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# Utilizing Information Systems in Small and Medium-sized Enterprises in Japan

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## Abstract

*Most small and medium-sized Japanese enterprises are confronted with almost insurmountable difficulties due to the long time recession of the Japanese economy after the so-called "bubble era" of 1980s. The strategic use of information systems (hereafter IS) will be one important key factor in overcoming the problems they are facing. From this point of view, we have been doing empirical research on IS utilization in small and medium-sized enterprises mainly in the Yokohama industrial area located about 30 km south of Tokyo. To clarify the effectiveness of IS utilization we focused our research on the following issues; namely how the effectiveness of IS has been improved years from 1991 to 1998, changes in the competitive impact of IS, and characteristics of the Yokohama industrial area compared with other industrial districts in Japan. From this study we conclude that the ratio of information through online systems, including the Internet, is still at a low level of approximately 20%. Face-to-face interviews, telephone and facsimile remain as major media. However, as online systems rapidly spread among many enterprises for B to B interactions, most organizations are perplexed about how to utilize the latest IT, how to train IS personnel, and how to measure the effectiveness of IS.*

**Keywords:** Internet, Small and medium-sized enterprises, Effectiveness of information systems

## 1. Introduction

There are many small and medium-sized organizations in Japan. Most of these organizations are facing difficulties in overcoming various problems due to the long time recession of the Japanese economy. However, most enterprises have survived by stepping up the rationalization of their management. In general, the strategic use of information systems (IS) seems to be one effective means to rationalize management processes.

Since we started our study of the utilization of IS in small and medium-sized enterprises in 1991, we are still wondering how best to understand the effectiveness of IS, especially in Japanese organizations.

When Nonaka and Takeuchi (1995) pointed out the importance of tacit knowledge in Japanese organizations, we resolved to clarify the relationship between the creation of tacit knowledge and the introduction of IS. We proposed a new IS model consisting of two elements: whether the process of IS is structural or not, and whether the contents of IS is open to another organization or not. From this IS model we expected to explain the relationship between the Nonaka's tacit knowledge and IS effectiveness (Hanaoka, Tachikawa, and Shimada, 1998).

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Meanwhile, we have continued our study on IS outsourcing (Apte, Sobol, Hanaoka, Shimada, Saarinen and Sarena, 1997), the relationship between IS and virtual corporations (Hanaoka and Shimada, 1997) and IS evaluation (Hanaoka, 1998). We gathered data by questionnaire and interview, mostly of small and medium-sized enterprises both in 1991 and 1998. In this paper, we will discuss mainly the results of research in 1998.

## **2. Theoretical Background**

### ***2.1 Classification of Information Systems***

To make clear the effectiveness of IS, we proposed that the structure of IS be expressed by the four cells shown in Figure 1 (Hanaoka, 1998). Along the vertical axis we can classify IS into two groups: high clarity IS and low clarity IS. Clarity, as used here, means the degree of openness of IS procedures to any departments or sections within the enterprise according to the rules or office regulations regardless of whether or not the operation is computerized. High clarity IS can be evaluated objectively by an observer rather easily because rules or office regulations are demonstrated clearly. However, it is difficult for an observer to evaluate low clarity IS because it is reflected by hidden corporate culture or organizational climate.

Along the horizontal axis we can classify IS into two groups: high flexibility IS and low flexibility IS. Flexibility means the degree of adaptability to environmental changes. Therefore, IS may be classified into the following four types.

- a. High clarity low flexibility IS in Cell 1. (Hereafter Type LH)
- b. High clarity high flexibility IS in Cell 2. (Hereafter Type HH)
- c. Low clarity high flexibility IS in Cell 3. (Hereafter Type HL)
- d. Low clarity low flexibility IS in Cell 4. (Hereafter Type LL)

The IS effectiveness of Type LH will be measured mainly by quantitative indexes because the characteristics of Type LH is similar to that of MIS according to the definition of Wiseman, C. (1988). However, the effectiveness of Type HL may only be measured by qualitative indexes suitable to the organization concerned. The effectiveness of Type HH and Type LL will be measured by a combination of quantitative and qualitative indexes. Accordingly, IS of Type LH will be relatively easily outsourced to outside organizations, but it is difficult to outsource IS of Type HH. Also outsourcing of Type HH and Type LL will depend on the situation of each organization (Apte, et al., 1997).

