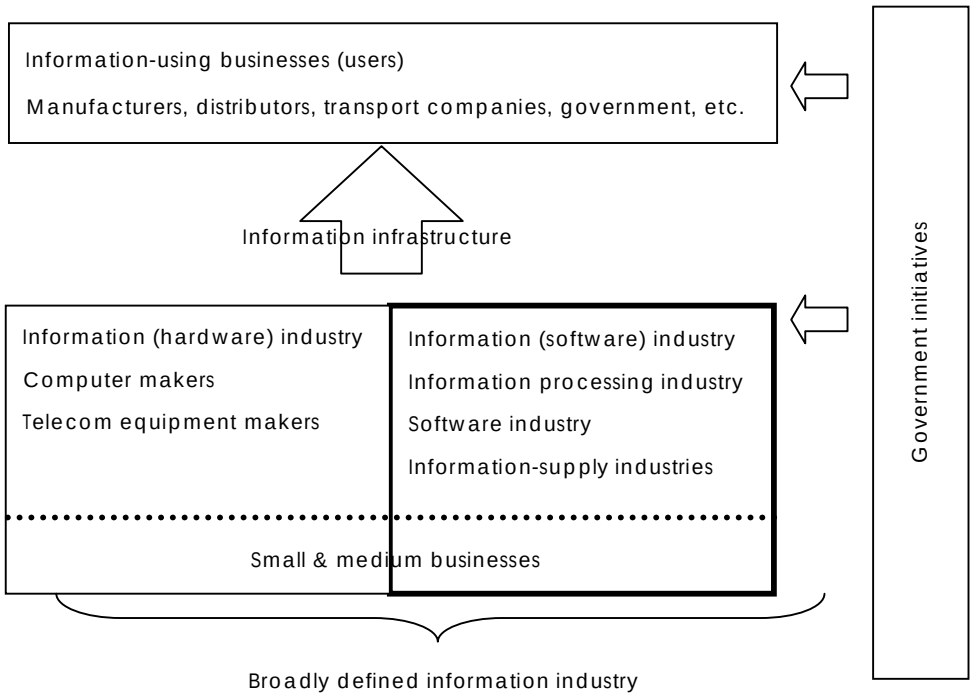
3.4 Information (Software) Industry

3.4.1 Trends in the World Information Industry

(1) Definition of the Information Industry

The broadly defined information industry, as shown in the diagram below, includes the hardware industry, but in this report the working definition of the industry that is used is that it comprises the information processing services industry, the software industry and information vendors. At times the expressions "information services industry" or "software industry" and the like are used, but in all cases can be understood to stand for "information industry" in the sense defined here.

The beneficiaries of the products and services provided by the broadly defined information industry are defined here as the information-using companies, or users.



(2) Market Scale

On a regional basis the world market for information services, in 1999, shows a pattern of North America accounting for 50%, followed by West and North Europe with 31%, Asia and Oceania, 15%, and Latin America, 2%. Growth has averaged 8.6% for the world as a whole, but 11.0% in North America where the largest market exists, followed by 8.3% recorded in West and North Europe. In the smaller markets of Latin America, Central and East Europe, and the Mideast and Africa, growth has been

13-15% during 1995-1999. Economic crises in Asia and Oceania have restrained growth but rapid expansion of the market there is expected in the future.

TABLE 3.4.1 AVERAGE GROWTH RATE OF THE WORLD'S INFORMATION INDUSTRY, 1995-99

(Unit: %)

	IT services	Software	Total industry
North America	10.1	13.1	11.0
Asia, Oceania	0.4	6.2	1.7
West, North Europe	9.1	6.7	8.3
Middle, East Europe	13.8	12.1	13.2
Latin America	14.2	13.4	14.0
Mideast, Africa	16.7	11.9	15.1
World	8.0	9.9	8.6

Source: WITSA Digital Planet 2000, Nov. 2000

(3) Information Service Trends

1) Application Service Providers and Internet Data Centers

Application Service Providers (ASP) and Internet Data Centers (IDC) have attracted considerable attention as new information service areas that have been created as a result of development of the Internet. ASP and IDC are services for the supply of application systems by means of networks, whereby use of software is "acquired when needed" rather than "acquired for use at any time." Various definitions of ASP and IDC are in use; here ASP is taken as meaning service whereby noncustomized application systems are provided to an indeterminate number of users, and IDC is taken to mean services involving supply of customized applications services to a certain number of users.

ASP is a one-to-many service. whereby application software is installed in a server that is jointly used by subscribers. There are two forms of ASP. One undertakes all processing at the server or back end and provides only results to users; the other uses a Java applet or equivalent to download the application software and data from the server for processing by the client or subscriber. It is generally believed that because ASP reduces the total cost of ownership (TOC) to user companies they are particularly valuable to small and medium scale enterprises (SMEs) that are less eager and less able to invest in IT relative to large companies. This has encouraged information service companies, applications vendors, computer vendors and others to

enter the ASP business. Reaction among potential users thus far has been slow, but there is no lack of observers who expect that in the future principal business activities and use of e-mail, groupware and so on will form a very large market.

