

p<.01 ; *p<.05 ; *p<.001

This table only indicates statistically significant variables.

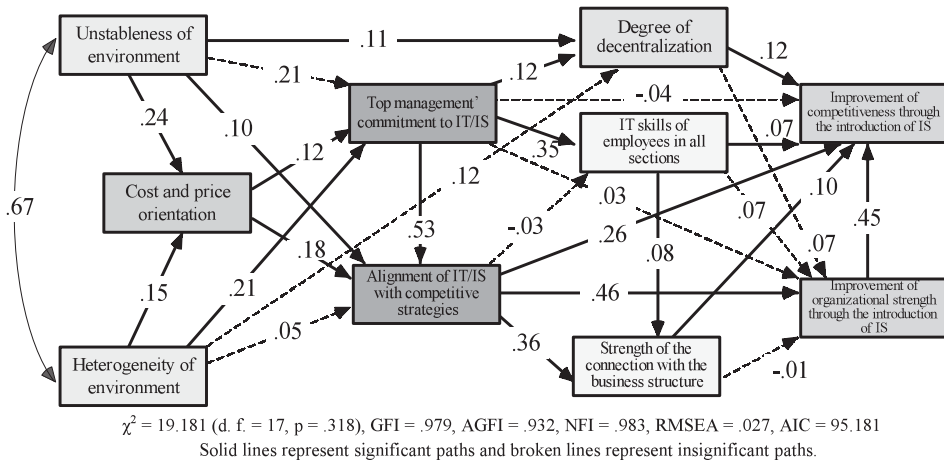
“information behavior of the leader (.531)” – were significant.

In the same way, the low-performance group shown in Table 6 only had two significant coefficients – “compatibility of internal IS and the business activities (.506)” and “degree of decentralization (.231).” Yet, in the high-performance group, there were five significant coefficients – “top management's commitment to IT and IS (.403),” “compatibility of external IS and the business activities (.385),” “IT skills within the production section (.511),” “difficulty in evaluating business performance (.329)” and the “degree of decentralization (.324).”

The above results show that clear patterns can be seen in the high-performance group as opposed to the low-performance group, depending not only on the top management's commitment to IS, the degree of influence of IS on the business structure and the degree of improvement of the information infrastructure, but also on the combination of external environment, strategy orientation and organizational characteristics of the company. Specifically, in case of high-performance group, as many as 8 variables affect to “the effectiveness of IS.” On the other hand, only 3 variables affect to “the effectiveness of IS” for low-performance group.

These facts suggest that there may be a difference in the competitive ad-

Figure 2 . Results of path analysis



vantage of companies resulting from the combination of various factors including the application of IS. So how is the correlation among various factors, including the patterns of application of IS, different between companies that are capable of combining the effectiveness of IS with management performance (high-performance group) and those that are not necessarily capable of it (low-performance group) ? To clarify this point, path analysis was conducted.

4.3 Path analysis

For path analysis, final models were constructed taking various variables, which were considered to have a direct or indirect influence on the effectiveness of IS and competitive advantage of companies, into consideration in addition to the variables that had already been found to have significant influence during the regression analysis, as explained above¹²⁾. Figure 2 shows the results of path analysis¹³⁾.

These analysis results (path model) are statistically significant ($\chi^2 =$

12) More specifically, various statistics that indicate the compatibility between data and models were calculated using Amos 4.0.2, a descriptive type of analysis software, for structural equation models. In other words, the χ^2 value, goodness for fit index (GFI), adjusted goodness for fit index (AGFI), normed fit index (NFI), Akaike's information criterion (AIC), root mean square error approximation (MSEA) and other indexes were calculated and models that fit the most with data were constructed.

13) Analysis was first carried out by developing separate path models for low-and high-performance groups. Since neither of the models was necessarily significant due to the limitation of the sample size, this paper presents the results obtained through path analysis conducted using combined data for low-and high-performance groups. The models presented in this paper were, however, thought to be capable of representing the characteristics of the high performance group to some extent because they are more fit to the data of the high-performance group than to that of the low-performance group. More detailed analysis with additional sample companies is currently being conducted as of the writing of this paper. Although it is still provisional, analysis is currently being carried out for each of the low-and high-performance groups, and the author intends to report more detailed analysis results in the near future.

