Project document

Information and Communication Technology (ICT) for development of small and medium-sized exporters in East Asia: Japan

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I. Introduction

The "New Economy", in Japan often referred to as the "Information Technology (IT) Revolution", has transformed not only economic systems but all facets of social life, thereby creating an entirely new society. New business models based on the Internet, concurrent engineering and supply chain management (SCM) are coming into their own, replacing many traditional forms of commerce.

In recent years, Japan has lagged behind other nations in adopting IT, for well known reasons. Because the Japanese economy peaked in the mid-1980s, just before the take-off of IT, the engines of Japanese growth were not powered by the new technologies. Important examples are the employment structure, with its lifetime employment and seniority systems; the structure of industry, with a combination of large and small companies; the banking and manufacturing sectors; and Japan's vaunted industrial policies, which targeted new business areas and nurtured them by encouraging collaboration between the public and private sectors.

In theory, these features of Japan's economic system are based on long-term contractual relationships rather than market mechanisms. As is known, such relationships can lead to lower transaction and information costs than those prevalent in a system predominantly governed by market mechanisms. Economic agents can accumulate and share information through long-term relationships, primarily of a personal nature. Japan's success is due to the full exploitation of these economic relationships. IT, by contrast, allows information to be obtained and shared more efficiently. Thus, ingredients of Japan's success in the 1980s became obstacles during the IT Revolution. The major pillars of the Japanese economy became were weakened, which was one of the causes of Japan's "Lost Decade" of the 1990s.

Japan's success also derives from its small and medium-sized enterprises (SMEs), which, with their vast accumulated technologies, skills and know-how, have long been the foundation of Japan's manufacturing sector. As this paper will show, SMEs contribute much more to the economy than do large companies. But SMEs are not exempt from the requirements imposed by the IT Revolution. These crucial firms have lagged behind in adopting IT and face serious problems due not only to the IT gap but also to Japan's aging population. If Japan's economy is to return to its dynamic growth and innovation and once again assume a role as a world leader, an effort must be made to ensure that its myriad SMEs catch up in the new IT-based economy.

This study F focuses on IT use by SMEs and examines these firms' current situation and the issues they face. Using the results of a survey and empirical analysis, it identifies the factors that encourage SMEs to adopt new technologies, and it makes policy recommendations on how to encourage SMS in both regional and national networks to do so.

This study is the result of research conducted by a team composed of H. Miyoshi, COE fellow (professor), Institute for Technology, Enterprise and Competitiveness, Doshisha University (with support from its 21st Century COE Program); T. Bunno, associate professor, Department of Management, Kinki University; H. Idota, associate professor, Faculty of Modern Management Information, Osaka Seikei University; M. Ogawa, assistant professor, Department of Management, Kobe Gakuin University; E. Tsutsumi and M. Nakanishi, graduate students, Osaka School of International Public Policy (OSIPP), Osaka University; and Noah Smith, international research assistant, Centre for Regional Economic Studies (CRES), OSIPP, Osaka University.

II. The current IT market and IT use by SMEs

The rapid growth of the IT industry is necessarily predicated on increased domestic demand. From 1995 to 2002, the value of information and communications technology (ICT) production in China increased more than fourfold, from 308.29 billion *Yuan* to 1.652 trillion *Yuan*. In the same period, China's information infrastructure improved greatly, spurring continuous growth in demand for IT products.

The Chinese government aggressively promoted the transition to an information society. The declarations making 2000 the "Year of Government Online" or making 2001 the "Year of Enterprises Online" did much to promote the transition to an information society and encourage the spread of computer use. IT allows companies to lower their costs and raise their economies of scale. E-commerce, in turn, allows them to raise sales volumes, boost their market share and become more competitive.

A. The size of the IT market and related market segments

1. Present situation

a) Hardware

Table 1 shows the size of the computer market in Japan. Although computer use grew substantially before 2000, it has declined since. In 2002, 9.84 million personal computers were sold, worth a total of ¥ 1.62 trillion, which was 25% less than the 2000 value. The number of mainframes and workstations has also declined: mainframe sales fell from 2,059 in 1999 to 1,305 in 2002 (in monetary terms, from ¥ 591.7 to ¥ 370.2 billion), while workstation sales peaked at 90,000 before declining to 70,000 (¥ 157 million vs. ¥ 69.3 million) in the same period. However, sales of midrange computers used as servers increased from some 134,000 in 1999 to 164,000 in 2002, although revenue on these sales fell from approximately ¥ 635 to ¥ 598 billion, also between 1999 and 2002.

The size of the market for printers, displays, scanners and other peripherals is given in table 2. Printers are the largest of these items, with some ¥ 618.4 billion in sales, and showed the

strongest growth —123% from 2002 to 2003. The next most important items are network storage devices (¥ 322.7 billion), displays (¥ 308.5 billion), and optical disk readers (¥ 310 billion). In terms of units sold, all categories except image scanners and optical character recognition readers (OCRs) showed positive growth from 2002 to 2003, which marked the beginning of the "Second IT Revolution". Trends for computer-related products since 1997 are shown in table 3.

TABLE 1
COMPUTER SALES

	1997FY	1998FY	1999FY	2000FY	2001FY	2002FY	2003FY
Personal computers (PCs)							
Number sold	6 851 000	7 538 000	9 941 000	12 102 000	10 686 000	9 840 000	10 783 000
Value (millions of yen)	1 654 300	1 632 700	1 973 900	2 144 200	1 769 200	1 616 700	1 612 000
Average price	241 468	216 596	198 562	177 177	165 562	164 299	149 495
Mainframes							
Number sold	2 822	3 034	2 059	1 490	1 574	1 305	-
Value (millions of yen)	823 119	745 685	591 637	499 068	474 540	370 151	-
Average price (thousands of yen)	291 679	245 776	287 341	334 944	301 486	283 640	-
Midrange computers							
Number sold	132 273	133 406	133 789	142 114	172 131	163 760	-
Value (millions of yen)	704 766	733 369	635 007	682 125	693 038	598 052	-
Average price (thousands of yen)	5 328	5 497	4 746	4 799	4 026	3 652	-
Workstations							
Number sold	131 944	109 915	89 830	92 340	91 694	70 066	-
Value (millions of yen	311 273	219 875	157 450	130 760	99 544	69 299	-
Average price (thousands of yen)	2 359	2 000	1 752	1 416	1 085	989	-

Source: On the basis of information from the Japan Electronics and Information Technology Industries Association (JEITA).

Note: Average price = sale price/number sold

TABLE 2
PERIPHERALS SALES (2003)

	Number		Value	
	(Thousands)	Increase over previous year	(Millions of yen)	Increase over previous year
Displays (CRT and LCD)	7 289	115%	308 532	92%
Printers (dot-matrix, inkjet, etc.)	7 919	106%	618 410	123%
Magnetic disk readers (2.5", 3.5")	23 860	119%	302 900	-
Optical disk readers (CD-R/RW, DVD-ROM, MO, etc.)	20 580	115%	310 000	-
Image scanners (flatbed, sheetfed, etc.	803	68%	15 888	73%
OCR (for slip and document processing)	200	94%	14 400	94%
Network storage	39 800TB	153%	322 700	95%

Source: on the basis of information from the Japan electronics and information technology industries association (JEITA).

Note: TB stands for terabytes of network storage.

TABLE 3
PERIPHERALS SALES

Actual (1 000 Units)

	1997	1998	1999	2000	2001	2002	2003	2004	2005*
Displays (CRT and LCD)	5 616	4 200	5 200	8 303	7 030	6 355	7 289	6 562	6 734
Printers (dot-matrix, inkjet, etc.)	4 434	4 661	6 199	8 020	7 702	7 364	7 919	8 157	8 636
Magnetic disk readers (2.5", 3.5")	1 170	11 990	14 510	19 810	19 560	20 020	23 860	23 830	27 730
Optical disk readers (CD-R/RW, DVD-ROM, MO, etc.)	7 536	11 604	15 730	20 950	18 100	17 420	20 580	19 090	20 590
Image scanners (flatbed, sheetfed, etc.)	-	-	-	1 656	1 640	1 180	803	1249	1317
OCR (for slip and document processing)	167	168	141	160	152	213	200	230	246
Ratio to the previous year's sales									
	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004***	**2005***
Displays (CRT and LCD)	96%	75%	124%	160%	85%	90%	115%	103%	103%
Printers (dot-matrix, inkjet, etc.)	112%	105%	135%	128%	96%	96%	108%	105%	106%
Magnetic disk readers (2.5", 3.5")	150%	91%	121%	137%	99%	102%	119%	110%	116%
Optical disk readers (CD-R/RW, DVD-ROM, MO, etc.)	120%	168%	124%	133%	86%	96%	118%	101%	108%
Image scanners (flatbed, sheetfed, etc.)	-	-	-	-	99%	72%	68%	103%	105%
OCR (for slip and document processing)	128%	101%	84%	114%	95%	140%	94%	107%	107%

Source: On the basis of information from the Japan Electronics and Information Technology Industries Association (JEITA).

* Predicted.

Note: Figures for image scanners and OCRs refer to domestic shipments.

b) Software

As shown in table 4, the domestic software market has been growing. In 2002, it stood at approximately ¥ 12.5 trillion. The largest share of sales is for software development (including system integration) for firms —approximately ¥ 6.868 trillion in 2002, or about 55% of total software sales. The next largest categories are data-processing software such as online or off-line data-processing products and application service provider (ASP) products, with ¥ 2.703 trillion, or 21.6% of all software sales. Sales of packaged software and similar products accounted for ¥ 1.431 trillion.

TABLE 4
SOFTWARE MARKET
(Millions of yen)

	1999	2000	2001	2002	% of all software sales in 2002
Data-processing software	1 194 900	1 610 989	2 611 430	2 703 214	21.6%
Orders for software development	5 496 900	5 707 006	6 763 421	6 868 182	54.9%
Software products	890 900	988 162	1 482 650	1 431 637	11.4%
Business software suites	-	681 384	728 429	736 553	5.9%
Gaming software	-	194 373	515 089	512 790	4.1%
Operating system software	-	112 405	239 133	182 294	1.5%
System operation and management software	730 200	795 782	1 159 789	1 243 612	9.9%
Database software	268 300	291 597	297 906	272 968	2.2%
Via Internet	-	135 064	121 415	100 731	0.8%
Others	-	156 532	176 491	172 237	1.4%
Total	**8 581 200**	**9 393 536**	**12 315 196**	**12 519 613**	**100.0%**

Source: On the basis of Ministry of Economy, Trade and Industry (METI), "Report of the survey on specified service industries", Tokyo, Bureau of Industrial Policy, Information Service.

c) Telecommunications services

Thanks to the spread of the Internet, use of telecommunications services has grown in recent years, accounting for ¥ 15.828 trillion in sales in 2001 (table 5). This market increased twofold from 1996 to 2001. Table 6 shows the market share for the different services, with more than half of the market consisting of voice transmission services. The most important category is voice cellular —even more important than legacy telephone services. Data transmission services accounted for less than 10% of telecommunications services sales.

TABLE 5
TELECOMMUNICATIONS MARKET
(millions of yen)

	1997FY	1998FY	1999FY	2000FY	2001FY	% of all telecom services sales in 2001
Voice services	9 600 382	9 837 671	11 003 078	9 811 119	10 285 362	65.0%
Cellular	3 089 201	3 972 610	4 932 004	4 325 323	5 450 399	34.4%
Personal Handyphone System (PHS)	501 251	372 791	405 386	127 736	116 949	0.7%
Other voice services	6 009 930	5 492 270	5 665 688	5 358 060	4 718 014	29.8%
Data transmission	298 914	279 249	360 070	898 395	1 053 649	6.7%
Via cellular and PHS	-	3 250	19 907	427 910	409 968	2.6%
Via pager	213 149	122 197	40 197	-	1 053	0.0%
Via Internet	3 884	16 324	99 557	232 276	642 628	4.1%
Via other media	81 580	137 477	200 408	238 209		
Leased circuit	738 261	799 389	1 051 420	1 127 450	1 142 991	7.2%
Telegraph	-	114 968	71 235	99 030	72 307	0.5%
Others	453 643	429 435	372 894	352 641	3 274 381	20.7%
Total	**11 090 900**	**11 460 711**	**12 858 697**	**12 288 635**	**15 828 690**	**100.0%**

Source: On the basis of Telecommunications Carriers Association (TCA), Telecom Data Book 2004, 2004.

TABLE 6
TELECOMMUNICATIONS MARKET (2001FY)
(Millions of yen)

	Sales by category-one telecom carriers	% of sales by category-one telecom carriers	Sales by category-two telecom carriers	% of sales by category-two telecom carriers	Total sales	% of all telecom sales	Number of firms surveyed
Voice services	10 285 362	58.4%	77 470	5.4%	10 362 832	54.4%	110
Fixed telephone	4 718 014	26.8%					
Cellular voice	5 450 399	31.0%					
PHS voice	116 949	0.7%					
Data transmission	1 053 649	6.0%	799 470	55.3%	1 853 119	9.7%	457
Via fixed telephone	642 628	3.6%					
Via cellular	214 005	1.2%					
Via PHS	195 963	1.1%					
Via pager	1 053	0.0%					
Leased circuit	1 142 991	6.5%	50 607	3.5%	1 193 598	6.3%	105
Telegraph	72 307	0.4%	-	-	72 307	0.4%	4
Others	3 274 381	18.6%	88 541	6.1%	3 435 229	18.0%	151
Not identified	1 779 937	10.1%	430 723	29.8%	2 138 353	11.2%	-
Total	**17 608 627**	**100.0%**	**1 446 811**	**100.0%**	**19 055 438**	**100.0%**	**658**

Source: Ministry of Internal Affairs and Communications (MIC), "Fundamental survey on the telecommunications industry". Tokyo, Telecommunications Bureau.

Note 1: Percentages are the ratio between a given service and the total for all services.

Note 2: As more than one company provides these services, the totals do not equal the sums of the individual items.

The evolution in the number of telecommunications subscribers is given in table 7. There is a negative correlation between the number of subscribers to legacy telephone and the number

of subscribers to integrated services digital network (ISDN), suggesting that as the Internet has gained increasing acceptance customers are switching from legacy to ISDN to obtain faster connections. In the early days of the Internet, dial-up services were the preferred method of connecting. However, since 2002 the number of legacy telephone subscribers has increased, to the detriment of ISDN. This is due to the introduction and spread of new services such as asymmetric digital subscriber lines (ADSL, also known as DSL). To connect through ADSL, which uses traditional copper lines, customers have had to switch from ISDN to fixed telephones.

TABLE 7
NUMBER OF TELECOMMUNICATIONS SERVICE SUBSCRIBERS
(tens of thousands subscribers)

	1996FY	1997FY	1998FY	1999FY	2000FY	2001FY	2002FY
Fixed telephone	6 153	6 045	5 847	5 555	5 226	5 100	5 116
ISDN	111	240	407	668	970	1 033	961
Cellular	2 088	3 153	4 153	5 114	6 094	6 912	7 566
PHS	603	673	578	571	584	570	546

Source: On the basis of Telecommunications Carriers Association (TCA), Telecom Data Book 2004, 2004.

Broadband use, including ADSL, cable modem and fiber to the home (FTTH), has increased rapidly in Japan since 2002. During the IT Revolution of the early 1990s, Japan lagged behind not only the Organization for Economic Cooperation and Development (OECD) countries but also other East Asian countries such as Korea, Singapore and Hong Kong (China). The main reasons were the lackluster government support, the lack of a consistent policy strategy to promote IT use and high charges for telecommunications services. In response, governments, telecommunications carriers, electronic and software companies, and Internet service providers (ISPs) have flocked to broadband since 2000. Large numbers of new players entered the broadband market, and the resulting strong competition led to an increased penetration of broadband, as shown in table 8. According to International Telecommunication Union data, Japan currently has the highest numbers of ADSL and FTTH subscribers in the world. Traditional telecommunications carriers such as NTT East/West and KDDI and power companies have installed optical fiber in all households, making FTTH a reality in Japan.

In mobile communications, Japan has also taken the lead in the world, in terms of both technology and applications. Japan is commonly perceived to have advantages in IT technology and IT infrastructure, although not in applications or software. Regarding mobile communications, this perception is grossly inaccurate. In addition to the increased popularity of 3G mobile telephones, which can transmit video, NTT DoCoMo's well known i-mode service offers mobile Internet access and has found a wide range of applications in various facets of Japanese life. As discussed below, e-commerce has spread less quickly in Japan than in other developed counties, but commerce over mobile phones (or "m-commerce") is highly advanced here.

TABLE 8
NUMBER OF INTERNET USERS
(Households)

Number of access lines	2000FY	2001FY	2002FY	2003FY	% of all users in 2003	Average annual growth rate from 2000 to 2003
Broadband	854 855	3 861 195	9 397 426	14 917 165	14.4%	159.4%
DSL	70 655	2 378 795	7 023 039	11 196 830	10.8%	441.1%
Cable	784 000	1 456 000	2 069 000	2 578 000	2.5%	48.7%
FTTH	200	26 400	305 387	1 142 335	1.1%	1687.5%
Narrowband	17 278 814	20 234 540	20 478 202	18 973 854	18.3%	3.2%
Mobile	34 567 000	51 925 000	62 460 000	69 732 000	67.3%	26.4%
Total	52 700 669	76 020 735	92 335 628	103 623 019	100.0%	25.3%
Total number of households	48 015 251	48 637 789	49 260 791	-	-	1.3%
Total population	126 926 000	127 291 000	127 435 000	127 619 000	-	0.2%
Ratio of adoption of broadband/narrowband	37.8%	49.5%	60.6%	-	-	-
Ratio of adoption of mobile access	27.2%	40.8%	49.0%	54.6%	-	-

Source: On the basis of Telecommunications Carriers Association (TCA), Telecom Data Book 2004, 2004.

Note 1: The ratio of adoption of broadband/narrowband is the number of broadband and narrowband lines divided by the total number of households.

Note 2: The ratio of mobile Internet access is the number of households that use mobile services divided by the total number of households.

Note 3: Annual growth rate refers to 2000 through 2003.

d) E-commerce

i) B2B

Regarding e-commerce, this paper will first look at the business-to-business (B2B) market. Table 9 shows that in 2003 the B2B market was worth ¥ 774.32 trillion and the EC ratio (the ratio of B2B e-commerce to total transactions) was 11.2%. A comparison with the figures for 2002 —¥ 463.07 trillion and 7.1%— shows that B2B expanded considerably in one year. Markets for products such as electronics, information-related equipment and devices and automobiles were larger and had a higher EC ratio. Although these figures are much lower than those for the United States, the size of these markets is expected to triple to ¥ 125.72 trillion by 2007.

TABLE 9
SIZE OF THE E-COMMERCE MARKET (B2B)
(100 million yen)

Sector	2 001 (EC ratio %)	2 002 (EC ratio %)	2 003 (EC ratio %)
Food	8 170 (1.30)	2 200 (0.4)	14 030 (2.4)
Fabric (for non-industrial use)	8 250 (2.20)	15 380 (4.7)	20 660 (6.2)
Chemicals	4 570 (0.80)	9 500 (1.7)	14 300 (2.5)
Iron non-ferrous materials	8 750 (2.30)	11 200 (2.9)	53 670 (13.5)
Industrial machines precision machines	9 650 (1.80)	30 080 (6.3)	37 360 (7.5)
Electronics and information-related equipment	150 840 (24.20)	197 730 (38.0)	242 940 (45.3)
Automobile	135 190 (30.50)	172 540 (36.2)	280 490 (57.6)
Construction	3 770 (0.40)	5 350 (0.6)	35 490 (4.1)
Paper and office supplies	1 340 (0.80)	1 970 (1.0)	4 900 (2.6)
Utilities (electricity gas water etc.)	0 (0.00)	0 (0.0)	0 (0.0)
Banking and insurance	10 (0.003)	40 (0.01)	0 (0.0)
Transportation and travel	5 500 (2.10)	5 600 (2.2)	39 340 (12.0)
Communication and TV and radio broadcasting	130 (0.10)	0 (0.0)	130 (0.1)
Information processing and software	3 840 (4.00)	9 300 (9.3)	20 090 (20.1)
Other	260 (0.00)	2 180 (0.2)	3 250 (0.3)
Total	**340 270 (5.00)**	**463 070 (7.1)**	**774 320 (11.2)**

Source: On the basis of Ministry of Economy, Trade and Industry (METI), "Survey on the Reality of the Market Size of e-Commerce 2003", Tokyo, 2004.

Note 1: The top figure in each category indicates revenue on e-commerce transactions, except for banking and insurance, where it indicates the amount charged for fees.

Note 2: EC ratio is B2B transactions as a percentage of total transactions, including traditional sales.

ii) B2C

Table 10 shows the size of the B2C market. In 2002, the market accounted for ¥ 2.685 trillion in sales and the EC ratio was 0.9%. The figures for 2003 were approximately ¥ 44.240 trillion yen, with an EC ratio of 1.6%, underscoring this market's remarkable growth. PCs and related products had the largest share, followed by automobiles, travel and entertainment. Since consumers do not need middlemen to help them with decisions regarding travel and entertainment, e-commerce is especially well suited for selling products in these industries. Although EC ratios for B2C remain low in all markets, sales are expected to rise in the future — to ¥ 12.300 trillion in 2007, or 4.6 times the 2003 figure.

TABLE 10
E-COMMERCE MARKET (B2C)
(100 million yen)

	2001		2002		2003	
	Sales	EC ratio (%)	Sales	EC ratio (%)	Sales	EC ratio (%)
PCs and peripherals	1 480	12.20	1 970	12.9	2 350	16.0
Travel	1 190	0.86	2 650	1.9	4 740	3.4
Entertainment	1 090	0.92	1 920	1.6	3 370	2.9
Books and music	340	1.07	620	2.0	1 310	4.2
Clothes and accessories	580	0.34	1 330	1.0	1 640	1.3
Food	620	0.14	1 300	03	2 190	0.5
Furniture and sundry home merchandise	490	0.35	1 090	0.9	2 490	2.0
Automobiles	3 470	2.80	5 770	4.6	6 030	4.8
Real estate	3 260	0.74	6 100	1.4	9 120	2.1
Other	990	0.47	1 390	0.6	2 470	1.0
Finance	630	0.63	1 160	0.4	2 150	0.7
Banking securities	-	-	510	4.1	1 460	11.8
Insurance	-	-	650	0.2	690	0.2
Services	700	0.09	1 550	0.2	6 380	0.8
Total	**14 840**	**0.55**	**26 850**	**0.9**	**44 240**	**1.6**

Source: On the basis of Ministry of Economy, Trade and Industry (METI), "Survey on the Reality of the Market Size of e-Commerce 2003", Tokyo, 2004.

Note 1: Sales refers to the amounts charged for e-commerce transactions, except for banking and insurance, where they indicate the amounts charged for fees.

Note 2: EC ratio is the ratio of B2B transactions to total transactions, including traditional transactions.

2. The future of IT and related industries

As noted, most of the growth in the IT sector and related markets has been in hardware. PCs have been introduced in homes as well as in offices, and the software market has expanded accordingly. Examples include PC software packages and made-to-order software for implementing information systems in firms. Both the hardware and software markets are expected to grow in the future in response to continued technological progress and innovation.

This recent transformation is made evident by the spread of broadband and mobile communications. As seen above, the use of ADSL, cable Internet and FTTH has grown rapidly, and this drives expansion in digital-content markets. It also spurs the growth of e-commerce, because digital contents can be transmitted over the Internet.

Regarding mobile communications, use of third generation (3G) devices is expected to expand, greatly increasing demand for communications services. Cellular Internet access is also expected to grow, driving the expansion of the market for contents such as movies, music and games. The coupling of mobile communications with global positioning (GPS) and electronic toll collection (ETC) systems for automobiles should lead to the creation of new businesses. Japan has taken the lead in mobile technology, and has enormous potential to offer new services. In this

sense, Japan may become the first u-economy, or economy in "the ubiquitous age", employing technologies far more advanced than those of the today's "e-economy".