IDC, in comparison to ASP, involves one-on-one arrangements. There are three forms of IDC. One is the infrastructure type that provides the functioning of an Internet Protocol (IP) network. A second a full-line operation that adds server functionality to the infrastructure, and the third is high-end type that provides a platform for e-business. The target market segments for the IDC include large and moderate scale companies as well as any company for which working with mission-critical data is important and where use of leased lines and backup lines are needed for safety and reliability.

Information service companies as well as computer vendors, telecoms, Internet Service Providers (ISP), power companies and others, provide IDC business services and vigorous competition among these is expected. Because IDC operations in Japan are costly, as investment requirements are on the scale of eight-digits, many IDCs rely on outsourcing for their equipment.

2) The Rush to Open E–Marketplaces

An e-marketplace is where businesses buy and sell to each other through a network and where there are a multiple number of buyers and sellers. In e-marketplaces, prices are considered to directly reflect the forces of supply and demand. The markets are therefore attractive to buyers who seek to minimize costs and sellers who seek to maximize their opportunities to sell. At the same time, the entities that open these marketplaces are driven by both business motives and the attraction of establishing a position of influence in the industry concerned. These factors have led to a rush in opening e-marketplaces.

System vendors, information service companies, IT ventures and a wide variety of large companies are undertaking the establishment and operation of e-marketplaces. E-marketplaces at the present time face a number of issues, however, relating to the coexistence of traditional or legacy distribution channels with which market participants must coordinate activities, to the competition among marketplaces, to the matter of product or service quality assurance, to fulfillment, and to payment methods. Because of this situation considerable further efforts and improvements are needed before there is strong and sustained development of e-marketplaces.

3) Outlook for Internationalization from the Viewpoint of IT Specialists

Some concern has become evident in Japan regarding a shortage of IT specialists, following on the exponential growth of IT applications in Japan. There is no quick remedy for this because of the time required to train IT personnel, and reliance on experts from abroad has resulted. In particular there has been growth of use of Indian and Chinese persons who have high skill levels and experience in the West. Securing a large force of Indian specialists, who do not require high salaries and who understand English, is attractive in this context, and that skills are available from this source was verified when work was being done on the Y2K problem. Many key Western companies in IT have established offices in India for the purpose of tapping this talent pool. In some instances American and German companies active there have attracted Indian employees by offering pay that is 10 times or more above prevailing levels.

China is experienced rapid growth of demand for IT personnel not only from abroad but also for work in China, and local companies, Japanese companies, and companies from Europe and North America are competing to hire qualified workers. Some companies have expanded to China with plans to acquire a track record there in light of the high future promise of the market to be formed by the huge population. Western governments are also strongly interested in securing IT workers from China and India; the United States raised the limit of H1-B (hi-tech) visas from 65,000 in 1999 to 115,000, while Germany has started to issue special work permits to attract IT workers from outside the European Union. In order to offset a domestic shortage of IT workers, it is necessary to provide an attractive employment environment for workers from other countries.

4) Increase in the Effects of System Malfunctions

At the same time that services provided by means of the Internet have increased and diversified, the effects of system malfunctions at service providers and users has increased in scale. This has been caused by a shortening of the duration of time-to-market and a degree of curtailment of testing owing to competitive pressure on product or service development, as well as by an increase in the use of cutting-edge technology with its accompanying higher risk, as a means of differentiation from competing providers. A third reason is experiencing problems, when the number of users exceeds anticipated demand levels. In addition, network security has been assigned greater importance as an issue. Business interruptions or

denials can cause great damage to companies at this time, as they are still getting established as e-businesses. The social responsibility accruing to information service companies is great, and is another issue that must be addressed by the industry.

5) Broadband Network Activities

Contents providers have greatly increased their activities consonant with the increase in Internet users and Internet use. In particular the provision of rich media content such as music and video has encountered limits to the utility of their offerings in the form of substandard image and sound quality, or long download times, and overcoming of these problems requires diffusion of broadband networks. The scope of broadband networks is not precisely defined, but for present purposes can be taken as meaning a transmission speed of about 500 kbps for smooth image movement in real time.

Table 3.4.2 summarizes the present situation and outlook for broadband, both wired and wireless, with emphasis on front-end networks.