19. 181, $p = .318$)¹⁴). The fitness of the data to the models was also very favorable (GFI = .979, AGFI = .932, NFI = .963, RMSEA = .027, AIC = 95.181).

The following points were clarified as a result of the analysis :

First, there is a complex causal relationship between the variables that determine the effectiveness of IS (improvement of organizational strength through the introduction of IS and improvement of competitiveness through the introduction of IS).

Second, the external environment surrounding the company and strategy orientation influence the “top management’s recognition of IS.”

For example, uncertainties (environmental instability and heterogeneity) in the external environment have a positive influence on “cost and price orientation,” a subcategory of strategy orientation. This suggests that pressure on “cost reduction” and “provision of products and services at lower prices” increases in relatively uncertain environments. This cost and price orientation also has a positive influence on the “top management’s recognition of IS” (top management’s commitment to IT and IS and alignment of IT and IS with competitive strategies). In other words, the ideal state of the top management’s commitment to IT and IS becomes clear based on clear strategy orientation, which refers to orientation toward costs and prices, and the alignment of IT and IS with competitive strategies can be improved.

Third, as the above multiple regression analysis revealed, the “top management’s recognition of IS” determines the “effectiveness of IS” either directly or indirectly. This means that “alignment of IT and IS with competitive strategies” is directly connected to “improvement of competitiveness through the introduction of IS” and “improvement of organizational strength through the introduction of IS.” At the same time, it can be seen that the “top management’s commitment to IT and IS” strengthens” competitiveness “by strengthening the information infrastructure, that is to say, the “IT skills of all sections.” Also, the “top management’s commitment to IT and IS,” which is in alignment with the external environment and strategy orientation, has an influence on some variables (degree of decentralization) for organizational characteristics, and there is a process with which it can lead to the improvement of competitiveness. Thus, the possibility of realizing competitive advantage is suggested when a certain clear pattern is seen in the correlation among variables in the order of the external environment ➔ strategies ➔ top management’s recognition of IS ➔ information infrastructure and organizational characteristics ➔ effectiveness of IS.

14) Chi-square testing here uses the assumed model as a null hypothesis. An alternative hypothesis (it is impossible to reject the assumed model) is therefore adopted when the probability level (p value) is high.

5. Conclusion

This study has clarified that the alignment of IS, strategies and the organization as well as the degree of improvement of the information infrastructure improves the effectiveness of IS. A hypothetical proposition that “the alignment of IS, strategies and the organization is the determinant of the effectiveness of IS,” which had previously been explained as a generalization or an empirical rule in many cases, was verified and confirmed through this study using empirical data. It was also revealed that strategy orientation and organizational characteristics influence the performance of IS.

In addition, models were presented concerning patterns with which the application of IS can be connected with competitive advantage. That is, concrete guidelines could be presented concerning how a company’s external environment, strategy orientation, organizational characteristics, the information infrastructure and IS itself can be combined to realize a competitive advantage.

The models presented in this study, however, must be further improved. More detailed theoretical clarification will be also necessary in terms of the relationships among the variables shown in the models. The author is currently conducting a more detailed analysis that includes data added after this study was carried out. These details will be reported in the near future.