B. SMEs: penetration of IT and use of e-commerce

1. Current use of IT by SMEs

This section examines IT use by SMEs in 2003. As shown in table 11, 90% of SMEs already use PCs and 80% use e-mail. Eighty percent of SMEs with fewer than five employees are connected to the Internet, which approximates the figure for companies with more than 300 employees (table 12). Most of the PCs owned by SMEs are on networks. Fifty percent of SMEs use the web to transmit and gather information. Other uses, such as intranets, online conferencing and schedule sharing are less common. The most widely implemented practice from 2001 to 2003 was IT training and education for employees, which grew 46.8% in that period.

TABLE 11
IT USE BY SMES

Contents	2001 (n=793)	2002 (n=881)	2003 (n=835)	Annual change (%)
Introduction of PCs	94.6%	96.3%	97.1%	1.25
Introduction of the Internet	87.9%	91.8%	93.9%	3.00
Use of e-mail	74.8%	78.7%	84.9%	5.05
Homepage construction	53.5%	57.7%	52.3%	-0.60
Use of the web to find information	45.8%	51.5%	50.3%	2.25
IT training and education of employees	29.9%	25.5%	46.8%	8.45
Use of databases to gather information	41.5%	44.0%	35.3%	-3.10
Implementation of an intranet	27.0%	27.6%	22.6%	-2.20
E-blackboard, e-meeting and schedule sharing	13.9%	16.2%	14.9%	0.50
Hiring of outside consultants for IT use	1.3%	12.7%	8.7%	3.70
Mobile computing	10.3%	11.5%	6.8%	-1.75
Other	0.6%	1.0%	1.0%	0.20

Source: On the basis of Small and Medium Enterprise Agency, "Survey on the reality of IT utilization by SMEs", Ministry of Economy, Trade and Industry (METI), Tokyo, 2003.

TABLE 12
INTERNET USE BY FIRMS

	1997	1998	1999	2000	2001	2002
Firms with more than 300 employees	68.2%	80.0%	88.6%	95.8%	97.6%	98.4%
Firms with fewer than 5 employees	12.3%	19.2%	31.8%	44.8%	68.0%	79.1%

Source: Ministry of Internal Affairs and Communications (MIC), "Survey on telecommunications users", Tokyo.

In 2003, the most common computer management applications were accounting and sales software, including point-of-sale (POS) applications. This type of software had been introduced by about 60% of SMEs, followed by purchase management programs, by 33.9%, and inventory management programs, by 31.0% (table 13).

SMEs use information system applications less than they use management system applications. Of information system applications, task-sharing applications (28.7%), document-

sharing applications (26.2%) and work-report applications (23.1%) are the most widely used (table 14).

TABLE 13
ACQUISITION OF BUSINESS MANAGEMENT APPLICATIONS BY SMES

Business management applications	2001 (n=793)	2002 (n=881)	2003 (n=835)	Average annual variation (%)
Accounting management	67.5%	68.4%	61.0%	-3.25
Sales management (including POS)	57.0%	65.7%	58.8%	0.90
Human resource and payroll management	55.5%	59.1%	46.0%	-4.75
Purchases management	29.0%	32.6%	33.9%	2.45
Inventories management	40.6%	39.4%	31.0%	-4.80
Cost management	34.4%	36.7%	26.0%	-4.20
Design management (including CAD, CAM)	23.3%	19.8%	23.1%	-0.10
Production management (production planning)	29.6%	26.2%	18.4%	-5.60
Distribution management	17.2%	14.3%	10.7%	-3.25
Other	3.0%	3.0%	5.6%	1.30

Source: On the basis of Small and Medium Enterprise Agency, "Survey on the reality of IT utilization by SMEs", Ministry of Economy, Trade and Industry (METI), Tokyo, 2003.

TABLE 14
ACQUISITION OF OFFICE INFORMATION APPLICATIONS BY SMES

Type of system	2003 (n=835)
Office task-sharing applications	28.7%
Document-sharing applications	26.2%
Daily work-report applications	23.1%
Schedule-sharing applications	12.2%
E-blackboard, e-meeting	11.6%
Electronic decision-making applications	3.8%
Knowledge-management applications	1.3%
Other	6.0%

Source: On the basis of Small and Medium Enterprise Agency, "Survey on the reality of IT utilization by SMEs",, Ministry of Economy, Trade and Industry (METI), Tokyo, 2003.

The above figures are national averages, and there is much regional variance. Below, this paper analyzes IT use by SMEs through two regional case studies. Subsequently, it discusses more specific problems and makes concrete policy recommendations.

TABLE 15
CURRENT SITUATION OF E-COMMERCE
(*all sectors except public sector*)

Total	Number of firms surveyed	1 617 600			100.00%
	Firms engaging in e-commerce	169 289			10.50%
	B2B		130 448		8.10%
	Only via the Internet			90 101	5.60%
	Only via media other than the Internet			30 635	1.90%
	Via the Internet and other media			9 712	0.60%
	B2C		64 549		4.00%
	Only via the Internet			56 297	3.50%
	Only via media other than the Internet			4 132	0.30%
	Via the Internet and other media			4 120	0.30%
	Firms not engaging in e-commerce	1 448 311			89.50%
SMEs	Number of firms surveyed	1 583 219			100.00%
	Firms engaging in e-commerce	160 319			10.10%
	B2B		123 820		7.80%
	Only via the Internet			86 579	5.50%
	Only via media other than the Internet			28 562	1.80%
	Via the Internet and other media			8 679	0.50%
	B2C		60 745		3.80%
	Only via the Internet			53 095	3.40%
	Only via media other than the Internet			3 961	0.30%
	Via the Internet and other media			3 689	0.20%
	Firms not engaging in e-commerce	1 422 900			89.90%
Large companies	Number of firms surveyed	34 381			100.00%
	Firms engaging in e-commerce	8 970			26.10%
	B2B		6 628		19.30%
	Only via the Internet			3 522	10.20%
	Only via media other than the Internet			2 073	6.00%
	Via the Internet and other media			1 033	3.00%
	B2C		3 804		11.10%
	Only via the Internet			3 202	9.30%
	Only via media other than the Internet			171	0.50%
	Via the Internet and other media			431	1.30%
	Firms not engaging in e-commerce	25 411			73.90%

Source: On the basis of Small and Medium Enterprise Agency, "Survey on the reality of IT utilization by SMEs", Ministry of Economy, Trade and Industry (METI), Tokyo, 2003.

2. E-commerce and SMEs

Although no definitive survey on e-commerce in Japan has been carried out, various institutions have published data on the topic. Table 15, which contains data from a 2001 MIC survey, summarizes current e-commerce use. The MIC surveyed more than 1.6 million companies, nearly 90% of which were SMEs. It found that about 10.5% of the firms in all categories engaged in e-commerce. For SMEs, the figure is 10.1%, while for large firms it is 26.1%. B2B transactions were conducted by 7.8% of SMEs, compared with 19.3% of large companies. In the case of B2C, the figures were 3.8% for SMEs, and 11.1% for large firms.

Giovannetti, Kagami and Tsuji (2003), after examining very different data, reported that B2B use for all categories of firms was 6.1% and B2C use was 0.6%. These figures are much lower than those previously reported. By comparison, 7.1% and 2.16% of United States firms engage in B2B and B2C.

a) B2B

Table 16 examines Japanese firms' objectives in adopting B2B. More than half (57.4%) of the firms reported that they used B2B for sales; 54.8%, for purchases; 18.2%, for distribution; and 21.8%, for after-sales services. These figures include both large companies and SMEs.

TABLE 16
PURPOSES OF B2B

	Number of firms conducting B2B transactions	Sales	Purchases	Distribution	After-sales services etc.
Total	130 448 (100.0%)	74 819 (57.4%)	71 426 (54.8%)	23 702 (18.2%)	28 408 (21.8%)
SMEs	123 820 (100.0%)	70 692 (57.1%)	67 175 (54.3%)	22 358 (18.1%)	27 383 (22.1%)
Large firms	6 628 (100.0%)	4 127 (62.3%)	4 251 (64.1%)	1 344 (20.3%)	1 025 (15.5%)

Source: Ministry of Internal Affairs and Communications (MIC), "Survey on business statistics 2001", Statistics Bureau, 2003.

b) B2C

As shown in table 17, B2C is primary used for taking orders (82.2%), followed by distribution (19.2%) and after-sale services (27.3%). This implies that many firms are using B2C to build a new kind of relationship with their customers. As with B2B, these figures do not vary significantly between large and small firms.

TABLE 17
PURPOSES OF B2C

	Number of firms engaging in B2C	Sales	Distribution	After-sales services etc.
Total	64 549	53 083	12 373	17 629
	(100.0%)	(82.2%)	(19.2%)	(27.3%)
SMEs	60 745	49 777	11 668	16 757
	(100.0%)	(81.9%)	(19.2%)	(27.6%)
Large firms	3 804	3 306	705	872
	(100.0%)	(86.9%)	(18.5%)	(22.9%)

Source: Ministry of Internal Affairs and Communications (MIC), "Survey on business statistics 2001", Statistics Bureau, 2003.

The next chapter presents our survey data for B2B and B2C use by SMEs and compares those data with the results given above.

3. Supply chain management and SMEs

In the preceding sections, it was noted that although some firms have engaged in e-commerce to make purchases and accept orders, the percentage remains relatively low. This section examines SCMs, the purpose of which is to raise the efficiency of the management of the entire chain through which goods are produced and distributed, including manufacturing, wholesaling, supplying of parts, retailing and delivery to consumers. The importance of SCM in the information society, or of the utilization of IT for SCM, hardly needs to be pointed out. Consumers' needs, as well as the practices of distribution networks, are in continuous flux. IT is an indispensable tool for processing all kinds of business-related information. If a firm makes mistakes in the way it applies technology, it will be forced out of the supply chain. This also holds for SMEs. This section analyzes the current situation with and issues faced by SMEs with respect to SCM.

a) SCM as practiced by SMEs

According to a survey by the Small and Medium Enterprise Agency, only one-third of SMEs in sectors in which SCM techniques are practiced, such as manufacturing, wholesale and retail, view SCM as useful; moreover, fewer than 15% of manufacturing firms practice SCM techniques (table 18). This underscores that SCM techniques have not yet found wide acceptance among SMEs.

TABLE 18
FIRMS THAT ARE FAMILIAR WITH AND HAVE ADOPTED SCM TECHNIQUES
(March 2002)

Sectors	Number of firms familiar with SCM techniques	Adoption of SCM techniques			
		Have fully implemented SCM techniques	Have partially implemented SCM techniques	Plan to implement SCM techniques	Are considering adopting SCM techniques
Manufacturing	36.0%	4.6%	9.1%	2.3%	4.0%
Wholesale	34.9%	2.7%	7.4%	1.3%	8.7%
Retail	31.1%	1.9%	6.6%	2.8%	3.8%
Total	34.4%	3.3%	7.9%	2.1%	5.6%

Source: On the basis of Small and Medium Enterprise Agency, "Research on the change of environments regarding efficiency of distribution networks", Ministry of Economy, Trade and Industry (METI), Tokyo, 2002.

A breakdown of these data by firm size shows that only one-fourth of SMEs are familiar with the concept of SCM, and only 8.4% use SCM techniques. This figure is lower than half that of large firms. As noted above, SCM techniques are not widely practised in Japan, especially among SMEs (table 19).

TABLE 19
SIZE OF FIRMS THAT ARE FAMILIAR WITH AND HAVE ADOPTED SCM TECHNIQUES
(March 2002)

Size of firms	Firms familiar with SCM techniques	Adoption of SCM techniques			
		Have fully implemented SCM techniques	Have partially implemented SCM techniques	Plan to implement SCM techniques	Are considering adopting SCM techniques
SMEs	24.8%	2.7%	5.7%	0.8%	4.6%
Large firms	49.4%	4.2%	11.3%	4.2%	7.1%

Source: On the basis of Small and Medium Enterprise Agency, "Research on the change of environments regarding efficiency of distribution networks", Ministry of Economy, Trade and Industry (METI), Tokyo, 2002.

b) Difficulties with introducing SCM

Although the following section closely examines the problems faced by SMEs in adopting IT, it should be noted briefly that the main obstacle to adopting SCM techniques is related to the importance placed on the interconnectivity of information and communications systems among different firms and the need to guarantee the security of confidential information. For SMEs, especially, there are four main issues to deal with regarding adopting SCM techniques: (i) collaboration among firms, (ii) senior management leadership, (iii) the establishment of internal systems, and (iv) employee training.

i) Collaboration among firms

Many SME owners view SCM is nothing more than a way for large firms to increase profits at the expense of their SME subcontractors. In principle, all related firms are equally responsible for using an SCM system and share the same information on purchases, sales and inventories. However, when a large firm takes the initiative of building an SCM system and fails to share information properly with its SME subcontractors, and when it fully leverages this advantage,

SMEs that react slowly end up with bloated inventories and experience a substantial waste of materials and products. It is important, therefore, that SCM systems be built on a basis of an equal partnership and fair information sharing.

ii) Top-management leadership

When an SCM system is introduced, senior management needs to understand the structure of transactions among related firms and then construct suitable information systems, so as to ensure that management's objectives are met. Inter-firm transactions, once based on hierarchical structures —with contractors divided into primary, secondary and tertiary tiers— are now based on non-hierarchical ones, with all firms using the Internet to connect through a B2B arrangement. Without adequate information systems, SMEs cannot receive orders from other firms. Hence, senior managers should provide strong leadership in adopting any SCM system and be sure that they fully understand market trends. Deciding on whether to investment in a technology such as an SCM system is quite complex, and choosing the wrong system can lead to heavy losses. Therefore, consultation with experts is extremely important.

iii) The establishment of internal systems

Before adopting SCM techniques, firms generally own different information management systems such as for purchases and sales, inventories, and production. For SCM to be effective, these existing systems must be integrated into the SCM system, to ensure that data flow smoothly through all information systems. All existing information systems should be evaluated on this basis before SCM is introduced.

iv) Employee training

Introducing SCM requires IT specialists, of which SMEs usually have few. If an SME lacks in-house IT specialists, it must hire a consultant to construct its information systems and SCM. Specialists are also required for the daily operation of the SCM system. Since SMEs cannot afford the high cost of hiring outside specialists, they must hire and train their own.

III. SME development in the IT revolution

A. The role of SMEs in the Japanese economy

In Japan, the definition of SMEs is unclear, with various laws each defining the concept differently. The Fundamental Law on SMEs, for example, defines manufacturing SMEs as companies with fewer than 300 employees and less than ¥ 100 million in capital. Wholesalers must have fewer than 100 employees and less than ¥ 100 million; retailers, 50 employees and ¥ 50 million; and service providers, 100 employees and ¥ 50 million. Although there are no official figures on the number of Japanese SMEs, the *White Paper on Small and Medium Enterprises in Japan* estimates that in 2001 over 1.5 million non-agricultural companies met the requirements for classification as SMEs, or about 99.2% of the 1.697 million total companies.

The Japanese economy has recently begun to bounce back from its long recession, in large part due to higher exports and an upturn in IT-related markets such as digital home appliances. Stronger export demand has been driven by the depreciation of the yen and general economic growth in East Asia. Although large companies have seen a remarkable recovery in profits, the improvement for SMEs has been less uniform. In the manufacturing sector, large firms as well as SMEs have recovered, but retail and services SMEs have seen little improvement.

This section examines the role of SMEs in the various sectors of the Japanese economy. Although there are no uniform official data on SMEs, available data provides a general picture of the roles played by SMEs. As shown in table 20, SMEs contributed 57% of the value added to production in 2002, compared with 43% for large firms. This breakdown has remained stable in recent years. Table 20 shows direct exports by the manufacturing sector. In 2000, SMEs' average share across all industries was 9.1%, while that of large firms was 20.6%. These are the only data available on exports. In most years, SME exports account for approximately one-half of those of large firms. But SMEs have a relatively stronger presence in sectors such as general machinery, electric machinery, and precision machinery, where Japanese firms have a technological advantage. In 2002, SMEs accounted for nearly 40% of all investment in the manufacturing sector, up slightly from previous years, as shown in table 22. Table 23, which gives data on the numbers of firms in various sectors shows that industry, is overwhelmingly dominated by SMEs. Across all sectors, SMEs account for nearly 100% of total firms. As for employment, data is

shown in table 24. In mining, construction, groceries and real estate, SMEs account for a high percentage of employment. However, in public utilities, including electricity, gas, and water, SMEs employ only 12.4% of all workers, and in finance and insurance, 13.9%. To take advantage of economies of scale and network externalities, these sectors require huge investments in equipment and infrastructure. This inherent feature of these sectors restricts entry to large firms. Still, SMEs play a leading role in employment, as evidenced by the fact that they account for two-thirds of all industrial employment.

TABLE 20
SMES' SHARE OF VALUE ADDED TO MANUFACTURING OUTPUT
(billions of yen)

	SMEs		Large firms	
	Value	Share	Value	Share
1998	48 997	56.7	48 997	43.3
2000	47 770	56.7	47 770	43.3
2002	41 827	57	41 827	43

Source: On the basis of Ministry of Economy, Trade and Industry (METI), Industrial Statistics, Tokyo, 2002.

Note: Totals do not add up to 100%, since percentages refer only to direct exports.

TABLE 21
SMES' SHARE OF MANUFACTURING EXPORTS (2000)
(%)

	SMEs		Large firms	
	Direct exports	**Indirect exports**	**Direct exports**	**Indirect exports**
Average for all industries	9.1	11.2	20.6	13.3
Steel	6.7	30.5	8.4	28.4
Non-ferrous metal	13.3	33.8	16.8	24.4
Metal products	3.9	11.0	2.5	8.0
General machinery	24.5	8.8	29	7.6
Electric machinery	24	16.6	30	11.0
Transportation equipment	11.1	35.1	30.7	16.5
Precision machinery	29.2	6.3	34.9	3.8
Paper	2.5	11.9	3.8	10.5
Chemicals	12.8	13.1	16.3	15.2
Plastics	4.6	21.1	6.9	22.5

Source: On the basis on Small and Medium Enterprise Agency, "Input-output table 2002", Ministry of Economy, Trade and Industry (METI), Tokyo.

TABLE 22
SMES' SHARE OF INVESTMENT IN THE MANUFACTURING SECTOR
(Billions of yen)

	SMEs		Large firms	
	Amount	Share	Amount	Share
1998	4 904	36.8	8 439	63.2
2000	4 127	36.4	7 199	63.6
2002	3 703	39	5 783	61

Source: On the basis of Ministry of Economy, Trade and Industry (METI), Industrial Statistics, Tokyo, 2002.

TABLE 23
NUMBER OF SMES IN VARIOUS SECTORS

	SMEs		Large firms	
Sector	Number	% of all firms in sector	Number	% of all firms in sector
Mining	2.6	99.7	9	0.3
Construction	543.4	99.9	363	0.1
Manufacturing	554.4	99.6	2 150	0.4
Electricity, gas, and utilities	0.5	97.7	28	5.2
Transportation and telecommunications	100.5	99.7	343	0.3
Wholesale, retail, and groceries	1 999.40	99.7	6 394	0.3
Wholesale	255.6	99.1	2 394	0.9
Retail	1 054.40	99.7	3 544	0.3
Grocery stores	689.5	99.9	456	0.1
Finance and insurance	34.30	99.1	312	0.9
Real estate	262.7	100	89	0
Service	1 191.80	99.7	3 742	0.3
Total	4 689.60	99.7	13 430	0.3

Source: Ministry of Internal Affairs and Communications (MIC), "Statistical survey on offices and firms", Tokyo, 2001.

TABLE 24
EMPLOYMENT BY SMES (2001)

	SMEs		Large firms	
Sector	Employees (thousands)	% of employment in sector	Employees (thousands)	% of employment in sector
Mining	29.7	84.5	5.4	15.5
Construction	3 151.00	86.5	493.1	13.5
Manufacturing	6 239.90	60.2	4 119.10	39.8
Electricity, gas, and utilities	27	12.4	190.7	87.6
Transportation and telecommunications	2 004.00	67.3	974.1	32.7
Wholesale, retail, grocery stores	8 036.70	67.8	3 815.30	32.2
Wholesale	2 364.70	66.9	1 170.50	33.1
Retail	3 784.10	63	2 221.30	37
Grocery stores	1 887.90	81.7	423.50	18.3
Finance, insurance	159.90	13.9	987.10	86.1
Real estate	432.80	83.3	88.90	17
Services	5 520.00	73.4	2 002.30	26.6
Overall	25 601.00	66.9	12 676.10	33.1

Source: Ministry of Internal Affairs and Communications (MIC), "Statistical survey on offices and firms", Tokyo, 2001.

One current problem related to SMEs is the fact that there are fewer start-ups than closedowns. Moreover, since the difference between start-ups and closedowns is growing, the total number of SMEs is shrinking, as shown in table 25. The reasons for this are the prolonged stagnation caused by the burst of the bubble economy; the "hollowing out" of firms; and the lack of successors to inherit businesses because of Japan's aging population. These phenomena will be re-examined in the section on SME-related policies.

TABLE 25
RATIO OF START-UPS TO CLOSEDOWNS

	1981-1986	1987-1991	1992-1996	1997-1999	Jan. 99
Start-ups	4.3	3.5	2.7	3.6	3.1
Close-downs	4	4	3.2	5.6	4.5

Source: Ministry of Internal Affairs and Communications (MIC), "Statistical survey on offices and firms", Tokyo, related years.

B. Case studies on IT use in two SME clusters: Higashi-Osaka and Ohta Ward

This section examines current IT use by SMEs and some related issues. It is based on field surveys, a mail survey and in-depth interviews conducted by the authors 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.

1. Description of the selected SME clusters

a) "Vertical" and "horizontal" SME clusters

SMEs undergird Japan's entire monotsukuri (manufacturing) sector by supplying it with high-quality parts; it is well known that the unsurpassed quality of Japanese products is largely based on the technological know-how and accumulated skills of the country's SMEs.

Higashi-Osaka city and Tokyo's Ohta ward were selected as the focus of the field study because they are the two largest SME clusters and they use highly specialized technologies and rely on regional networks. The two regions, however, are no in no way identical, and the differences between them are described below.

SMEs in Higashi-Osaka excel at manufacturing finished products in the machinery and metalwork industries. More than 100 SMEs in Higashi-Osaka manufacture unique products and control the largest shares of the markets for those products in Japan as well as abroad. The core sectors of Higashi-Osaka's SMEs include manufacturing of metal, plastic and electronic products, general machinery and printing and publishing. Although they produce under contract for some large companies such as Panasonic, Sanyo, and Sharp, these SMEs tend to be more independent and less focused on acting as subcontractors than are their counterparts in Ohta ward. Higashi-Osaka's manufacturing SMEs have built local networks through horizontal cooperation with producers of niche products and related peripheral products. SMEs in this cluster engage in various types of "inter-industrial transactions" so as to devise ideas on new technologies, product marketability, etc. These exchanges are strongly oriented towards encouraging market innovation.

Most SMEs in Ohta ward specialize in metalworking and processing, and possess a high level of technical know-how. Large as well as leading medium-sized companies in the electronics and automobile industries, such as Toshiba, Sony, NEC and Nissan, have benefited by purchasing

high-quality parts from them. Ohta ward's SMEs have strong ties with the large companies that historically have congregated in the Tokyo metropolitan area. Although this collaboration has increased SMEs' competitiveness, it has also limited their options: SMEs in Ohta ward tend to passively accept their role as subcontractors.

