

# **Comparative Analysis of Information Communications Technology Use among Japanese SMEs**

Teruyuki Bunno  
School of Business administration, Kinki University  
tbunno@bus.kindai.ac.jp

Hiroki Idota  
Faculty of Management, Otemon Gakuin University

Masatsugu Tsuji  
Graduate School of Applied Informatics, University of Hyogo

## **1. INTRODUCTION**

Small-and medium-sized enterprises (SMEs) play an important role in the process of Japanese economic development in that they supply high-quality parts to the manufacturing sector. In fact, the unsurpassed quality of Japanese products is largely due to SMEs. In this age of information, Japanese SMEs are required to face global challenges in order to survive. For this reason, they must utilize information and communications technology (ICT), which is key to the renovation of all business activities, especially organization. This paper focuses on one category of innovation, namely, the adoption of a new organizational structure originated by ICT use, and the analysis of factors that promote organizational innovation.

Previous papers by Tsuji *et al.* [2005] and Bunno *et al.* [2006a], [2006b] attempted to determine what factors promote ICT use by SMEs. Field surveys, a mail survey, and in-depth interviews were conducted in two of Japan's most prominent SME clusters, which are located in Higashi-Osaka city in Osaka prefecture, and Ohta ward in the metropolitan area of Tokyo. In 2004, questionnaires were sent to more than 6,000 SMEs in the two clusters, which yielded nearly 1,200 replies. Although ICT use and innovative organizational renovation were not extensive in those SMEs, we also sent a mail survey to some of those chosen as the "top 100 SME business practices in the

Kansai Area” and “the 100 best SMEs, as selected by the Ministry of Economy, Trade, and Industry (METI).” Because these SMEs were thought to use ICT extensively, the same questionnaires were sent to them in December 2005. Of the 336 contacted, 137 replied. The results of this mail survey were summarized in Bunno *et al.* [2007].

The questions sent to the SMEs dealt with (i) company characteristics (amount of capital, number of employees, etc); (ii) managerial orientation, which classifies SMEs as expanding, incentive-providing, adapting, or data-using; (iii) business environment, such as the degree of competition; (iv) purposes of ICT use, such as increasing profits and productivity; (v) expectations for ICT use; and (vi) other factors such as ICT investment in the last fiscal year, and the company's understanding of the importance of ICT in business management. The previous papers present common issues to be analyzed, which are (i) identification of factors that promote ICT use by SMEs, with focus on management type and policies and (ii) construction of an index to measure ICT use among SMEs.

In these papers, the main issues are to construct a suitable index for ICT use by SMEs, and based on this, identify factors which promote ICT use. Tsuji *et al.* [2005] determined that the following items are good indicators of the degree of ICT use by SMEs: (i) the amount of software contributing to efficient utilization of managerial resources and (ii) Internet use. Based on these data, they constructed an index in which the use of simple software or the Internet was worth 1 point, while more complicated and integrated utilization was worth 10. This scoring may seem somewhat arbitrary, but Bunno *et al.* [2006a], considered commonly used software or the Internet, which are used by many small SMEs, to be less important and thus worth fewer points. The points for each type of software were assigned according to the percentage of SMEs that use it, that is, the number of points is reciprocal to percent use. In other words, the more advanced and integrated the use, the more points were assigned to them.

Bunno *et al.* [2006b], [2007] constructed an index to represent the degree of ICT use by SMEs by applying the Analytical Hierarchical Process (AHP).<sup>1)</sup> The index is mainly based on the utilization of (i) hardware and (ii) information systems. The former consists of items such as (iii) the number of PCs owned by an SME, and (iv) the number

of PCs connected by networks such as LAN. The latter includes (v) software use, (vi) Internet use, and (vii) security measures. In addition, the index takes into account (v) software use related to routine and non-routine work, (vi) Internet use related to collecting and sending information as well as e-commerce, and (vii) security use related to technical and organizational measures for security. In order to calculate the AHP level, 11 ICT experts were asked to reply to questions about the importance of those indices and items.

By utilizing these indices, Bunno *et al.* [2006a], [2006b], and [2007] found that one of the most important factors was “ICT expectations,” such as “the restructuring of the whole business process,” which was identified as a significant factor in all of our estimations. SMEs that use ICT extensively believe in its effectiveness and invest a significant amount of money in it. It follows then, that the most important way to promote ICT use among SMEs is to encourage them to be forward-thinking. Once they adopt such an outlook, SMEs can determine the exact ways in which they will introduce and use ICT to meet their specific goals. In addition, a probit analysis revealed that the behavior of the CEO or top management was especially important. Since ICT use is a function of business management and strategy, the decisions made by senior managers are crucial. Even if SMEs operate under optimal conditions, they would not be able to use new technologies to their advantage unless their managers make correct decisions.<sup>1)</sup> We also identified policies that promote ICT investment by SMEs, such as tax and subsidy schemes as well as various deregulation measures.

This paper focuses on factors which promote organization innovation through ICT use by applying the index based on AHP developed by Bunno *et al.* [2006b]. In addition, two groups, one comprising developed SMEs and the other underdeveloped, are compared in one model; the former is represented by SMEs in Higashi-Osaka/Ohta, while the latter by those selected by the IT *Hyakusen* Committee and METI (referred to as the IT *Hyakusen* group). Differences in the use of ICT for organizational innovation are analyzed. In so doing, this paper fully utilizes dummy variables to clarify the differences between two SME clusters; especially in addition to add dummy variables to the constant term, we attach them to coefficients of independent variables.

The paper consists of six sections. In section 2, we discuss the definition of organizational innovation generated by ICT use. The indices of ICT use by SMEs by focusing on AHP are presented in section 3. The estimation variables employed to clarify the difference between the two SME groups are in section 4. In section 5, the estimation method and OLS, logit, and probit estimations are presented, and factors to promote organizational innovation are identified based on survey responses. In section 6, ICT use problems and policies encountered by SMEs are identified. Concluding remarks and suggestions for further analysis are given in the final section.

## **2. ORGANIZATIONAL INNOVATION AND ICT**

### **2.1. Definition of Innovation**

The Schumpeterian definition of innovation covers the following five changes: (i) new product, (ii) new technology, (iii) new materials, (iv) new market, and (v) new form of management.<sup>2)</sup> In the context of innovation, focus has been on the first three factors; in other words, innovation has been discussed in physical technology terms. This is applicable to ICT (Information and Communication Technology). ICT is an entirely new technology that has resulted in products such as PCs, servers, and mobile communications tools. It has also played a part in the development of semiconductors and CPUs as new materials; namely, semiconductors are said to be the “source of industry,” just as steel used to be referred to as the “rice of industry”. ICT also created e-commerce, e-banking, and on-line trading as a new form of market; now we can buy almost all commodities via the Internet. In some areas, the number of transactions taking place on the Internet far exceeds those through traditional trade.

The development of business management has also increased greatly due to ICT. Business organizations have also been undergoing rapid transformation; ICT has created new forms of organization by destroying the traditional ones. The nature of ICT, (i) the ability to outsource work, (ii) economy of speed, and (iii) economy of networking, has transformed the business model. Businesses can promote productivity by delegating their jobs to outside firms with higher productivity and professional skills, but they can

obtain the same information as before through the ICT networks. ICT can also transmit large volumes of information within moments, which allows firms to make decisions quickly. Networks such as the Internet connect governments, research institutions such as universities, firms, and individuals, which results in a dense flow of information. Under these circumstances, new ideas are more easily generated.

## **2.2 Case study: an SME supply chain that promotes exporting**

Although SMEs were once the primary force behind Japanese exporting, large firms eventually took over this role. However, with the spread of ICT, the pendulum appears to be swinging back. This section examines an example of an export-oriented SME that has achieved organizational innovation by using ICT to help it construct its own international supply chain.

### **Profile of the firm**

Dan, a sock manufacturer, wholesaler, and retailer, was established in 1968. It sells through its own shops in London as well as Japan. The company's head office is located in Yao City, a suburb of Osaka. Its total capital is approximately ¥333 million, and it has 82 employees (since it has fewer than 100 employees, it is classified as an SME).

Sock manufacturers are divided into three types of firms: highly competitive national brands, specialized sock makers, and SME sock makers. Dan's socks go for ¥850 to ¥900 at its retail shops. Since most of its customers—mainly schoolgirls—usually make monthly visits to the store, Dan changes its stock every month. Customer information is collected through the firm's POS system, which is directly connected to its distribution centre as well as its suppliers (sock knitters). This business model requires Dan to specialize in a wide range of designs and colours, although it produces relatively few of each item. Dan offers 500 items in 12 colours, for a total of 6,000 products. Management monitors sales at its shops and orders products on a weekly basis, so as to ensure that it can offer a full range of socks to appeal to its young customers.

Unlike many Japanese SMEs that have outsourced production to countries such as China, Dan manufactures mainly in Japan.