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References

- Akiba, Futoshi, Motohiro Aihara and Kenta Hiramoto (2001) “Innovation Strategies of Region-based Companies –Development of New Products by Utilization of a Network,” *New Century of Business Administration: Memoirs of 100 Years and Prospects of Business Administration* (collection of business administration papers 71) edited by Japan Society for the Study of Business Administration, pp. 227-235. (in Japanese)
- Barney, Jay B. (2001), *Gaining and Sustaining Competitive Advantage* (2nd. ed.), Prentice Hall.
- Bohnstedt, George W. and Knoke, David (1982), *Statistics for Social Data Analysis* (2nd. ed.), F. E. Peacock Publisher, Inc.
- Earl, Michael J. (ed.) (1996), *Information Management –The Organizational Dimensions*, Oxford University Press.
- Grant, Robert M. (1998), *Contemporary Strategy Analysis: Concepts, Techniques, Applications* (3rd. ed.), Blackwell.
- Hage, J. (1972), *Techniques and Problems of Theory Construction in Sociology*, John Wiley & Sons.
- Hiramoto, Kenta (1995), “Information Systems and Competitive Advantage,” *The Hikone Ronso*, pp. 298, 97-119. (in Japanese)
- Hiramoto, Kenta (2003), “Management Information System and Competitive Advantage: An Empirical Study,” *IT Revolution and Management*, (collection of business administration papers 73) edited by Japan

- Society for the Study of Business Administration, pp.63-76. (in Japanese)
- Inoue, Tatsuhiko (1998), *Evolution of Information Technology and Business Systems*, Hakuto Shobo. (in Japanese)
- Ishizuka, Hiroshi (1996), "Information Technology and Organizational Changes," *Hiroshima Prefectural University Bulletin* 7(2), pp.97-111. (in Japanese)
- Kearns, G. S. (1997), *Alignment of Information Systems Strategy with Business Strategy: Impact on the Use of IS for Competitive Advantage*, UMI (unpublished Ph. D. dissertation).
- Markus, M. L. and D. Robey (1988), "Information Technology and Organizational Change: Causal Structure in Theory and Research," *Management Science*, 34(5), pp. 583-598.
- Nonaka, Ikujiro (1974), *Organizations and Markets*, Hakuto Shobo. (in Japanese)
- Nunnally, J. C. (1978), *Psychometric Theory* (2nd. ed.), McGraw-Hill.
- Orlikowski, W. J., and D. Robey (1991), "Information Technology and the Structuring of Organizations," *Information Systems Research*, 2(2), pp. 143-169.
- Porter, Michael E. (1980), *Competitive Strategy: Techniques for Analyzing Industries and Competitors*, The Free Press.
- Porter, Michael E. (1985), *Competitive Advantage: Creating and Sustaining Superior Performance*, The Free Press.
- Powell, Thomas C. and Anne Dent-Micallef (1997), "Information Technology as Competitive Advantage: The Role of Human, Business, and Technology Resources," *Strategic Management Journal*, 18(5), pp. 375-405.
- Robey, D. (1981), "Computer Information System and Organization Structure," *Communications of the ACM*, 24(10), pp. 679-686.
- Walton, Richard E. (1989), *Up and Running: Integrating Information Technology and the Organization*, Harvard Business School Press.
- Xia, Weidong (1998), *Dynamic Capabilities and Organizational Impact of IT Infrastructure: a Research Framework and an Empirical Investigation*, UMI (unpublished Ph. D. dissertation).

Appendix A List of the companies that cooperated with this survey

Companies that cooperated with this survey (only those companies that permitted the presentation of company names in the announcement of research results) include: Kumagai Gumi Co., Ltd., Penta-Ocean Construction Co., Ltd., Tetra Co., Ltd., Tokyu Construction Co., Ltd., Fujita Corporation, Yahagi Construction Co., Ltd., Wakachiku Construction Co., Ltd., Ezaki Glico Co., Ltd., Key Coffee, Inc., Nichirei Corporation, Mikuni Coca-Cola Bottling Co., Ltd., Rock Field Co., Ltd., Shiseido Co., Ltd., Fujisawa Pharmaceutical Co., Ltd., Japan Energy Corporation, Bando Chemical Industries, Ltd., Aichi Steel Corporation, Kawasaki Steel Corporation, Dowa Mining Co., Ltd., Nippon Mining & Metals Co., Ltd., Furukawa Electric Co., Ltd., Mitsubishi Cable Industries, Ltd., Ishikawajima-Harima Heavy Industries Co., Ltd., Kubota Corporation, Japan Steel Works, Ltd., Anritsu Corporation, Ibiden Co., Ltd., Iwatsu Electric Co., Ltd., Kyowa Electronic Instruments Co., Ltd., Sanyo Electric Co., Ltd., Shinko Electric Co., Ltd., Toshiba Corporation, NEC Corporation, Matsushita Electric Works, Ltd., Kanto Auto Works, Ltd., Suzuki Motor Corporation, Nabco Ltd., Topcon Corporation, Kokuyo Co., Ltd., Yamaha Corporation, Osaka Sanso Kogyo Ltd., Nihon Unisys, Ltd., Shikoku Electric Power Co., Inc., Tokyo Gas Co., Ltd.,