		Flexibility of Operation		
		High	Low	
Clarity of Operation	High	Cell 2 (Type HH)  Fixed operating procedure. Daily job processed by humans.	Cell 1 (Type LH) Machine oriented  Fixed operating procedure. Processed by computer	Machine oriented
	Low	Cell 3 (Type HL) Man oriented  Arbitrary processing by humans under self-willed	Cell 4 (Type LL)  Arbitrary processing by self-willed decision as exceptional process by computer	
		Man oriented		

**Figure 1. Structure of IS**

The term IS in a wide sense includes all types of IS in Figure 1, but in a narrow sense it means computer based IS corresponding to Type LH and Type LL. In this paper, the term IS will be used in a narrow sense unless specified.

### ***2.2 Tacit Knowledge and the Types of Information Systems***

We have framed the following hypothesis about the relationship between tacit knowledge and four types of IS in a wide sense as illustrated in Figure 1.

- (1) There are many ways for executing Type HL and Type LL.
- (2) The executing procedure depends on the common tacit knowledge of the organization.
- (3) Evaluation for Type HL and Type LL acceptance will conflict between concerned organizations due to differences in tacit knowledge.
- (4) Tacit knowledge will vary by organization culture, management style, types of business, regional differences, etc.

### ***2.3 Evaluation of Information Systems***

The effectiveness of IS can be evaluated by output/input ratio. The main objective of IS for transaction processing is to improve the ratio by "output constant / input decrease" strategy, i.e., making the denominator small. We can evaluate the amount of both numerator and denominator objectively by applying quantitative indexes. However, with IT progress (e.g., DSS, EIS, etc.) the strategy will change to "output increase / input constant". At the same time it becomes more difficult to evaluate by applying quantitative indexes alone.

The effectiveness of IS in a wide sense for the creation of tacit knowledge is expressed by the product of two fractions, namely,  $E = (f/i)(t/f)$ . Where "E" is effectiveness of IS in a wide sense, "f" represents IS in narrow sense developed by input "i", and "t" is tacit knowledge created by the introduction of "f". The majority of the component of these variables cannot be measured quantitatively. Consequently, every organization must have its own mechanism for evaluating IS acceptance by both the IS staff, the end users and people from all levels of organization.

## ***2.4 Mutual Influence of Tacit Knowledge and Information Systems***

Although we can explain the relationship between tacit knowledge and IS, it is also obvious that the first fraction ( $f/i$ ) will be improved by the tacit knowledge of the organization because explicit knowledge will be generated by the improvement of tacit knowledge (Nonaka, et al., 1996). As a result, the improvement of IS will accelerate the creation of tacit knowledge and then generate explicit knowledge. Also, in reverse, IS will change by the generation of new tacit knowledge. Thus, we conclude that there are mutual influences between tacit knowledge and IS.

## **3. Main Objectives of Our Research**

### ***3.1 Basic Function of Information Systems***

From the above point of view, we started our research mainly on the present status of computer utilization in small and medium-sized manufacturing enterprises in Japan, because they play an important role as driving forces of Japan's economy. In general, most of these enterprises are equipped with predominant high technology of their own. We are interested in the proposition that IS plays an important role for management activities in small and medium-sized enterprises.

In order to clarify the effectiveness of IS, we defined the basic function of IS as Type LH (i.e., IS in a narrow sense), because it is indispensable for building advanced IS such as DSS, EIS, SIS, etc. The development of tacit knowledge may be accelerated by the proper use of advanced IS. Thus the proper use of Type LH is a key factor for realizing advanced IS.