### **Supply chain**

Dan's president initially wanted to have factories located near the company's outlets, but this proved unfeasible. However, the company achieved a similar result by using ICT. It built its own supply chain system to transmit customer information through the POS system in real time, and to allow the factories, distribution centres, and marketing departments to receive and utilize this information for decision-making. Dan has 40 knitters under contract, seven of which produce exclusively for the company. These knitters have from 8 to 25 employees and are located close to the distribution centre — typically within a ten-minute drive. Sales information transmitted through the POS is received by the knitters, allowing them to update their own production plans. Dan has installed counters on its suppliers' knitting machines, and production data are automatically transmitted to Dan's managers, and this allows them to monitor the production process. The total cost of constructing the distribution network and the supply chain network was ¥1.350 billion, most of which was provided through government subsidies.

Dan's supply chain is vertically structured, with Dan at the top, and the knitters below. Dan cannot organize upstream networks, such as those that distribute thread, since codes and purchase units vary from one company to another. This makes it impossible for Dan's supply system to manage these transactions.

Dan has unique purchasing and ordering schemes. Rather than ordering socks from its knitters, Dan requires the knitters to determine the amount of products they need to bring to the distribution centre using the information in the POS system. If products go unsold, the knitters must absorb the losses. This high degree of risk aversion regarding inventory precludes Dan from taking advantage of potential opportunities for large sales. After conducting a risk analysis, management chose to emphasize inventory management at the expense of potentially losing large orders. Although this marketing strategy could be criticized for being overly conservative, the

company believes that it is a safe one for an SME.

### **Overseas shops and the international supply chain**

Dan is one of only three Japanese sock makers with overseas retail outlets. The company established Dan Socks, United Kingdom, in London in 2001, and opened its first shop in March 2002. It also sells socks through department stores such as Harrods. Dan's overseas marketing strategy is different from those of other Japanese companies, which tend to rely on large trading firms for overseas sales; it manages its overseas business directly. Prior to opening its London shop, Dan learned important skills from trading firms, including how to carry out tasks internally as much as possible and thereby reduce costs.

The London shops are connected with the company's home offices through the Internet-based POS system. The King Street shop has IBM computers, and the one on Neal Street has Dell computers. Both systems report data such as number of items sold, time of each sale, and customers' gender and age, and can automatically calculate the value-added tax. All data are also transmitted to the knitters via Dan's home offices. If additional socks are needed in London, the knitters can deliver them to the distribution centre at 24 hours' notice. Once the customs declarations for export to the United Kingdom have been completed, the products are sent to Kansai International Airport. Although Dan tried to find suitable knitters in the United Kingdom, their quality did not meet the company's standards. Due to differences between the two countries, such as British regulations that prohibit the importation of assembled machinery from Japan, as well as voltage and safety standards, Dan gave up on its attempts to establish its own factory there. Thus, Dan ships all its products from Japan. The software for the POS system in the London shops was designed by six employees. Dan prefers to hire locally rather than outsource, despite the large cost differential. Although the ability to outsource to foreign manufacturers—one of the commonly cited advantages afforded by IT—purportedly allows firms to increase efficiency, such outsourcing also requires a substantial investment. Hence, Dan has found it more economical to subcontract to local companies in Japan.

### **3. ORGANIZATION INNOVATION IN TWO GROUPS OF SMEs**

#### **3.1 Characteristics of the Higashi-Osaka/Ohta SMEs**

Japanese manufacturing SMEs have supported the entire Japanese “*Monostukuri* (manufacturing)” sector by supplying better parts, and the well-known superiority of Japanese products is based largely on the SMEs’ technological know-how and accumulated skills. In this paper, two groups of SMEs, Higashi-Osaka/Ohta and ICT *Hyakusen*, are compared in terms of organizational innovation initiated by ICT. The former represents developed SMEs, and the latter developing ones. This paper compares these two groups, and examines whether there are any differences in organizational innovation, and what kinds of factors affect the introduction of ICT.

Higashi-Osaka City and Tokyo’s Ohta ward were the objects of our field study, as these are the two largest SMEs clusters that have highly specialized technologies and networks of regional collaboration. The two regions, however, are not equivalent because the characteristics described below differ between them. SMEs in Higashi-Osaka manufacture completed products for the machinery and metalwork industries. More than 100 SMEs in Higashi-Osaka manufacture unique products of their own, and maintain the largest shares of the markets for these products in Japan as well as abroad. Core sectors of SMEs located in Higashi-Osaka include metalware, plastics, electronics, general machinery, and printing/publishing. Although they take contracts for some large “demand transporter” companies such as Panasonic, Sanyo, and Sharp, these SMEs tend to be more independent-minded and less focused on subcontracting than their counterparts in Ohta ward. In Higashi-Osaka, manufacturing SMEs have been constructing local networks through horizontal cooperation among SMEs who produce unique niche products and the accompanying peripheral products. In the Higashi-Osaka cluster, SMEs practice various cross-industrial exchanges so as to assimilate ideas for new technologies, product marketability, etc. These exchanges are strongly oriented towards creating novelty in the market.

Most SMEs in Ohta Ward specialize in metalworking and processing, and are

known to possess a high level of technical capability. Large as well as leading medium-sized companies in the electronic and automobile industries, such as Toshiba, Sony, NEC, and Nissan have benefited by purchasing superior parts from them. Historically, large companies have chosen to locate in Tokyo's metropolitan areas, and this has allowed the SMEs in Ohta Ward to develop strong ties and collaborations with them. This collaboration increases the SMEs' effectiveness, but in turn, restricts their behavior, that is, SMEs in Ohta Ward tend to be passive and accept the role of subcontractor. Taking these differences between the two locations into consideration, the SMEs in Higashi-Osaka can be referred to as a "horizontal cluster," while those in Ohta Ward are a "vertical cluster".

We conducted field surveys, a mail survey, and in-depth interviews in two of Japan's most prominent SME clusters, located in Higashi-Osaka city, Osaka Prefecture, and Ohta ward, in the metropolitan area of Tokyo. In 2004, questionnaires were sent to more than 6,000 SMEs in the two clusters, which yielded nearly 1,200 replies.

### **3.2 Characteristics of IT Hyakusen SMEs**

Higashi-Osaka and Ohta were both found to be less developed with regard to ICT use. To balance the pool, we included other SMEs that used ICT extensively, and the results for the two SME clusters were compared with those obtained by Bunno *et al.* [2006b]. In so doing, we selected SMEs from among those chosen as the "top 100 SME business practices in the Kansai Area" and "the 100 best SMEs, as selected by the Ministry of Economy, Trade, and Industry (METI)," referred to as the "IT *Hyakusen* Group". The former SMEs were selected by the *Kansai* IT Strategic Committee according to their use of ICT for management and business practice, and the latter SMEs were selected from all over Japan according to the same criteria. Some SMEs were selected for both groups. In December 2005, we sent a mail survey to 336 SMEs, including those mentioned above. Of the 336 contacted, 137 replied.

## **4. INDEX OF ICT DEVELOPMENT**

### **4.1. Index Constructed by AHP**

Organizational innovation due to ICT use cannot be assessed with a single index because various factors are involved, including size, industry, business practices, etc. For the surveys, the following indicators of Organizational innovation by SMEs were selected: (i) the number of PCs owned, (ii) number of PCs connected to networks such as LAN, (iii) extent to which software that contributes to the efficient utilization of managerial resources has been implemented, and (iv) Internet use. No explanation is required for (i) and (ii) since these indices are simple quantitative proxies for ICT use: the number of PCs is positively correlated with the degree of business activity transformation. Items (iii) and (iv) are more qualitative measures of ICT use, since having a large number of computers does not necessarily mean that they are being used efficiently. Initially, software packages -- for example, those for accounting and marketing management -- were introduced to promote efficiency for internal tasks. These applications were generally used on individual PCs, without any network connection. Businesses with more advanced ICT systems connect the users of these applications and make shared databases available to them. Item (iii) sheds more light on this. Subsequently, the PCs in one or several locations may become connected to each other, generally through use of a groupware program.

In previous studies by Tsuji *et al.* [2005], [2006] and Bunno *et al.* [2007], the index was constructed in such a way that questions 1 to 8 were worth 1 point, and questions 9 to 13 were worth 10 points. The description of ICT use in questions 1 to 8 was quite different from 9 to 13 since the latter dealt with more complicated and integrated utilization. This scoring may seem somewhat arbitrary. In this paper, we utilize AHP, which is a more rigorous methodology for constructing an index.