Hankyu Corporation, East Japan Railway Company, Sumitomo Corporation, Tomen Corporation, Mitsubishi Corporation, Jujiya Co., Ltd., Senshukai Co., Ltd., Daidoh Limited, Yellow Hat Ltd., Skylark Co., Ltd., Ringer Hut Co., Ltd., Shizuoka Bank, Ltd., Tokai Tokyo Securities Co., Ltd., Hokuriku Bank Ltd., Orient Corporation, NIPPONKOA Insurance Co., Ltd., Diamond Lease Co., Ltd., Hitachi Capital Corporation, Gakken Co., Ltd., Tokyu Tourist Corporation, Aoi Advertising Promotion Inc., Tokyu Community Co., Ltd.

Appendix B Questionnaire

Questionnaire Survey on Your Company's Information System and Competitive Advantage

Management Information System Research Group, Hokkaido University Graduate School of Economics and Business Administration

I. First, please summarize the business areas of your company.

Q1. Please circle ONE of the items below that best describes the MAIN business area of your company. If your company has two or more main business areas, please circle the one with the highest sales volume.

< Manufacturing >

- | | | |
|--|--|--|
| 1. Agriculture, forestry and fisheries | 2. Mining | 3. Construction |
| 4. Food manufacturing | 5. Textile industry | 6. Pulp/paper/paper product manufacturing |
| 7. Chemical engineering | 8. Petroleum / coal product manufacturing | 9. Rubber product manufacturing |
| 10. Ceramic engineering/stone and clay product manufacturing | 11. Steel industry | 12. Nonferrous metal manufacturing |
| 13. Metal product manufacturing | 14. Non-electrical machinery and equipment manufacturing | 15. Electrical machinery and equipment manufacturing |
| 16. Transport machinery and equipment manufacturing | 17. Precision machinery and equipment manufacturing | 18. Other |

< Non-manufacturing >

- | | | |
|---------------------------------------|--------------------------------|-----------------|
| 19. Electricity/gas/heat/water supply | 20. Land, sea or air transport | 21. Warehousing |
| 22. Telecommunications | 23. Wholesaling | 24. Retailing |
| 25. Restaurant | 26. Finance/insurance | 27. Real estate |
| 28. Service | 29. Other | |

Q2. Which of the following four types do you think most accurately represents the management policy of your company's main business area over the past five years? Even if you feel that two or more types apply, please circle ONLY ONE that is the most applicable.

		Source of competitive advantage	
		Pursuit of low costs	Provision of unique products and services that cannot be offered by other companies at high prices
Size/scope of the target market (e.g., specific products or services, specific groups of customers or specific sales areas)	Only part of the market is the target.	Type 1 () Business to provide products and services at low costs for limited fields and areas of the market	Type 2 () Business to provide products and services with high added value for limited fields and areas of the market
	The entire market is the target.	Type 3 () Business to provide products and services at low costs for a wide range of fields and areas of the market	Type 4 () Business to provide products and services with high added value for a wide range of fields and areas of the market

II. Please tell us about the progress of IT application in your company.

Q3. Please circle the numbers that are most applicable concerning the influence of the introduction of an information system and IT application on business management.