TABLE3.4.2 CHARACTERISTICS OF HIGH-SPEED DIGITAL ACCESS TECHNOLOGY

Circuit			System	Speed	Issues	Notes
Wired access network	Optical fiber		FTTH (PDS)	192Kbps～	• Smooth shift to high-speed use of ATMs and PDSs through supply of high-speed broad regional services such as digital image transmission	• Effectively unlimited service region possible by use of WDM technology • No electromagnetic noise
			π system	144Kbps	• Present conditions do not permit access by same cable as DSL	• Hybrid metallic and optical fiber cable
	Metallic cable		DSL	128Kbps ～ 52Mbps	• Need for compatibility with optical fiber cable • Need for measures following removal of metallic cable • Need to prevent leakage between metallic and ISDN or other cable	• Transmission speed depends on DSL method; distance etc.
	Coaxial cable		CATV	～30Mbps	• Need countermeasures for noise • Study of measures for adoption of optical fiber cable and digitization • Measures for multiunit dwellings where installation is difficult	• Internet connectivity for single-channel TV over broad area (6MHz) at about 30MHz • Service region per one user varies because of sharing within region
Wireless access network	Ground	Fixed	FWA	156Mbps	• Increase in users can strain system in service area • High equipment cost • Installation difficult owing to adverse outlook	• Uses 22GHz, 26Ghz and 38GHz bands
			Low-power data transmission	～10Mbps	• Need for ground station • Need to have line to ground station	• Uses 24GHz, 5GHz bands
		Mobile	IMT-2000	144Kbps ～ 2Mbps	• Make IP network seamless, high-speed	• Uses 2GHz band • Interior speed up to 2Mbps
	Telecom system		GEO	～30Mbps	• When bi-directional satellite circuit is used costly ground station equipment is needed	• IP network service can use ground lines for up circuit.

Source: Compiled by Mitsubishi Research Institute after , "Report of Study Group on High-Speed Digital Technology.

6) Corporate Shift to EC

The explosive movement toward information use that has accompanied the diffusion of Internet use during the latter half of the 1990s has changed the environment for society and for individuals, and has not been limited to changing conditions for companies. In keeping with the great change taking place, we are experiencing changes in industrial structure, business models, modes of labor

employment, communities, communication, and lifestyles. There are very many companies that are actively pursuing e-commerce goals through the Internet, whether they are in the areas of B to B or B to C.

Expansion of B to B business has been largely a consequence of companies in the manufacturing sector who are seeking to reduce the cost of goods and services purchased from vendors, or to improve development, production and sales processes, or to share information, or to increase sales opportunities. They are paying attention in particular to Electronic Data Interchange (EDI) via the web, and using the Internet for purchasing materials and products in e-marketplaces, as well as using it for Supply Chain Management (SCM). In short, the Internet is being used for interchange of information for production, sales and distribution activities. In the B to C area, companies in the distribution sector and financial institutions are seeking to make use of customer data to improve one-to-one marketing and customer satisfaction levels. They offer Net shopping and Net banking services to customers. The Internet, moreover, has facilitated starting new businesses. In Japan, for example, the Internet has made it possible for trading companies, manufacturers and retailers to enter the banking business, through Net banking, while convenience store chains provide goods delivery (fulfillment) service and payment collection and remission services for goods sold via the Internet. Parcel delivery companies have found opportunities to do business with individuals through Net auctions. As new arrangements, user companies are making their self-developed systems available to others and are cooperating with system vendors as partners for joint development activities, all by means of the Internet, creating new relationships between user companies and IT companies in the process.

7) Digital Divide

The problem of the digital divide is the gap between the more highly educated members of society who have frequent opportunities to use personal computers and the Internet, and the socially disadvantaged members who lack such opportunities. The digital divide was on the agenda at the Kyushu-Okinawa Summit in July 2000, when attention was given to the linkage between information disparities and economic disparities when issues related to national development are taken up. As diffusion of Internet use increases and greater use is made of computers in government and in education, and as e-commerce becomes more entrenched, those people who are retarded in their ability to use information are prone to becoming socially handicapped.

In the State of the Union address delivered by President Bill Clinton in January 2000, use of tax incentives to eliminate the digital divide was advocated. He proposed a plan for providing Internet access at schools, libraries and 100 technical centers across the nation. According to the Department of Commerce report released in October of that year, diffusion of Internet access had risen to 41.5% of all households, and it was disclosed that diffusion had also risen for low-income groups and Americans living in remote locations. The report stated that results were being achieved in America's efforts to eliminate the digital divide.

In general, use of the Internet is low among the elderly and physically handicapped, and the potential for a digital divide exists in these groups, but the Internet facilitates their participation in society, and it is desirable to utilize IT through the Internet as a means of achieving a barrier-free society.

(4) Trends in the United States Information Industry

The information services market in the United States in 1999 expanded by 11.8% to $235,300 million and accounted for 47.0% of the total world market. This is one indication at the macro level of the United States' leadership in the information services industry. Professional services are the largest part of the information services market in the United States, and it includes consulting, system integration, programming, education and training, maintenance, rental/lease services, and so on.

Next largest is the combination of data processing and network services. These services include mechanical data input, credit authorization and account management, payroll calculations and a broad range of other services. It is believed that these services have increased parallel to the growth of the information services industry.

Another market is that of information search services. This covers a very wide range including financial and securities data and information for business use, economic data and information, corporate databanks, educational information for use by individuals, and information for leisure and recreational use. There are many online services for these, as well as services that provide this information by means of CD-ROM, magnetic tape, floppy disks and the like.