### ***3.2 Research Interest***

Concerning the circumstances mentioned above, our research interests could be summed up as follows.

- a. Can IS be an important key factor to improve management activities?
- b. Are there any differences between large enterprises and small and medium sized enterprises?
- c. Has the level of IS utilization been advanced in the last few years?

Our main research subjects are a thousand small and medium-sized enterprises mainly located in Yokohama industrial area. We performed our research by both questionnaire and interview.

## **4. Research by Questionnaire**

### ***4.1 Distribution of Respondents***

We sent the same questionnaire in 1991 and 1998 to about 1,000 enterprises located in the Yokohama area (Hanaoka, S., 1991). In 1991, we received 348 responses out of possible 1,151, with 341 from manufacturing industries (Hanaoka, S., 1992). The typical trends at 1991 are:

- a. The ratio of IS cost to sales is continuously increasing (0.54% in 1991),
- b. Major processing is off-line.
- c. The main objectives of introducing online systems are elimination of processing time and to catch up actual status quickly.
- d. The area of online systems tends to be closed within enterprises.

In 1998, we sent the same questionnaire to the same group. There were 107 respondents out of possible 831 (173 were address unknown). At the same time we interviewed typical enterprises to confirm the results of the research. Table 1 shows the distribution of respondents.

**Table 1. Distribution of respondents**

Type of industry	Respondents	%
Electrical appliance and electronics	27	25.2
Chemical, plastics, rubber	22	20.6
Machinery and equipment	14	13.1
Precision instrument	11	10.3
Transportation machine	10	9.3
Ceramics, quarrying	3	2.8
Steel, nonferrous metals	3	2.8
Food	2	1.9
Textile	1	0.9
Non-manufacturing industries	14	13.1
Total	107	100.0

#### **4.2 Contents of Questionnaire**

The questionnaire used in both 1991 and 1998 consists of the following major categories:

1. Saturation level of computers.
2. Saturation level of online systems.
3. Kind of major online application systems.
4. Main partners for online application systems.
5. The objectives and effectiveness of online systems.
6. Comparison between expected effectiveness and results.
7. Sort of information utilizing online systems.
8. Change in transactions by applying online systems.
9. Future plan for the introduction of online systems.
10. Problems in utilizing online systems.

#### **4.3 Result of the Research**

##### *4.3.1 Saturation Level of Computers*

The results of the questionnaire from 1991 and 1998 suggest the following trends. Namely, saturation levels of main-frame computers, stand-alone personal computers and word processors decreased, while saturation levels of office computers/mini computers and terminal equipment increased as shown in Table 2.

**Table 2. Change in saturation level of computers (%)**

Saturation level of computers	1991	1998	Trends
a. Main-frame computer	24.5	21.5	Down
b. Office computer/Mini computer	46.9	59.8	Up
d. Stand-alone personal computer	84.7	75.9	Down
e. Terminal equipment	46.0	58.9	Up
f. Word processor	84.7	76.6	Down

#### 4.3.2 Saturation Level of Online Systems

Although the percentage of online to associated companies, to finance businesses, sales networks and subsidiary companies increased, in-house online systems, online to finance and online through VAN vendors decreased as shown in Table 3.

**Table 3. Change in saturation level of online systems (%)**

Saturation level of online system	1991	1998	Trends
a. In-house online systems	75.6	60.0	Down
b. Online systems with associated companies	18.8	33.3	Up
c. Online systems with finance	15.7	33.3	Up
d. Online with holding company	14.5	9.3	Down
e. Online through VAN vendor	12.8	6.7	Down
f. Online sales network	9.9	20.0	Up
g. Online to subsidiary companies	8.1	14.7	Up

#### 4.3.3 Objectives of Introducing Online Systems

The objectives of introducing online systems changed dramatically during the seven years from 1991 to 1998 as shown in Table 4. The percentage of the items a, b, and c increased, while .d to h decreased as shown in Table 4.