	Completely inapplicable	Almost completely inapplicable	Rather inapplicable	Not sure	Rather applicable	Quite applicable	Completely applicable
1. Information sharing concerning customer information and production has progressed.	1	2	3	4	5	6	7
2. Shared information has begun to influence actual management activities.	1	2	3	4	5	6	7
3. Communications among sections have become smoother through information sharing.	1	2	3	4	5	6	7
4. The speed of on-site decision making has increased.	1	2	3	4	5	6	7
5. The speed of provision of products and services has increased.	1	2	3	4	5	6	7
6. Rationalization and improvement of the efficiency of operation have progressed.	1	2	3	4	5	6	7
7. Planning and analysis abilities have improved.	1	2	3	4	5	6	7
8. New customers have been obtained.	1	2	3	4	5	6	7
9. New services and operations have been started.	1	2	3	4	5	6	7
10. Customer service has improved.	1	2	3	4	5	6	7
11. Production has improved through IT application.	1	2	3	4	5	6	7
12. The competitive position of the company has improved through IT application.	1	2	3	4	5	6	7
13. Business performance of the company has improved in general through IT application.	1	2	3	4	5	6	7
14. The so-called "thinning-out of middle management" (a phenomenon in which middle management becomes unnecessary) has become obvious.	1	2	3	4	5	6	7
15. The shortage of IT-related workers has become obvious.	1	2	3	4	5	6	7
16. The IT-related workforce was actually increased (including outsourcing)	1	2	3	4	5	6	7
17. Costs for the reeducation of employees have increased as a result of IT application.	1	2	3	4	5	6	7
18. The necessity of workers and sections for improvement of customer service has increased.	1	2	3	4	5	6	7
19. Workers and sections for improvement of customer service have actually been increased.	1	2	3	4	5	6	7
20. If anything, the application of IT is uneconomical.	1	2	3	4	5	6	7
21. Communications among members have decreased as a result of IT application.	1	2	3	4	5	6	7
22. The frequency of face-to-face communications has increased as a result of IT application.	1	2	3	4	5	6	7
23. Problems concerning system security have become obvious as a result of IT application.	1	2	3	4	5	6	7
24. There are problems in operations because the versions of applications and operating systems used in the company are not uniform.	1	2	3	4	5	6	7

Q4. Please circle the numbers that are most applicable concerning changes in the management organization that has progressed over the past three years.

	Completely inapplicable	Almost completely inapplicable	Rather inapplicable	Not sure	Rather applicable	Quite applicable	Completely applicable
1. The number of levels in the organization has decreased (the organization has been flattened).	1	2	3	4	5	6	7
2. Delegation of authority to lower organizations has progressed.	1	2	3	4	5	6	7
3. Sharing of responsibility by each person in each department/section has become clear.	1	2	3	4	5	6	7
4. Spin-offs have increased.	1	2	3	4	5	6	7
5. The number of informal teams in which employees participate in has increased.	1	2	3	4	5	6	7

Q5. Please circle the numbers that are most applicable concerning the introduction of IT-related equipment in the (1) production section (e.g., the production/production management section of a manufacturer and the service provision/service provision management section of a non-manufacturer), (2) sales section (sales and marketing) and (3) management section (e.g., personnel, financial or purchases).

	① Production					② Sales					③ Management				
	Not introduced at all	Introduced for 1/4 of the section	Introduced for half of the section	Introduced for 3/4 of the section	Introduced for almost the entire section	Not introduced at all	Introduced for 1/4 of the section	Introduced for half of the section	Introduced for 3/4 of the section	Introduced for almost the entire section	Not introduced at all	Introduced for 1/4 of the section	Introduced for half of the section	Introduced for 3/4 of the section	Introduced for almost the entire section
1. Personal computers (including laptops)	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
2. General-purpose (large) computers	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
3. Mobile phones/PHS terminals	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
4. Mobile-type personal computers/mobile terminals	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
5. Other (specific type of equipment :)	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Q6. What do you think the level of employee IT skills is in the (1) production, (2) sales and (3) management sections? Please circle the number that is most applicable for each section.