AHP was also adopted in the studies by Bunno *et al.* [2006a], [2006b], [2007], in which the steps of the decision-making process were assigned a numerical value. For example, when making a purchase, on what factors does a consumer base the decision? A consumer may consider the price, performance, and design of various alternatives, before making a decision based on his/her own criteria. AHP formulates the mechanism of such decision-making. It allows us to give a numerical value to the subjective parts of the decision making process, which could be applied to a wide array of fields. Normally,

each individual has not one but several evaluation criteria, and these often conflict with each other. In a consumers' decision-making process, the "problem" of what to choose comes first, followed by several "alternatives". AHP attempts to objectify the decision making process, assuming that there are some "criteria" relating the specific "problem" and the "alternatives," using a hierarchical structure.

In this paper, the main factors that boosted ICT use among SMEs are broken down into the following two categories: establishment of hardware and utilization of the information system. The former has two sub-factors, (i) number of PCs owned and (ii) number of PCs connected to networks such as LAN. The latter consists of following three: (iii) the extent to which software that contributes to the efficient utilization of managerial resources has been implemented, (iv) Internet use, and (v) security measures. Moreover, (iii) software use includes that related to routine and non-routine work, and (iv) Internet use includes that related to collecting and sending information as well as e-commerce.

#### **4.2. Software and Internet Use**

The questions about software and Internet use that were included on the survey are explained in this section and listed in Tables 1 and 2, respectively.

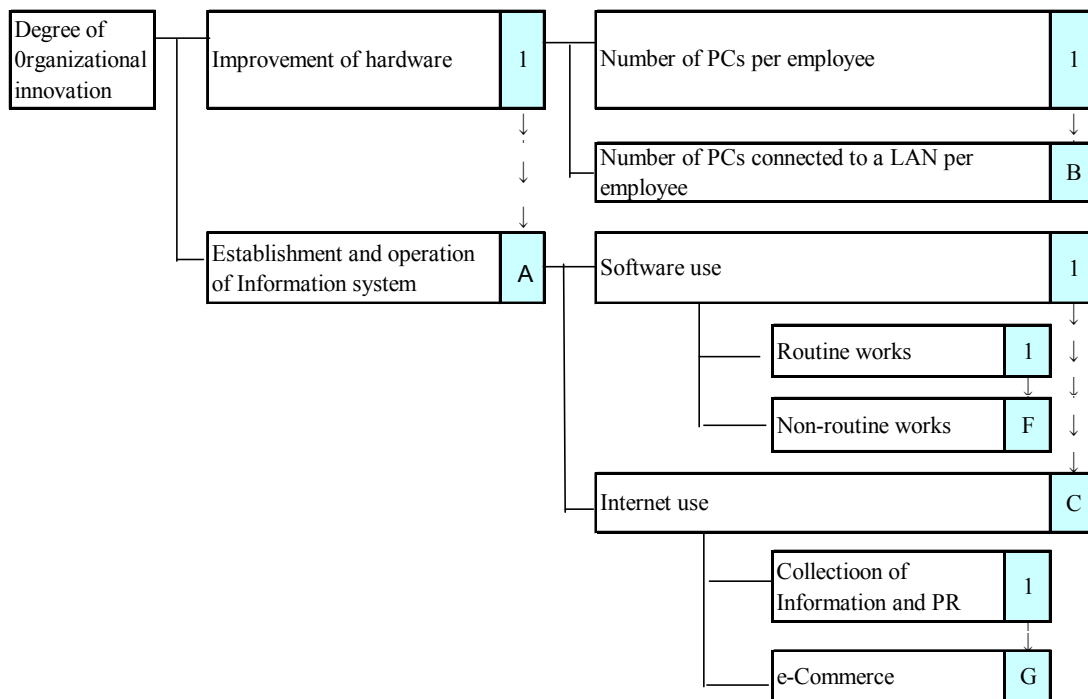
The number of questions on the survey made it impossible to ask pair-wise questions for the determination of relative weights, which is basic to AHP. Therefore, we divided the questions into layers, which are indicated in Figure 1, in order to make the number of questions manageable.

**Table 1 Question on Software Use**

Routine Works
1. Sales management (including POS and bar code)
2. Accounting
3. Payroll management
4. Purchase management
5. Inventory management
6. Design management (include CAD/CAM)
7. Production management
8. Logistics
Non-routine Works
9. Enterprise resource planning (EPR) package
10. Customer Relations Management (CRM)
11. Group-ware (office information sharing system)
12. Sales Force Automation (SFA)
13. Supply Chain Management (SCM)

**Table 2 Question on Internet Use**

Collection /exchange of information
1. Collection /exchange of information
2. PR of company and products
3. Efficient business management
e-Commerce
4. Net-banking
5. e-commerce with companies (BtoB)
6. e-commerce with consumers (BtoC)

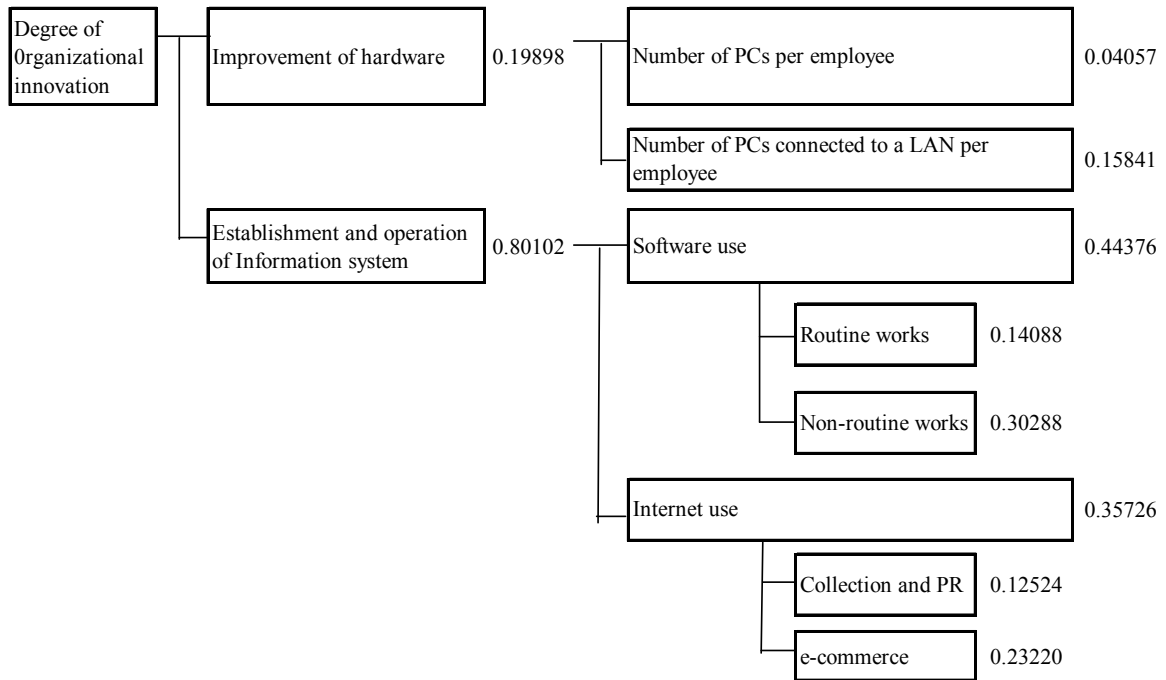


**Figure 1 Layer of Questions in AHP**

#### **4.3. Weight of items derived by AHP**

According to replies from 11 ICT experts, AHP divides the questions into three weighting layers (Figure 2). They rated “establishment and operation of an information system” higher than “importance of hardware;” specifically, the former is 0.801, while the latter 0.199. The former includes factors such as software use and Internet use

(0.444 and 0.357, respectively).

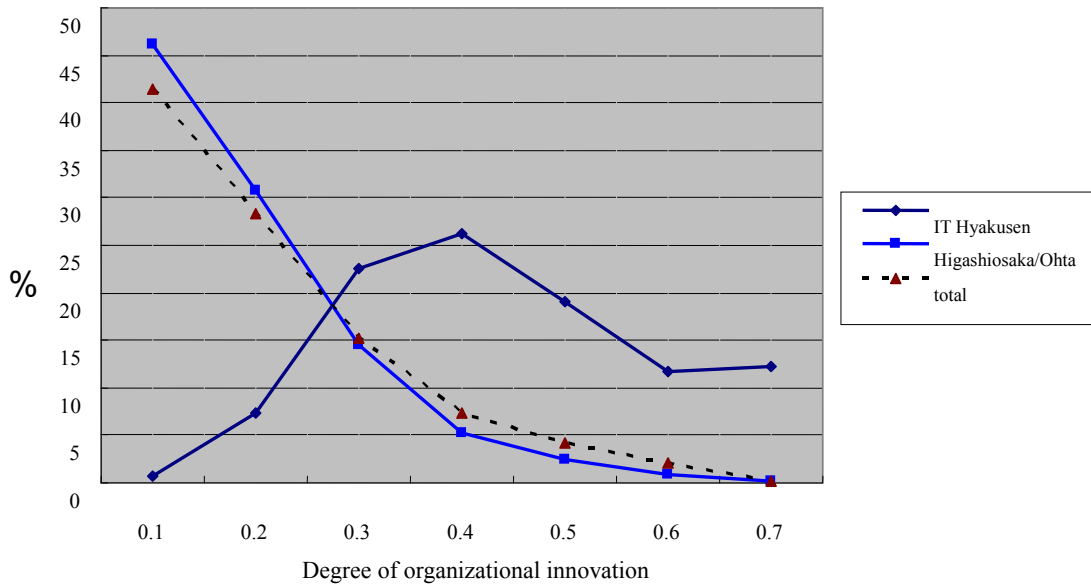


**Figure 2 Weight obtained by AHP**

Next, based on the AHP weighting, we calculated the degree of organizational innovation index for each SME and compared them with those of the two SME groups, Higashi-Osaka/Ohta and IT *Hyakusen*, which were selected by the IT Hyakusen Committee. The results are summarized in Table 3 and Figure 3.