(5) Brazil's Information Industry

1) Market Scale

Partly due to the devaluation enforced in 1999, the economy has made swift recovery from the 1997 currency crisis. Month-on-month growth in December 1999 was 8.8%, to which a large contribution was made by exports of manufactured goods. Industrial output during the first quarter of 2000 rose by 6.6% (consumer durables, 19.7%; intermediate goods, 7.9%). Growth of this magnitude has started an investment cycle in the automobile, steel, mining, and paper and pulp industries, as well as in the area of improvement of physical infrastructure. In terms of ratio to GDP, private investment in plant and equipment, that had averaged 18.7% in 1991-1993, rose to 20.7% in 1997-1999. Much of the investment has been in modernization f technology. The number of personal computers in the country, estimated by the Ministry of Finance, rose from 2,000,000 in 1994 to 10,000,00 in 2000, an increase of five times.

Transactions in Brazil's information industry (including sale of equipment for digitization in the telecom sector) increased by nearly 100% from 1993 to 1998, from $6.6 billion to $11.2 billion. In regard to this, the Ministry of Finance has stated, "Exports by this sector rose rapidly from the level of $200 million a year at the start of the 1990s to the present, when it is slightly short of $800 million. Further growth is expected and because the industry has made efforts to fine-tune the production chain in the industry, imports of electronics-related components have declined."

2) Evolution of Brazil's Software Industry

Brazil's software industry originated in the 1970s, with simple data processing. In the latter half of the decade, the government adopted the Reserva de Mercado that included measures for protection of the information industry market, with the intention of promoting growth of the domestic hardware industry. The software industry consequently acquired the opportunity to benefit greatly from cooperation by domestic producers of hardware. The software industry further was protected in effect by a non-tariff barrier even in the absence of legalities, as Brazil had its own specifications for hardware.

Secure behind the protective policies that had been maintained for a long time, the software industry during the 1980s tended to refrain from investment in equipment. But as a consequence of inflation, the magnitude of requirements for management of financial assets rose dramatically, and the financial sector needed capacity for

high-speed processing of financial data. At the same time the influence of international price competitiveness created additional pressure the software industry, that had been concentrated in one area of industry where cutting-edge and high-quality software was required, had acquired technical competence enabling it to compete with foreign-affiliated rivals, and through supplying products to multinational corporations secured opportunities to enter overseas markets. Further, the large-scale data processing centers that were installed in financial institutions came to be seen as important aspects of financial business, leading to formation of small-scale software companies specializing in specific functions required for financial data processing. Many of these companies started as spin-offs of specialists who had obtained experience by working in financial institutions and they came to comprise a large number of software companies each possessing advanced technical capabilities. Research centers dedicated to technical R&D were established as an effect of the market protection policies, and many courses in software engineering and system analysis were created at the nation's universities, leading to development of human resources equipped with the technical skills required in the market.

Demand for software experienced explosive growth after the market protection policies wee abandoned and, at mid-decade during the 1990s, the Real Plan worked to bring inflation under control and the economy began to regain vigor. This started a shakeout in the software industry. By obtaining financing from their business customers, companies that had strong customers in the financial and industrial sectors, and that had competitiveness, were enabled to compete with foreign companies on a level playing field, while many companies that were unable to secure suitable credit (preferential-rate loans without concrete security, or venture capital) failed as they proved incapable of competing with foreign companies that had access to adequate amounts of capital in the home country. Among those former employees of the software and hardware companies that were forced out of business by the competition, many discovered valuable niche markets in fields where they could use their expertise in Brazil's legal, taxation, and financial regulation areas. These fields included department stores, supermarkets, and other wholesale and retail companies in the distribution sector, as well as tax accountants. Meanwhile, among the software companies that stayed in business, some discovered niche markets in areas that foreign software companies which were making large-scale investments had neglected as being low-tech: agriculture and livestock raising, small-scale shops, transport, gasoline filling stations, real estate, and automobile repair. The software companies were able to expand their market by supplying consulting services at no

charge to companies in these areas, as those latter companies tended to be weak in terms of managerial techniques. During the latter half of the 1990s when this area of business started to grow, many of the software companies that had targeted these areas achieved significant growth.

The tough competition experienced in Brazil prompted a raising of technical levels in the surviving companies, and more than 200 of them have expanded overseas on the strength of that. These companies are constantly searching for strategic partners in order to maintain competitiveness in the domestic market and to compete in foreign markets. The types of partners they are seeking are companies that can furnish products complementary to their own, companies that can collaborate with them to improve ability to compete with foreign companies in the domestic market, and companies that can help them achieve the objective of increasing business overseas.

3) Trends Among Brazil's Software Companies

Reportedly there are about 4,500 Brazilian companies engaged in development of software products and data processing services. Of them about 3,500 are registered in the databank of the Instituto de Economia do Empresa de Software (IEES). Using a sample from the IEES databank, an inquiry was made into the location (geographic distribution), scale (in terms of sales and number of employees), and years in business of companies in the fields of software development and data processing services.

a. Locational Features

Of the sample of 2,727 companies in the IEEES databank about 90% are in the Southeast region (66%) and South (22%) combined. In the state of Sao Paulo in the Southeast about 40% of the total companies are congregated. This is followed, with low percentages, by Rio de Janeiro (12%), Minas Gerais (11%), Rio Grande do Sul in the South (9%) and St. Catalina (7%). Sao Paulo City alone has 27% of the companies and52% of the national total are concentrated in four cities. Moreover, 70% of the total are in these plus the six cities of Curitiba (4%), Campinas (4%), Brasilia D.F. (3%), Fortaleza(3%), Blumenau (2%) and Florianopolis (2%). These constitute most of Brazil's major industrial cities. Seen percent are fond in the Northeast that borders on Venezuela. In order by state, they are Seara (3%), Pernanbuco and Baia (both 2%), and the others (1%).