**Table 4. Change in objectives of online systems (%)**

Object of online systems	1991	1998	Trends
a. Improve total IS	22.7	25.4	Up
b. Standardize business procedure	45.3	47.3	Up
c. Optimize business planning	14.5	20.9	Up
d. Reduce business processing time	82.6	68.7	Down
e. Clarify the actual situation	57.0	37.3	Down
f. Saving of manpower	59.3	47.8	Down
g. Cost reduction	39.0	31.3	Down
h. Improve business accuracy	22.7	13.4	Down

#### 4.3.4 Information Obtained from Online Systems

The change in the percentage of information obtained from online systems is shown in Table 5.

**Table 5. Change in information ratio from online systems (%)**

Information from online systems	1991	1998	Trends
a. Information from customers	22.5	26.7	Up
b. Information of the same business lines	14.7	25.0	Up
c. Financial information	10.9	20.0	Up
d. IS maintenance information	9.3	15.0	Up
e. Logistics information	29.5	8.3	Down
f. Technical know-how	51.2	45.0	Up
g. Patent information	38.8	23.3	Down

#### 4.3.5 Problems for Introducing Online Systems

Although there are many difficulties in introducing online systems, these problems have changed remarkably during the seven years from 1991 to 1998 as shown in Table 6. These changes indicate that online systems become more common for many enterprises, while problems seem to have become more serious. In particular, lack of IS and IT know-how have been extremely serious for the majority of organizations. Consequently, reliable consulting facilities are much appreciated by these organizations.

#### 4.4 Distribution of Communication Media

In the research of 1998 we also surveyed the distribution of communication media between business to business (B to B) using Porter's (1979) support activities model. We classified media into two groups: (1) online systems (Media 1) and (2) interview, telephone and facsimile (Media 2). According to Imai (1984), information managed B to B will be classified into (1) information A (IA) and (2) information B (IB). IA is formalistic or syntax oriented information. We can easily measure the quantity of IA such as number of data, negative entropy, etc. On the contrary, IB is semantic oriented information. The value of IB will change by the judgment of each receiver. IA will be generated or received from each transaction or structured repetitive job operation, while IB will be generated or received from ad hoc rules of management activities such as market situation, business news, etc.

**Table 6. Change in problems in online systems. (%)**

Problems in introducing online system	1991	1998	Trends
a. Lack of know-how and technology	46.3	90.7	Up
b. Lack of proper consulting facilities	14.1	81.3	Up
c. Lack of IS staff	3.2	70.7	Up
d. Excessive initial investment	39.0	87.2	Up
e. Much time required for IS development	34.1	74.2	Up
f. Difficult connectivity to existing systems	15.1	62.5	Up
g. Increase of IS operating cost	13.1	63.2	Up
h. Inadequate database systems	6.3	61.5	Up
i. Poor coordination between logistics and IS	7.8	47.1	Up
j. Anxiety for information security	3.9	57.1	Up
k. Anxiety of selection from holding company	2.0	0.0	Down
l. Anxiety from the change of contract terms	4.4	2.3	Down

We classified information into the following three groups by taking Imai's information classification: (a) Type 1: Information for transaction and repetitive job operation, (b) Type 2: Information for ad hoc management activities, and (c) Type 3: Information for RandD and technology.

Type 1 will correspond to IA, while type 2 and type 3 will correspond to IB. Result of our survey is shown in Table 7. In general, the ratio of information depending on online system seems to be very low. The average figures of utilizing online system are only around 20% except (11) and (12).



## 5. Case Studies

### 5.1 Legacy Information Systems are Still Thriving

To verify the results of the questionnaire survey, we interviewed typical enterprises located not only in the Yokohama industrial area, but also in other locations such as Fukui, Osaka, Nagoya and Tokyo. Typical cases are shown in Table 8. We found that legacy IS still seems to be thriving in most enterprises.