Hence, the SMEs in Higashi-Osaka will be referred to in this paper as a "horizontal cluster", and those in Ohta ward, as a "vertical cluster".

b) Characteristics of the two selected clusters

i) Higashi-Osaka

The well known industrial city of Higashi-Osaka is Japan's fifth largest in terms of the number of manufacturing facilities. With over 8,000 factories, it has the highest number of factories per square km in Japan.

The authors mailed questionnaires to 3,500 SMEs in June 2004. Firms in Higashi-Osaka too large to be considered SMEs were not sent questionnaires and were omitted from the sample. The authors received 691 responses, for a response ratio of 17.4%. The survey results allow Higashi-Osaka SMEs to be described on the basis of the following characteristics: (i) size, in terms of capital and number of employees, (ii) industrial sector.

Capital and employees

Table 26 gives a breakdown of SMEs by amount of capital. More than half of the SMEs surveyed in Higashi-Osaka have less than ¥ 10 million, and the average capital is nearly ¥ 21.8 million. As seen in table 27, 80% have fewer than 50 employees and 60% have fewer than 20 employees. The number of IT-related employees is indicated in table 28. Nearly 30% of SMEs in this cluster have no IT-related employees, and the overall average is only 1.5.

TABLE 26
CAPITAL

	Combined total		Higashi-Osaka		Ohta ward	
Millions of yen	**Firms**	**% of all firms**	**Firms**	**% of all firms**	**Firms**	**% of all firms**
<1	15	1.3	4	0.6	11	2.2
1-5	221	18.4	57	8.2	164	32.3
>5-10	446	37.2	287	41.5	159	31.4
>10-30	229	19.1	161	23.3	68	13.4
>30-50	91	7.6	57	8.2	34	6.7
>50-100	54	4.5	38	5.5	16	3.2
>100-300	12	1.0	7	1.0	5	1.0
>300-	0	0.0	0	0.0	0	0.0
Did not respond	130	10.9	80	11.6	50	9.9
Total	**1 198**	**100.0**	**691**	**100.0**	**507**	**100.0**
Average	19.0		21.8		15.3	

Source: Prepared by the author.

TABLE 27
EMPLOYEES

	Combined total		Higashi-Osaka		Ohta ward	
	Firms	% of all firms	Firms	% of all firms	Firms	% of all firms
1-5	280	23.4	76	11.0	204	40.2
6-10	258	21.5	176	25.5	82	16.2
11-20	237	19.8	157	22.7	80	15.8
21-50	226	18.9	158	22.9	68	13.4
51-100	75	6.3	50	7.2	25	4.9
101-300	46	3.8	33	4.8	13	2.6
>300	0	0.0	0	0.0	0	0.0
Did not respond	76	6.3	41	5.9	35	6.9
Total	**1 198**	**100.0**	**691**	**100.0**	**507**	**100.0**
Average	23.7		28.2	4.1	17.5	3.5

Source: Prepared by the author.

TABLE 28
IT-RELATED EMPLOYEES

	Combined total		Higashi-Osaka		Ohta ward	
	Firms	% of all firms	Firms	% of all firms	Firms	% of all firms
0	338	28.2	194	28.1	144	28.4
1	129	10.8	86	12.4	43	8.5
2-4	126	10.5	83	12.0	43	8.5
≥5	30	2.5	25	3.6	5	1.0
Did not respond	575	48.0	303	43.8	272	53.6
Total	**1 198**	**100.0**	**691**	**100.0**	**507**	**100.0**
Average	1.3		1.5		0.9	

Source: Prepared by the author.

Industrial sector

Table 31 gives a breakdown of SMEs by industrial sector. More than half of SMEs are in the manufacturing sector, while 17.7% are wholesalers. This underscores the manufacturing orientation of the Higashi-Osaka cluster. Table 32 gives a breakdown of categories of products in the manufacturing sector: metalware accounts for 32%; plastics and rubber products, 14.6%; electric machinery and equipment, 13.9%; and general machinery, 12.8%. Most companies in the two sectors are currently attempting to expand their traditional lines of business. Very few have changed their basic business models since their inception. An examination of the correlation between the number of employees and the type of business shows that companies with fewer than 20 employees are predominantly involved in manufacturing, retailing, money lending, real estate, information services and a range of other services. By contrast, a large number of companies with between 21 and 300 employees are in the transportation, telecommunications services and construction sectors. The average net profit margin for all SMEs in the two sectors ranged from 11% to 20% in fiscal year 2003.

TABLE 29
SECTOR

	Combined total		Higashi-Osaka		Ohta ward	
	Firms	% of all firms	Firms	% of all firms	Firms	% of all firms
Manufacturing	863	72.0	397	57.5	466	91.9
Wholesale	155	12.9	122	17.7	33	6.5
Retail	52	4.3	38	5.5	14	2.8
Transportation, communication	17	1.4	17	2.5	0	0.0
Construction	76	6.3	67	9.7	9	1.8
Finance, insurance	1	0.1	1	0.1	0	0.0
Real estate	18	1.5	17	2.5	1	0.2
Corporate services	55	4.6	46	6.7	9	1.8
Individual services	30	2.5	28	4.1	2	0.4
Information services	14	1.2	10	1.4	4	0.8
Other	61	5.1	49	7.1	12	2.4
Did not respond	45	3.8	33	4.8	12	2.4
Total	**1 198**		**691**		**507**	

Source: Prepared by the author.

TABLE 30
CATEGORIES OF PRODUCTS IN THE MANUFACTURING SECTOR

	Total		Higashi-Osaka		Ohta ward	
	Firms	% of all firms	Firms	% of all firms	Firms	% of all firms
1. Food	28	3.2	18	4.5	10	2.2
2. Textiles	14	1.6	13	3.3	1	0.2
3. Wool	14	1.6	5	1.3	9	1.9
4. Paper	28	3.2	19	4.8	9	1.9
5. Synthetic resin and rubber	97	11.2	58	14.6	39	8.4
6. Ceramics, stone and sand	7	0.8	6	1.5	1	0.2
7. Steel	56	6.5	27	6.8	29	6.2
8. Non-ferrous metals	88	10.2	38	9.6	50	10.7
9. Metals	275	31.9	127	32.0	148	31.8
10. Machinery and equipment	161	18.7	51	12.9	110	23.6
11. Electric machinery	160	18.5	55	13.9	105	22.5
12. Transportation equipment	59	6.8	22	5.6	37	7.9
13. Other	180	20.9	93	23.4	87	18.7
Did not respond	11	1.3	5	1.3	6	1.3
Total	**863**	**100.00**	**397**	**100.00**	**466**	**100.00**

Source: Prepared by the author.

ii) Ohta cluster

Capital and employees

As noted, table 36 gives a breakdown of SMEs by amount of capital. Two-thirds of Ohta's SMEs have less than ¥ 10 million in capital. With an average of nearly ¥ 15.3 million, Ohta's SMEs are, overall, much smaller than those in Higashi-Osaka. More than half of Ohta's SMEs have fewer than 10 employees, and the average is 17.5 (table 37). Hence, Ohta ward has more small companies than does Higashi-Osaka. Table 38, which gives the number of IT-related employees, shows that nearly 30% of SMEs in Ohta have no IT-related employees, and they average merely 0.9.

Industrial sector

As shown in table 39, some 91.9% of all SMEs that returned valid responses are involved in manufacturing, making this by far the most important sector. For all other categories, the percentages were nearly the same as in Ohta as in Higashi-Osaka. Table 40 gives a breakdown by categories of products in the manufacturing sector, with metalware (31.8%), machinery and tools (23.6%), electric machinery (22.5%) and other manufactured products ranking high. As in Higashi-Osaka, many companies have expanded their lines of business but very few have made structural changes. In table 29, an examination of the correlation between number of employees and type of business shows that many companies with fewer than 20 employees are involved in manufacturing, wholesaling, retailing, house construction or other services. A large number of companies with 21 to 300 employees provide real estate or information services. The average net profit margin ranged from 6% to 10% in fiscal year 2003. Ohta ward SMEs had much lower net profit margins than those in Higashi-Osaka.

2. E-commerce and SCM in two SME clusters

Large Japanese firms have implemented SCM techniques within their own keiretsu (industrial groups), each of which is centered on a major manufacturing company. The objective of this structure is to streamline transactions within the keiretsu. A typical example is the Toyota Motor Corporation's just-in-time system, also referred to as the "kanban method". Toyota's production system consists of a hierarchical structure of 36,000 primary, secondary and tertiary part suppliers. Under the just-in-time system, all subcontractors are required to deliver the right number of parts to the right production lines at the right time. They are also asked to coordinate production among themselves. Until now, traditional methods such as telephones and fax machines have sufficed for transmitting information to SME subcontractors. Advanced IT systems such as computer-aided design/computer-aided manufacturing (CAD/CAM) have, at best, been introduced for secondary parts suppliers.

As part of the field survey, questionnaires on e-commerce and SCM were sent to 6,900 SMEs in Ohta ward and Higashi-Osaka, and 1,198 valid replies were received. According to the responses received, 242 SMEs (25.4%) conduct transactions by means of B2B e-commerce, but only 91 (9.6%) resort to B2C. In addition, only six companies (0.5%) have adopted SCM techniques. Hence, the SCM system is not widely accepted in Japan's two largest SME clusters. In the following section, problems associated with the introduction of SCM will be discussed from the standpoint of cooperation and collaboration among SMEs, managerial leadership, internal controls and human resources related to IT.

Since most SMEs in these two clusters do not belong to a keiretsu, they have diversified their customer and parts-supplier bases. This suggests that they do not find it beneficial to adopt SCM techniques. Given the current level of SCM development in Japan, to adopt these techniques, they would have to limit their transactions to specific firms.

3. Issues related to IT use in both clusters

The survey results indicate that SMEs use information systems for the following purposes: accounting and financial control (712 companies, 59.4%); sales management (549 companies, 45.8%); payroll (525 companies, 43.8%); inventory management (401 companies, 33.5%); purchases management (373 companies, 31.1%); and production management (211 companies, 17.6%) (Table 32). Hence, SMEs have introduced IT systems primarily for internal management, whereas they still make scant use of new technologies, such as SCM or B2C, to interact with other companies.

Furthermore, the respondents emphasized the following problems preventing them from making greater use of IT: employees' lack of familiarity with IT (555 companies, 46.3%); lack of IT specialists (403 companies, 33.6%); inadequate leadership (356 companies, 29.7%); and management's failure to identify goals for IT use (316 companies, 26.4%). The issues raised provide important information for devising policies to encourage SMEs to adopt new technologies, especially since these issues, far from being unique to the two clusters under study, are common to SMEs throughout Japan.

Based on the data given above, the next section expands the analysis of SME IT use beyond e-commerce and SCM, to include other, related issues in the two clusters.

C. Quantitative analysis of IT use in two SME clusters: Higashi-Osaka and Ohta ward

This section summarizes the Higashi-Osaka and Ohta surveys and analyzes the results of the mail survey and in-depth interviews. By focusing on the differences in how the two clusters use IT, this analysis will identify obstacles and provide important lessons.

1. Number of PCs owned

The responses to this question in the mail survey are shown in table 31. Each cluster will be examined individually.

i) Higashi-Osaka

Higashi-Osaka SMEs own an average of 19.1 PCs. The number is higher for companies that are growing in terms of capital, staff, sales and total profits. More than 50% of the SMEs with five or more IT specialists and/or users own 21 or more PCs. Hence, there is a strong correlation between having at least five IT specialists and/or users and the acquisition of new computers. SMEs here have an average of 17 PCs connected to a local area network (LAN). It was also found that SMEs experiencing growth had more computers connected through LANs.

ii) Ohta ward

SMEs in Ohta ward own an average of 8.8 PCs, just under one-half of the average for Higashi-Osaka, and most own only two or three. As in Higashi-Osaka, the SMEs in Ohta ward with a larger number of PCs are experiencing growth in terms of capital, staff size, sales and total profits. The average number of PCs connected to a LAN is 7.5 —again less than one-half of the figure for Higashi-Osaka. With the exception of these indicators, SMEs in Ohta ward are similar to those in Higashi-Osaka.

TABLE 31
NUMBER OF PCS OWNED BY SMES

	Combined total		Higashi-Osaka		Ohta ward	
	PCs	% of all SMEs	PCs	% of all SMEs	PCs	% of all SMEs
0	95	7.9	23	3.3	72	14.2
1	163	13.6	70	10.1	93	18.3
2-3	261	21.8	152	22.0	109	21.5
4-5	92	7.7	61	8.8	31	6.1
6-10	273	22.8	180	26.0	93	18.3
11-20	142	11.9	97	14.0	45	8.9
21 or more	150	12.5	104	15.1	46	9.1
Did not respond	22	1.8	4	0.6	18	3.6
Total	**1 198**	**100.0**	**691**	**100.0**	**507**	**100.0**
Average	14.8		19.1		8.8	

Source: Prepared by the author.

2. Software use

The responses to this question in the mail survey are shown in table 31.

i) Higashi-Osaka

The main uses for software by SMEs in Higashi-Osaka are accounting (67.6% of the SMEs), sales (54.3%), payroll (50.9%), inventories (37.6%), purchases (35.5%) and design management (33.6%). Groupware and customer relationship management (CRM) software are used by 20.4% and 18.7% of the SMEs, respectively. The more PCs an SME has, the more it uses groupware and sales force automation (SFA) software. Of SMEs with 21 or more PCs, more than 50% use groupware to share information. The types of software that SMEs intend to acquire in the future include applications for inventories (16.8%), production (16.8%), payrolls (12.0%) management, SFA (11.7%), CRM (11.4%) and distribution management (11.3%). Importantly, 10% intend to use CRM and SFA. In general, the more intensively an SME wants to use IT, the stronger the likelihood that it intends to use CRM, groupware, SFA or SCM in the future.

ii) Ohta ward

Ohta SMEs use software most often for accounting (48.3%), design (37.7%), sales (34.3%), payrolls (34.1%), inventory (27.8%) and purchases management. Groupware and CRM are used by 11.0% and 8.1%, respectively. Firms with more PCs are more likely to use groupware, SFA and applications for design, inventories and production management. In the future, 12.8% of these firms intend to use software for inventory, 12.6% for production and 11.4% for payroll management. The proportion of SMEs using either SCM or SFA remains under 10%. As in Higashi-Osaka, the more intensively an SME wants to use IT, the stronger the likelihood that it intends to turn to CRM, SFA and groupware.

TABLE 32
SOFTWARE USE BY SMES

	Combined total		Higashi-Osaka		Ohta ward	
	Firms	% of all firms	Firms	% of all firms	Firms	% of all firms
1. Sales management (including POS and barcode applications)	549	45.8	375	54.3	174	34.3
2. Accounting	712	59.4	467	67.6	245	48.3
3. Payroll management	525	43.8	352	50.9	173	34.1
4. Purchases management	373	31.1	245	35.5	128	25.2
5. Inventory management	401	33.5	260	37.6	141	27.8
6. Design management (including CAD/CAM)	423	35.3	232	33.6	191	37.7
7. Production management	211	17.6	112	16.2	99	19.5
8. Logistics	100	8.3	73	10.6	27	5.3
9. Enterprise resource planning (EPR)	23	1.9	19	2.7	4	0.8
10. CRM	170	14.2	129	18.7	41	8.1
11. Groupware (office information-sharing systems)	197	16.4	141	20.4	56	11.0
12. SFA	46	3.8	31	4.5	15	3.0
13. SCM	6	0.5	4	0.6	2	0.4
14. Others	62	5.2	35	5.1	27	5.3
Not specified	223	18.6	79	11.4	144	28.4
Total	**1 198**	**100.0**	**691**	**100.0**	**507**	**100.0**

Source: Prepared by the author.

3. Internet use and purposes

Table 33 summarizes the responses to the questions related to Internet use. Table 34 gives detailed information on Internet use, including the purposes for using it and the way it affects business operations in the two clusters.

i) Higashi-Osaka

The Internet is used by 86.0% of the SMEs located here. The largest increase was seen in 2000, but many companies also came online in 1998 and 2001. All told, approximately half connected between 1998 and 2001. The primary types of access are ADSL (43.8%), FTTH (24.75%) and ISDN (22.9%). The main reasons for using the Internet are to do homepage maintenance and to use e-mail and secure domain names. Firms have an average of 120.2 e-mail addresses.

SMEs also use the Internet to gather and exchange information (85.8%), for public relations and product advertising (44.6%), as a tool to boost internal efficiency (37.4%), for banking (25.1%), for B2B (25.1%) and for B2C (9.6%). Only a small, albeit rising proportion of SMEs (24.6%) presently conduct e-commerce transactions. On average, SMEs here make 11.2% of their sales over the Internet, compared with 7.2% of their purchases.

ii) Ohta ward

The Internet is used by 70.6% of the SMEs located here, 15 percentage points lower than in Higashi-Osaka. Ninety-five percent of SMEs with more than four PCs are connected to the Internet. The year in which they first connected is most frequently 2000 (18.2%), followed by 1998 and 2001. Nearly 60% of the SMEs here came online between 1998 and 2001. ADSL is the

most widespread mode of access, followed by ISDN and FTTH. The Internet is used to do homepage maintenance, send e-mail and secure domain names. Firms have an average of 14.8 e-mail addresses —considerably fewer than in Higashi-Osaka. They also use the Internet to gather and exchange information (86.0%), for public relations and product advertisement (47.2%), as a tool to boost internal efficiency (34.6%), for B2B transactions (31.6%), for banking (28.5%) and for B2C transactions (9.5%). E-commerce accounts for 41.1% of all transactions by SMEs in Ohta ward, higher than the ratio in Higashi-Osaka. On average, SMEs here make 13.6% of their sales over the Internet, versus 4.6% of their purchases. Hence, the proportion of sales is higher than in Higashi-Osaka, while the percentage of purchases is lower. These differences are due to the nature of the two clusters: Higashi-Osaka, a horizontal cluster, focuses on consumers, while Ohta is vertical a cluster and has stronger ties with other firms.

TABLE 33
INTERNET USE

	Combined total		Higashi-Osaka		Ohta ward	
Connected to the Internet	**Firms**	**%**	**Firms**	**%**	**Firms**	**%**
Yes	952	79.5	594	86.0	358	70.6
No	208	17.4	78	11.3	130	25.6
Not specified	38	3.2	19	2.7	19	3.7
Total	**1 198**	**100.0**	**691**	**100.0**	**507**	**100.0**

Source: Prepared by the author.

TABLE 34
REASONS FOR USING THE INTERNET

	Combined total		Higashi-Osaka		Ohta ward	
	Firms	**%**	**Firms**	**%**	**Firms**	**%**
1. Gather or exchange information	817	85.8%	509	85.7%	308	86.0%
2. Promote company and/or products	434	45.6%	265	44.6%	169	47.2%
3. Banking	251	26.4%	149	25.1%	102	28.5%
4. Raise management efficiency	346	36.3%	222	37.4%	124	34.6%
5. B2B	242	25.4%	129	21.7%	113	31.6%
6. B2C	91	9.6%	57	9.6%	34	9.5%
7. Other	35	3.7%	16	2.7%	19	5.3%
Did not reply	23	2.4%	17	2.9%	6	1.7%
Total	**952**	**100.0%**	**594**	**100.0%**	**358**	**100.0%**

Source: Prepared by the author.

4. Investment in IT

i) Higashi-Osaka

As shown in table 35, although approximately half of the SMEs in Higashi-Osaka invested less than ¥ 1 million in IT in 2003, the average amount invested was nearly ¥ 22.1 million. SMEs that believe that IT has an important role tend to invest more.

ii) Ohta ward

Slightly over half (50.7%) of the SMEs here invested less than ¥ 1 million in IT, and the average IT investment was ¥ 2.8 million in 2003 —one-eighth the level invested in Higashi-Osaka. As with Higashi-Osaka, SMEs that see IT as important tend to invest more.

TABLE 35
SME INVESTMENT IN IT

	Combined total		Higashi-Osaka		Ohta ward	
Millions of yen	**Firms**	**%**	**Firms**	**%**	**Firms**	**%**
0	138	11.5	59	8.5	79	15.6
>0-0.2	125	10.4	67	9.7	58	11.4
>0.2-0.5	183	15.3	101	14.6	82	16.2
>0.5-1.0	133	11.1	95	13.7	38	7.5
>1.0-2.0	92	7.7	56	8.1	36	7.1
>2.0-5.0	108	9.0	70	10.1	38	7.5
>5.0-10.0	42	3.5	34	4.9	9	1.8
>10	37	3.1	24	3.5	13	2.6
Did not reply	339	28.3	185	26.8	154	30.4
Total	**1 197**	**100.0**	**691**	**100.0**	**507**	**100.0**
Average (millions of yen)	14 185		22 101		2 838	

Source: Prepared by the author.

5. Expectations from and satisfaction with IT use

The combined results for the questions on expectations from and satisfaction with IT use in the two clusters are summarized in tables 36 and 37.

i) Higashi-Osaka

More than 80% of the SMEs had at least some expectation that IT use would raise productivity in routine tasks, including 44.1% that had strong expectations for substantial improvements from IT. The categories with the next highest expectations were enhanced communication and information and better knowledge sharing, followed by improved collaboration with customers and business partners and faster decision-making and business development. The firms surveyed expect IT first to increase internal efficiency and then to contribute to better communication with outside parties.

These expectations have not been met, however: dissatisfaction is currently more prevalent than satisfaction. The category with the highest satisfaction level is improved productivity in routine tasks, followed by communication and information and knowledge sharing. In these categories, IT has lived up to expectations. By contrast, it has been found less useful in helping understand customer needs and enhancing customer satisfaction through better services and products. Hence, respondents feel that IT contributes to increasing internal efficiency, although it has not yet been shown to substantially enhance collaboration with persons on the outside, such as customers and business partners.

ii) Ohta ward

Approximately 80% of the SMEs in Ohta ward have at least moderate expectations that IT will increase profits. This is followed, in descending order, by the expectation that IT will bring about closer relationships with customers and business partners, encourage communication and information sharing, increase profits and speed up decision-making and business development. These results are similar to those for Higashi-Osaka.

Firms are most satisfied with IT's role in increasing productivity in routine tasks, followed by improving cooperation with customers and business partners. They are, however, dissatisfied with its usefulness for business restructuring, enhancing customer satisfaction, raising

productivity in non-routine tasks, helping understand customer needs and increasing profits. These results should be taken into account in designing policies to promote IT use.

TABLE 36
EXPECTED BENEFITS FROM IT USE
(% of firms)

	High expectation	Moderate expectation	Low expectation	No expectation	Did not reply
1) Increased profits	22.1	30.1	27	11.1	9.7
2) Higher productivity in routine tasks, such as administrative tasks	44.1	35.8	7.6	5.1	7.4
3) Higher productivity in non-routine tasks, such as project planning	15.6	27.2	28.4	13.4	15.4
4) Faster decision-making in management and business development	22.8	37.3	19.6	7.9	12.4
5) Restructuring the entire business process	14.2	32.0	27.3	10.3	16.3
6) Encouraging communication and sharing of information and knowledge	28.9	36.2	15.6	6.7	12.7
7) Closer cooperation with customers and business partners	27.7	37.7	18.8	5.4	10.5
8) Better understanding of customer needs	19.1	33.3	26.1	8.1	13.3
9) Enhanced customer satisfaction through improvements in services and products	17.8	34.0	24.5	9.9	13.8

Source: Prepared by the author.