TABLE 3.4.3 LOCATION OF BUSINESSES

Region	State	No. of sample cos.	Ratio to total (%)
Southeast	Sao Paulo	1,092	40.1
	Rio de Janeiro	336	12.3
	Minas Gerais	305	11.2
	Espirit Santo	67	2.5
	Total	1,800	66.0
South	Rio Grande do Sul	243	8.9
	Santa Catarina	197	7.2
	Parana	165	6.1
	Total	605	22.2
Northeast	Seara	70	2.6
	Pernanbuco	50	1.8
	Baia	45	1.7
	Others	37	1.4
	Total	202	7.4
Midwest	Brasilia Federal District	77	2.8
	Others	28	1.0
	Total	105	3.9
North	Total	15	0.6
Total sample		2,727	100.0

Source: : IEES Data Bank

b. Sales

Of the sample of 371 companies, about 85% of 1999 sales were by small-scale companies. Of these, companies with sales $500,000 or less account for about 60% of all companies and the next largest segment, with sales up to $2,500,000, are 18% of the total. Medium-scale companies are only 5%. It is to be noted that there also are companies that did more than $280,00,000 of business.

TABLE 3.4.4 FISCAL 1999 SALES

(US$)

Sales	No. of cos.	Ratio to total (%)
Less than 500,000	227	61.2
500,000～2,500,000	68	18.3
2,500,000～5,500,000	19	5.1
5,500,000～280,000,000	41	11.1
More than 280,000,000	16	4.3
All samples	371	100.0

Source: IEES Data Bank

c. Employees

Of the sample of 348 companies, 90% had fewer than 100 employees. Within this group, 65% were micro-enterprises with employees numbering less than 24. Thus, the small scale of these companies stands out. Judging from the close match of the sample companies to the number of companies in the sample for sales, it can be thought that there is a correlation between the number of employees and the magnitude of sales, and the evidence indicates that the software industry is labor-intensive.

TABLE 3.4.5 NUMBER OF EMPLOYEES

Employees	No. of cos.	Ratio to total (%)
Less than10	111	31.9
10～25	112	32.2
25～100	90	25.9
100～200	17	4.9
200～300	7	2.0
More than 300	11	3.2
All samples	348	100.0

Source: IEES Data Bank

d. Years in Business

Almost all of the companies now in operation were established since 1980. There was an increase in the founding of companies during the period 1986-1990, coordinated with the boom in personal computer acquisition. Approximately 40% of the companies were established during the first half of the 1990s, and a lower percentage was established since then. This reflects economic conditions and a peaking of information-related investment, factors that had a great impact on the software industry.

TABLE 3.4.6 DATE OF ESTABLISHMENT OF COMPANY

Date	No. of cos.	Ratio to total (%)
Prior to 1971	4	0.8
1971～1975	9	1.8
1976～1980	14	2.8
1981～1985	59	11.6
1986～1990	151	29.7
1991～1995	203	39.9
1996～1999	69	13.6
All samples	509	100.0

Source: IEES Data Bank

4) Trends in Brazilian Software Products

a. Objective of Developing Software Products in Brazil

A survey regarding the objective in developing software, made using the 2,500 companies in the IEES databank, discloses that the majority of motivations are for commercialization by the software house itself (85%), and many of these are out-of-the-box products, i.e., ready for users to install. Products developed to meet orders booked from third party customers account for only 11%.

TABLE 3.4.7 OBJECTIVE OF DEVELOPMENT OF SOFTWARE IN BRAZIL

Objective	No. of software	Ratio to total (%)
Commercialization of software	1,984	85.0
Contract with third party	264	11.3
In-house use	85	3.6
All samples	2,333	100.0

Source: EES Data Bank

b. Sales Channels for Brazilian Software Products

The majority (90%) of software houses in Brazil sell products directly to customers. 53% of the sampled companies sell through sales agents. New channels have emerged in the form of sale via the Internet (used by 24% of the companies) and by software retailers (13%), whereby sales channels have been diversified.

TABLE 3.4.8 SALES CHANNELS FOR SOFTWARE PRODUCTS

Channel	Share of total (%)*
Direct to users	90.1
Sales agent	52.9
Partnership	33.1
Consulting	26.8
Internet	24.1
Rental	19.3
Software (bricks & mortar) retailer	13.1
General retailer	7.0
OEM	4.6
Other	0.8

* 2,332 software products.