For example, Matsuura has predominant technologies specialized in machining center manufacturing, but their IS still remains at an average level. Moreover, NEC Saitama abandoned their FMS systems applying the latest IT, because the system stretched their patience for eliminating overheads. The IS for Noritake is also very traditional, but their product quality is excellent. Takeda's IS is also nothing special, but their business showing in recent years has been excellent. Fuji Seiyaku constructed very unique IS utilizing outsourcing. They outsourced communication networks to @nifty, one of the largest Internet providers in Japan, but their applications are traditional transaction processing.

**Table 7. Distribution of communication media**

Items		Type	Media 1 (%)	Media 2 (%)
(1)	Communication to / from Supplier	Type 1	11.3	88.7
		Type 2	12.7	87.3
		Type 3	14.3	85.7
(2)	Communication to / from distributor	Type 1	18.3	81.7
		Type 2	14.8	85.2
		Type 3	13.5	86.5
(3)	Communication for purchasing logistics	Type 1	9.4	90.6
		Type 2	9.3	90.7
		Type 3	8.1	91.9
(4)	Communication for sales logistics	Type 1	15.4	84.6
		Type 2	10.3	89.7
		Type 3	8.6	91.4
(5)	Communication for manufacturing	Type 1	5.1	94.9
		Type 2	9.1	90.9
		Type 3	7.9	92.1
(6)	Communication for manufacturing	Type 1	5.1	94.9
		Type 2	9.1	90.9
		Type 3	7.9	92.1
(7)	Communication for marketing	Type 1	10.6	89.4
		Type 2	13.2	86.8
		Type 3	9.4	90.6
(8)	Communication for service	Type 1	9.8	90.2
		Type 2	7.5	92.5
		Type 3	8.6	91.4
(9)	Communication for human resources management	Type 1	10.4	89.4
		Type 2	8.1	91.9
		Type 3	11.8	88.2

(10)	Communication for accounting	Type 1	14.0	89.6
		Type 2	11.1	88.9
		Type 3	11.4	88.6
(11)	Communication for information systems	Type 1	17.6	82.4
		Type 2	21.4	78.6
		Type 3	31.3	68.9
(12)	Communication for RandD	Type 1	19.2	80.8
		Type 2	19.1	80.6
		Type 3	35.0	65.0
(13)	Communication for procurement	Type 1	10.6	89.4
		Type 2	12.5	87.5
		Type 3	7.5	85.3

**Table 8. Typical Examples**

Enterprises	Business line	Location
Matsuura Seisakusho	Precision Machinery	Fukui
IMN	Precision Machinery	Fukui
Shimizu Seisakusho	Motorcar Parts	Tokyo
Fuji Seiyaku	Medicine	Tokyo
Noritake	Ceramic Ware	Nagoya
Takeda Yakuhin	Medicine	Osaka
RICOH	Precision Machinery	Tokyo
NEC Nagano	Electronics	Nagano
NEC Saitama	Electronics	Saitama
Daiwa Chemical	Rubber Parts	Atsugi

## 5.2 Facing at the Dawn of Internet Business

Very few enterprises have been keeping up with the trends of the time (Table 9). They introduced Internet business positively (Kanagawa-ken, 1999).

**Table 9. Internet business in the typical enterprises**

Name	Business	Internet application	Location
K	Construction	Written estimate, CAD	Kawasaki
S1	Motor car parts	Employment announce	Kawasaki
W	Motor car parts	Order placement	Fujisawa
Y	Packing sheet	QandA from customers	Odawara
F	Wholesaler	QandA from customers	Kawasaki
S2	Retailer (cake)	Event information	Yugawara
N	Retailer(wine)	PR	Chigasaki
S3	Restaurant	Discount coupon	Chigasaki
M	Japanese hotel	PR	Hakone
T	Manufacturer	CAD data	Yokohama

(Names of each enterprise withheld by request.)

Company K engages in the electricity construction business in Kawasaki. They submit written estimates

and confirmation data of CAD through their homepage. They also have been utilizing LOTUS Notes relatively well, but their largest problem is how to minimize IS skill gap among employees.