**Table 3 Index of Organizational Innovation of Two Groups**

Degree of organizational innovation	frequency			ratio ( % )		
	<i>ITHyakusen</i>	Higashiosaka/Ohta	total	<i>ITHyakusen</i>	Higashiosaka/Ohta	total
0-0.05	1	553	554	0.73	46.16	41.5
0.05-0.1	10	368	378	7.3	30.72	28.31
0.1-0.15	31	173	204	22.63	14.44	15.28
0.15-0.2	36	63	99	26.28	5.26	7.42
0.2-0.25	26	28	54	18.98	2.37	4.27
0.25-0.3	16	11	27	11.68	0.92	2.02
0.3-0.35	17	2	19	12.24	0.17	0.22
total	137	1,198	1,335	100.00	100.00	100.00
Degree of organizational innovation	Average	Standard Deviation				
<i>ITHyakusen</i>	0.39	0.15				
Higashiosaka/Ohta	0.13	0.11				
total	0.16	0.14				



**Figure 3 Degree of organizational innovation**

The average organizational innovation index value for IT *Hyakusen* and Higashi-Osaka/Ohta are 0.17 and 0.07, respectively, with the former using ICT at a more advanced level. Using this index, we can extract the essential factors promoting ICT use among SMEs.

#### 4.4. Factors That Affect Organizational Innovation

Here, we explain variables that encourage organizational innovation caused by the development of ICT. The questionnaires asked SMEs about (i) company characteristics, (ii) managerial orientation, (iii) business environment, (iv) importance of the introduction of ICT, (v) expected results from ICT use, and (vi) ICT investment in the last fiscal year. A list of these variables and related concrete questions are shown in Table 4.

**Table 4 Result of Component Analysis**

Management Behavior	Common Factors			
	Training/expansion type	Information-sharing type	Adaptive type	Data-using type
There is training and rotation to utilize each employee's ability and knowledge.	<b>0.790</b>	0.127	0.256	0.116
The company offers ICT training to executives, managers and employees.	<b>0.662</b>	0.187	0.202	0.142
Employees are apprised of the company's plan for next 2- 3 years.	<b>0.566</b>	0.306	0.179	0.382
New lines of business are constantly being sought and products developed..	<b>0.453</b>	0.322	0.206	0.198
Company's business performance is disclosed to employees.	0.243	<b>0.684</b>	0.221	0.256
Senior managers are provided broad responsibility and authorities.	0.210	0.355	<b>0.444</b>	0.290
Company studies competitors' mistakes and learn from them	0.180	0.404	<b>0.486</b>	0.280
Company listens to any employee's opinion on how to improve management.	0.261	0.182	<b>0.708</b>	0.276
Past business data is extensively utilized in company's management.	0.175	0.239	0.245	<b>0.567</b>
Monthly business data are utilized to improve management.	0.349	0.217	0.237	<b>0.428</b>
Eigen Value	4.568	1.049	0.774	0.765
Rotated Factor Pattern ( % )	41.045	6.065	3.050	2.214
Cumulative Proportion ( % )	70.670			

The first four of these six variables are explained as follows. First, (i) Company characteristics include variables such as amount of capital, number of regular employees, number of part-time employees, year of business establishment, and the generation of the present owners.

A detailed explanation is required to understand why (ii) Management orientation is considered to be one variable. The questionnaires contain ten items on managers' daily activities (Table 4). Since there is some overlap between the ten questions, an attempt was made to isolate the variables through component analysis. The respondents in the two groups, Higashi-Osaka/Ohta and IT *Hyakusen*, created a pool of data from which the types of management were derived. Four variables, which account for 70.7% of the total responses, were determined in this manner. The first of the questions determine the extent to which an SME is geared toward expansion as well as ICT training and education. This category is referred to as "orientation toward training/expansion". The second category, "orientation toward information-sharing" contains question on the disclosure of business performance. The third variable includes questions on the extent to which firms learn from their mistakes, and on whether top management considers employee suggestions. Since such courses of action are indicative of management's responsiveness, this factor is referred to as "orientation toward adapting". The last variable, "orientation toward data use," contains questions on how firms make use of data for decision-making. A summary of the statistics for all variables is shown in Table 5.<sup>3)</sup>

**Table 5 Summary Statistics**

Variables		Higashiosaka/Ohta		IT Hyakusen		Pooled data	
		Avg.	Std. Dev.	Avg.	Std. Dev.	Avg.	Std. Dev.
Degree of organizational innovation *		0.13	0.11	0.39	0.15	0.16	0.142
Characteristics of firm	Capital ( 10 thousand Yen )	1,963.66	2,612.46	13,356.10	40,297.08	14,070	40,297
	The number of Employees	20.491	31.078	78.938	108.45	48.866	108.45
	The number of Part-time job Employees	5.719	10.778	32.734	74.729	27.639	74.729
	Operation years	44.09	79.863	49.11765	40.24814	7.575	40.248
	CEO's generation	1.79	0.848	2.199	0.091	0.876	0.091
Managerial behavior **	Training/expansion type	0	1	0	1	0	1
	Information-sharing type	0	1	0	1	0	1
	Adaptive type	0	1	0	1	0	1
	Data-using type	0	1	0	1	0	1
Business Environment	We obtain new business partners every year.	3.106	1.33	3.689	1.034	1.31	1.034
	The share of new products and services in our business is larger than before.	3.055	1.214	3.008	1.044	1.014	0.95
	Many purchase orders are repeatedly from the same business partners.	3.932	1.01	3.91	0.95	1.263	1.193
	We can price our own products.	3.323	1.26	3.403	1.193	1.212	1.044
	In recent years, we have not been able to employ younger (30-year-old or younger) workers.	2.938	1.59	2.121	1.214	1.587	1.214
Importance of	the introduction of ICT in business management	3.974	1.122	4.728	0.051	3.968	1.162
Expectation of ICT usage	Increased profit	2.712	0.964	3.44	0.072	1.133	0.072
	Higher productivity of routine works, such as administrative works	3.292	0.828	3.744	0.046	0.895	0.046
	Higher productivity of non-routine business, such as project planning	2.536	0.956	3.069	0.08	1.233	0.08
	Higher speed of decision-making in management and business development	2.867	0.902	3.45	0.064	1.081	0.064
	Restructuring of the whole business process	2.598	0.9	3.252	0.067	1.183	0.067
	Active communication and accumulation sharing of information knowledge	3.012	0.895	3.511	0.06	1.046	0.06
	Precise understanding of customer needs	2.733	0.91	3.183	0.076	1.124	0.076
	Better customer satisfaction by improvement in services and products	2.697	0.918	3.323	0.068	1.143	0.068
Company's IT investment last Fiscal Year ( 10 thousand Yen )		292.735	1,646.98	2,781.20	5,591.50	1,574	22,361
amount of samples		1,198		137		1,335	

Notes: \* shows the result of Analytic Hierarchy Process.

\*\* shows the four types of corporate management which was clarified by the method of the factor analysis.

## 5. ESTIMATION

### 5.1. Estimation of the Differences between Two Groups

The factors that determine the particular scores obtained by each SME were

examined (shown below) by using pooled data from the two groups. First, we examined whether there is a difference between the indices of the IT *Hyakusen* and Higashi-Osaka/Ohta groups by introducing a dummy variable that takes 1 for the former and 0 for the latter. The following regression model was constructed:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \dots + \beta_n X_{ni} + \beta_d ITdummy + e_i, \quad (1)$$

where  $Y_i$  is each SME's index of organizational innovation;  $X_{ji}$  denotes variables such as the characteristics of the SMEs, managerial behaviour, expectations for ICT use, etc.;  $\beta_i$  indicates the coefficients to be estimated; *IT dummy* is a dummy variable attached to the IT *Hyakusen* group that uses  $\beta_d$  as its coefficient; and  $e_i$  is the residual. For this estimation, important variables are selected by checking a covariance matrix. The result of this estimation is summarized in Table 6.