Source: : IEES Data Bank

c. Classification of Brazilian Software Products

The classification of Brazilian software products discloses wide diversity and absence of a concentration in any given field. The categories where software products can be said to be relatively numerous are sales management; POS automation (22%), accounting, finance (19%), and corporate management (16%). They are followed by office automation etc. (9%), information management etc. (8%), personnel management (7%), education, CAE (computer aided education) (7%) and factory management and automation (7%).

TABLE 3.4.9 APPLICATION AREAS FOR SOFTWARE DEVELOPED IN BRAZIL*

Application	Number of software packages	Application	Number of software packages
Sales management; POS automation	22.2	Marketing events	2.6
Accounting, finance	18.7	Public services	2.6
Corporate management	16.3	ERP systems	2.6
Office automation etc.	8.8	Amusement	2.4
Information management etc.	7.9	Architectural design	2.3
Personnel management	7.1	Transport, distribution	2.3
Education, CAE	6.6	Finance, taxation	2.2
Factory management; automation	6.6	Civil engineering, construction	2.0
Insurance, health care automation	4.6	Utilities	2.0
Public administration	4.6	School management	1.9
Quality & process control	3.4	Administrative	1.9
Telecommunication	3.1	System development tool	1.9
Banking & finance automation	3.0	SOHO	1.7
Telecom network control	3.0	Intranet/Extranet	1.7
Agrobusiness	2.6	Other	18.1

* Sample number, 2,346.
Source: IEES Data Bank

It is characteristic of software products related to telecommunication that they show an emphasis in B to C electronic transactions on corporate-provided consumer and customer service support. Examples include call center response to customer inquiries, automated services for customers, response to complaints by customers, information supply by telephone, and automatic generation of invoices. A characteristic of Internet and intranet related software is that very many products have been developed for SMEs as infrastructure for e-commerce. These products include software for automatic conversion of telecommunications protocols in EDIs, software for easy-to-make websites for taking orders, and software for format control of transaction documents.

d. Technical Support for Brazilian Software Products

A variety of traditional forms of technical support are provided to users of Brazilian software, including printed and CD-ROM manuals, user manuals, courses and training for users, customer visits and so on. Technical support is provided for customer retention through, for example, online help service, Internet chat service, telephone hotlines and other methods of using the new telecom technology, as well as sales engineer visits to customers and other methods.

5) Demand Trend in Brazil for Software

a. Trend of Demand for Enterprise Resource Planning Software for SMEs

The extent of ERP use by companies having annual sales of less than $100,000,000 was studied by selecting a sample from the companies registered at the IEES databank. It was found that 88.8% of the 303 companies were using an ERP system. Judging from this, it is believed that a substantial number of SMEs is using ERP. Examining the sample by groupings according to magnitude of sales, some groups are employing ERP at rate lower than 88.8%, but among companies with $50,000,000 or more in sales, 100% are using ERP.

TABLE 3.4.10 EXTENT OF ERP ADOPTION, BY LEVEL OF ANNUAL SALES

Annual sales (US$)	No. of cos.	Share of total (%)	
		ERP used	ERP not used
Up to 2,500,000	53	88.7	11.3
2,600,000～5,000,000	38	78.9	21.1
5,100,000～12,500,000	106	90.6	9.4
12,600,000～25,000,000	66	95.5	4.5
25,100,000～50,000,000	30	86.7	13.3
50,000,000～100,000,00	10	100.0	0
All samples	303	Average 88.8	11.2

Source: IEES Data Bank

Further, 367 of the companies were grouped according to the number of employees and by this means it was found that without regard to the scale of employment, ERP was being used at more than eight out of ten companies.

TABLE 3.4.11 EXTENT OF ERP ADOPTION, BY SCALE OF EMPLOYMENT

No. of employees	No. of cos.	Share of total (%)	
		ERP used	ERP not used
Up to 100	126	85.7	14.3
101～150	81	84.0	16.0
151～300	74	90.5	9.5
301～500	40	100.0	0
501 or more	46	93.5	6.5
All samples	367		

Source: IEES Data Bank

b. Trends in Demand for Financial Management Systems

Of the sample of companies from the IEE's databank, 313 or 96.2% were using software for financial management. Inquiry into the extent that they were using this

software found that at 43.6% of the companies financial functions had been completely automated, while 23.8% had partially automated the functions and 24.2% were using manual methods. The areas where there was the highest degree of automation were verification of accounts receivable and accounts payable (81.2%), payments (78.0%), and cash flow monitoring (75.1%). The taxation-related affairs that were most highly automated were keeping ledgers for tax documents for which 89.8% of the companies had fully or partially automated, followed by issuing tax vouchers (Notas Fiscais; 89.2%)

TABLE 3.4.12 RATIO OF COMPANIES AUTOMATING FINANCIAL ACTIVITIES (NUMBER OF SAMPLE COMPANIES: 313)