TABLE 37
SATISFACTION WITH IT USE

	Very satisfied	Somewhat satisfied	Not very satisfied	Not at all satisfied	Did not reply
1) Increased profits	3.3	18.6	35.2	14.7	28.2
2) Higher productivity in routine tasks, such as administrative tasks	10.9	40.5	18.6	5.1	24.9
3) Higher productivity in non-routine tasks, such as project planning	3.1	18.1	34.5	13.5	30.8
4) Faster decision-making in management and business development	4.1	24.1	31.5	10.7	29.7
5) Restructuring the entire business process	2.1	16.5	35.9	13.3	32.2
6) Encouraging communication and information and knowledge sharing	5.6	30.4	25.7	8.8	29.4
7) Closer cooperation with customers and business partners	5.6	28.7	28.2	9.2	28.4
8) Better understanding of customer needs	2.51	16.9	35.1	15.0	30
9) Enhanced customer satisfaction through improvements in services and products	2.3	16.7	36.4	14.1	30.5

Source: Prepared by the author.

6. Perceived importance of IT and intention to invest in IT in the future

The results for these questions are shown in tables 38, 39 and 40. Although most SMEs recognize the importance of computer technology and firmly intend to utilize it, many are reluctant to increase their investments in this area. To facilitate comparisons of the answers to these questions in the two clusters, weighted average values are indicated in the last row of each table. For instance, in table 38, 2 points were given for a response of "very important"; 1 point for a response of "somewhat important"; 0 points for "uncertain"; -1 points for "not very important"; and -2 points for "not at all important". In table 39, 2 points were given for a response of "intend to increase IT use substantially"; 1 point for a response of "intend to increase IT use somewhat"; 0 points for "uncertain"; -1 points for "do not intend to increase IT use much"; and -2 points for "do not intend to increase IT use at all". In table 40, 2 points were given for a response of "intend to increase investment substantially"; 1 point for a reply of "intend to increase investment somewhat"; 0 points for "uncertain"; -1 for "do not intend to increase investment much"; and -2 for "do not intend to increase investment at all".

i) Higashi-Osaka

Seventy percent of Ohta's SMEs responded that IT was either very important (43.1%) or somewhat important (23.6%) in management. Nearly 84% intend to use IT in the future, either substantially (48.2%) or somewhat (25.5%). Firms with more PCs tended to place more on

importance on IT and were more likely to want to increase their use of new technologies in the future. However, only 16.8% of the SMEs planned to increase their IT investment. This discrepancy between recognizing the importance of IT and actually investing in it is one of core issues to be considered for IT-promotion policies.

ii) Ohta ward

More than half of the SMEs here felt that IT is either very important (30.6%) or somewhat important (24.3%) in management. As in Higashi-Osaka, the more PCs an SME owns, the more important it views IT. More than half of the SMEs responded that they planned to use IT, either substantially (32.1%) or somewhat (25.6%). Once again, the SMEs with the most PCs had the strongest intention of expanding their IT use. However, only 23.4% planned to increase their IT investment —considerably lower than the proportion of SMEs in Higashi-Osaka (32.9%). The only SMEs that planned to increase their IT investment were those that viewed these technologies as important and that intended to use them for management tasks.

TABLE 38
IMPORTANCE OF IT IN MANAGEMENT

	Combined total		Higashi-Osaka		Ohta ward	
	Firms	**%**	**Firms**	**%**	**Firms**	**%**
1. Very important	453	37.8	298	43.1	155	30.6
2. Somewhat important	305	25.5	182	26.3	123	24.3
3. Uncertain	208	17.4	113	16.4	95	18.7
4. Not very important	111	9.3	55	8.0	56	11.0
5. Not at all important	54	4.5	17	2.5	37	7.3
Did not reply	67	5.6	26	3.8	41	8.1
Total	**1 198**	**100.0**	**691**	**100.0**	**507**	**100.0**
Average	0.9		1		0.7	

Source: Prepared by the author.

TABLE 39
INTENTION REGARDING FUTURE IT USE

	Combined total		Higashi-Osaka		Ohta ward	
	Firms	**%**	**Firms**	**%**	**Firms**	**%**
1. Intend to increase IT use substantially	496	41.4	333	48.2	163	32.1
2. Intend to increase IT use somewhat	306	25.5	176	25.5	130	25.6
3. Uncertain	237	19.8	116	16.8	121	23.9
4. Do not intend to increase IT use much	43	3.6	24	3.5	19	3.7
5. Do not intend to increase IT use at all	45	3.8	14	2.0	31	6.1
Did not reply	71	5.9	28	4.1	43	8.5
Total	**1 198**	**100.0**	**691**	**100.0**	**507**	**100.0**
Average	1		1.2		0.8	

Source: Prepared by the author.

TABLE 40
INTENTIONS REGARDING FUTURE IT INVESTMENT

	Combined total		Higashi-Osaka		Ohta ward	
	Firms	%	Firms	%	Firms	%
1. Intend to increase investment substantially	166	13.9	111	16.1	55	10.8
2. Intend to increase investment somewhat	180	15.0	116	16.8	64	12.6
3. Uncertain	424	35.4	248	35.9	176	34.7
4. Do not intend to increase investment much	202	16.9	116	16.8	86	17.0
5. Do not intend to increase investment at all	128	10.7	65	9.4	63	12.4
Did not reply	98	8.2	35	5.1	63	12.4
Total	**1 198**	**100.0**	**691**	**100.0**	**507**	**100.0**
Average	0		0.1		-0.1	

Source: Prepared by the author.

7. Problems faced by SMEs in introducing and using IT

This section presents a summary of the issues encountered by SMEs when introducing and using IT. The results are shown in tables 41 and 42.

i) Higashi-Osaka

One-third of the SMEs in Higashi-Osaka reported having encountered problems in introducing IT, specifically because of employees' lack of familiarity with IT (51.2%); insufficient staff with IT skills; the high cost of IT investment (33.1%); a lack of leadership regarding IT (32.3%); and IT security-related issues (30.7%). The SMEs in Higashi-Osaka that acknowledged having problems pointed to difficulties with human resources as well as to security and the cost of IT investment as the main obstacles.

ii) Ohta ward

More than 30% of the SMEs here reported facing problems, specifically because of employees' lack of familiarity with IT (39.6%); insufficient staff with IT skills (30.8%); the high cost of investment in IT (28.0%); a lack of leadership regarding IT (26.2%); a lack of concrete management objectives (24.3%), and issues related to IT security (24.3%). Hence, SMEs here that acknowledged having problems pointed to difficulties with human resources as the main problem.

TABLE 41
EXTENT OF PROBLEMS REPORTED REGARDING IT USE

	Combined total		Higashi-Osaka		Ohta ward	
	Firms	%	Firms	%	Firms	%
1. Serious problems	175	14.6	101	14.6	74	14.6
2. Some problems	211	17.6	133	19.2	78	15.4
3. Uncertain	334	27.9	194	28.1	140	27.6
4. Minor problems	232	19.4	150	21.7	82	16.2
5. No problems	88	7.3	41	5.9	47	9.3
Did not specify	158	13.2	72	10.4	86	17.0
Total	**1 198**	**100.0**	**691**	**100.0**	**507**	**100.0**

Source: Prepared by the author.

TABLE 42
PROBLEMS ENCOUNTERED BY SMES IN USING IT

	Combined total		Higashi-Osaka		Ohta ward	
	Firms	%	Firms	%	Firms	%
1. Lack of leadership regarding IT use	356	29.7%	223	32.3%	133	26.2%
2. Lack of concrete management objectives for IT use	316	26.4%	193	27.9%	123	24.3%
3. Introduction of IT without restructuring of processes	243	20.3%	144	20.8%	99	19.5%
4. Insufficient staff with adequate IT skills	403	33.6%	247	35.7%	156	30.8%
5. Employees' lack of familiarity with IT	555	46.3%	354	51.2%	201	39.6%
6. Employees' reluctance to use IT	111	9.3%	69	10.0%	42	8.3%
7. Lack of IT consultants	329	27.5%	206	29.8%	123	24.3%
8. Company's failure to instruct consultants on how to introduce IT	70	5.8%	40	5.8%	30	5.9%
9. Company's failure to instruct suppliers (manufacturers) on planning and introduction of IT	123	10.3%	78	11.3%	45	8.9%
10. Lack of software to meet needs of company's business and processes	248	20.7%	168	24.3%	80	15.8%
11. Company's inability to keep up with rapid development of IT	205	17.1%	117	16.9%	88	17.4%
12. Attempt by business partners to adopt their own IT systems	172	14.4%	98	14.2%	74	14.6%
13. Perception that IT investment does not translate into higher profits	281	23.5%	170	24.6%	111	21.9%
14. High cost of IT investment	371	31.0%	229	33.1%	142	28.0%
15. Concern with compromising information through introduction of IT	335	28.0%	212	30.7%	123	24.3%
16. Concern with leakage of personal data through introduction of IT	187	15.6%	104	15.1%	83	16.4%
17. Time required to introduce IT	141	11.8%	79	11.4%	62	12.2%
18. Other	36	3.0%	12	1.7%	24	4.7%
Did not specify	202	16.9%	90	13.0%	112	22.1%
Total	**1 198**	**100.0%**	**691**	**100.0%**	**507**	**100.0%**

Source: Prepared by the author.

8. Findings based on the interviews in the two clusters

In addition to quantitative analyses, the authors also conducted in-depth interviews with selected SMEs in the two clusters. These interviews identified some concrete problems not detected in the mail survey.

i) Higashi-Osaka

Company A

This company controls a large share of the market for tools such as pincers, which it sells to major discount stores. After a new president was named, in order to restructure management and allow it to cope with new business environments, consultants were hired as IT coordinators and management advisors. The company learned how to apply strengths, weaknesses, opportunities and threats (SWOT) analyses. It set objectives, such as the doubling of profits. With IT, inventories were reduced to one-sixth of their previous levels and the percentage of products rejected by at inspection was also lowered. "The introduction of IT contributes greatly to changing the attitudes of everyone, from the top to the bottom of the firm", noted the company's president.

Company B

This company manufactures sealant for cellular phones. After introducing IT, management concluded that "e-mail is just a tool, but combining IT with something new, such as concrete ideas, makes e-mail a business tool".

Company C

This company is a wholesaler of packing and wrapping materials and kitchen supplies. When the lease on its office computers expired, it introduced new IT systems to manage customer accounts. The system allows employees to see a customer's past transactions on the screen by clicking on the customer's name. The system can also be used to place orders. Since the system was implemented, inventories have been reduced and the total amount spent on wages has been cut by 40%. Solely system engineers did not carry out the construction of the system, since one manager in the firm played a pivotal role in constructing it and making it operational. The company was fortunate in that found a manager who took an interest in IT.

Company D

This company sells products using the B2B model. Since 1996, when it started selling over the Internet, it has successfully marketed to customers throughout Japan. Currently, 80% of its sales are made over the Internet. The key element of its success was the decision to join an e-marketplace named Beta-Valley, allowing it to gain an understanding of B2B commerce.

Company E

A manufacturer of insecticides and other chemicals, this company uses computers for accounting and payroll management and for a shipping-management system connected to a trucking company. However, this system does not allow the company to request shipping from any other courier. The firm wants to use IT for production and sales management, but because of its small-scale production and the variety of its products manual processing is more efficient.

Summary of perceptions in Higashi-Osaka

Introducing IT contributes to the attainment of quantitative objectives such as increasing sales and profits and managing inventories. It also helps change employees' awareness of IT itself, provides direct access to customers and business partners throughout Japan and raises the profile of the firm as well as its products. The interviews indicate that the SMEs in Higashi-Osaka that have successfully introduced IT had initially sought benefits related not only to management but also to their employees; that is, they did not introduce IT solely for the sake of introducing IT. Their success has hinged either on the leadership of top management or on the enthusiasm of employees who were asked to take part in introducing information systems.

ii) Ohta ward

Company F

This is a metalworks company that uses numerically controlled machine tools. Because it has mostly repeat customers, IT is not a key factor for its business. The fact that it produces to order means that face-to-face communication with customers is much more useful than is e-mail.

Company G

This company specializes in precision plastic moulds, metal moulds and precision pressing. It has an FTTH Internet connection. By placing purchase orders over the Internet, it has sped up its purchasing process. Although the company uses IT to share information and bring down labor costs, it does not feel that IT has led to higher sales. The company lured IT specialists away from

other companies, because, like other SMEs, it had found that its small size was an obstacle to recruiting younger workers. This underscores the urgency for SMEs to hire and train IT specialists. The company feels that IT is not necessarily the only solution for improving management's performance and that new technology should not be relied on in excess.

Company H

In 1985, this manufacturer of precision parts introduced CAD/CAM, and since 2004 its computers have run on Windows. It has used the Internet to exchange three-dimensional data with Taiwanese SMEs. The company has found groupware useful, and it has also used IT to transmit blueprints and gather information; however, although the introduction of IT has allowed the company to expand its range of products, total sales have not increased.

Company I

This company, which specializes in metalworking, found it difficult to introduce PCs, because its employees lacked experience using them. It now uses computers solely for internal tasks, but not for marketing and sales. The company has also had to overcome a lack of computer specialists.

Company J

This seaweed wholesaler was founded more than 100 years ago. Monthly sales data are tracked in Excel, and nearly 800 direct mailings are managed with IT. The firm sells over the Internet, and its products are subsequently resold under various brand names. The seaweed industry continues to be dominated by traditional practices, discouraging IT use.

Summary of perceptions

All the firms interviewed agree that IT has advantages, such as contributing to efficiency and information sharing. Still, each market has its own ingrained business practices in sales and purchases. This is more marked in Ohta ward, where SMEs tend to specialize in made-to-order or custom-made manufacturing, areas in which IT is not easily implemented. These traditional practices make it difficult for IT to lead to tangible gains such as increased sales or profits. Thus, SMEs in Ohta ward have little expectation that IT will solve many of their problems.

9. Policy recommendations

The survey examined what kind of IT-promotion policies SMEs would like to see implemented. The results are shown in table 43.

i) Higashi-Osaka

SMEs in Higashi-Osaka favors government policies such as subsidies on IT investment (36.1%), the promotion of low-cost leases (35.1%) and IT seminars (32.6%). Financing and education are the two policies most often mentioned. SMEs with a firmer intention to use IT are stronger advocates of financial assistance for IT investment.

ii) Ohta ward

SMEs in Ohta would like government to implement policies to promote investment in IT, such as subsidies (31.0%), low-interest loans for computer equipment (29.4%), computer training (29.0%) and IT seminars (27.2%) —that is, they would like to see government support in the form of financing and human resource development. Here also, the SMEs with a stronger intention of using IT see a greater need for financial assistance for investment. This case study also shows that since many SMEs cannot afford to hire younger workers, they are unlikely to have IT leaders (e.g., Company G). Moreover, they do not want to resort to "head hunters" to find

skilled IT specialists (e.g., Company I). They request assistance for IT training and seminars for their employees. They would also like government to provide examples of IT use, both successful and unsuccessful. Still, one firm went so far as to state that it did not expect any government support, since it believes that all IT-related issues should be dealt with by the private sector.

TABLE 43
IT-PROMOTION POLICES RECOMMENDED BY SMES

	Combined total		Higashi-Osaka		Ohta ward	
	Firms	%	Firms	%	Firms	%
1. IT seminars	391	32.6	253	36.6	138	27.2
2. PC training	344	28.7	197	28.5	147	29.0
3. Training in website development	212	17.7	120	17.4	92	18.1
4. Consultancy on IT promotion	267	22.3	176	25.5	91	17.9
5. Low-interest loans for IT	377	31.5	233	33.7	144	28.4
6. Affordable computer-equipment leases	421	35.1	272	39.4	149	29.4
7. Tax exemptions on IT investment	384	32.1	238	34.4	146	28.8
8. Grants and other financial support for IT investment-related projects	432	36.1	275	39.8	157	31.0
9. Support for opening new portals	37	3.1	18	2.6	19	3.7
10. Deregulation	202	16.9	125	18.1	77	15.2
11. Showcasing of small-business models that use IT	47	3.9	32	4.6	15	3.0
12. E-procurement, e-purchasing	86	7.2	50	7.2	36	7.1
13. Other	61	5.1	29	4.2	32	6.3
Did not specify	224	18.7	102	14.8	122	24.1
Total	**1 198**		**691**		**507**	

Source: Prepared by the author.

10. Summary of quantitative research and interviews

The previous sections presented the results of the surveys conducted in two SME clusters, Higashi-Osaka and Ohta ward. Below, the results of the surveys are examined and the lessons learned from empirical research are discussed in greater detail.

i) Higashi-Osaka

In Higashi-Osaka, the following findings were made:

- The most commonly used software is accounting and management programs, although firms want to introduce more advanced software, such as SFA and SCM.
- The Internet is used by 86.0% of the SMEs, and e-commerce transactions are conducted by 25%. Internet sales are increasing.
- SMEs view IT as a tool primarily to promote productivity in routine tasks, followed by improving communication and decision-making. However, they are not satisfied with its ability to help them grasp customer needs and satisfaction.
- They view security, cost and the lack of skilled human resources as the prime obstacles.
- SMEs' conviction of the importance of IT and their desire to use it more have not prompted them to boost their investments in technology.
- They would like government to provide financing and training, followed by promotion of new businesses, products and ideas.

The responses to the questionnaires indicate that SMEs would like government to implement, firstly, IT investment-promotion policies, such as subsidization and affordable lending, followed by education, for example, through IT seminars and training. The SMEs that

feel the strongest need to use IT more intensively favor higher amounts of assistance for IT investment. In addition, SMEs are apprehensive that technology advances might broaden the "digital divide", putting them at a greater disadvantage in adopting new technologies.

SMEs' evaluations and policy recommendations vary according to their current level of IT use. All SMEs hope for assistance with financing and education. They call on government not only to provide more information and thereby assuage their apprehensiveness related to IT, but also to promote a business climate conducive to regional IT use.

ii) Ohta ward

The following is a summary of the characteristics of IT use in Ohta ward:

- SMEs have an average of 8.8 PCs, of which overages of 7.5 are connected to LANs. This is less than half of the figure for Higashi-Osaka.
- As in Higashi-Osaka, accounting and management programs are the most commonly used software, although firms want to introduce SFA and SCM applications.
- Of the SMEs in Ohta ward, 71.0% use the Internet and 34% engage in e-commerce. Internet sales are increasing.
- In descending degree of importance, SMEs view IT as a tool to promote productivity in routine tasks, to improve internal communications and decision-making, to bring about better sharing of information and to raise profits.
- SMEs in Ohta are not satisfied with their results from using IT to restructure operations and raise customer satisfaction, although they are pleased with its ability to improve communication and enhance productivity in routine tasks. They are much less satisfied with the overall results of IT than are their counterparts in Higashi-Osaka.
- They view skilled human resources, followed by financing, as the prime obstacles.
- SMEs' conviction of the importance of IT and desire use it more have not translated into higher investments in technology.
- They would like government to provide financing and training, followed by promotion of new businesses, products and ideas.

The SMEs in Ohta would like to see government promote IT use in manufacturing, in particular by providing more information to help them use computers more intensively. Ohta's SMEs have technologies for made-to-order and custom-made products, as well as traditional production techniques, all of which are difficult to integrate with IT or to systemize using IT. Hence, they would like government assistance in addressing these issues. In addition, their workforce is rapidly aging, and they would like to see policies focused on helping older workers adjust to rapidly changing technologies.

D. Empirical analysis of factors that encourage IT use, based on survey data

This section has two objectives: first, to use the survey data for the two SME clusters to heuristically isolate and analyze factors that encourage SMEs to adopt IT. To this end, indices of degree of IT use have been constructed and will be used for the analysis. In addition, since the two clusters exhibit different degrees of IT use, this section examines the practical meaning of these differences. The second objective is to identify issues that SMEs in the two clusters are now facing in introducing IT; on the basis of this analysis, policy recommendations will be made.

1. Factors that affect IT use and development

The factors that encourage IT use will first be identified and then they will be analyzed. The questionnaires asked SMEs about: (i) company characteristics; (ii) management orientation; (iii) business environment and (iv) expected results from IT use.

Company characteristics include variables such as industrial category, amount of capital, and number of employees. These six variables are listed in table 44.

Regarding management orientation, a detailed explanation is called for. The questionnaires contain ten items on managers' daily activities, shown in table 45. Since there is some overlap between the ten questions, an attempt was made to isolate the variables through component analysis. In this manner, four variables, which account for 70.1% of the total responses, were isolated. The first of these includes questions to determine to what extent an SME is geared toward expansion. The second category, orientation to incentives, contains questions on management's performance vis-à-vis stakeholders and on any incentives it gives employees by relinquishing rights and responsibilities to them. 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 to adapting". The last variable, called "orientation to data use", contains questions on how firms make use of data for decision-making. The results of the component analysis are summarized in table 45.

As for business environment, seven variables were selected, including winning of new business partners, product characteristics and the effect of new entrants into the market.

Finally, since the introduction and use of IT depend on firms' expectations regarding their future business and management, nine variables were selected for the fourth category, including increased profits, promotion of higher productivity and timely decision-making.

TABLE 44
LIST OF VARIABLES

		Variables
Dependent Variables	Indices of IT development	1. Number of PCs per employee 2. Number of PCs connected to a LAN, per employee 3. Software use 4. Internet use
Independent Variable	Company characteristics	1. Industry 2. Capital 3. Number of regular employees 4. Number of part-time employees 5. Years in business 6. Generation of present
	Managerial orientation	1. Expansion 2. Providing incentives 3. Adapting 4. Using data
	Business environment	1. New business partners are won every year.
		2. Many repeat purchase orders from the same business partners.
		3. Company is free to set its own prices.
		4. Competition with rival companies has recently become more intense.
		5. There has been a recent increase in new entrants from other business segments.
		6. Company has increased its share of new products and services.
		7. In recent years, company has not been able to hire workers 30 years old or younger.
	Expectation of IT usage	1. Increased profits
		2. Higher productivity in routine tasks, such as administrative tasks
		3. Higher productivity of non-routine tasks, such as project planning
		4. Faster decision-making in management and business development
		5. Restructuring of the entire business process
		6. Better communication, and accumulation and sharing of information
		7. Closer cooperation with customers and business partners
		8. Better understanding of customers' needs
		9. Higher customer satisfaction through improvements in services and products
	Company's IT investment in preceding fiscal year	

Source: Prepared by the author.

TABLE 45
RESULT OF COMPONENT ANALYSIS

Managerial Behavior	Common Factors			
	Expansion	Providing incentives	Adapting	Using data
There is employee training and rotation to utilize each employee's ability and knowledge.	**0.836**	**0.152**	**0.124**	**0.126**
The company offers IT training to executives, managers and employees.	**0.813**	**0.056**	**0.074**	**0.210**
Employees are apprised of the company's plans for next 2-3 years.	**0.599**	**0.515**	**0.179**	**0.156**
New lines of business are constantly being sought and products developed.	**0.552**	**0.284**	**0.321**	**0.085**
Company's performance is disclosed to employees.	**0.200**	**0.824**	**-0.006**	**0.301**
Senior managers are given broad responsibility and authorities.	**0.112**	**0.567**	**0.488**	**0.194**
Company studies competitors' mistakes and learns from them	**0.172**	**0.015**	**0.844**	**0.288**
Companies listen to any employee's opinion on how to improve management.	**0.281**	**0.538**	**0.587**	**0.064**
Past business data are extensively analyzed in company management.	**0.074**	**0.230**	**0.255**	**0.784**
Monthly business data are utilized to improve management.	**0.345**	**0.175**	**0.123**	**0.708**
Eigenvalue	**2 308**	**1 745**	**1 531**	**1 422**
Rotated Factor Pattern (%)	**44.8**	**10.7**	**7.3**	**7.2**
Cumulative Proportion (%)	**70.1**			

Source: Prepared by the author.

2. Examination of differences and similarities between the two SME clusters

Focusing on factors that affect IT use and development in the two clusters, this study compares the clusters' characteristics and attempts to identify their differences and similarities. To this end, it uses two methods for testing the statistical spread: the Levene test, and the t-test. The Levene test is used to examine whether two factors have equal variance in terms of F statistics. The null hypothesis was examined with the two factors being assumed to have equal population variance. The t-test was then applied to determine if the average values of factors that satisfy the Levene test were similar. Lastly, the null hypothesis was examined with the two factors being assumed to have equal averages.