Company S1 has been utilizing their homepage mainly (a) for recruiting new graduates, (b) collecting information of new business acquaintances, and (c) downloading software through the Internet.

Company W, in Fujisawa, has been utilizing the Internet for (a) finding new outside suppliers, (b) negotiations between holding companies or the same business line, and (c) mailing to/from their factory in Shizuoka prefecture about 100Km east from Fujisawa. They also receive an average of 30 inquiries per a day through their homepage.

Company Y, located in Odawara; accepts any QandA information through their homepage concerning packing, wrapping, shipping, etc. From some of these QandA, they can get new customers.

Company F, located in Kawasaki, has been introducing various information regarding their business lines such as (a) popularity ranking of nonalcoholic drinks, (b) how to keep drinks, and (c) QandA information. They are now in a trial and error phase for further utilization of the Internet.

Company S2, located in Yugawara, has been furnishing their product information and events through the homepage of the Yugawara Chamber of Commerce, and has conducted tours of traditional Japanese cake makers. As a result, advertising effectiveness has been increased.

Company N, located in Chigasaki, is a liquor shop. They promote locally brewed "Shonan beer" on their Internet homepage and receive orders via telephone or facsimile, but the amount of transactions is very small.

Company S3 is a barbecue restaurant in Chigasaki. They issue discount coupons through their home page. They also sell books and year-end presents through their mail-order systems. The top management said that, above all else, the choice has been increased by the homepage.

Company M is a Japanese style hotel at Hakone. They display their service menu and color pictures on the homepage of a tourist industry website. Few guests seem to have made reservation via homepage.

Company T is a manufacturer of electric circuit in Yokohama. Company T and customers exchange CAD data by e-mail.

As these examples suggest, only a few organizations are successful in the strategic use of Internet applications. At present, for the majority of enterprises the concrete use of the Internet is not a matter of great concern.

## **6. Findings - Typical Changes from 1991 to 1998**

Bellows are the typical changes in utilization of online systems from 1991 to 1998.

- a. The application level of online systems has been expanding from simple transaction processing to database-oriented applications.
- b. The percentage of online systems has become larger in the application area (e.g., customer-oriented information, competitive information, financial information and maintenance information), while the percentage becomes smaller in logistics information, patent information, etc.
- c. Lack of IS know-how and technology has become more serious.

- d. Shortages of high-skilled manpower has become much more serious.
- e. There has been a great increase in prior investment and operating costs of IS.
- f. The major part of B to B communication depends on simple media such as face-to-face interviews, telephone and facsimile, with only 10% to 20% of total information through online systems.

Also, although the majority of enterprises in the Yokohama industrial area are still on the level of transaction oriented IS, they are facing difficulties in how to introduce effectively into their business lines new IT such as the Internet, EC, CALS.

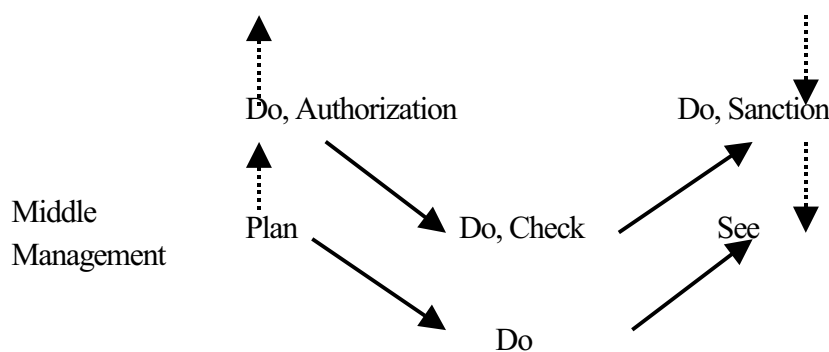
Some advanced enterprises have already been introducing advanced IT such as estimation of cost, CAD data exchange, QandA with customers, cyber business in their business lines. The gap of IS utilization between each enterprises seems to be conspicuous.