**Table 6 Result of OLS Estimation**

Variables	Coefficient	t-value	
Manufacturing	0.009	1.338	
Retail	0.019	1.401	
Capital	0.016	4.382	***
We can determine prices.	0.006	2.261	**
Frequency of shipment of new products	0.005	1.756	*
Recognition of ICT importance	0.020	6.352	***
Improve profitability	-0.001	-0.380	
Efficiency of routine works	-0.005	-1.291	
Precise understanding of customer needs	-0.004	-1.266	
Amount of ICT investment	0.034	10.825	***
Training/expansion type	0.025	5.975	***
Adaptive type	0.002	0.544	
Data-using type	0.021	4.020	***
Dummy variable attached to IT <i>Hyakusen</i> Group	0.146	12.389	***
Constants	-0.022	-1.085	
$R^2$	0.571		

Note: \*\*\*, \*\*, and \* indicate the significant at the 1, 5, and 10% level.

Table 6 indicates that that the IT *Hyakusen* dummy variable is significant at the 1% level, and a significant difference exists between the average indices of organizational innovation of the two groups; namely, the average index of the IT *Hyakusen* Group is larger than that of the Higashi-Osaka/Ohta Group by 0.26 (See Table 5).

## 5.2. OLS Estimation of factors that affect Indices of Organizational Innovation

In this section, we identify the factors that affect the indices of organizational innovation in the two groups. In so doing, dummy variables are attached to each explanatory variable; again, 1 is taken for the IT *Hyakusen* Group, and 0 for the Higashi-Osaka/Ohta Group. As in the previous procedure, explanatory variables were selected by their degree of correlation with the indices. The variable coefficients estimated without the dummy variables indicated an effect on both groups, while those with dummy variables affected only IT *Hyakusen* Group. The former is referred to as the “common effect,” whereas the latter as the “cross effect”. The following equation is used for estimation:

$$Y_i = b_0 + \sum_{j=1} b_j X_{ji} + \sum_{j=1} b_j' (X_{ji} ITdummy_i) + b_0' ITdummy_i + \varepsilon_i \quad (2)$$

The results of the OLS estimation are given in Table 7. In this estimation, taking the effects on both groups into account, variables related to “Capital,” “Recognition of ICT importance,” “Amount of ICT investment,” and managerial behaviour-related variables such as “Training/expansion type” and “Data-using type” were found to be significant at the 1% level, while “we can determine prices” and “Precise understanding of customer needs” were significant at the 10% level. Regarding the cross effect-related to dummy variables, “Capital” was significant at the 5% level, while “We can determine the process,” “Frequency of shipment of new products,” “Efficiency of routine work,” and “Training/expansion type” were significant at the 10% level.

**Table 7 Factors to affect to Organizational Innovation**

Variables	Coefficient	t-value	
Manufacturing	0.012	1.641	
Retail	0.002	0.138	
Capital	0.023	5.520	***
We can determine prices.	0.004	1.703	*
Frequency of shipment of new products	0.005	1.544	
Recognition of ICT importance	0.020	6.243	***
Improve profitability	-0.001	-0.394	
Efficiency of routine works	-0.006	-1.512	
Precise understanding of customer needs	-0.006	-1.784	*
Amount of ICT investment	0.033	9.814	***
Training/expansion type	0.021	4.987	***
Adaptive type	0.002	0.547	
Data-using type	0.021	4.038	***
Dummy variable attached to IT <i>Hyakusen</i> Group	-0.196	-1.636	
Cross-effect (dummy X variable)			
Manufacturing	-0.026	-1.232	
Retail	0.025	0.801	
Capital	-0.022	-2.374	**
We can determine prices.	0.017	1.877	*
Frequency of shipment of new products	0.018	1.768	*
Recognition of ICT importance	0.022	1.224	
Improve profitability	-0.006	-0.444	
Efficiency of routine works	0.035	1.851	*
Precise understanding of customer needs	0.013	1.026	
Amount of ICT investment	0.005	0.564	
Training/expansion type	0.026	1.653	*
Adaptive type	0.028	1.407	
Data-using type	-0.010	-0.443	
Constant	-0.019	-0.936	
$R^2$	0.591		

Note: \*\*\*, \*\*, and \* indicate the significant at the 1, 5, and 10% level.

In order to identify the factors in more detail, we classified the variables used for estimation into four categories: Groups I, II, III, and IV. Group I variables have a significant cross effect (affect only IT Hyakusen) as well as a common effect (affect both groups); Group II variables have only a cross effect, in other words, they affect only the IT *Hyakusen* Group; Group III variables affect both groups; and Group IV variables are not significant and can be ignored. This classification scheme is shown in Table 8.

**Table 8 Factors Affecting Organizational Innovation (2)**

Variables		Higashioska/Ohta	IT <i>Hyakusen</i>
		Coefficient	Coefficient
I	Capital	0.023	0.001
	We can determine prices.	0.004	0.021
	Training/expansion type	0.021	0.047

I : Variables which cross and own effects are significant

The variables in Group I, such as “Capital,” “We can determine prices,” and “Training/expansion type” were significant to both groups, but affected the IT *Hyakusen* Group more (except for “Capital,” which had a negative coefficient). This implies that larger SMEs in general tend to make more advanced organizational innovations, but for SMEs with developed ICT, such as those in the IT *Hyakusen* Group, the amount of capital is less relevant to innovation. For Group II, “Efficiency of routine work” and “Frequency of shipment of new products” were associated only with the IT *Hyakusen* Group. Well-developed SMEs ship new products to the market more frequently and are eager to seek efficiency through organizational innovation. The Group III variables “Recognition of ICT importance,” “Data-using type,” “Precise understanding of customer need, and “Amount of ICT investment” were common characteristics of both IT *Hyakusen* and Higashi-Osaka/Ohta groups.

### 5.3. Probit/Logit estimation of Factors that affect the Innovation Index

The variables of logit and probit estimations were constructed using data obtained

through the mail survey, and usually take discrete value, which make them better than OLS.

In these estimations, the SMEs were divided into two categories, ones with a larger index than the average, and ones with smaller. The equations to be estimated are as follows:

$$\text{Logit model: } F(\mathbf{x}_i, \boldsymbol{\beta}) = \frac{\exp(\mathbf{x}_i \boldsymbol{\beta})}{1 + \exp(\mathbf{x}_i \boldsymbol{\beta})} \quad (3)$$

$$\text{Probit model: } F(\mathbf{x}_i, \boldsymbol{\beta}) = F(\mathbf{x}_i \boldsymbol{\beta}) \quad (4)$$

where F denotes the standard normal distribution function, and the  $x_i$  variables are similar to those in the OLS estimation.

**Table 9 Logit/ Probit Estimation**

Variables	Logit-model				Probit-model			
	coefficient	z-value		Marginal effect	coefficient	z-value		Marginal effect
Manufacturing	0.271256	1.36		0.057283	0.153233	1.28		0.054518
Retail	0.730847	1.56		0.128956	0.430335	1.59		0.133835
Capital	0.314020	2.90	***	0.064808	0.187331	3.00	***	0.065617
We can determine prices.	0.119759	1.71	*	0.024716	0.073819	1.76	*	0.025857
Frequent shipment of new products	0.097406	1.26		0.020103	0.060102	1.30		0.021052
Recognition of ICT importance	0.193460	2.04	**	0.039927	0.119398	2.07	**	0.041822
Improve profitability	0.131059	1.29		0.027048	0.079551	1.31		0.027865
Efficiency of routine works	-0.021216	-0.19		-0.004379	-0.016012	-0.23		-0.005609
Precise understanding of customer needs	-0.068534	-0.71		-0.014144	-0.031692	-0.55		-0.011101
Amount of ICT investment	0.641695	6.30	***	0.132434	0.372755	6.64	***	0.130566
Training/expansion type	0.208766	1.87	*	0.043085	0.128950	1.93	*	0.045168
Adaptive type	0.005962	0.05		0.001230	-0.000197	0.00		-0.000069
Data-using type	0.368409	2.63	***	0.076032	0.227890	2.72	***	0.079824
Dummy variable attached to IT Hyakusen Group	2.177614	3.55	***	0.293446	1.185455	3.93	***	0.298379
Constants	-2.937576	-4.99	***		-1.786065	-5.03	***	
Log likelihood	-412.66702				-412.13722			

Note: \*\*\*, \*\* and \* indicate the 1%, 5% and 10% significant level.