The results of these test hypotheses are summarized in table 46. Ten variables satisfied the Levene test. Of these variables, the t-test found the following six with differing average values: number of regular employees; number of part-time employees; promotion of productivity in non-routine tasks; streamlining business operations; winning new business partners; and heightened competition among firms with similar lines of business. Except in these variables, no differences were found. It should be noted that the average values of all factors were higher in Higashi-Osaka than in Ohta ward.

TABLE 46
TEST OF DIFFERENCES IN AVERAGE VALUES

	Variables	Levene Test	Region				t -value
			Higashiosaka		Ohta		
		F -value	Average	Standard deviation	Average	Standard deviation	
1	Number of PCs per employee	1,448	1,025	6,459	0,675	0,787	1,029
2	Number of PCs connected to a LAN, per employee	1,759	0,795	6,583	0,392	0,604	1,117
3	Score for software use	0,563	8,000	8,873	5,280	7,540	-0,034 **
4	Score for Internet use	24,044 **	2,170	1,075	2,180	1,105	5,206
5	Capital (x ¥ 10,000)	3,704	2,198,360	2,798,892	1,621,880	2,274,901	3,445 **
6	Number of employees	5,608 *	22,700	33,762	17,090	26,098	2,861 **
7	Number of part-time employees	42,203 **	6,610	12,851	2,980	5,748	5,881 **
8	Years in business	5,018 *	44,450	102,414	43,570	18,628	0,199
9	IT investment in most recent fiscal year (x ¥ 10,000)	0,564	285,190	804,162	304,200	2,421,370	-0,158
10	Increased profits	0,352	2,720	0,959	2,690	0,972	0,500
11	Higher productivity in routine tasks, such as administrative tasks	1,364	3,340	0,798	3,220	0,871	2,134 *
12	Higher productivity in non-routine tasks, such as project planning	6,963 **	2,620	0,984	2,400	0,891	3,415 **
13	Faster decision-making in management and business development	9,649 **	2,960	0,876	2,710	0,924	3,881 **
14	Restructuring of the entire business process	0,743	2,690	0,889	2,440	0,900	3,903 **
15	Encouraging communication and sharing of information and knowledge	1,291	3,090	0,863	2,880	0,930	3,367 **
16	Closer cooperation with customers and business partners	1,518	2,970	0,871	3,010	0,847	-0,737
17	Better understanding of customer needs	0,007	2,790	0,916	2,650	0,895	2,218 *
18	Enhanced customer satisfaction through improved services and products	1,891	2,770	0,907	2,580	0,924	3,011 **
19	Expansion	0,853	0,150	0,990	-0,226	0,973	5,946 **
20	Providing incentives	11,248 **	0,025	0,936	-0,389	1,088	0,975
21	Business improvement-oriented	2,593	0,047	0,966	-0,070	1,046	1,817
22	Using data	6,062 *	-0,003	0,952	0,004	1,069	-0,109
23	Winning of new business partners every year	17,06 **	3,370	1,235	2,710	1,372	7,747 **
24	Increased share of new products and services in company's business	1,882	3,150	1,183	2,910	1,249	2,997 **
25	More intense competition with rival companies seen recently	20,561 **	4,100	1,011	3,720	1,199	5,290 **
26	Recent increase in new entrants from other business fields in company's market	0,012	2,990	1,276	2,610	1,195	4,771 **
27	Many repeat purchase orders from the same business partners	7,272 **	3,970	0,967	3,870	1,071	1,493
28	Company's ability to set prices for its own products	2,166	3,380	1,227	3,230	1,305	1,870
29	Company's inability in recent years to hire employees 30 years old and younger	10,52 **	2,830	1,534	3,100	1,660	-2,626 **

Source: Prepared by the author.

Note 1: The average values for items 10-18 and 21-29 were obtained using the Richart method. Higher values indicate a stronger positive response

Note 2: Values in items 19-22 were calculated from scores based on the factor analysis

Note 3: ** and * are significant at 5% and 1%, respectively.

SMEs in Higashi-Osaka have more employees than do those in Ohta ward. This is consistent with the survey data. SMEs in Higashi-Osaka belong to various sectors, while those in Ohta ward are mainly manufacturers. Also, Higashi-Osaka is a horizontal cluster, whereas Ohta ward is a vertical cluster. In addition, the interviews indicated that Ohta ward has problems with specific technologies and traditional commercial practices that hinder the introduction of IT. Since Higashi-Osaka's SMEs are situated in a horizontal cluster, they must use IT to win over

new business partners. Competition is more intense among SMEs in the horizontal cluster, while the SMEs in the vertical cluster face less competition because of their long-term contracts with large companies.

3. Summary of differences and similarities among SMEs in the two clusters

Higashi-Osaka and Ohta ward are referred to as a vertical and a horizontal cluster, respectively. The data from most of the questions on IT use, such as number of PCs and Internet use, indicate that firms in Higashi-Osaka understand IT better and use it more effectively than do those in Ohta ward. This difference is due to the nature of two regions —i.e., the open vs. the closed nature of their respective regional business environments.

Higashi-Osaka and Ohta ward have long been SME clusters. The small companies located in the two clusters traditionally worked as subcontractors for large firms, with which they maintained exclusive, closed relationships, following the traditional Japanese model. This tradition began to wane in Higashi-Osaka earlier than in Ohta ward, when large companies in Osaka moved their headquarters and factories to Tokyo or other regions. In the absence of large firms with which to do business, companies in Higashi-Osaka had to build closer relationships with consumers and other manufacturers in the region. In other words, they had to shift from the traditional vertical structure to a horizontal one in which information was shared more openly. Openness is much more necessary in the information age, as shown by California's Silicon Valley. Today, the success of small businesses depends on their having open relationships in which they can form new alliances and network with each other for specific purposes, such as supplying parts and providing funds, selling products, and jointly conducting research and development (R&D). "Modulization" is another example of how SMEs in Higashi-Osaka have adapted.

By contrast, in Ohta ward, SMEs are still bound by traditional structures. Vertically organized companies maintain closed, long-term relationships, and therefore require more information on companies within their cluster and less on parties outside of it (including consumers). In the typical example of the Japanese automotive industry, the close ties between automotive assemblers and parts suppliers has allowed an extremely efficient production structure to be forged; a broad range of necessary information, such as regarding routine tasks, parts orders and even R&D and innovation, is exchanged only among related companies.

Therefore, the closed versus the open nature of the business atmosphere is the main source of differences in IT use between the two SMEs clusters.

4. Indices of IT development

IT utilization cannot be described with a single index, since various factors are involved, including size, industry, business practices, etc. For the surveys, the following indicators of IT use by SMEs were selected: (i) number of PCs owned; (ii) number of PCs connected to networks such as LANs; (iii) the 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 IT use: having more PCs is equivalent to using IT more intensively. Items (iii) and (iv) are more qualitative measures of IT use, since having a large number of computers does not necessarily mean using them efficiently. Initially, software packages —for example, for accounting and marketing management— are introduced to promote efficiency in internal tasks. These applications are generally used independently on each PC. At more advanced stages of IT, the various applications are no longer used separately but are interconnected and share databases. Item (iii) sheds more light on this.

Subsequently, the PCs in one or several offices are connected to each other, generally with a groupware program. This use is covered by item (iv).

Regarding item (iii) in Q2 of our questionnaires, SMEs were asked if they used the software listed in table 47 below. One point was assigned for affirmatives responses to questions 1-8, and 10 points for questions 9-14. The first eight questions are quite different from the last six in their description of IT use. Because the latter deal with more advanced and integrated uses, more points were assigned to them. Although the scoring may seem somewhat arbitrary, a more rigorous procedure to determine the appropriate weighting will be applied in a future study.

TABLE 47
QUESTIONS ON SOFTWARE

1. Sales management (including POS and barcode)
2. Accounting
3. Payroll management
4. Purchases management
5. Inventories management
6. Design management (including CAD/CAM)
7. Production management
8. Logistics
9. EPR packages
10. CRM
11. Groupware
12. SFA
13. SCM
14. Other

Source: Prepared by the author.

The index presented in (iv) above looks at Internet use in the same manner as does item (iii) of the questionnaire on software use. The corresponding questions are Q3-3, which are shown in table 48.

TABLE 48
QUESTIONS ON CURRENT INTERNET USE

1. Create and manage the company's homepage or related web pages
2. Employees' personal e-mail accounts (number of addresses)
3. Create and utilize electronic bulletin boards, and/or electronic meeting boards
4. Create and utilize mailing lists of customers and business partners
5. Establish a private domain name
6. Other

Source: Prepared by the author.

One point was assigned for each affirmative response, and the numerical index of IT usage is the point total in table 49. The quantitative analyses are based on these indices and the other variables given in the table.

The indices given thus far are dependent variables. For independent variables related to IT usage, the authors selected the questions from the survey related to: (i) company characteristics such as industrial category, amount of capital, and number of employees; (ii) managerial behavior, with SMEs classified as expansion-oriented, incentives providers, adaptive, or data users; (iii) business environment such as the intensity of competition; and (iv) expectations from and purposes of IT use, such as increasing profits and raising productivity.

TABLE 49
STATISTICS SUMMARY

Variables		Average	Standard Deviation
Indices of IT development	Number of PCs per employee	0.887	5.055
	Number of PCs connected to a LAN, per employee	0.640	5.175
	Internet use index of company	6.915	8.469
	Software use index of company	2.174	1.086
Characteristics of firm	Capital (x¥ 10,000)	1,963.659	2,612.458
	Number of employees	20.491	31.078
	Number of part-time employees	5.179	10.778
	Years in business	44.090	79.863
	IT investment in most recent fiscal year (x¥ 10,000)	292.735	1,646.981
Expectations from IT use	Increased profits	2.712	0.964
	Higher productivity in routine tasks, such as administrative tasks	2.598	0.900
	Higher productivity in non-routine tasks, such as project planning	3.292	0.828
	Faster decision-making in management and business development	2.536	0.956
	Restructuring of the entire business process	2.867	0.902
	Encouraging communication, and accumulation and sharing of information	3.012	0.895
	Closer cooperation with customers and business partners	2.988	0.861
	Better understanding of customer needs	2.733	0.910
	Better customer satisfaction through improved services and products	2.697	0.918
Managerial orientation	Expansion	0.000	1.000
	Providing incentives	0.000	1.000
	Adapting	0.000	1.000
	Data using	0.000	1.000
Business environment	Winning of new business partners every year	3.106	1.330
	Increased share of new products and services in company's business	3.055	1.214
	Recent increase in competition with rival companies	3.949	1.106
	Recent increase in new entrants from other business fields in our market	2.841	1.258
	Many repeat purchase orders from the same business partners	3.932	1.010
	Company's ability to set prices as it sees fit	3.323	1.260
	Company's inability in recent years to hire employees 30 years old and younger	2.938	1.590

Source: Prepared by the author.

The factors that determine the particular scores obtained by each SME will be examined below. To examine the validity of these factors, the following regression model was constructed:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \ldots \ldots + \beta_n X_{ni} + e_i,$$

Where Y_i is the index of IT use; X_{ji} denotes variables such as the characteristics of the SMEs, amount of IT investment, expectations for IT use, etc.; β_i indicates the coefficients to be estimated; and e_i is the residual.

For the actual estimation, the following procedures were followed: (i) a stepwise method was adopted to select variables; (ii) the selection criteria were such that the F value was $F_{in}=F_{out}=2.0$. (This is the same as the Akaike Information Criterion [AIC]). In addition, the following two criteria are also used: (i) since the significant probability of F-statistics is sufficiently smaller than $\alpha = 0.005$, the null hypothesis H_0 ("the regression equation cannot be used for prediction") is rejected; and (ii) since the significant probability of t-statistics is sufficiently smaller than $\alpha=0.005$, the null hypothesis H_0 ("the estimated coefficients are zero") is rejected. The following two models were estimated, in accordance with the index selected: (i) the software utilization model, and (ii) the Internet utilization model. These indices were explained in detail in the preceding section.

a) Estimation based on pooled data

Factors of IT use were estimated using pooled data; that is, the data for Ohta ward and Higashi-Osaka were estimated together.

Software utilization model

The index for this model measures software utilization. The result of the estimation is given in table 50. In this model, variables related to SME size, such as amount of capital and number of regular employees, are the most significant. Belonging to the retail sector is also significant; the reason for this is that SME retailers need software to manage the large number of customers and suppliers they deal with. Another interesting result is found in variables such "orientation to using data", in the category of orientation toward expansion. Software is essential to make full use of data on customers and other parties with which a company does business.

TABLE 50
ESTIMATION OF POOLED DATA: SOFTWARE UTILIZATION MODEL

	R^2	Variables		Coefficient	t -value	
Software use	0.187	Characteristics of firms	Capital	0.120	2.687	***
			Number of employees	0.156	3.542	***
			Wholesale	0.102	2.641	***
			Generation of present CEO****	-0.069	-1.717	*
		Expectations from IT use	Restructuring of the entire business process	0.171	3.569	***
			Faster decision-making in management and business development	0.106	2.328	**
			Close cooperation with customers and business partners	-0.074	-1.717	*
		Managerial orientation	Expansion	0.082	2.043	**
			Providing incentives	0.096	2.495	**
			Using data	0.121	3.110	***
		Business environment	Recent increase in number of new entrants from other business fields in company's market	0.073	1.901	*

Source: Prepared by the author.

Note 1: ***, **, and * are significant at 10%, 5%, and 1%, respectively.

Note 2: "First generation" is the company founder; "second generation", the founder's son; and so on.

Internet utilization model

Table 51 shows the results when the estimation of Internet use is the parameter. In this estimation, the size of the firm again affects Internet use. Other noteworthy variables are "belonging to the information service industry" and "increased handling of new products". The first of these is altogether to be expected, and the latter implies that SMEs often require the Internet to launch new products on the market. Management orientations such as "expanding" and "providing incentives" are also important for Internet use.

Some variables were isolated in both estimations —namely, the number of regular employees, business restructuring, an orientation to expanding and orientation to providing incentives. SMEs that use the Internet intensively can be described as follows: they are relative large, they hope to restructure their business by introducing IT and they recognize that IT is indispensable for raising efficiency.

TABLE 51
ESTIMATION OF POOLED DATA: INTERNET USE MODEL

	R 2	Variable		Coefficient	t -value
Internet usage	0.248	Company Attribute	Capital	0.101	1.816 *
			Number of employees	0.161	2.855 ***
			Wholesale	0.181	3.519 ***
			Information services	0.192	3.685 ***
		Benefits that company expects from IT use	Restructuring of the entire process	0.162	2.587 ***
			Higher productivity in non-routine tasks such as project planning	0.102	1.804 *
			Faster decision-making in management and business development	-0.142	-2.281 **
			Closer cooperation with customers and business partners	0.110	1.920 *
		Management orientation	Expansion	0.163	2.985 ***
			Providing incentives	0.099	1.917 *
			Adapting	-0.089	0.085 *

Source: Prepared by the author.

Note: ***, **, and * are significant at 10%, 5%, and 1% level, respectively.

b) Disaggregated estimates

This section estimates Higashi-Osaka and Ohta ward separately, and compares the results to determine if there is any difference in IT use between the two clusters.

Software-use model

i) Higashi-Osaka

The results for Higashi-Osaka are indicated in table 52, which shows that variables such as belonging to the wholesale or retail sector, intending to restructure operations, being a data-user and focusing on IT investment are significant. Wholesale and retail businesses require software to track customers' transactions. Naturally, SMEs oriented to using data tend to require more software, since they are horizontally inter-related, and to use software as they themselves decide to use it.

TABLE 52
ESTIMATES OF DISAGGREGATED DATA, I: HIGASHI-OSAKA

	R^2	Variable		Coefficient	t -value	
Software use	0.209	Characteristics of firms	Capital	0.083	1.681	*
			Wholesale	0.114	2.364	**
			Retail	0.104	2.171	**
			Real estate	0.089	1.836	*
		Expectation from IT use	Restructuring of the entire business process	0.172	3.268	***
		Managerial orientation	Incentive type	0.087	1.791	*
			Data-using type	0.116	2.365	**
		Amount of IT investment in most recent fiscal year		0.268	5.485	***

Source: Prepared by the author.

Note: ***, **, and * are significant at 10%, 5%, and 1%, respectively.

ii) Ohta ward

The results for shown in table 54 indicate that firms in Ohta ward use technology primarily to promote efficiency, manage their large number of employees and speed up operations. Interestingly, young SME owners in Ohta tend to use software more intensively than do older owners. The types of industry do not appear to be significant, which might reflect the fact that most of the samples in the survey were taken from the manufacturing industry. However, the predominance of manufacturing SMEs in Ohta explains why these firms' software use tends to include using software such as CAD/CAM to speed up business processes.

TABLE 53
ESTIMATES FOR DISAGGREGATED DATA, I: OHTA WARD

	R^2	Variables		Coefficient	t -value
Software use	0,266	Characteristics of firms	Capital	0,156	2,019 **
			Number of employees	0,189	2,273 **
			Number of part-time employees	0,174	2,528 **
			Generation of present CEO	-0,191	-3,010 ***
		Expectation from IT use	Faster decision-making in management and business development	0,176	2,753 ***
			Enchanced customer satisfaction through improved services and products	-0,140	-2,200 **
		Managerial orientation	Expanding	0,136	2,227 **
			Using data	0,130	2,158 **

Source: Prepared by the author.

Note: ***, **, and * are significant at 10%, 5%, and 1%, respectively.

Internet-use model

i) Higashi-Osaka

The results for this estimate are given in table 54. Size of SMEs in terms of number of employees is significant in both regions. Variables such as belonging to the wholesale sector and providing information services were also found to be significant. Other significant variables are a desire to restructure operations and being oriented to expanding. Thus, SMEs in this cluster that want to restructure their operations typically use the Internet.

TABLE 54
ESTIMATE FOR DISAGGREGATED DATA, II: HIGASHI-OSAKA

	R 2	Variable		Coefficient	t -value
Internet use	0,248	Firm's characteristics	Capital	0,101	1,816 *
			Number of employees	0,161	2,855 ***
			Wholesale	0,181	3,519 ***
			Information services	0,192	3,685 ***
		Expected benefits of IT use	Restructuring of the entire business process	0,162	2,587 ***
			Higher productivity in non-routine tasks, such as project planning	0,102	1,804 *
			Faster decision-making in management and business development	-0,142	-2,281 **
			Closer cooperation with customers and business partners	0,110	1,920 *
		Managerial orientation	Expansion	0,163	2,985 ***
			Providing incentives	0,099	1,917 *
			Restructuring	-0,089	0,085 *

Source: Prepared by the author.

Note: ***, **, and * are significant at 10%, 5%, and 1%, respectively.

ii) Ohta ward

Table 55 gives the results for this estimation. Significant variables include number of employees, intention to restructure operations, desire to encourage communication and orientation toward providing incentives.

TABLE 55
ESTIMATION OF DISAGGREGATED DATA, II: OHTA WARD

	R^2	Variable		Coefficient	t -value
Internet use	0,408	Firm's characteristics	Number of employees	0,179	2,576 **
			Number of part-time employees	0,115	1,697 *
		Expected benefits from IT use	Restructuring of the entire business process	0,186	2,805 ***
			Encouraging communication, and accumulation and sharing of information	0,143	2,252 **
		Managerial orientation	Expansion	0,013	2,147 **
			Providing incentives	0,178	2,901 ***
		Business environment	Winning of new business partners every year	0,127	1,954 *
			Company's present share of new products and services is larger than before	0,121	1,900 *

Source: Prepared by the author.

Note: ***, **, and * are significant at 10%, 5%, and 1%, respectively.

c) Summary of the estimations

These estimations show that various factors significantly affect IT use by SMEs. To shed light on the factors that most important of these factors, the results given in table 56 are summarized below:

In all estimations, a management orientation toward expanding is perceived as significant. This implies that SMEs tend to use technology to as a tool to seek new business through restructuring and to adjust to the transformation of the business environment.

The results of all relevant estimations on software use point to two variables as significant, namely, amount of capital and management's orientation toward using data. The importance placed on using data implies that SMEs adopt technology to enhance the skills of management. In the case of Higashi-Osaka, this is clearly the case, since SMEs there are horizontal and firms independently decide whether or not to introduce IT. In Ohta, where firms are vertically structured, further research is required to determine to what extent they introduce IT because of pressure from the large firms that contract them.

As for Internet use, in addition to an orientation to expanding, three variables are identified that are common to the three pooled estimations and to the two disaggregated estimations: the number of regular employees, a desire to restructure operations and orientation to providing incentives, the latter in the category of management orientation. The larger a firm is, the more difficulty it has in making decisions quickly and in responding to changes in the business environment. The Internet helps obviate these difficulties and raises employee morale by encouraging decentralized decision-making. In addition, large firms can afford to invest more money and human resources in IT.

It follows from the analysis thus far that the most important way to promote IT use among SMEs is encourage them to be forward-looking. Once they adopt such an outlook, they can determine the exact ways in which they will introduce and use IT, according to their specific goals.

TABLE 56
SUMMARY OF ESTIMATIONS

Independent Variables \ Dependent Variables		Number of PCs per employee			Number of PCs connected to LAN, per employee			Internet use			Software use		
		Total	Higashi-Osaka	Ohta	Total	Higashi-Osaka	Ohta	Total	Higashi-Osaka	Ohta	Total	Higashi-Osaka	Ohta
Firm's characteristics	Capital	+ *	+ *						+ ***		+ ***	+ *	+ **
	Number of employees	- ***	- ***		- ***	- ***		+ ***	+ ***	+ **	+ ***		+ **
	Number of part-time employees	+ *			+ **					+ *			+ **
	Years in business			- **									
	Generation of present CEO										- *		- ***
	Manufacturing						- **						
	Wholesale	+ **			+ *			+ *	+ ***		+ ***	+ **	
	Retail											+ **	
	Information services							+ **	+ ***				
	Real estate											+ *	
Expectation from IT use	Increased profits							+ **					
	Restructuring of the entire business process							+ ***	+ ***	+ ***	+ ***	+ ***	
	Higher productivity in routine tasks, such as administrative tasks			- **									
	Higher productivity in non-routine tasks, such as project planning								+ *				
	Faster decision-making in management and business development			+ **			+ **				+ **		+ **
	Encouraging of communication, and accumulation and sharing of information							+ **		+ **			
	Closer cooperation with customers and business partners								+ *				
Managerial orientation	Expansion	+ **	+ *	+ **	+ *	+ **	+ ***	+ ***	+ ***	+ **	+ *		+ **
	Providing incentives	- *						+ ***	+ *	+ ***	+ **	+ *	
	Adapting												
	Using data										+ ***	+ **	+ **
Business Environment	Winning of new business partners every year									+ *			
	Expansion in share of new products and							+ ***		+ *			
	Recent increase in competition with rival companies												
	Recent increase in new entrants from other business fields										+ *		
IT investment in most recent fiscal year		+ **	+ ***		+ ***	+ ***						+ ***	
R 2		0,036	0,102	0,087	0,092	0,095	0,084	0,278	0,248	0,408	0,187	0,209	0,266

Source: Prepared by the author.

Note 1: "+" and "-" refer to estimated coefficient.

Note 2: ***, **, and * are significant at 10%, 5%, and 1%, respectively.

Note 3: estimated coefficients considered unrealistic have been omitted.

6. Problems of IT use identified based on empirical research

Thus far, the analysis has focused on factors that encourage IT use. This section examines the IT-related issues that SMEs are facing, so as to identify problems and recommend policies that could be implemented to solve them.

a) Classification of SMEs by development of IT

In the preceding analysis, four indices of degree of IT development by SMEs were defined. In this section, two of these indices —software use and Internet use— are used, firstly to classify SMEs into different categories. With the average for each index, SMEs were then divided into two categories. Those with the highest score are referred to as "developed", while those with lower scores are termed "developing". Hence, the two indices resulted in four classifications: developed (148 SMEs); software-oriented; network-oriented (126); and developing (340). These four classifications are given in table 57.