	① Production					② Sales					③ Management				
	No one in the section can	About 1/4 of the section can	About half of the section can	About 3/4 of the section can	Most workers in the section can	No one in the section can	About 1/4 of the section can	About half of the section can	About 3/4 of the section can	Most workers in the section can	No one in the section can	About 1/4 of the section can	About half of the section can	About 3/4 of the section can	Most workers in the section can
1. Use e-mail	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
2. Use word-processor and spreadsheet software	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
3. Use database software	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
4. Use the intranet and Internet	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
5. Set up personal computers and install software	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
6. Maintain/manage server machines and networks	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
7. Program with languages (e.g., Visual Basic)	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Q7. (1) What is the extent of the introduction of *internal* and *external* information systems in your company, and (2) how compatible are those information systems with the business structure of your company? Please circle the numbers that are most applicable.

		① Extend of introduction							② Compatibility with the business structure						
		Not introduced at all	Introduced in about 20% of the company	Introduced in about 40% of the company	Introduced in about half of the company	Introduced in about 60% of the company	Introduced in about 80% of the company	Introduced in almost the entire company	Completely inapplicable	Almost completely inapplicable	Rather inapplicable	Not sure	Rather applicable	Quite applicable	Completely applicable
Internal	1. In-house LAN, intranet, BBS	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	2. System to integrate in-house LAN with business management (e.g., ERP)	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	3. Design, production and processing using computers (e.g., CAD/CAM)	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	4. Knowledge management system to integrate and utilize internal knowledge	1	2	3	4	5	6	7	1	2	3	4	5	6	7
External	1. Computerization of distribution-related business activities (exchange of electronic data / distribution EDI)	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	2. Computerization of customer management (e.g., POS system, CRM)	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	3. Sharing of information on acceptance / placement of orders, stocks and sales (e.g., CALS, SCM)	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	4. Electronic commerce (B-to-B EC and information exchange among companies via the Internet)	1	2	3	4	5	6	7	1	2	3	4	5	6	7

Q8. (1) To what extent do you think the information systems referred to in Q 7 are applied on an everyday basis, and (2) to what extent do you think those systems contribute to the general performance (e.g., cost reduction and improvement in productivity) of the main business of your company? Please circle the numbers that are most applicable.

		① Extent of everyday application							② Extent of contribution to business performance						
		Completely unapplied	Almost completely unapplied	Rather unapplied	Not sure	Rather applied	Quite applied	Extremely applied	Completely noncontributory	Almost completely noncontributory	Rather noncontributory	Not sure	Rather contributory	Quite contributory	Extremely contributory
Internal	1. In-house LAN, intranet, BBS	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	2. System to integrate in-house LAN with business management (e.g., ERP)	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	3. Design, production and processing using computers (e.g., CAD/CAM)	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	4. Knowledge management system to integrate and utilize internal knowledge	1	2	3	4	5	6	7	1	2	3	4	5	6	7
External	1. s (exchange of electronic data / distribution EDI)	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	2. Computerization of customer management (e.g., POS system, CRM)	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	3. Sharing of information on acceptance / placement of orders, stocks and sales (e.g., CALS, SCM)	1	2	3	4	5	6	7	1	2	3	4	5	6	7
	4. Electronic commerce (inter-corporate EC and information exchange among companies via the Internet)	1	2	3	4	5	6	7	1	2	3	4	5	6	7

III. Please tell us about your company's general management activities.

Q11. Please circle the numbers that are most applicable concerning the characteristics of everyday management activities.