The results of the Logit and Probit estimations are shown in Table 9. They are similar to the OLS estimation in the previous section. “Amount of capital” (marginal effect: 0.0648 and 0.0656), “Amount of ICT investment” (marginal effect: 0.1324 and 0.1306), “Data-using type” (marginal effect: 0.0760 and 0.0798), and IT *Hyakusen* dummy (marginal effect: 0.2934 and 0.2984) were all significant at the 1% level. “Recognition of ICT importance” (marginal effect: 0.0399 and 0.0418) was significant at the 5% level. In addition, “We can determine prices” (marginal effect: 0.0247 and 0.0259) and “Training/expansion type (marginal effect: 0.0431 and 0.0452) was significant at the 10% level. These results are consistent with those of the OLS analysis.

## **6. PROBLEMS WITH ORGANIZATIONAL INNOVATION USING ICT**

### **6.1. Problems with Organizational Innovation Using ICT**

Thus far, analysis has focused on factors that encourage organizational innovation through ICT use. This section examines innovations in business organization and ICT-related issues that SMEs are facing, so as to identify problems and recommend policies that could be implemented to solve them.

The kinds of obstacles faced by the SMEs in each category of the developed (IT *Hyakusen*) and the developing (Higashi-Osaka/Ohta) groups were also examined. The obstacles are summarized in Q9 of questionnaire. We utilized the same analysis as in the previous section, with the addition of two kinds of dummy variables: the IT *Hyakusen* dummy was used as a constant, and each variable; the latter is also referred to as the cross effect. The results of the OLS estimation using equation (2) are shown in Table 10. A list of the independent variables can be found in Table 11.

**Table 10 Problems of Organizational Innovation by SMEs**

Variables	Coefficient	t-value	
<b>Common effect</b>			
Lack of leadership regarding ICT use	-0.025	-3.139	***
Unclear objectives of management	0.014	1.696	*
ICT has been introduced without any restructuring of works.	0.015	1.694	*
Lack of employees who can use ICT.	0.007	0.887	
Lack of workers' ICT Knowledge	0.010	1.302	
Lack of workers' cooperation with ICT usage at the office.	0.007	0.551	
Lack of ICT advisers	-0.008	-0.998	
We leave everything of ICT introduction to ICT adviser(s).	0.031	2.177	**
We leave everything of ICT introduction to ICT makers	0.009	0.834	
Lack of software that we need	0.017	2.025	**
We can't keep up with technological innovation.	-0.026	-2.917	***
Each business partner wants to adopt its own ICT systems.	0.046	4.895	***
ICT investment does not yield explicit profit.	-0.013	-1.626	
ICT investment is very costly.	0.022	2.872	***
We have deep concern for information security, if ICT is introduced.	0.051	6.831	***
It takes time to introduce ICT.	-0.024	-2.290	**
Others	-0.032	-1.655	*
IT <i>Hyakusen</i> dummy variable	0.302	15.589	***
<b>Cross-effect (dummy X variable)</b>			
Lack of leadership regarding ICT use	-0.013	-0.391	
Unclear objectives of management	-0.043	-1.676	*
ICT has been introduced without any restructuring of works.	-0.029	-1.028	
Lack of employees who can use ICT	-0.013	-0.527	
Lack of employees' ICT Knowledge	-0.060	-2.315	**
Lack of workers' cooperation with ICT usage at the office.	0.095	1.763	*
Lack of ICT advisers	0.033	0.928	
We leave everything of ICT introduction to ICT adviser(s)	-0.085	-1.450	
We leave everything of ICT introduction to ICT makers	-0.100	-2.101	**
Lack of software that we need	0.026	0.914	
We can't keep up with technological innovation	0.042	1.303	
Each business partner wants to adopt its own ICT systems.	-0.043	-1.462	
ICT investment does not yield explicit profit.	-0.001	-0.019	
ICT investment is very costly.	-0.010	-0.424	
We have deep concern for information security, if ICT is introduced.	-0.060	-2.764	***
It takes time to introduce ICT.	0.015	0.313	
Others	0.110	2.488	**
Constants	0.107	18.94	***
R <sup>2</sup>	0.390		

Note: \*\*\*, \*\*, and \* indicate the significant at the 1, 5, and 10% level.

**Table 11 Problems of Organizational Innovation by SMEs (2)**

Variables		Higashioska/Ohta	IT <i>Hyakusen</i>
		Coefficient	Coefficient
I	Unclear objectives of management	0.014	-0.029
	We have deep concern for information security, if ICT is introduced.	0.051	-0.034
	Others	-0.032	0.078

I : Variables which cross and own effects are significant

The information in Table 10 was used to identify the issues for organizational innovation. Since the dependent variable is the degree of organizational innovation and the dependent variables the kinds of obstacles, coefficients are expected to be negative, that is, because of these serious obstacles, SMEs have been reluctant to introduce ICT. The positivity of coefficients, on the other hand, can be interpreted in such way that even if SMEs have these problems, they make effort to introduce ICT in order to solve them. In this sense, the negativity (positivity) of coefficients implies negative (positive) reasons of decision-making of towards ICT investment.

As in the previous section, related variables are classified into four categories by significance. The Group I variables, “Unclear objectives of management” and “ICT security is a major concern” are significant to both the common and cross effects. Care should be taken to the following: coefficients of the cross effect are negative, while those of the common effect positive. Since the latter shows those of Higashi-Osaka/Ohta SMEs, while those of IT *Hyakusen* are expressed by totals of two effects, that is, IT *Hyakusen* SMEs have negative coefficients with respect to these two variables.<sup>4)</sup> The opposite signs of these variables can be interpreted as follows: IT *Hyakusen* SMEs are already achieved the higher level of ICT use, and these two might not be major reasons to introduce ICT, while Higashi-Osaka/Ohta SMEs are relatively at the low level of ICT use and they strongly concern about these problems and thus have been positively introducing ICT.<sup>5)</sup> The second category was more significant for the IT *Hyakusen* Group: “Employees’ lack of ICT knowledge,” “Introduction to ICT is left up to the hardware/software makers,” and “Lack of workers’ cooperation with ICT

usage at the office”. The first two have negative sign, which implies that they are less serious issues for the IT *Hyakusen* Group, but the last one is positive; this problem is more important for them. The eight variables in Group III are issues common to both groups. A positive (negative) sign implies that this variable is more related to SMEs with larger (smaller) innovation indices. “ICT has been introduced without any restructuring of work,” “Introduction of ICT is left to the ICT adviser(s),” “Lack of necessary software,” “Each business partner wants to adopt its own ICT systems,” and “ICT investment is very costly” are more serious to SMEs with larger indices. On the other hand, “Lack of leadership regarding ICT use,” “We can't keep up with technological innovation,” and “It takes time to introduce ICT” are more important problems for SMEs with smaller indices. The last three variables in particular seem to be common hurdles for the introduction of ICT into small SMEs.

The problem common to both groups is “Lack of leadership regarding ICT use”, which indicates that Japanese SMEs still need top management with strong ICT leadership. The surveys revealed that both ICT knowledge for employees and ICT leadership for top management need to be improved, which implies that the problem is related to human resources. This is key to policies geared toward promoting ICT in SMEs.

## **6.2. Policies Advantageous to Innovation as Suggested by Empirical Research**

This section analyzes the kinds of policies that are required to encourage adoption of organizational innovations. In order to examine this problem, the OLS model [equation (2)] was used. The results of our estimations are shown in Tables 12 and 13.

“Tax exemptions for ICT investments,” “Grants and other financial support for ICT investments,” “Commendation of small company business models that make use of ICT,” “Introduction of an e-bidding system,” “Low-interest loans for ICT,” and “Low-interest leases for ICT,” and “Deregulation” were policies desired by both SMEs groups, and were positively related to the innovation index. The IT *Hyakusen* Group was particularly concerned about the e-bidding system because it is related to a higher rate of ICT use. In contrast, they are less interested in subsidies, such as tax exemption,

and training and education. These are consistent within the IT Hyakusen Group, since they have already achieved a certain level of organizational innovation.

**Table 12 Policy Desired for Organizational Innovation**

Variables	Coefficient	t-value	
<b>Common effect</b>			
Opening of ICT seminars	0.007	0.969	
Implementation of education for PC operation	-0.002	-0.205	
Adviser system	0.005	0.656	
Low-interest loans for ICT	0.016	2.090	**
Low-interest lease for ICT	0.016	2.199	**
Tax exemptions on ICT investment	0.064	8.887	***
Support for opening new portals	-0.002	-0.132	
Deregulation	0.039	4.469	***
Commendation of small company business models that make use of ICT	0.059	3.546	***
Introduction of e-bidding system	0.031	2.482	**
Others	0.012	0.834	
Dummy variable attached to IT <i>Hyakusen</i>	0.277	15.199	***
<b>Cross-effect (dummy X variable)</b>			
Opening of ICT seminars	-0.013	-0.476	
Implementation of education for PC operation	-0.072	-2.082	**
Adviser system	-0.046	-1.764	*
Low-interest loans for ICT	-0.019	-0.736	
Low-interest lease for ICT	-0.004	-0.152	
Tax exemptions on ICT investment	-0.042	-1.943	*
Support for opening new portals	0.061	1.405	
Deregulation	0.009	0.378	
Commendation of small company business models that make use of ICT	-0.073	-2.453	**
Introduction of e-bidding system	0.119	2.740	***
Others	0.077	2.053	**
Constants	0.088	15.795	***
$R^2$	0.404		

Note: \*\*\*, \*\*, and \* indicate the significant at the 1, 5, and 10% level.