Financial activity	A Rate of automation (%)	B Rate of semi-automation (%)	A+B (%)	Manual work (%)	Not using (%)
Verification of accounts receivable and accounts payable	63.6	17.6	81.2	14.7	4.2
Payments	56.9	21.1	78.0	16.9	5.1
Monitor cash flow	50.2	24.9	75.1	20.1	4.8
Update cash flow expectations	46.3	28.1	74.4	19.2	6.4
Bank transfers	47.6	22.0	69.6	25.9	4.5
Bank settlements	39.7	25.5	65.2	28.1	6.8
Managerial, accounting budgeting	37.0	27.5	64.5	23.6	11.8
Manage investment & borrowings	33.0	26.9	59.9	27.6	12.5
Management of banking charges	34.8	23.3	58.1	34.5	7.3
Management of loan contracts	27.0	20.9	47.9	31.8	20.3
Average	**43.6**	**23.8**	**67.4**	**24.2**	**8.4**

Source: IEES Data Bank

c. Demand Trends for Tax Management Systems

Of the 316-company sample from the IEES databank, 91.8% use software for managing their tax-related activities. By examining the extent that tax-related activities have been automated, it is found that 66.7% of tax-related functions have been fully automated, and 10.7% have been partially automated; 12.7% is being done manually. The tasks that are most highly automated are tax documentation (Documentos Fiscais); 88.9% of all companies have fully or partially automated

this work, that is followed by issuance of tax vouchers (Notas Fiscais; 89.2%), keeping tax ledgers & verification (88.9%), and recordkeeping for products and services received (86.2%). Tax planning is the area where manual work is at the highest level (23.0% of the companies).

TABLE 3.4.13 RATIO OF COMPANIES AUTOMATING TAXATION RELATED ACTIVITIES

(NUMBER OF SAMPLE COMPANIES: 316)

Taxation related activity	A Rate of automation (%)	B Rate of semi-automation (%)	A+B (%)	Manual work (%)	Not using (%)
Tax documentation	81.0	8.9	89.8	7.5	2.6
Issue tax vouchers	85.3	3.9	89.2	8.2	2.6
Tax ledgers & verification	76.1	12.7	88.9	9.8	1.3
Products, services received	77.7	8.5	86.2	10.5	3.3
Management of mandatory payment obligations	66.3	14.1	80.4	15.4	4.2
Regulation No.68 • 95	64.6	13.8	78.4	12.8	8.9
ICM • IPI tax credit control	63.4	9.2	72.5	15.4	12.1
Tax planning	52.5	14.4	66.9	23.0	10.2
Manage tax incentives	52.3	10.8	63.1	14.4	22.5
Manage transfer tax	47.5	11.1	58.7	10.2	31.1
Average	**66.7**	**10.7**	**77.4**	**12.7**	**9.9**

Source: IEES Data Bank

(6) Trends in the Japanese Information Industry

1) Market Scale

Sales in the information services industry in 1999 amounted to JPY 10,148,400,000,000, 3.5% higher than in the preceding year. Among the sub-industries, software development and programming is the largest, with a 63% share. Outsourcing of system management and operation, and machine time sale, show high levels of growth. The absolute level of sales is low but has grown 1.8-fold from 1995's level.

TABLE 3.4.14 SALES OF THE INFORMATION SERVICES INDUSTRY, BY TYPE OF SERVICE

(Unit: JPY 100,000,000)

Business Activity	1995	1996	1997	1998	1999
On-, off-line processing	9,764	10,520	10,418	11,837	11,949
Software development; program writing	36,971	42,591	46,685	60,253	63,872
Keypunching, data input	1,775	1,887	1,732	2,179	1,918
Machine time sales	348	437	443	615	668
Commisioning system management & operations.	3,563	3,960	4,267	6,885	7,302
Database services	1,973	2,354	2,578	2,910	2,683
Research, surveys	2,395	2,490	2,666	3,458	3,469
Others	6,831	7,195	7,090	9,869	9,623
Total	63,620	71,434	75,879	98,006	101,484

Source: Ministry of Economy, Trade and Industry (METI) “Specific Service industries Survey”

The number of employees in information services in 1999 was 535,000, down 0.2% from a year earlier. By job category, system engineers are the largest group, followed by programmers; combined these account for 60% of the total.

TABLE 3.4.15 EMPLOYMENT IN THE INFORMATION SERVICES INDUSTRY BY JOB TITLE

(Unit: 1,000 persons)

Job title	1995	1996	1997	1998	1999
Systems engineer	159	169	175	215	215
Programmer	80	80	82	107	110
Operator	35	28	31	39	39
Keypuncher	25	24	25	28	25
Researcher	8	8	8	9	9
Sales	32	32	31	39	40
Management	41	42	42	52	51
Other	28	35	33	47	46
Total	408	418	427	536	535

Source: METI “Specific Service industries Survey”

The outlook for the industry in 2000, as gauged by a questionnaire survey carried out by the Information Service Industrial Association, showed that the industry was bearish relative to its views a year earlier. The percentage of companies expecting that sales would grow declined slightly, while the percentage anticipating a decline in sales was much greater than that a year previously. Further, with respect to recurring profits, the percentage of companies that foresaw an increase dropped by half. Those

companies that are facing grim conditions now are very bearish in their outlook through 2005. Whereas 80% of the companies expected sales to increase in 2000 only 70% expected that recurring profits would grow. It has become incumbent on the industry to shift to low-cost operation in order to secure profits in the current economic environment where deflationary forces hold sway.