## 7. Conclusions

### 7.1 No Remarkable Relationship Found between Tacit Knowledge and Information Systems

Our research does not suggest a remarkable relationship between the creation of tacit knowledge and the utilization of IS. For examples although the IS of a certain company A in Table 8 seems to be very traditional and far behind the time, this company is well known as one of the most excellent enterprises in Japan. The IS of a certain small size company is also still rudimentary. Although they are using only a few software packages on a PC, their business showing in these years has been excellent, because they have excellent tacit knowledge for generating new ideas. The most influential factor for the generation of new ideas seems to be the individuality of top management. We were perplexed from these examples what tacit knowledge is. So far our research suggests that tacit knowledge of each organization seems to depend on the organizational culture.

Hijikata (1973) pointed out the Japanese style of "plan-do-see cycle" as shown in Figure 1. Hijikata stressed the importance of the role of middle management, because middle management creates plans and circulates them around to get approval for a decision.



**Figure 1. Plan-Do-See Cycle in typical Japanese enterprises (Hijikata, 1966)**

Nonaka (1995) proposed "Middle Up Down" management style as a peculiar Japanese way of management that seems to be quite similar to Hijikata's (1966) model. Our research explains clearly Hijikata and Nonaka's theory of how Japanese organizations create new technologies, ideas, etc. The only exception seems to be the utilization of IS. The majority of small and medium-sized enterprises seems to be far behind in the use of IS as compare with that of advanced countries.

One of the important reasons why IS in Japanese companies is lagging is that the importance of IS has not yet been fully recognized among the top management of those enterprises. Most of managers are self-confident due to past successes without the aid of IS. In fact, some of them boast about their lack of IS literacy.

### 7.2 IS Staff's Gain and End Users' Gain?

Suppose that  $A=(f/i)$  and  $B=(o/f)$ , the above equation can be rewritten to  $E=AB$ . The responsibility for maximizing A rests with IS staff, while for maximizing B rests with end users. In other words, A represents IS staff's gain and B represents end users' gain (Figure 2).

Cell 1 illustrates "excellent use of excellent IS", namely an ideal model where the value of both A and B are maximized. Cell 2 illustrates "poor use of excellent IS" where the value of A is large but B is small. In this case, end users are much more responsible for improving the value of E. Cell 3 illustrates "excellent use of poor IS", where IS staff are more responsible for improving E. Cell 4 illustrates "poor use of poor IS", where both IS staff and end users are equally responsible for improving E.

		End users' gain (B)	
		Small	Large
IS staff's gain(A)	Large	Cell 2 A: Large B: Small (1) Excellent IS (2) Poor utilization of IS	Cell 1 A: Large B: Large (1) Excellent IS (2) Excellent utilization of IS
	Small	Cell 3 A: Small B: Small (1) Poor IS (2) Poor utilization of IS	Cell 4 A: Small B: Large (1) Poor IS (2) Excellent utilization of IS

**Figure 2. Combination of IS staff's gain and End users' gain**

From the discussion of Figure 2, we can categorize tacit knowledge into two domains: A-oriented tacit knowledge (hereafter KA) and B-oriented tacit knowledge (hereafter KB). The most important role of top management is to press for improvement in KA and/or KB. For this purpose, top management must have the ability to evaluate IS objectively.

From our empirical survey, it is obvious that most top management do not perceive their lack of IS evaluation. The major sources of this situation are:

- a. They succeeded in their business without the use of IS.
- b. Most Japanese did not become familiar with typewriting.
- c. Lack of IS specialists due to manpower limit peculiar to small and medium-sized enterprises.

### 7.3 Further Research in the Nest Phase

In the next phase of research we will look at:

- a. How "knowledge spirals" (Nonaka, 1995) are influenced by the utilization of IS in Japanese

- enterprises.
- b. The relationship between each stage of Grainer's (1972) growth model and the influence of IS.
  - c. The activity of middle class management in small and middle-sized enterprises for the effective use of IS.

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