**Table 13 Policy Desired for Organizational Innovation**

Variables		Higashiosaka/Ohta	IT <i>Hyakusen</i>
		Coefficient	Coefficient
I	Tax exemptions on ICT investment	0.064	0.022
	Commendation of small company business models that make use of ICT	0.059	-0.014
	Introduction of e-bidding system	0.031	0.15

I : Variables which cross and own effects are significant

## 7. CONCLUSIONS

Based on the intensive mail surveys conducted in two Japanese major SME groups, Higashi-Osaka/Ohta ward and IT *Hyakusen* SMEs, the latter of which was recognized for their ICT use. The data collected by the survey were used to create an index of ICT use by these SMEs, thereby clarifying the factors that promote SME organizational innovation via ICT use. SMEs that use ICT intensively were found to believe in its effect and invest a lot of money in it so as to improve their businesses. It follows from this that the most important way to promote ICT use among SMEs is to encourage them to be forward-thinking. Once they adopt such an outlook, they can determine the exact ways in which they will introduce and use ICT to meet their specific goals.

The estimation of the problems related to ICT introduction, which was particularly relevant to the Higashi-Osaka/Ohta SMEs, showed a positive relationship between ICT index and “Each business partner wants to adopt its own ICT systems” or “Information security is a major concern”. This indicates that the issues are mainly location- and human resource-related due to the following reasons:

- Large firms want subcontractors to use the firms’ ICT systems
- A large amount of money is required to comply with the ICT demands of these large firms
- Lack of human resources to handle ICT
- Security concerns for data related to customers, transactions, and privacy

SMEs with advanced levels of ICT use in these regions tend to shift all of their business activities or solve managerial problems by restructuring their businesses. In so doing, problems involving customer relationships and ICT utilization by employees become important.

IT Hyakusen SMEs, on the other hand, introduce and operate ICT without help from outside experts, but through their own employees. In addition, they do not introduce it in such a way so as to restructure all business activities, but rather to improve their businesses gradually. In this way, they improve employee ICT capability and renovate ICT systems.

This paper focuses on extracting factors that promote ICT use by SMEs. Once identified, they can be used to establish suitable policy measures. Our investigations revealed that Higashi-Osaka/Ohta requested tax exemptions and subsidies for ICT investment, which indicates that shortage of funds is the most serious obstacle for ICT development. This problem is doubled because of the need for ICT updates as technology improves. IT *Hyakusen* SMEs, on the other hand, are interested in measures that expand their business chances, such as the introduction of an e-bidding system.

The findings in this study are needed as a basis for further policy measures. Many policies have been implemented by various ministries of the government so far (Tsuji *et al.* [2005], and Small and Medium Enterprise Agency [2001], [2002], [2003], [2004]), but they can hardly be considered successful. Proper policy measures based on rigorous research are needed, but have yet to be established.

## NOTES

- 1) For AHP, refer to Saaty [1980] and [1986], for example.
- 2) See Schumpeter [1934].
- 3) This category was referred to as “orientation to data use” or “data-using type” in Tsuji *et al.* [2005] and Bunno *et al.* [2006a], [2006b].
- 4) -0.029 for “Unclear objectives of management” and -0.034 for “ICT security is a major concern”.
- 5) The coefficient expresses the marginal contribution of an independent variable to the index, and its amount depends on the current level of the index. This is a one interpretation, but a more rigorous analysis is required to identify reasons of these problems for future research.

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- |  |
|--|
| 1 Development of the company's home page or other related web pages. |
| 2 Employees' personal E-mail addresses (number of such addresses).   |
| 3 Electronic boards, and/or electronic meeting boards.               |
| 4 Utilizing mailing lists of customers and business partners.        |
| 5 Own domain name.   |
| 6 Others   |

Q3-4) What is the purpose of your internet use?

- |  |                                     |           |
|--|-------------------------------------|-----------|
| 1. Collection /exchange of information | 4. Efficient business management    | 7. Others |
| 2. PR of company and products          | 5. e-commerce with companies (BtoB) |           |
| 3. Net-banking                         | 6. e-commerce with consumers (BtoC) |           |

If you checked "e-commerce" (5 or 6) at Q3-4, please go to Q3-5 and Q3-6.  
If not, please skip to Q4.

Q3-5 How was your company's e-commerce performance in the last Fiscal Year?

Ratio of sales by the internet (Total sales is 100%)

About  %

Compared with that of three years ago, thus ratio is

- |              |                |              |
|--------------|----------------|--------------|
| 1. Increased | 2. Almost same | 3. Decreased |
|--------------|----------------|--------------|

Ratio of purchase through the Internet (All purchase = 100%)

About  %

Compared with that of three years ago, the ratio is

- |              |                |              |
|--------------|----------------|--------------|
| 1. Increased | 2. Almost same | 3. Decreased |
|--------------|----------------|--------------|

Q3-6) The proportion of business with the companies in your region conducted by e-commerce, compared with that of three years go, is:

- |               |                |               |
|---------------|----------------|---------------|
| 1. Increasing | 2. Almost same | 3. Decreasing |
|---------------|----------------|---------------|

**Q4) What kind of IT training does your company provide to employees? (Check one or more)**

- |   |                                     |                       |
|---|-------------------------------------|-----------------------|
| Support participation in outside IT training and seminars | 1. Support individual learning      | 2. Others             |
| In-house IT training and seminars                         | Employ persons with high IT ability | 3. We do not have any |

**Q5) What kind of security measures does your company have? And, what kind of security does your company plan to introduce? (Check one or more)**

	We have	We'd like to have
1. Principle of security	1	1
2. Risk analysis	2	2
3. Ranking of classified information	3	3
4. Prohibition of leaking classified information and customer information	4	4
5. Control of passwords		
6. Introduction of firewalls	5	5
7. Anti-virus measures	6	6
8. System audition and information security audition	7	7
9. Others	8	8
	9	9

**Section B: Your corporate opinion about IT use.**

Q6) What benefits of IT use do you expect to enjoy in the following areas?

	We expect very much	We expect to some extent	We expect not so much	We expect not at all
1) Increased profit	1	2	3	4
2) Higher productivity of routine works, such as administrative works	1	2	3	4
3) Higher productivity of non-routine business, such as project planning	1	2	3	4
4) Higher speed of decision-making in management and business development	1	2	3	4
5) Restructuring of the whole business process	1	2	3	4
6) Active communication and accumulation sharing of information knowledge	1	2	3	4
7) Close cooperation with customers and business partners	1	2	3	4
8) Precise understanding of customer needs	1	2	3	4
9) Better customer satisfaction by improvement in services and products	1	2	3	4

Q7) How satisfied are you with the current benefits of your company's IT use in the following areas? If your company has not used IT so far, please skip to Q8.

	We expect very much	We expect to some extent	We expect not so much	We expect not at all
1) Increased profit	1	2	3	4
2) Higher productivity of routine works, such as administrative works	1	2	3	4
3) Higher productivity of non-routine business, such as project planning	1	2	3	4
4) Higher speed of decision-making in management and business development	1	2	3	4
5) Restructuring of the whole business process	1	2	3	4
6) Active communication and accumulation sharing of information knowledge	1	2	3	4
7) Close cooperation with customers and business partners	1	2	3	4
8) Precise understanding of customer needs	1	2	3	4
9) Better customer satisfaction by improvement in services and products	1	2	3	4

Q8) Do you think there are any problems with your company's current IT use? (Check one)

1. We have serious problem(s).	3. Uncertain	4. We have few problems.
2. We have some problem(s).		5. We have no problems at all.

Q9) What is the problem(s) in your company's current IT use? (Check one or more)

- |  |
|--|
| <ol style="list-style-type: none"> <li>1. Nobody takes leadership for IT use.</li> <li>2. No corporate target for IT use has been clarified.</li> <li>3. IT has been introduced without any restructuring of works.</li> <li>4. Shortage of staff with strong IT skills.</li> <li>5. Employees' poor IT knowledge.</li> <li>6. Lack of workers' cooperation with IT use at the office.</li> <li>7. Lack of appropriate IT advisers.</li> <li>8. The company leaves adviser(s) to introduce IT as they like.</li> <li>9. The company leaves vendors (manufacturers) to plan and introduce IT as they like.</li> <li>10. There is no software applicable to our business and works.</li> <li>11. We cannot catch up with the rapid development of IT.</li> <li>12. Each business partner wants to adopt its own IT systems.</li> <li>13. IT investment does not yield explicit profit.</li> <li>14. IT investment is very costly.</li> <li>15. We have deep concern for information security, if IT is introduced.</li> <li>16. We have deep concern for leakage of personal data, if IT is introduced.</li> <li>17. IT introduction takes too much time.</li> <li>18. Others (please specify: _____)</li> </ol> |
|--|

Q9-1) What are the three most serious among the above 18 problems.