TABLE 57
CLASSIFICATION OF SMES ACCORDING TO DEGREE OF IT USE
(*Number of SMEs***)**

		Score for software usage		Total
		Developing	Developed	
Score for Internet use		340	131	471
	Developing			
		①	②	
		126	148	274
	Developed			
		③	④	
		466	279	745
	Total			

Source: Prepared by the author.

Note 1: The average scores for software use and Internet use were 2.17 and 6.91, respectively.

Note 2: The meaning of the circled numbers is as follows: 1 means below 340; 2, below 131; 3, below 126; and 4, below 148.

b) Obstacles, and the degree of IT development

Table 56 allows an examination of the kind of obstacles faced by SMEs in each category. Table 58 correlates the classifications described above and the particular problems inquired about in the surveys. Hence, in table 58, a positive (negative) sign indicates that an issue correlates to the category of developed (developing) in IT use. The obstacles for the developed group were identified as related to security, coordination with purchasers and sellers and funding for IT investment, while those for the developing group were lack of leadership, difficulty in keeping up with technological change, lack of confidence regarding return on investment and the length of time required to introduce new technologies.

TABLE 58
OBSTACLES AND STAGES OF IT DEVELOPMENT

Obstacles to IT use	Ranking	
Lack of leadership regarding IT use	-0.150	**
Lack of management objectives for IT use	0.008	
Introduction of IT without restructuring of processes	0.046	
Insufficient staff with adequate IT skills	-0.003	
Employees' lack of familiarity with IT	-0.064	
Employees' reluctance to use IT	0.025	
Lack of IT consultants	-0.068	
Company's failure to instruct consultants on how to introduce IT	-0.026	
Company's failure to instruct suppliers (manufacturers) on planning and introduction of IT	-0.009	
Lack of software to meet needs of company's business and processes	0.016	
Company's inability to keep up with rapid development of IT	-0.102	**
Attempt by business partners to adopt their own IT systems	0.130	**
Perception that IT investment does not translate into higher profits	-0.079	*
High cost of IT investment	0.076	*
Concern with compromising information through introduction of IT	0.143	**
Concern with leakage of personal data through introduction of IT	0.036	
Time required to introduce IT	-0.094	*
Other	0.020	

Source: Prepared by the author.

Note: ** and * are significant at 5% and 1%, respectively.

c) Policies advantageous to IT use as suggested by empirical research

The preceding section focused on issues that were brought up in the surveys. Using these results, this section analyzes what kinds of policies are required to encourage the adoption of new technologies.

Table 59 correlates firms' degree of IT development with the promotion policies they would like to see implemented. As was the case above, a positive (negative) coefficient indicates that a proposed policy is recommended by the developed (less developed) group. SMEs in the developed group focused on initiatives such as low-interest loans, tax exemptions and subsidies on IT investment along with a relaxing of several regulations; in other words, they advocated establishing an environment conducive to IT investment. By contrast, the developing group tended to prefer initiatives such as IT seminars and training in computer operation and homepage construction; these proposals can be summarized as "human resource development to encourage IT use".

TABLE 59
RECOMMENDED POLICIES AND STAGE OF IT DEVELOPMENT

Government IT policies recommended by company	Ranking	
IT seminars	-0.099	**
PC training	-0.112	**
Training in website development	-0.123	**
Consultancy on IT promotion	-0.050	
Low-interest loans for IT	0.091	*
Affordable computer-equipment leases	0.026	
Tax exemptions on IT investment	0.241	**
Grants and other financial support for IT investment-related projects	0.110	**
Support for opening new portals	-0.012	
Deregulation	0.112	**
Showcasing of small-business models that use IT	0.085	*
E-procurement, e-purchasing	0.016	
	-0.018	

Source: Prepared by the author.

Note: ** and * are significant at 5% and 1%, respectively.

E. Case study: Dan, an SME supply chain that promotes exports

Although, as noted above, SMEs were once the primary engine of Japanese exports, large firms eventually took over this role. However, with the spread of IT, the pendulum appears to be swinging back. This section examines an example of an export-oriented SME that has used IT to help it construct its own international supply chain.

1. 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 in 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 is 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— generally visit the store at monthly intervals, Dan typically 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 to its suppliers (sock knitters). This business model requires Dan to specialize in a wide range of designs and colors although it produces relatively few of each item. Dan offers 500 items in 12 colors, 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.

2. 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 IT. It built its own supply chain system to transmit customer information through a POS system in real time, and to

allow factories, distribution centers 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. Knitters, allowing them to update their own production plans, receive sales information transmitted through the POS. Dan has installed counters on its suppliers' knitting machines, and production data are automatically transmitted to Dan's managers, allowing 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 it. Dan cannot organize upstream networks, such as those that distribute thread, since codes and purchase units vary from one company to another, making 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 to bring to the distribution centre —that is, to decide on their own, using information in the POS system. If products go unsold, the knitters must absorb the losses. Thus, Dan's high degree of risk aversion regarding inventories precludes it 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.

3. Overseas shops and 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. By contrast, Dan directly manages its overseas business. Prior to opening its London shop, it 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 by 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 knitters via Dan's home offices. If additional socks are needed in London, knitters can deliver them to the distribution centre on 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 British regulations that prohibit importing assembled machinery from Japan and other differences between the two countries such 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. Six employees designed the software for the POS system in the London shops. 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.

IV. Government IT policies vis-à-vis SMEs

A. IT policies within Japan's overall development strategy

1. Japan's IT strategy

Policies to support SMEs in Japan have generally aimed to help these firms catch up with large firms. The most significant policies once treated all SMEs equally. Despite some noteworthy positive results, in general these policies were less effective than expected. Moreover, in the age of globalization and the information society, such traditional measures cannot promote SMEs and help them develop without hurting the country's international competitiveness.

Recognizing these drawbacks, the government drastically changed course in 1999 by amending the Fundamental Law for SMEs. Under the amended legislation, SMEs with a firm intention to target new business opportunities and to attempt to expand on their own receive preferential treatment. Thus, government policy has become more discriminating, in that it now focuses on one segment of SMEs.

Just when the government was searching for a new set of policies vis-à-vis SMEs, the IT Revolution too off in Japan. This led local governments to recognize that promoting IT was the best way to assist more forward-looking SMEs. Since not only large firms but also SMEs stand to reap substantial benefits from technological innovation, IT has been made the linchpin of national policies intended to help business adapt to the economic transformation taking place in Japan.

By November 2000, the government had decided on a basic IT strategy, and the Fundamental Law on Information Technology was approved. The government also established an office to devise an IT strategy. In January 2001, the "e-Japan strategy" was launched. These successive policies sought to bring the IT Revolution to Japan and to completely transform the economy so as to allow the country to meet the challenges of globalization and the information society.

2. The e-Japan strategy

The e-Japan strategy approved in January 2001 recognizes IT promotion as the most urgent issue for the Japanese economy. Its goal is a society in which IT is used to create knowledge through the transformation of existing socio-economic systems and customs and the restructuring of

interest groups. The aim of this strategy is to make Japan among the countries that make the best use of IT, through: (a) the establishment of ultra high-speed Internet networks; (b) the promotion of e-commerce; (c) the development of e-government; and (d) training in IT.

a) Establishment of ultra high-speed Internet networks

The e-Japan strategy initially set specific goals such as the establishment of affordably priced ultra-fast Internet connections (running at speeds from 30 to 100Mbps) within five years available to users at any time. It also aimed to make Internet access available to all within one year, even to those without a cable connection. Another goal was the implementation of Internet Protocol version 6 (Ipv6).

b) Promotion of e-commerce

To enable all firms and individuals to carry out e-commerce transactions, regulations obstructing e-commerce as well as related laws on digital contracts and consumer protection needed to be brought up to date. These measures were expected to facilitate commercial transactions over the Internet.

c) Development of e-government

By 2003, the public was to be able to fulfill all administrative requirements online, individuals were to be able to file applications online and all administrative information was to be available to the public via the Internet.

d) Training in IT

The strategy called for government to support human resource development to increase information literacy, and to cultivate IT leaders and content creators. It was felt that if this was accomplished by 2005, Japan would be able to produce IT engineers and researchers much more skilled than those in the United States.

Naturally, concrete policies are required to make advances in these four areas. The IT Strategy Headquarters is required to report each year on progress toward fulfilling each objective.

As a result of active efforts in these four areas, almost all the objectives have been achieved. The results are as follows:

a) Establishment of ultra high-speed networks

The number of subscribers to high-speed Internet services rose from some 850,000 in March 2001 to 15.4 million in April 2004, an 18-fold increase. More than 70 million persons have mobile Internet access, the most anywhere in the world.

b) Promotion of e-commerce

Not only has significant e-commerce infrastructure been built, but e-commerce itself has also been effectively promoted. Japanese is second only to the United States in the spread of e-commerce. Online stock trading jumped from 6% of all trading in March 2001 to about 23% by April 2003. Seventy percent of individual investors use the Internet for their transactions.

c) Development of e-government

There has been a sharp increase in the use of the Internet for submitting paperwork to the central government —from 1% to 97% between March 2001 and March 2003— underscoring the success of the e-government initiative. The same is true of bidding on government contracts, and bids for any national project may now be submitted online. Also, since June 2004, the e-tax system has been available to taxpayers throughout Japan.

d) Training in IT

By March 2003, all public schools were connected to the Internet, and 60% had homepages.

As the basic infrastructure for broadband neared completion, the government launched its e-Japan strategy II in 2003, which encourages further uses for IT in various areas of the economy and for general purposes. The goal of E-Japan II is to use IT to make life in Japan healthier, safer, more interesting and more convenient. It also seeks to encourage the intensive application of IT in the following seven areas: medical services, food, lifestyle, SMEs financing, education, employment and labour, and public service.

B. Policies to support SMEs

1. Export promotion

With the advance of economic globalization, even SMEs can set up factories overseas and establish ties with foreign firms. Policies have been put forth to help SMEs take advantage of these opportunities. Most noteworthy are the following initiatives to promote exports: (a) overseas market-research projects; (b) overseas tradeshow projects; (c) overseas export-promotion missions; and (d) overseas coordination projects.

a) Overseas market-research projects

The aim of these projects is to research overseas markets and determine the feasibility of exporting to them. The Japan External Trade Organization (JETRO), which has many overseas offices and networks of contacts, including important business people and government officials, is the agency primarily responsible for implementing the projects. These networks help SMEs locate market opportunities overseas.

b) Overseas tradeshow projects

These projects subsidize SME participation in foreign tradeshows. This support allows SMEs to set up booths at tradeshows and negotiate with foreign importers. Local governments in conjunction with industry associations sponsor the projects.

c) Overseas export-promotion missions

This initiative helps SMEs send representatives to foreign countries to look for market opportunities. Participating firms can hold information-sharing and sales meetings during these missions. This is also a joint project of local governments and industry associations.

d) Overseas coordination projects

This project uses the business coordinators that JETRO sends all over the world to promote SME exports. By working with these coordinators, SMEs can expand their overseas activities and exports.

2. Trade facilitation

The Japanese economy, once known as an export powerhouse, is designed to export more than it imports. However, numerous regulations are being relaxed to promote imports and make it easier for foreign firms to enter the Japanese market. This underscores the imperative for Japan to raise imports and bring its foreign trade into equilibrium. Deregulation includes reforms in the retail, telecommunications and medical-supplies markets. Recently there has been a strong effort to use IT to boost imports. The following are typical of the steps taken:

24-hour port services

In keeping with international standards, seaport import-clearance facilities are shifting to a 364-day, 24-hour-per day, work schedule, closing only on New Year's Day, and import-clearance services are provided from 8:30 to 20:00.

IT to automate customs-clearance systems

The National Customs Clearance System (NACCS) was introduced, to speed up customs procedures. It simplifies customs clearance and other administrative procedures, to save time and effort for importers. In addition, a one-stop customs-clearance service and other documentation procedures will soon be introduced at ports of entry. These improvements are expected to halve the fees charged by Sea-NACCS, lowering the cost of clearing imports through customs.

Streamlining the import process

There are plans to introduce a Preliminary Inspection System, allowing import procedures to be completed prior to the arrival of a shipment. In addition, importations will be approved immediately after cargo arrives at a bonded area.

Introduction of high-tech inspection machines

High-power X-ray inspection machines will be installed to allow containers to be checked without goods being unloaded.

Radio Frequency Identification (RFID), to be used for international distribution channels, is expected to play an important role in allowing instant inspections of large volumes of cargo.

In addition to the introduction of IT hardware and improvements to software, international agreements are also required to promote international trade. Hence, global trade has been promoted through multilateral trade negotiations at the World Trade Organization (WTO), and regional free trade agreements have been sought. Japan needs to take a leadership role in promoting international trade. It could collaborate with the members of the Association of South East Asian Nations (ASEAN), as well as with Korea and other members of the Asia-Pacific Economic Cooperation (APEC) forum. Discussions with these trade partners should include rules and frameworks for promoting international trade. Such steps can be considered trade-facilitation measures. Another example of cooperation is the protection of intellectual property rights, which must be enforced in international trade. Import and export applications by companies not in compliance with intellectual property rights standards should be thoroughly checked, while

companies that make an effort to abide by the rules should be given an assurance that customs clearance procedures will be efficient and transparent.

3. FDI promotion

Foreign Direct Investment (FDI) refers to investment by which companies or individuals obtain a controlling interest or participate in the management of companies in foreign countries. Japan has a long tradition of making FDI in other countries, but recently it has also had to attract FDI. The reason is clear: Japan has experienced long-term stagnation since the burst of the bubble economy, in part because factories and jobs have been leaving the country —in what is known as a "hallowing out of the economy". To reverse this trend, foreign companies must be invited to Japan.

There are other reasons for encouraging FDI in Japan. Foreign companies would help transform the Japanese economy, putting it on surer footing and making it more competitive. The introduction of new managerial talent, technologies and systems by foreign companies should help Japan attain global standards. Higher FDI inflows could be expected to increase employment, raise tax revenues of both central and local governments and revitalize and globalize regional economies. Local as well as central governments have gone to great lengths to attract foreign companies by relaxing regulations, providing information, offering tax breaks and other direct incentives and providing foreign managers with suitable living conditions.

Successful examples of FDI can be found in regions such as Yokohama city, Kanagawa prefecture; Toyohashi city, Aichi prefecture; and Kumamoto prefecture.

Yokohama: This city was among the first to invite foreign companies, with efforts dating back to the late 1980s. The proximity of the German Industry and Trade Centre, the British Industry Centre and the United States-based Technology Village Partnership —all located in Tokyo— facilitated the gathering of information on the local and central governments and on Japanese consumers.

Toyohashi. Volkswagen and two other foreign automakers established facilities here to unload imported automobiles. Volkswagen later brought its repair factories here as well. Toyohashi is in the centre of Japan, close to Toyota City, headquarters of Toyota Motor Corporation. Because of the city's privileged location, the city government has built the International Automobile Complex Project and taken other initiatives to attract companies related to the automotive industry. The region is also seeking stronger ties with German companies. These measures make the city even more attractive to foreign investors.

Kumamoto prefecture: Kumamoto is located on the island of Kyushu. Following successful efforts to lure the Research Institute of Applied Electronic Machinery Technology here in the 1980s, clusters of manufacturers of electronics and electric products related to the semiconductor and automotive industries have formed on the island. In 1986, the prefectural government offered subsidies to foreign companies, successfully wooing the world's second largest manufacturer of semiconductor inspection devices.

FDI promotion policies

The ratio of FDI inflows to GDP in 2000 in major countries was as follows: United States, 27.9%; United Kingdom, 31.9%; Germany, 22.6%; and Japan, 1.1%. Following up on its initial deregulations, the government established the Japan Investment Council (JIC) to promote FDI within the country through the implementation of policies, including further deregulation as well as the provision of increased information and incentives. Other incentives that the JIC intends to launch to attract foreign companies to Japan would provide tax cuts and other forms of subsidies as well as consulting services, promote mergers and acquisitions (M&As), ensure a stricter

enforcement of competition policy rules, restructure the distribution sector, establish English schools, medical facilities and other conditions amenable to foreign managers and increase transparency in government procurement.

To further accelerate FDI inflows to Japan, and eventually see it double in five years, the JIC decided to focus on five areas. It asked all ministries, JETRO, the Develop Bank of Japan and local governments to work together on outlined below:

Disseminating information

The message that Japan welcomes FDI must be conveyed by all available means, including through diplomatic channels abroad. FDI's importance for revitalizing the Japanese economy must be emphasized.

Fostering a pro-FDI environment

This includes changing domestic rules to facilitate international M&As, strengthening corporate governance to increase the transparency and reliability of Japanese companies, promoting start-ups, encouraging foreign companies to participate in public projects and public services and providing FDI-related legal services for foreign companies.

Reforming administrative processes

This category includes promoting "one-stop administration" to streamline requirements and allowing public comments and no-action letters to foster transparency in government.

Improving living conditions and increasing employment opportunities

This includes assisting international schools and accepting more foreign students in Japan; promoting practical skills among Japanese students by reforming the educational system; and increasing the number of foreign medical doctors in Japan.

Reforming local governments as well as the central government

Government, including at the local level, should take all necessary steps to promote FDI inflows to Japan, and local governments' efforts to invite foreign companies must be supported.

Many Japanese companies facing managerial difficulties and possible bankruptcy have been revitalized after receiving financial or other types of assistance from foreign companies. Large companies receiving help from abroad include Nissan, Mitsubishi Motor Corporation, Mazda Motor Corporation and Shinsei Bank (formerly the Japan Long-term Credit Bank). In addition, some Chinese companies have bought Japanese SMEs with specific skills and technologies and that were facing financial difficulties. Without such assistance, these companies might have gone bankrupt. Hence, M&As by foreign companies have helped shore up Japanese SMEs.

4. Business promotion

Since the mid-1990s, various measures have been implemented to revitalize industries and the economy through the creation of new businesses. These policies were inspired in similar small-business promotion measures the United States. The Law to Promote Creative Activities by SMEs, the Law of New Business Promotion and the Special Law on the Revitalization of Industrial Power are some examples. These laws typically introduced novel measures such as direct subsides, tax exemptions and the promotion of business matching, in addition to more traditional ones such as loans and loan guaranties for SMEs. The common purpose of these

measures is to encourage the creation of new businesses in various industrial sectors. Some examples are listed below.

Practical skills for start-ups

Various forums and training programs have been established throughout the country, to create an environment conducive to the creation of start-ups —whether small businesses or companies founded with venture capital. These forums and programs teach skills required for starting a company, such as how to make business plans and apply for public funding. During the preliminary phase, prospective companies that have promising technologies or ideas are eligible for free consultancy on topics such as R&D and commercialization.

Legal support for start-ups

Japanese law requires a minimum amount of capital for the establishment of a firm. Ten million yen is required to incorporate a company and ¥ 3 million is required to establish a limited liability company. These requirements are a formidable barrier to entry for small firms. However, the Law to Promote New Businesses provides an exemption for small businesses. This exemption allows for what are known as "one-yen start-ups", deferring the traditional requirements for five years. After this period, if a company has not reached the required amount of capital, it must be dissolved.

Financial support

Start-ups and other companies with less than a certain time in business are eligible for various forms of government financial support, such as unsecured loans, if they are judged to have strong or creative business plans, or if they are strongly involved in investment and new business creation. Venture capital firms can also receive financial support from government entities such as the Shoko Chukin Bank (the central cooperative bank for commerce and industry) when they invest in early-stage venture businesses with new products and technologies.

Tax exemptions

Venture businesses and venture capitals are also eligible for various tax exemptions. For instance, capital gains on investments in venture businesses are tax-exempt, to promote such investments. Investments in equipment by approved venture businesses are also tax-exempt, as are certain R&D investments. Approximately 10-12% of R&D investments are excluded from corporate (or income) tax.

Supports for marketing

There are various forms of support to help start-ups meet the many challenges of marketing their products and expanding their business. These include "venture plazas" and venture fairs, which give start-ups the opportunity to show their products and technologies to large firms such as trading companies and investment firms.

Support for R&D

Following the example of the Small Business Innovation Research program (SBIR) in the United States, Japanese ministries offer support for small businesses to participate in those ministries' R&D activities, thereby encouraging them to carry out R&D. Small businesses that apply for intellectual property rights (IPR), business ventures with novel business plans and businesses that invest more than 3% of their total sales revenue in R&D, pay only half of the normal fees for applying for IPRs.

Business incubation

The purpose of business incubation is to provide venture businesses with inexpensive office or manufacturing space and R&D laboratory space. The number of incubation facilities has increased recently. Most public incubators have specialized "incubation managers", able to provide highly advanced consultancy on management and technology.

Specialists for venture companies

Not only venture companies but also SMEs are hard-pressed to find management and technology specialists to help them develop their business. To meet this need, local governments and public organizations enlist retired business people and engineers to provide assistance to this type of companies.

C. Special measures to narrow the digital divide between companies

1. Human resources

SMEs have had to surmount their lack of human resources to introduce and operate IT. Various entities, such as central and local governments, government agencies and industrial associations, have experimented with seminars and training courses to educate management and employees on how to learn about and implement IT. However, since classroom knowledge and technological know-how cannot always be immediately applied in the workplace, IT specialists are also being sent to firms and factories, to teach hands-on IT skills. In addition to basic IT training, the following measures are required to help IT specialists assist SMEs and disseminate a high level of technological know-how: (i) standardization of IT skills; (ii) cultivation of IT coordinators; (iii) cultivation of IT associates and (iv) and cultivation of specialists in IT security.

Standardization of IT skills

The purpose of standardizing IT skills is to allow IT experts to assess the acquisition of these skills, so as to establish a market value for them and to bring national standards in line with international standards.

Cultivation of IT coordinators

Qualified IT coordinators who are knowledgeable of both technology and management and who support managerial innovation in SMEs are needed.

Cultivation of IT associates

Guidelines for IT associates who specialize in e-purchasing need to be established and disseminated, beginning with norms for public officials and specialized government purchasers; subsequently these guidelines should be expanded to include private companies.

Cultivation of specialists in IT security

Also needed are engineers capable of evaluating and designing security systems in line with ISO/IEC 15408. This will promote the establishment of a strong and flexible system to evaluate security-related issues.

2. Technical issues

Two projects have been created to address technology-related issues that affect SMEs: (a) one to strengthen strategic technologies, and (b) another to give strategic support to and encourage investment in IT.

Project to strengthen strategic technologies

The aim of this project is to enhance the international competitiveness of SMEs by supporting basic and strategic technological development. Technological themes have been selected based on their potential to strengthen and revitalize the competitiveness of Japan's manufacturing industry. The project supports R&D carried out jointly by SMEs, large firms and universities.

Project to give strategic support to and encourage investment in IT

This project is intended to train IT coordinators who are specialists in both technology and management. By resorting to such coordinators, SMEs can greatly increase their degree of IT innovation. This project includes the following activities: (i) information-sharing meetings of SME owners, (ii) training of SME owners, (iii) consultancy for business planning, (iv) consultancy for IT investment, and (v) meetings to present the results of IT utilization.

Information-sharing meetings of SME owners

These meetings allow SME owners with a strong interest in IT to exchange views and opinions on common issues. Experts and academic researchers coordinate the meetings.

Training of SME owners

This course provides SME owners training on how to establish business plans. It is designed for owners with a strong interest in strategic IT investment.

Consultancy for business planning

This purpose of this is to assist SME owners who want to apply for government support for start-ups or venture projects by, for example, showing them how to complete application forms and draft the required business planning documents.