	Completely inapplicable	Almost completely inapplicable	Rather inapplicable	Not sure	Rather applicable	Quite applicable	Completely applicable
1. Employees exchange information with a wide range of workers outside their own sections.	1	2	3	4	5	6	7
2. Information exchange in writing or by word of mouth is actively carried out.	1	2	3	4	5	6	7
3. Information exchange between the head office and branches is actively carried out.	1	2	3	4	5	6	7
4. Information exchange with affiliate companies is actively carried out.	1	2	3	4	5	6	7
5. Conflicting opinions or views within the company are discussed thoroughly even if it takes time.	1	2	3	4	5	6	7
6. Management with an emphasis on reduction of production or service provision costs is practiced.	1	2	3	4	5	6	7
7. Price competitiveness is important to the management policy of our company.	1	2	3	4	5	6	7
8. Emphasis is placed on individual customer service (one-to-one marketing, handling of individual customers in B-to-B or B-to-C).	1	2	3	4	5	6	7
9. Greater emphasis is placed on the functions and quality of products/service than in other competitive companies.	1	2	3	4	5	6	7
10. Emphasis is placed on provision of unique products/services that are not offered by other companies in the same industry.	1	2	3	4	5	6	7
11. The responsibilities and authorities of management are specifically stipulated in manuals, job descriptions or rules.	1	2	3	4	5	6	7
12. The behavior of employees is strictly managed by superiors or rules.	1	2	3	4	5	6	7
13. The corporate philosophy and policy of management are carried out even at the lowest level of the organization.	1	2	3	4	5	6	7
14. Employees have willingly accepted new information technology.	1	2	3	4	5	6	7
15. Our company has a general atmosphere of seeking out and keeping up with changes.	1	2	3	4	5	6	7
16. Management clearly indicates demands for information("what they want to know") to relevant sections at all times.	1	2	3	4	5	6	7
17. Management voluntarily collects information on events that have occurred within and outside of the organization and the status of the front line.	1	2	3	4	5	6	7
18. Management's ideas, philosophy, principles and beliefs are reflected in various systems of the organization.	1	2	3	4	5	6	7
19. Management makes efforts to increase the sense of unity between employees and the company.	1	2	3	4	5	6	7
20. Employees need expertise and skills that require advanced education and training.	1	2	3	4	5	6	7

Q12. Circle the numbers that are most applicable concerning the current management environment faced by your company.

	Completely inapplicable	Almost completely inapplicable	Rather inapplicable	Not sure	Rather applicable	Quite applicable	Completely applicable
1. Our company is currently facing severe price competition.	1	2	3	4	5	6	7
2. Our company is currently facing severe competition concerning the quality of products/services.	1	2	3	4	5	6	7
3. The purchase behavior of customers is considerably diversified in the industry to which our company belongs.	1	2	3	4	5	6	7
4. The nature of competition is extremely diversified in the industry to which our company belongs.	1	2	3	4	5	6	7
5. Marketing channels that are necessary to reach customers are diverse.	1	2	3	4	5	6	7
6. Our company's products, services and brands are diverse.	1	2	3	4	5	6	7
7. Products/services themselves change (become obsolete) very quickly in the industry to which our company belongs.	1	2	3	4	5	6	7
8. Technologies for provision of products/services change (become obsolete) very quickly in the industry to which our company belongs.	1	2	3	4	5	6	7
9. It is possible to predict exactly what other competitive companies will do next.	1	2	3	4	5	6	7
10. It is possible to predict when the demand for our company's products/services will change.	1	2	3	4	5	6	7
11. Our company is currently facing a threat by newcomers in the market.	1	2	3	4	5	6	7
12. Our company is currently facing a threat by products/services that serve as an alternative to our company's products.	1	2	3	4	5	6	7

Q13. Please circle the numbers that are most applicable concerning the length of time required for performance feedback in your company.

	1 day	1 week	1 month	3 months	6 months	1 year	2 years, or longer
1. How long does it take from the first contact with a customer to the acceptance of an order?	1	2	3	4	5	6	7
2. How long does it take from the introduction of a product/service to the market to the time when it becomes possible to evaluate the success or failure of the product/service?	1	2	3	4	5	6	7
3. What is the minimum length of time for an employee to become a full-fledged worker?	1	2	3	4	5	6	7

IV. Lastly, please give us a summary of your company.

Q15. How do you evaluate the performance (satisfaction) level of the main business area of your company over the past three years? Circle the numbers that are most appropriate in comparison with other companies in the same industry.

	Completely unsatisfactory	Almost completely unsatisfactory	Rather unsatisfactory	Not sure	Rather satisfactory	Quite satisfactory	Extremely satisfactory
1. Sales volume	1	2	3	4	5	6	7
2. Current profit	1	2	3	4	5	6	7
3. Return on investment (ROI)	1	2	3	4	5	6	7
4. Growth rate of sales volume	1	2	3	4	5	6	7
5. Growth rate of ordinary profit	1	2	3	4	5	6	7