#1	#2	#3
----	----	----

Q10) How important is the introduction of IT in business management? (Check one)

1. Very important	3. Uncertain	4. Not very important.
2. Somewhat important		5. Not important at all

Q11) How much does your company plan to use IT more? (Check one)

1. Very much	3. Uncertain	4. Not so much
2. To some extent		5. Not at all

Q12) How much does your company plan to increase IT investment? (Check one)

1. Very much	3. Uncertain	4. Not so much
2. To some extent		5. Not at all

Q13) How much was your company's IT investment last Fiscal Year?

About  Yen

### Section C: Your Company's corporate policy

Q14) What are the current important challenges for your company? (Check one)

- |   |                                  |
|---|----------------------------------|
| 1. To secure orders and sales                               | 5. IT utilization                |
| 2. To secure positive profit and fund management            | 6. Company succession            |
| 3. To secure good employees and human resource management   | 7. Other (please specify: _____) |
| 4. Development of ability for planning, R&D, and technology |                                  |

Q15) How applicable are the following statements to your company?

	Very much	To some extent	Uncertain	Not so much	Not at all
1. Company's business performance is disclosed to the employees.	1	2	3	4	5
2. Past business data is utilized in business management.	1	2	3	4	5
3. The executives are provided with broad responsibility and jurisdiction.	1	2	3	4	5
4. We study other companies' failures and learn from them	1	2	3	4	5
5. We hear any employee's opinion concerning better management.	1	2	3	4	5
6. We are constantly developing new business and products.	1	2	3	4	5
7. Monthly business statistics are utilized for management.	1	2	3	4	5
8. We offer IT training to corporate executives, managers and workers.	1	2	3	4	5
9. Training and personnel job rotation are conducted so as to mobilize each employee's ability and knowledge.	1	2	3	4	5
10. Employees are well informed of the 2- or 3-year future direction of the company.	1	2	3	4	5
11. We obtain new business partners every year.	1	2	3	4	5
12. Many purchase orders are repeatedly from the same business partners.	1	2	3	4	5
13. We can price our own products.	1	2	3	4	5
14. Competition with rival companies has recently become more severe.	1	2	3	4	5
15. New entrants from other business fields have recently increased in our market.	1	2	3	4	5
16. The share of new products and services in our business is larger than before.	1	2	3	4	5
17. In recent years, we have not been able to employ younger (30-year-old or younger) workers.	1	2	3	4	5

**Section D: Future IT and Policy**

Q16) What future government policies regarding IT use would you like to see implemented? (Check one)

- |   |
|---|
| <ol style="list-style-type: none"> <li>1. IT seminars</li> <li>2. Training for PC use</li> <li>3. Training for website development</li> <li>4. Advice for IT promotion</li> <li>5. Low-interest loans for IT</li> <li>6. Lease of IT with low fees</li> <li>7. Tax exemption incentives for IT investment</li> <li>8. Grants and financial supports for IT investment related projects</li> <li>9. Support for opening new portal sites</li> <li>10. Deregulation</li> <li>11. Commendation of small company business models that make use of IT</li> <li>12. e-procurement, e-purchase</li> <li>13. Others (please specify: _____ )</li> </ol> |
|---|

Q16-1) What are the three most expected among the above 13 initiatives?

#1	#2	#3
----	----	----

Q17) The Japanese government is promoting deregulations by establishing a "Special Zone for the Structural Reform." The "Special Zone for IT and new business promotion" is described as follows. Please give us your opinion:

<p>"The Special District for IT and New Business Promotion" is designed for the creation of new industries, the invitation and incubation of new businesses, and better services for the public through the development of IT and telecommunications infrastructure based on fiber optical networks and deployed by local governments. This deregulation makes it much easier to conduct businesses with IT use in various fields.</p>
--

	Quite agreeable	To some extent	Uncertain	Not so agreeable	Not agreeable at all
1. The Special Zone is a large advantage for Japanese manufacturers to achieve stronger international competitiveness.	1	2	3	4	5
2. We expect the Special Zone to provide us with financial support.	1	2	3	4	5
3. We expect the Special Zone to support our human resources development.	1	2	3	4	5
4. Only large companies or IT industries will be able to take advantage of the Special Zone, and other SMEs may take nothing from it.	1	2	3	4	5
5. If the Special Zone is established in Higashiosaka City or Ohta-ku (Tokyo), we'd like to make practical use of it.	1	2	3	4	5

Q17-1) If the above described "Special District for IT and New Business Promotion" is established in Higashiosaka City or Ohta-ku (Tokyo), what do you expect of it?

**Q18) Would your company like to promote collaborative projects with research institutions of university and other organizations? (Check one)**

1. Yes, very much	3. Uncertain	4. Not really
2. Yes, to some extent		5. Not at all

**If you check Yes (1 or 2), please go to Q18-1.**

If you check 3 to 5, please skip to Q19).

**Q18-1) In what specific field(s) would you like to collaborate?**

**Q19) Do you consider IT communication spaces (ex. Internet) to fundamentally be public spaces or private spaces? (Check one)**

1. Public spaces, absolutely	3. Uncertain	4. Primarily private spaces
2. Primarily public spaces		5. Private space absolutely

**Q20) How much do you agree on the following views? (Check one for each view)**

	Quite agree	Agree to some extent	Uncertain	Not so agreeable	Don't agree at all
1. IT provides all people with equal opportunity for information exchange.	1	2	3	4	5
2. Data obtained by IT is fully open to the public and businesses.	1	2	3	4	5
3. IT achieves higher autonomy of people and business.	1	2	3	4	5
4. IT will widen the gap between large companies and SMEs.	1	2	3	4	5
5. IT will widen the economic gap between the developed and developing countries.	1	2	3	4	5
6. IT promotes the globalization of the world.	1	2	3	4	5
7. IT creates new markets and replaces old ones.	1	2	3	4	5
8. IT makes it possible to have responses from the world to what we disseminate, so that we can adjust direction anytime.	1	2	3	4	5

Q21) Any further opinion and request regarding IT and new business will be appreciated.

#### Section E: Corporate Profile

Q22)

Established	Present CEO is:	Capital
Year:            Month:	1. Founder of the company	
	2. 2 <sup>nd</sup> CEO	
	3. 3 <sup>rd</sup> CEO	
	4. 4 <sup>th</sup> or later	Japanese Yen

**Q23) Your business field(s) (Check one or more)**

1. Manufacturing	5. Construction	9. Individual services
2. Wholesale	6. Finance, Insurance	10. Information services
3. Retail	7. Real Estate	11. Others ( )
4. Transport, Communication	8. Corporate services	

**Q23-1) If you checked "1" (manufacturing), what are the manufactured product(s)?**

1. Food	6. Ceramic, rock and sand	11. Electric machinery and tools
2. Textile	7. Steel	12. Machinery for Transport
3. Wool	8. Non-ferrous metals	13. Others ( )
4. Paper	9. Metals	
5. Synthetic resin, rubber	10. Machinery and tools	

**Q24) What is the position of the current business relative to the initial (original) position when your company was founded? (Check one)**

1. Same as the original businesses.
2. Has developed to the upstream (maker/vender side) based on the original business.
3. Has developed to the downstream (consume/user side) based on the original business.
4. Has developed horizontally (to different business) based on the original business.
5. Is a completely different business, and the original business has been abolished or reduced.

**Q25) How many employees does your company have?**

	Total	Regular/full-time	Part-time
Total number			
IT workers (ex. System administrators)			

Q26) and Q27) are definitely important in this survey. Please make sure the following boxes are filled.

**Q26)**

Gross profit margin (gross margin/sales X 100)		Return of sales (Operating income/sales X 100)	
About	%	About	%

**Q27) Please fill the boxes as much as your company policy allows. If you can't give the numerical data in the upper boxes, please tell us the trend in the lower box.**

	Sales	Gross margin	Operating income	Equipment investment	IT investment	Export	Import
Last Fiscal Year (Three years before as 100)							
Trend (Compared to that of three years before)	1. Increasing 2. Almost same 3. Decreasing	1. Increasing 2. Almost same 3. Decreasing	1. Increasing 2. Almost same 3. Decreasing	1. Increasing 2. Almost same 3. Decreasing	1. Increasing 2. Almost same 3. Decreasing	1. Increasing 2. Almost same 3. Decreasing	1. Increasing 2. Almost same 3. Decreasing

That's it. We really appreciate your cooperation  
We would be grateful if you would post this to us by June 30. Please use enclosed "return envelope".