Consultancy for IT investment

SMEs owners who complete the requirements indicated in the preceding item can receive further assistance on how to invest in IT effectively. This consists mainly of assisting them with and monitoring their purchases and use of computer equipment.

Meetings to present the results of IT utilization

Meetings are held to discuss the results of cases in which SMEs have received support through the project components listed above, and to introduce the projects to other SME owners who may be interested in applying for assistance.

3. Financial aspects

A lack of capital is one of the main obstacles preventing SMEs from using IT. The precarious financial situation of most SMEs means that they cannot quickly adopt new technologies; thus, they are forced to postpone investments solely because of financial constraints. The many programmes to provide financial assistance to SMEs are grouped into two categories: low-interest loans to SMEs, and allowances for investment expenditures be deducted from taxes. The first type of programmes consists of financial assistance through public financial institutions; loan-

guarantee programs; SME-loan programs; programs to lease machines and equipment to SMEs; programs to allow SMEs to adopt strategic information equipment for data processing and other uses; and lending programs for IT investment through public financial institutions. The second category of programs gives SMEs tax breaks on general and IT investments.

4. Infocenters

Most SMEs lag behind in IT primarily because they lack capital and human resources. To address this situation, central and local governments have established centers that provide SMEs with information, such as on the creation of new support systems, technological advances, training, etc. These centers also provide them with technology consulting. Some representative examples of these initiatives are the e-Small Business Agency and the Network Project; portal sites such as J-Net 21; and the Techno-Knowledge Network, which provides information on technological advances.

5. Other measures

The aim of the policies discussed in the preceding sections is to raise the capacities of all SMEs, by providing them with a broad range of information. These measures, however, do not address the needs of individual SMEs attempting to enter new fields or break new ground. Currently there is a need, above all, to select and assist SMEs that have a strong probability of attaining rapid growth, by providing them with funding and resources.

D. E-Government initiatives vis-à-vis SMEs and trade promotion

1. Overall strategy and structure of e-government

The successful introduction of e-government procedures is one of the core objectives of the e-Japan strategy. The basic aim of e-government is to achieve efficiency, simplicity, reliability and transparency in government services, as well as to make government more accessible to the public through the use of technology in the public sector and amendments to rules concerning government contracts. These objectives can be summarized as the provision of efficient, transparent, secure and citizen-oriented administrative services, and efficient and useful public works projects. The following guidelines have been established to promote these objectives:

Citizen-oriented administrative services

This aim of this initiative is to ensure that individuals and companies may receive administrative services at any time, regardless of their location. These services have traditionally been provided by a variety of government offices, without any coordination among them. The promotion of e-government encourages IT use in day-to-day activities as well as e-commerce.

Accountability and transparency

One way that e-government increases access to a broad range of information is by gathering the opinions of people and firms during each stage of the policy-making process. For instance, all ministries are now required to have websites where they can receive feedback from the public regarding their policies.

Universal accessibility

Information systems should be accessible to the elderly and handicapped. One way to accomplish this is by allowing audio input on government websites.

Collaboration with the private sector

The aim of this is for work and services to be outsourced to the private sector so as to allow government to cope with and learn to use rapidly changing technology.

Assuring the privacy, reliability and security of information systems

Collaboration from government agencies, and international standards

The provision of any service requires collaboration among all government agencies. Hence, systems must meet international standards on capabilities for cooperation with foreign and international agencies.

2. Some applications

The government has introduced web pages with information on, for example, taxes, social security, social insurance, job openings and export- and import- procedures. Some examples are listed below:

a) E-procurement

To promote the use of e-applications, all government offices have been asked to devise and establish information systems that simplify application requirements so as to reduce paperwork and speed up applications processing. Information on online applications should be made available through a variety of media, including homepages, brochures, etc. Job candidates are also encouraged submit their applications online.

b) Customs and other trade-related procedures

Increased economic activity in East Asian countries has dramatically changed the international distribution of commodities and products. Accordingly, competition among East Asian economies for imports and exports has become fierce. All the countries in the region have introduced IT to streamline their customs-clearance procedures and lower administrative costs. In response to these international trends, Japan needs to adopt IT for trade-related procedures so as to lower transaction costs. Likewise, the development of SCM on a global scale is required to reduce costs of storing inventories and to shorten production lead times.

Because customs clearance procedures also need to be simplified, a preliminary Inspection System and an Instant Approval System have been introduced. Under the Preliminary Inspection System, before imports arrive in the country or before exports are taken to a bonded area, required documents can be submitted to the authorities for approval. The Instant Approval System allows goods approved through this procedure to be cleared as soon as they arrive, with no need for inspection. IT has been used to establish customs clearance systems such as the “24-hour open port”. Other examples include the Customs Procedure Execution System (CuPES), which accepts applications submitted electronically; NACCS; and the Port Electronic Data Interchange (EDI) System. The interconnection of these systems allows one-stop customs clearance. In addition, the Customs Bureau has promoted the digitization of its procedures. Approximately 90% of import and export applications have been converted to electronic format, and nearly all customs clearances can now be handled electronically. In the future, customs authorities, businesses and industries will likely be connected over a single network.

Security is another important element of customs procedures. Customs offices are responsible for ensuring security, preventing terrorism and illegal drug trafficking and protecting intellectual property rights. Technology plays an essential role in security, as it can be used to detect explosives and other dangerous items, to control border crossings and to search for information. Ultra-sensitive cameras have been installed to monitor the wharves of the country's main ports at night, and high-power x-ray machines are used to inspect entire containers. Nevertheless, since such devices require human intervention. IT should always be viewed as an element for enhancing security, not as substitute for deploying human inspectors.

In the future, integrated circuit (IC) and RFID tags are expected to be widely used for security purposes. A pallet with an IC tag attached can be monitored and the routes that it has taken can be determined. An RFID tag in a container with information on the merchandise being transported will facilitate checking data and inspecting goods. Electronic seals can be used to determine whether a container has been opened. IC tags can also buttress efforts to protect intellectual property rights. In sum, IC and RFID tags are highly effective for promoting international trade and security, and are expected to play an important role in customs procedures.

c) E-finance and e-payment

Before putting the electronic tax system online, the National Tax Agency conducted trials with the electronic filing of individual and corporate returns, starting in November 2000. By June 2004, the system had been fully implemented. The trials thoroughly examined issues such as security, transparency and compatibility with existing software, and an analysis of how existing tax procedures would be adapted to the new system was conducted.

The fact that any electronic system would have to serve a vast array of individuals and firms is another obstacle to the construction of a secure system. Administrative procedures for certain areas, such as patent applications, were greatly streamlined. The online tax-payment system was also simplified.

Development is underway of tax- and fee-payment systems utilizing the current Multipayment Network (MPN) to connect financial institutions with governmental agencies via leased circuits. Under this system, firms will request a password electronically and then pay taxes and fees by electronic transfers to a bank, which will use the MPN to forward the payment to the proper agency.

d) Other applications

Firms as well as government agencies prepared for the April 2005 implementation of the Individual Information Protection Act. However, many concerns regarding individual privacy remain. Protecting privacy is an urgent issue for business management. In Japan, security and information protection have not traditionally been viewed as prime concerns, but with the arrival of information society, the awareness of the need to address these issues has gradually grown.

E. Institutional issues

1. Standardization

EDI

EDI is designed to improve efficiency by automating tasks. It allows data to be exchanged and transactions to be completed via a telecommunications network. In response to firms' increasing

need to exchange data, the Electronic Commerce Promotion Centre of the Japan Information Processing Development Corporation (JIPDEC) has begun introducing and managing standardized industry-wide codes. The standardized code system is composed of a six-digit company identification code plus a maximum of six more digits. Approximately 18,000 companies were registered as of February 2004. The spread of the Internet has led to increased use of online EDI. This method for exchanging data makes conducting transactions as simple as viewing web pages. According to a JIPDEC survey, 34.3% of the companies utilize online EDI. Although online EDI is an efficient method for SMEs that conduct few transactions, there are obstacles to its widespread use, such as the requirement for human intervention, connectivity with existing systems and compatibility with systems used by related companies. To address these issues, a new online EDI is expected to be introduced. It will be connected to the Internet and use eXtensive Markup Language (XML). In Japan, associations such as the Fabric and Fashion SCM Promotion Association, the Japan Association of Aeronautics and Astronautics Industries and the Japan Electronics and Information Technology Industries Association have examined the XML/EDL system. At the international level, the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) and the Organization for the Advancement of Structured Information Standards (OASIS) are in the process of defining web-XML standards. Other XML/EDI standards include RosettaNet, which was developed by international consortia of manufacturers of electronic devices and parts, IT products and semiconductors. These standards have not yet been finalized, although efforts to implement them are currently underway.

Cryptography

Japan has not adopted standards for EDI cryptography. The Secure Sockets Layer (SSL) protocol, which enciphers certificates sent from one firm to another and which has been included in web browsers and web server products, has been used widely in Japan to guarantee security in communications.

In February 2003, the Cryptography Research and Evaluation Committees (CRYPTRECs), established by the Ministry of Internal Affairs and Communication (MIC) and the METI, recommended a list of encryption methods for e-government, which all ministries have since agreed to use for making purchases. This list includes the United States government's Triple-DES standard (a data encryption method that uses three keys instead of two), and the Advanced Encryption Standard (AES), which was adopted by the United States government as its next-generation standard.

2. Public key-enabled security services

Public key infrastructure

Public key infrastructure (PKI) is an authentication system that uses digital signatures to ensure smooth electronic transactions among economic agents. In April 2001, the Diet passed the Digital Signature and Authentication Law, giving documents with digital signatures the same legal status as those with handwritten signatures or official seals. In addition, to increase certainty regarding electronic authentication, as of June 2004 the government had authorized 21 authentication firms that satisfied government standards for equipment and facilities and personal identification methods.

Government public key infrastructure

Until now, companies or individuals sending applications to administrative offices, or government offices sending notices to private parties, have been required to affix signatures and/or seals to such documents. When such documents are sent over the Internet, a method is required to authenticate that the companies and persons in question issued the documents and to

rule out falsification. To meet this need, a government public key infrastructure (GPKI) is being constructed. GPKI consists of a bridge certificate authority (BCA) registered with the MIC and with each ministry's certificate authority (CA). The term bridge refers to the infrastructure's function of cross-certifying the CAs used by the different ministries as well as those used by private-party CAs.

3. Intellectual property rights

In June 2002, an overarching strategy was devised to ensure that intellectual property rights are respected in Japan. The objective of this strategy is to revitalize Japanese industries by giving priority to digital content such as that contained in technologies, designs, brands, music and movies. Although Japan has a long tradition of manufacturing, the creation of intangible assets based on intellectual property rights should be emphasized in order to strengthen these industries. In line with this overall strategy, the Fundamental Law on the Intellectual Property Rights Strategy was passed in November 2002 and took effect in March 2003. It amended the Patent Law, Copyright Law, Anti-Trust Law and other laws.

4. Other instruments

In the information society, it has become dramatically easier to obtain individuals' personal information. There must be a balance between public access to personal information and people's need for privacy and the protection of their rights. In Japan, although private information stored on government computers is legally protected, the rapid advance of technological capabilities has created a need for uniform legislation to protect personal information. Accordingly, a law to protect privacy and took effect in April 2005.

V. Regional networks

A. Existing regional networks

For SMEs to expand they must collaborate more closely with other regional firms, local governments and what are known in Japan as "national productivity organizations" (NPOs). In the age of the information society, taking advantage of such networks requires having access to the Internet. This section discusses nationwide activities intended to support regional SME networks. It first presents examples of the Ministry of Economy, Trade and Industry's (METI) Small and Medium Enterprise Agency and of the IT Coordinators Association, the largest NPO in Japan, and then of networks of regional firms, local governments and NPOs. Finally, it discusses collaboration between industry, government and academia.

1. Nationwide networks

a) Government

METI's Small and Medium Enterprise Agency has taken various steps to support SMEs. This section discusses some activities related to regional networks.

Research and Development Consortium Project for Regional Revitalization

This project promotes R&D and marketing and distribution and the creation of new high-tech businesses as the foundation for regional industries, in order to encourage the establishment of networks of regional firms, governments and academic institutions.

Local Industry Revitalization Project

To revitalize local industry, this project subsidizes the development and marketing of new products, as well as human resources development.

R&D Assistance for the Creation of New Local Businesses

This project supports R&D activities aimed at exploring the possibility of entering new lines of business and creating new companies; such activities are undertaken by SMEs and venture companies that are essential to rekindle regional economies.

Regional Industrial Agglomeration Project

The regions considered "SME clusters" include the "castle towns" of large firms as well as industrial and technological clusters of general and specialized parts makers that supply Japanese manufacturers. SMEs in these regions are eligible for assistance such as low-interest loans, tax breaks and direct subsidies to allow them to conduct R&D on new products and to explore new marketing channels.

Government-sponsored search engines to support SMEs

One notable example of the many websites that support SMEs is J-Net21 (http://j-net21.smrj.go.jp), which provides a wide array of general information useful to SMEs.

b) IT Coordinator Associations

Although the construction of regional networks and websites requires technology, IT vendors are often unfamiliar with clients' managerial processes. Moreover, SMEs are often unfamiliar with relevant technologies and systems. The combination of these factors can lead SMEs to make misguided investments. Hence, there is a need for professionals with sufficient knowledge of and experience with both clients and IT vendors to help SME management make decisions related to IT investments. These professionals are referred to as "IT Coordinators", a title approved by the IT Coordinator Association, an NPO. METI collaborates with IT coordinators in the following ways: by helping SMEs apply for low-interest loans from IT coordinators who belong to government financial institutions; by hiring IT coordinators for seminars and other training activities; and by hiring IT coordinators to provide consultancy to SMEs in accordance with arrangements made by regional SME support centers.

2. Regional networks

a) Local government

Matching sites

One example of local government initiatives are websites created to bring sellers and purchasers together. Numerous local governments, related organizations and chambers of commerce have built websites to put SMEs in their regions in contact with buyers throughout Japan or even abroad. Some illustrative examples are the Tokyo Metropolitan SME Promotion Corporation, the Mie Industry Supporting Centre (a system which is known as "Trade Matching Information"), the Siga Industry Support Plaza, the Kyoto Industry 21 Foundation (BP Net), the Hyogo SME Valorization Centre (Hyogo Trade Matching System), the Hiroshima Industrial Promotion Organization, the Ehime Industry Promotion Foundation (known as the "Ehime Firm Search System"), the Ohita Industrial Creation Organization and the Miyazaki Industrial Support Foundation (which is referred to as "i-matching").

Case 1: Shoudan Jouzu

The Shoudan Jouzu ("Better Matching") website is sponsored by iMedia, an Osaka-based organization established in October 2001. The purpose of the site is to match buyers and sellers of IT products so as to promote IT venture businesses. Approximately 3,500 SMEs have registered with this system. SMEs are automatically furnished with information on business transactions that potentially meet their needs. Buyers can receive quick replies to their purchase orders. The web page of each registered SME gives a history of its past matches and the relevant prices, which helps ensure the reliability of participating SMEs. Information is transmitted over the Internet in real time, which speeds up searches for matches. To make the site more useful, success

stories of participating SMEs are posted, SMEs not familiar with computers and the Internet are given assistance with registration and free IT consultancy is offered.

Support for online shops

Many SMEs lack the expertise to build online stores or find it difficult to make their online stores profitable. Hence, various local governments and chambers of commerce teach them how to design home pages and manage online stores.

A case in point is the e-Merchant School, established in 2000 by the Kohchi Industry Promotion Centre. This school teaches SMEs how to raise sales and respond to client needs when initially operating an online store. It also teaches firms to promote sales by targeting potential customers in Japan through e-mail and e-zines. Online stores typically set monthly sales targets of about ¥ 1 million.

b) Firms

i) Group management of sales

In several regions, SMEs have formed groups and pooled their efforts in order to raise sales. This allows a member firm to make more sales than it could on its own. Moreover, by working with other group members and taking advantage of their specialized skills, an SME can comply with a clients' request for complex samples and eventually fill orders for such products. Higashiosaka, one of the densest SME clusters in Japan, has the following groups: Soko, Yarimasse Higashioosaka, Rodan 21, Atumaro Group-FOMY, HIT and Soyumu.

Case 2: Kyoto Shisaku Net

Kyoto Shisaku Net (Kyoto Prototype Network), established in 2001, is a virtual group of ten Kyoto-based SMEs in the machine processing and metal sector. The group has built a B2B network and specializes in producing prototypes. By using the Internet, they have greatly reduced the time needed to comply with customer requests. In addition, this now allows customers to accept prototypes in the R&D stage.

Formation of SME supply chains

SMEs located in a single distribution network can form a supply chain so as to collaborate with each other and raise efficiency, thereby reducing inventories, rationalizing distribution and shortening lead times. Although it is generally large firms that take the initiative in the formation of supply chains, in the case described below the supply chain was formed by the SMEs themselves.

Case 3: Kagoshima Construction Market

The Kagoshima Construction Market has such a network. Established in 1998, it is composed of SMEs in the construction industry. The objective of the network is to put SMEs in this industry on surer financial footing and improve local economies. In addition, SMEs in this network have formed an independent IT-based network, which handles tasks related to design, construction, purchases and distribution for the construction of high quality houses.

This group of SMEs is using IT to bring down the cost of building traditional wooden houses. Such houses require complex, costly processes and the intervention of numerous firms and craftsmen, such as carpenters. The virtual network is attempting to restructure the tasks carried out by firms and craftsmen and establish a distribution supply chain. In general, the network operates as follows:

(a) The joint operation of CAD/CAM centers allows member firms to outsource tasks such as estimate formulation, cost management, material purchases and construction management, leaving them free to concentrate on their own area of expertise.

(b) By utilizing CAD, firms can quickly determine quantities and costs and submit them to customers.

(c) All needed materials for the different processes are promptly determined and ordered through the CAD centre, which delivers them to the right location at the right time (in much the same manner as Toyota's just-in-time system).

(d) In addition, customers and firms can use web cameras to monitor construction work from remote locations. Construction-related records are posted on member firms' websites, which enhances their reputation for trustworthiness.

c) National productivity organizations

NPOs have been established in various industries for varying purposes, including: to support ventures and start-ups; evaluate technologies and projects; introduce "angles" to invest in business ventures; and to evaluate and promote the distribution of intellectual property rights. NPOs cooperate among themselves and with related agencies and companies.

Case 4: Veteran no kai

One example of an NPO is Veteran No Kai ("veterans group"), established in 2001 to support SMEs. Its members are highly experienced, retired business people who provide consultancy and give seminars to, and exchange information with, venture businesses. Their exchanges with SMEs are often conducted over the Internet, using such media as e-mail and electronic blackboards.

A venture business seeking support will give a presentation at a group meeting. This allows information to be exchanged and public relations work to be done for promising business plans. Planning, development and management of local portals, knowledge management and e-commerce are generally the topics that most interest group members seeking consultancy services.

d) Cooperation among industry, government and academia

Listed below are some examples of networks that comprise all three organizations in a single region:

Iwate Network System (INS)

This is a network to allow people working in industry, government and academia to share knowledge about R&D in science and technology. The objective of Iwate Network System's (INS) is to promote science, technology and industry in Iwate Prefecture. Since 1987, it has been broadening the scope of its activities, and it now has 1,036 members, of which 540 are from industry, 293 from government and 203 from academia. It focuses on organizing research groups in the fields of materials science, aerospace, electronics and multimedia, so as to promote new discoveries in these fields. There are now 36 such groups, and their core members are researchers at Iwate University. The groups also hold joint seminars twice a year for specialists from various fields and the general public to exchange information. The network has worked with Iwate University's Technology Licensing Office and the prefectural government's Industry Promotion Centre.

Exchanges between Tokyo Electronic University and industries in Saitama

Tokyo Electronic University's Faculty of Science and Technology is located in the city of Hatoyama, in Saitama prefecture. In 1990, it began an exchange project with the Saitama Industrial Club, which is made up of SMEs in the region. The project now teaches 150 seminars and holds monthly meetings. It also arranges joint research projects, coordinates business contracts among member companies from the region and disseminates information. Eight universities that have engineering faculties in Saitama maintain a liaison office at the Saitama Prefectural Industrial Technology Centre and support SMEs in the region.

B. Networks under development

This section discusses initiatives by the central government (mainly the METI), local governments and industry to stimulate regions and regional networks.

1. Government

METI's Small and Medium Enterprise Agency has initiated a cooperation program to network SMEs with particularly useful or specialized technologies. Its objective is to support what is known as "soft and flexible collaboration", through which SMEs with special resources such as advanced technology, business expertise or intellectual propriety rights support each other by sharing these resources to create new products, open new lines of business and establish new marketing channels. The agency expects the project to create specific and high value-added products for SMEs, provide products to consumers by streamlining production and distribution processes and open up new markets. One example of the potential creation of new markets is the Micro Module Factory project proposed by Kyoto Shisaku Net (discussed in the preceding section). In Kyoto, venture businesses have converted houses into factories. Companies that belong to this network plan to produce equipment suited for these small factories. This would include the designing and manufacture of small, inexpensive processing machines and measuring instruments.

2. Local governments

Ease of use has rendered matching sites more powerful. For example, Virtual PIO, established in Ohta ward by the Tokyo city government, supports business matching. It is operated by the Ohta Industry Promotion Association, which has used software efficiently and economically for purposes such as conducting commercial negotiations, issuing orders and preparing estimates online. Electronic commercial negotiations are conducted primarily through the remote operation of Windows applications installed on a member company's host computer. Using a program named IP Collaboration, SMEs can access matching sites easily and securely.

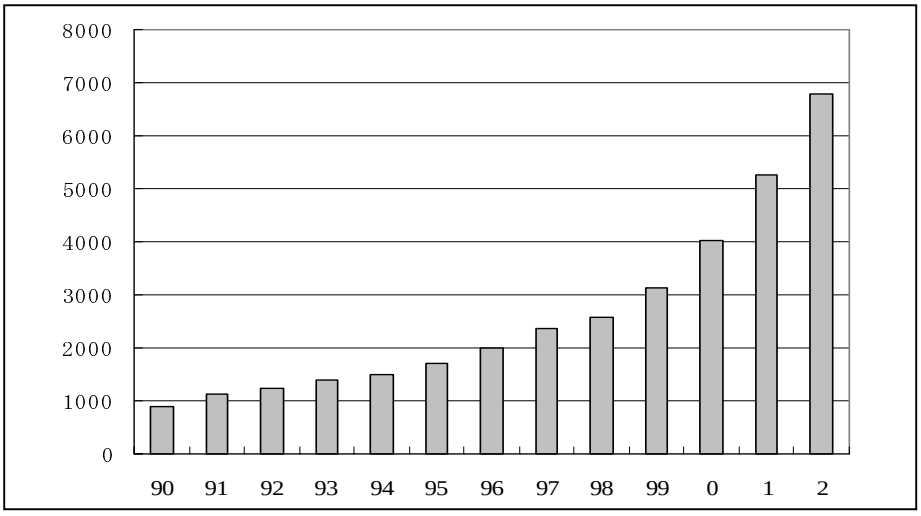
3. Cooperation among industry, government and academia

Inspired by the success of Iwate's INS, the Kansai region has created a similar system, the Kansai Network System (KNS). A network of individuals who want to promote economic development in Kansai, KNS has sponsored activities such as online meetings of its members.

Following the enactment of the Law of Promotion of Technology Transfer from Universities (TLO), exchange and cooperation between universities and local firms has increased. In 2001, clustering became the core concept of these projects, as METI initiated the Industrial Cluster Project while the Ministry of Education, Science and Technology launched the Intellectual Cluster Creation Project. These projects seek to promote cooperation between

industry and academia. As shown in figure V.1, 6,767 joint research projects were carried out between firms and national universities in 2002. (The figure is 9,255 if all universities were included.) The total cost of the projects was ¥ 21.6 billion. Nearly 800 venture businesses originated at universities in 2003 (table 60). These figures are expected to increase in coming years.

FIGURE 1
JOINT RESEARCH PROJECTS BETWEEN FIRMS AND UNIVERSITIES



Source: On the basis of information provided by Ministry of Education, Culture, Sports, Science and Technology, Tokyo.

TABLE 60
VENTURE BUSINESSES ORIGINATING AT UNIVERSITIES

Year	1979	1989	1995	1996	1997	1998	1999	2000	2001	2002	2003
Number	23	49	92	111	140	188	260	384	534	678	799

Source: On the basis of Ministry of Economy, Trade and Industry (METI), "Basic investigation on venture businesses born in universities", Tokyo, 2003.

The number of joint research projects between national universities and SMEs is given in table 61. These projects accounted for nearly one-third of all joint research projects conducted by national universities. This underscores the strong ties between universities and SMEs, which should contribute to strengthening SMEs in the future.

TABLE 61
JOINT RESEARCH PROJECTS BETWEEN NATIONAL UNIVERSITIES AND SMES

	All joint research projects involving national universities	Joint research projects with SMEs	Joint projects with SMEs/total projects
2000	4,070	1,363	33.5%
2001	5,340	1,715	32.1%
2002	6.861	2,330	34.0%

Source: On the basis of information provided by Ministry of Education, Culture, Sports, Science and Technology, Tokyo.

C. Possibility of interregional linkages

To allow SMEs to find new business opportunities, their marketing activities should extend throughout Japan, rather than focusing solely on their local region. Some examples of how this might be done are given below.

1. Local governments

a) National matching sites

Users of these sites can search for information about SMEs throughout Japan. Some examples in this category are the Small and Medium Enterprise Trade Network System (SMET), operated by the Ohta Industry Promotion Association; the Osaka Chamber of Commerce's "Business Mall"; and J-Net 21 (discussed above). SMET has more than 30,000 registered SMEs from industrial clusters all over Japan, including Kawaguchi, in Saitama prefecture, and Higashi-Osaka and Yao, in Osaka prefecture. Searches for registered SMEs can be conducted from anywhere in Japan.

In addition to information sites, there are "business matching" sites. The transaction-matching systems of the National Subcontractors Promotion Association and the Kansai E-Business Network (KEBN) are typical examples. KEBN —managed by the Kansai Economic Federation in cooperation with the Business Mall mentioned above, J-Net 21 and the Hyogo SME Vitalization Centre— provides B2B matching services. And, more importantly, it also has a search-engine function; an "open" purchasing service (through which sellers enter bids with registered companies that want to make a purchase); and public-relations information posting (through which companies list their selling points, such as technological specialties, for potential buyers to see).

b) Business mall

The largest database operated by public organizations such as chambers of commerce is the Business Mall, which has more than 300,000 members from various chambers of commerce. Its origins lie in the Kinki Business Mall, which comprised chambers of commerce in Kinki (Kansai). In 2000, when the database was expanded to cover all of Japan, its name was changed to reflect its broader reach. The website features a search engine, a commercial bulletin board and links to many e-commerce sites and other sites of interest to SMEs.

c) Trade matching system

This is one of the portals used to support SME members of the National Subcontractors Association. Companies can use an automated matching function to find information on purchases and sales. In addition, they can quickly search for companies that meet certain criteria for transactions they wish to conduct.

2. Group of firms

Sites with a nationwide reach commonly provide information to other firms located throughout Japan. Some examples are given below.

Specialized sites

One example is the NC Network, which specializes in numerically controlled machine tools and CAD. Young SME owners in Tokyo's Katsushika ward founded the network. Its website has a

searchable database with information, such as technologies used, for 12,000 registered companies from throughout the country. It also provides information on sales and purchases of machine tools and matches employers with job seekers.

Supply chain management

To meet the challenges of this age of rapid innovation, SMEs need to adopt SCM techniques and thereby break down the traditional structures of industrial groups. It is also important that they share the knowledge that they gain from successful websites with SMEs throughout the country. Below are two examples of how they can accomplish this.

JeMarche was created by the Japan Electronic Industry Association to promote e-commerce by accepting transactions from users outside the territory of the traditional industrial group. “JeMarche” is French for “I go forward”, alluding to the objective of promoting e-commerce in Japan. The purpose of the system is to advance e-procurement, e-commerce, EDI and SCM; promote the digitization of catalogues, including of electric machinery parts; and encourage the sharing of design information.

Another example is the Kagoshima Construction Market (discussed above), which comprises construction companies, architectural design offices and realtors related to the home construction sector. The original networks of this kind that existed in several regions eventually expanded, interconnecting 17 regional networks in, for example, Tokyo, Osaka and Kagoshima. Interregional SME networks are expected to play a larger role in various industries in the future.

VI. Final remarks

This paper has focused on present IT use by SMEs in Japan, through mail surveys and in-depth interviews in two of the country's largest SME clusters, Higashi-Osaka and Ohta ward. An attempt has been made to highlight the similarities and differences between the two clusters. This has made it possible to shed light on various facts and to provide insights not apparent from the secondary data published in various other reports.

Obstacles to IT use

This paper has also attempted to elucidate the real obstacles to IT use. Various publications have pointed to many, sometimes contradictory, issues. A survey was conducted by mail and through interviews to pinpoint factors that encourage the use of new technologies. The results of these surveys indicate that, although most SMEs recognize the need for IT and say they intend to use it more, their actual adoption of these technologies is less than optimal. Their reluctance to invest in IT stems primarily from a lack of qualified personnel and funds and from insufficient government efforts. The analysis given above weighs the importance of these various factors.

IT leadership

Since IT use is a function of a business's management and strategy, the decisions made by senior managers are crucial. Even if SMEs operated under optimal conditions —if they had IT specialists, sufficient money and government support— they would not be able to use new technologies to their advantage without correct decisions by their managers. The empirical study identified the following types of management outlooks that affect IT use: an orientation to expanding, to adapting, to using data and to providing incentives. Similar conclusions were reached by Tsuji and Choe (2004), who also tried to identify factors that encourage regional information policies, in the framework of an analysis of demand for and supply of such policies. Using the same empirical methodology as the present study, these authors concluded that leadership shown by top local government officials is more crucial than the availability of funding.

The current study has sought to understand how top management determines what information technologies are to be used, and what kind of decision-making leads to greater IT use. In the interviews, informants often said that IT is "just a tool", by which they meant that it is useful only for promoting internal efficiency or productivity in routine tasks. In contrast, the

authors believe that its prime function is to create entirely new business models. Ideally, IT completely transforms businesses, and the economy itself, through Schumpeterian creative destruction. As emphasized in chapter V, most SMEs that successfully use IT create new business models based on that more intensive use of technology.

Traditional business practices

Japan's traditional business practices, most of which predate the information age, are another obstacle to the adoption of new technologies. Foreign governments have held many of these practices out as proof of Japan's closed economy. As mentioned in the discussion on Ohta ward, these practices constitute restrictions that prevent optimal IT use. IT can be used to bypass traditional distribution networks and to allow consumers and producers to contact each other directly or to allow retailers to purchase directly from producers and thereby cut costs. However, since this practice usually runs against tradition, wholesalers sometimes pressure producers to not sell to retailers that deal directly with producers. These impediments do not show up in research based on quantitative methods.

Costs of IT investment

Many respondents pointed to the high cost of IT investments. This indicates that they do not fully understand the long-term benefits of such investments and focus more on present costs than on future increases in profits. Still, it is true that IT investment is expensive in Japan. One reason is that software providers often buy foreign software and adapt it to local needs, which entails high customization costs. In addition, large companies have their own in-house software, which they ask SMEs to use. The high costs of purchasing and customizing various software packages make SMEs reluctant to invest heavily in IT.

Considerations for Japanese IT policy

Like previous research projects, this one underscores the importance of policies to promote IT use by SMEs. Large sums of tax revenues have been spent on such promotional policies. As noted in Japan's official SME policy guideline, the government has deviated from the course it charted several years ago. Rather than supporting all SMEs indistinctly, it now focuses on those that intend to expand by dint of their own efforts. Not all IT-promotion policies have proven effective, although these policies still enjoy strong support. SMEs most frequently request support though education, such as seminars and on-hands training, although they often fail to understand the limits of such efforts. While most IT training in Japan focuses on techniques for using computers, building homepages and taking advantage of other web-related materials, SMEs stand to benefit more from learning to base business models on IT as well as from solutions tailored to their individual needs. Training of senior managers is also paramount, as noted above. Policies should target, and limited resources should focus on, firms that have proven themselves to be effective IT users. Government's primary objective should be to create new firms and foster infant industries. For example, consultations on business restructuring should be stressed.

One respondent stated that a government IT policy is unnecessary. In a certain way, this is an insightful comment, since market competition is normally the most efficient mechanism for spreading new technologies. In Japan's economic system, however, this does not hold true, and SMEs continue to request government assistance. Japan's post-war success stems from the harmonious interaction of the public and private sectors, with government playing the role of providing funding and information, especially information for the coordination of a diverse array of private entities. This is one of the pillars of Japan's industrial policy. With regard to technology, the central government's most useful contribution is to coordinate such diverse local players as local governments, economic-promotion agencies, NPOs and private companies, and to encourage them to create and promote new ventures. Specifically, the central government can

publicize and provide information on start-ups that have successfully used IT. As noted in chapter V, there are many cases of successful business models built around IT. One reason SMEs are reluctant to invest in technology is that they place a premium on short-term, tangible results. Hence, giving them examples of success stories would surely serve as an incentive.

Toward successful IT use by SMEs

As stressed above, the Japanese economy has undergone a transformation from a tradition-based system to a more modern one. Traditional structures such as the employment system, industry, banking and the SME sector are in transition. It is difficult to say what an ideal economic system for Japan would look like, but at the very least, it would be more competitive, more market-oriented, more open and more attuned to a globalized world. These characteristics are exactly what IT offers the Japanese economy. In this sense, the spread of IT is creating a new Japanese economic system. SMEs able to grasp the essence of IT and create new business models have been started up all over Japan. With sound policies, their numbers will increase and they will become stronger. And SMEs that take advantage of such policies will thrive in the new information age.

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Appendix

Appendix 1

Questionnaires on Information Technology
Osaka School of International Public Policy, Osaka University
Masatsugu Tsuji, Professor of Economics

Please provide your name and contact information

Company name			
Address			
Telephone number		**Fax number**	
Name of respondent		**Title/position**	
E-mail			

Section A: IT in your company

IT refers to information technology, such as personal computers and the Internet. This section asks about your company's initiatives to restructure management through IT use.

Q1) How many PCs (including leased or rented PCs) does your company have?

Q1-1) How many of these PCs are connected to a LAN (local area network)?

Q2) What kind of software does your company use? What kinds of software would you like to use in the future?

	Now Using	Would like to use
1. Sales management (including POS and barcode)	1	1
2. Accounting	2	2
3. Payroll management	3	3
4. Purchases management	4	4
5. Inventory management	5	5

6. Design management (including CAD/CAM)	6	6
7. Production management	7	7
8. Logistics	8	8
9. Enterprise resource planning (EPR)	9	9
10. Customer relations management (CRM)	10	10
11. Groupware (office information sharing systems)	11	11
12. Sales force automation (SFA)	12	12
13. Supply chain management (SCM)	13	13
14. Other	14	14

Q3) Does your company use the Internet?

1 Yes 2 No

↓ ↓

If you answered yes, continue with Q3-1 through Q3-4.

If you answered no, skip to Q4.

Q3-1) When did your company start to use the Internet?

Year

Q3-2) What kind of Internet connection are you using? (check all applicable)

1. Leased circuit	4. Asymmetric digital subscriber line (ADSL)
2. Fibre optic	5. Integrated services digital network (ISDN)
3. Cable	6. Dial-up

Q3-3) What is your company's current usage of the Internet? (check all applicable)

1. Create and manage the company's home page or other related web pages.
2. Employees' personal e-mail accounts (number of addresses)
3. Create and utilize electronic bulletin boards, and/or electronic meeting boards
4. Create and utilize mailing lists of customers and business partners
5. Establish a private domain name
6. Other

Q3-4) What is the purpose of your company's Internet use?

1. To gather/exchange information
2. To promote the company and its products
3. To conduct banking-related operations
4. To make management more efficient
5. To conduct e-commerce with other companies (B2B)
6. To conduct e-commerce with consumers (B2C)
7. Other

If you checked e-commerce (5 or 6) in Q3-4, continue with Q3-5 and Q3-6. If you did not check e-commerce, please skip to Q4.

Q3-5 How important was e-commerce for your company in the last fiscal year?

Sales over the Internet, as a percentage of total sales:

Approximately ☐ %

Compared with three years ago, thus percentage is

1. higher 2. roughly the same 3. lower

Purchases over the Internet as a percentage of total purchases

Approximately ☐ %

Compared with three years ago, thus percentage is

1. higher 2. roughly the same 3. lower

Q3-6) Compared with three years ago, the percentage of business with companies in your region conducted by e-commerce, is currently:

1. higher 2. roughly the same 3. lower

Q4) How does your company encourage employees to receive IT training? (check all applicable)

1. Through support for participation in outside IT training and seminars 2. Through in-house IT training and seminars	3. Through support for employees to learn on their own 4. By recruiting new persons with strong IT skills	5. Other 6. It does not have such a policy

Q5) What kind of security measures does your company have? What kind of security policies does your company plan to introduce? (check all applicable)

	Now in place	Plan to introduce
1. Security guidelines	1	1
2. Risk analysis	2	2
3. Classification of information according to security risk	3	3
4. Policies prohibiting leaking of classified information and customer information	4	4
5. Password management		
6. Firewalls	5	5
7. Antivirus programs	6	6
8. System auditing and information-security auditing	7	7
9. Other	8	8
	9	9

Section B: Company's view of IT use

Q6) What benefits do you expect from using IT?

	High expectation	Moderate expectation	Low expectation	No expectation
1) Increased profits	1	2	3	4
2) Higher productivity in routine tasks, such as administrative tasks	1	2	3	4
3) Higher productivity in non-routine tasks, such as project planning	1	2	3	4
4) Faster decision-making in management and business development	1	2	3	4
5) Restructuring the entire business process	1	2	3	4
6) Encouraging communication and information and knowledge sharing	1	2	3	4
7) Closer cooperation with customers and business partners	1	2	3	4
8) Better understanding of customer needs	1	2	3	4
9) Enhanced customer satisfaction through improvements in services and products	1	2	3	4

Q7) How satisfied are you with the current benefits from your company's IT use in the following areas? If your company does not yet use IT, please skip to Q8.

	Very satisfied	Somewhat satisfied	Not very satisfied	Not at all satisfied
1) Increased profits	1	2	3	4
2) Higher productivity in routine tasks, such as administrative tasks	1	2	3	4
3) Higher productivity in non-routine tasks, such as project planning	1	2	3	4
4) Faster decision-making in management and business	1	2	3	4

development				
5) Restructuring the entire business process	1	2	3	4
6) Encouraging communication and information and knowledge sharing	1	2	3	4
7) Closer cooperation with customers and business partners	1	2	3	4
8) Better understanding of customer needs	1	2	3	4
9) Enhanced customer satisfaction through improvements in services and products	1	2	3	4

Q8) Are there any problems with your company's current IT use? (check one)

1. Serious problems	3. Uncertain	4. Minor problems
2. Some problems		5. No problems at all

Q9) What problem(s) does your company currently face in using IT? (check all applicable)

1. Lack of leadership regarding IT use
2. Lack of concrete management objectives for IT use
3. Introduction of IT without restructuring of processes
4. Insufficient staff with adequate IT skills
5. Employees' lack of familiarity with IT
6. Employees' reluctance to use IT
7. Lack of IT consultants
8. Company's failure to instruct consultants on how to introduce IT
9. Company's failure to instruct suppliers (manufacturers) on planning and introduction of IT
10. Lack of software to meet needs of company's business and processes
11. Company's inability to keep up with rapid development of IT
12. Attempt by business partners to adopt their own IT systems
13. Perception that IT investment does not translate into higher profits
14. High cost of IT investment

15. Concern with compromising information through introduction of IT
16. Concern with leakage of personal data through introduction of IT
17. Time required to introduce IT
18. Other
Not specified

Q9-1) Of the problems listed above, which three are the most serious?

#1	**#2**	**#3**

Q10) How important is the introduction of IT for your company's management? (check one)

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

Q11) To what extent does your company plan to increase its use of IT? (check one)

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

Q12) To what extent does your company plan to increase its investment in IT? (check one)

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

Q13) How much did your company invest in IT in the last fiscal year?

Approximately ¥

Section C: Company policies

Q14) Which of the following challenges is currently the most important for your company? (check one)

1. Ensuring orders and sales	5. Using IT
2. Ensuring profits and sound financial management	6. Preparing for a smooth transition to new management
3. Ensuring good employee and human-resource management	7. Other (please specify:)
4. Developing the ability to plan, conduct R&D and implement technology	

Q15) To what extent do the following statements apply to your company?

	Very much so	To some extent	Uncertain	Not very much	Not at all
1. Company's performance is disclosed to employees.	1	2	3	4	5
2. Past business data are utilized in company management.	1	2	3	4	5
3. Senior managers are given broad responsibilities and authorities.	1	2	3	4	5
4. The company studies other companies' mistakes and learns from them.	1	2	3	4	5
5. The company listens to employees' opinions on how to improve management.	1	2	3	4	5
6. New lines of business are constantly being sought and products developed.	1	2	3	4	5
7. Monthly sales figures are utilized by management.	1	2	3	4	5
8. The company offers IT training to executives, managers and employees.	1	2	3	4	5
9. Training and job rotation are designed to make the most of each employee's abilities and knowledge.	1	2	3	4	5
10. Employees are apprised of the company's plans for next 2-3 years.	1	2	3	4	5
11. The company wins over new business partners every year.	1	2	3	4	5
12. A large share of the company's business is with repeat customers.	1	2	3	4	5

13. The company is able to set prices as it sees fit.	1	2	3	4	5
14. Competition with rival companies has recently become more intense.	1	2	3	4	5
15. There has been a recent increase in new entrants from other business fields in our market.	1	2	3	4	5
16. The share of new products and services in our market is larger than before.	1	2	3	4	5
17. In recent years, the company has been unable to hire employees 30 years old and younger.	1	2	3	4	5

Section D: Future IT use and policy

Q16) What policies regarding IT use would you like to see the government implement? (check one)

1. IT seminars
2. PC training
3. Training in website development
4. Consultancy on IT promotion
5. Low-interest loans for IT
6. Affordable computer-equipment leases
7. Tax exemptions on IT investment
8. Grants and other financial support for IT investment-related projects
9. Support for opening new portals
10. Deregulation
11. Showcasing of small-business models that use IT
12. E-procurement, e-purchasing
13. Other (please specify:)

Q16-1) Of the initiatives listed above, which three are the most important to your company?

#1	**#2**	**#3**

Q17) The Japanese government is promoting deregulation by establishing a "Special Zone for Structural Reform". Please give your opinion on the "Special Zone for IT and New Business Promotion" as it is described below:

> The Special District for IT and New Business Promotion is designed to promote the creation of new industries, to encourage the incubation of new businesses and to foster better public services through the development of IT and telecommunications infrastructure based on fibre optic networks to be deployed by local governments. This relaxation of regulations in this area makes it much easier to conduct businesses by using IT in various fields.

	Agree strongly	Agree somewhat	Uncertain	Disagree	Disagree strongly
1. The Special Zone strongly enhances the possibilities for Japanese manufacturers to become more competitive internationally.	1	2	3	4	5
2. The Special Zone should provide financial support to our company.	1	2	3	4	5
3. The Special Zone should support human resource development at our company.	1	2	3	4	5
4. Only large companies or IT firms will be able to take advantage of the Special Zone, and other SMEs might gain nothing from it.	1	2	3	4	5
5. If the Special Zone is established in Higashi-Osaka City or Ohta ward (Tokyo), we would like to obtain support from it for practical applications.	1	2	3	4	5

Q17-1) What results would you expect from the establishment of a Special Zone for IT and New Business Promotion in Higashi-Osaka or Ohta ward (Tokyo)?

Q18) Would your company like to take part in collaborative projects with research institutions at universities and other organizations? (check one)

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

If you checked yes (1 or 2), continue with Q18-1.

If you checked 3, 4 or 5, skip to Q19.

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

Q19) In your opinion, is the Internet a public or private space? (check one)

1. Clearly public spaces	3. Uncertain	4. Primarily private spaces
2. Primarily public spaces		5. Clearly private spaces

Q20) To what extent do you agree with the following statements? (check one for each item)

	Agree strongly	Agree somewhat	Uncertain	Disagree somewhat	Disagree strongly
1. IT provides people everywhere with equal opportunities to exchange information.	1	2	3	4	5
2. With IT, the public and businesses have full access to information.	1	2	3	4	5
3. IT makes individuals and business more autonomous.	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 gaps in income and other economic indicators between the developed and developing	1	2	3	4	5

countries.					
6. IT encourages the globalization process.	1	2	3	4	5
7. IT replaces old markets with new ones.	1	2	3	4	5
8. IT allows my company to receive input from anywhere in the world on the information the company disseminates, and hence to change course at any time.	1	2	3	4	5

Q21) Please give any additional opinions regarding IT and your expectations from it, including how it can encourage the creation of new businesses.

Section E: Company profile

Q22)

Established Year: Month:	The current president is: 1. The founder of the company 2. Its second president 3. Its third president 4. Its fourth or subsequent president	Capital ¥

Q23) Business sector (check all applicable)

1. Manufacturing	5. Construction	9. Individual services
2. Wholesale	6. Finance, insurance	10. Information services
3. Retail	7. Real estate	11 Other ( )
4. Transportation, communication	8. Corporate services	

Q23-1) If you checked 1, what product(s) do you manufacture?

1. Foodstuffs	6. Ceramic, rock or sand-based products	11. Electric machinery and/or tools
2. Textile products	7. Steel products	12. Transportation equipment
3. Wool products	8. Non-ferrous metal products	13. Other ( )
4. Paper-based products	9. Metal-based products	
5. Synthetic-resin or rubber products	10. Machinery and/or tools	

Q24) How does the current position of your company compare to its position when it was founded? (check one)

1. Same as the original business
2. The company has developed upstream (on the maker/vender side), in businesses related to its original market.
3. The company has developed downstream (consumer/user side), in businesses related to its original market.
4. The company has developed horizontally, in markets related to its original market.
5. The company is now involved in a completely different business, and the original company has been dissolved or downsized.

Q25) How many persons does your company employ?

	Total	Regular/full-time	Part-time
Total			
IT workers (e.g., systems administrators)			

Q26) and Q27) are very important for this survey. Please make every effort to answer them.

Q26)

Gross profit margin (gross margin/sales x 100)	Return on sales (Operating income/sales x 100)
Approximately %	Approximately %

Q27) Please provide the following information to the extent that your company policy allows. If you are unable to give the numerical data requested in the upper row, please indicate the trend in the lower row.

	Sales	**Gross margin**	**Operating income**	**Equipment investment**	**IT investment**	**Exports**	**Imports**
Most recent fiscal year (three years back=100)							
Trend (compared with three years back)	1. Increasing 2. Roughly the same 3. Decreasing	1. Increasing 2. Roughly the same 3. Decreasing	1. Increasing 2. Roughly the same 3. Decreasing	1. Increasing 2. Roughly the same 3. Decreasing	1. Increasing 2. Roughly the same 3. Decreasing	1. Increasing 2. Roughly the same 3. Decreasing	1. Increasing 2. Roughly the same 3. Decreasing

This is the end of the survey. We appreciate your willingness to participate.

We would be grateful if you could return this to us by June 30. Please use the enclosed return envelope.