TABLE 3.4.16 BUSINESS OUTLOOK JUDGMENT IN THE INFORMATION SERVICES INDUSTRY

(Unit: %)

	Business outlook judgment	1999 (Previous survey)	2000	Up to 2005
Sales	Big increase	28.2	23.5	30.4
	Some increase	28.6	31.5	50.0
	About same	32.3	27.7	13.8
	Some decrease	6.8	11.9	2.3
	Big decrease	3.2	4.2	1.9
	N.A.	0.9	1.2	1.5
Operating Profits	Big increase	30.0	14.6	18.8
	Some increase	20.0	28.8	47.7
	About same	28.6	31.5	25.8
	Some decrease	10.0	12.7	3.8
	Big decrease	9.5	11.2	1.9
	N.A.	1.8	1.2	1.9

Source: Japan Information Technology Service Industry Association (JISA)

2) The Road Toward Making Japan an IT-Strong Country

A multiplicity of policies and legislative actions have been adopted in Japan since 2000 against the backdrop of the international revolution in IT. In July, the Information Technology Strategic Office, and a private body affiliated with it, the IT Strategy Council, were created with the objective of assuring that all citizens become beneficiaries of the IT revolution, and that Japan be made fully competitive as an IT nation. The council is made up of knowledgeable persons and businesspersons, and among other activities related to IT policy has advocated that the Electronic Government (e-government) concept that had been scheduled for materialization in fiscal 2003 be accomplished at an earlier date.

On the basis of such work, the advance information communication network society formation basic law (IT Basic Law) was promulgated, and became effective as of January 2001. This law gives the priority areas, seven in number, for the creation of an advanced information-cum-telecom network society, such as creating

the world's most advanced high-grade information and telecom network; promotion of education and study for the development of the requisite human resources; promotion of e-commerce; digitizing administration and creating e-government; and assuring safety and reliability. It was on the basis of the law, further, that the IT strategic headquarter composed of all members of the Cabinet and knowledgeable persons started its functions in January 2001 by adopting four strategic policy areas for examination, and approved "e-Japan Strategy," a program for making Japan world leader within five years. Given this strong effort by the Japanese government, the IT sector in Japan, including the information services industry, is now expected to take commensurate, strong action.

3) Managerial Revolution Via IT Among SMEs

a. Diffusion of Internet Use Among SMEs

SMEs are making steady advances in deployment of the Internet as part of core infrastructure of information technology in managing business. As of fiscal 2000, 70% of all SMEs had access to the Internet. The ratio in manufacturing is 73.3%, higher than the 65.7% for non-manufacturing.

TABLE 3.4.17 EXTENT OF SME USE OF THE INTERNET

(%)

	All industry		Manufacturing		Non-manufacturing	
	1999	2000	1999	2000	1999	2000
Already in use	49.9	69.2	54.7	73.3	45.7	65.7
Studying adoption	22.0	16.9	21,6	14.9	22.3	18.5
Not planned	28.1	13.9	23.7	11.8	32.0	15.8

Source: Shoko Chukin Bank, "Survey of SME Internet Usage"

b. Objective of Using the Internet

Information interchange with customers by means such as e-mail; information interchange and sharing within the company; publicizing the company's products and services by means of a homepage; and buying and selling with predetermined companies are among the major objectives of the SMEs for using the Internet at this time. The uses that are more under study than actually adopted at this time include selling the company's products and services through the homepage; taking in opinions, complaints and inquires regarding the company's products and services; and making purchases or announcing requests for quotations (RFQ) at the homepage. SMEs are actively engaged in information interchange within the company and with others by means of the Internet, and, moreover, tend to be

interested in vigorously pursuing business and improving services by use of the Internet.

TABLE 3.4.18 REASONS FOR USING INTERNET

Reason	Now using	Studying use
General information gathering	79.0	5.3
Exchange information with business associates via e-mail etc.	62.2	13.4
Information exchange and supply in-house	43.1	16.6
Publicity for own products, services via homepage	37.2	22.3
Buying, selling from/to specific companies	26.0	24.9
Recruiting	22.2	21.2
Get opinions, process claims re own products, services	17.9	22.7
Acquire software	17.3	12.2
Sell own products, services B to C via homepage	15.9	24.0
Purchase materials, goods	12.9	20.3
Sell own products, services B to B via homepage	11.0	26.4
Storage own data outside company (server rental)	5.8	13.7
Issue RFQ	3.5	20.9
Respond to Internet-posted RFQ	2.9	20.3
Software use in specific period (use ASP)	2.5	14.9
Others	11.9	22.5

Source: Shoko Chukin Bank, "Survey of SME Internet Usage"

c. Effects of Application of IT

When queried as to the effects of the use of IT, SMEs responding by frequently citing "improved rationalization and efficiency," and "accomplished in-house sharing of information." This indicates both that IT has fundamentally strengthened the businesses and that the companies are low-cost oriented. Making it possible for any authorized person in the organization to instantly extract information including fresh information from the systematically accumulated and ordered company pool improves internal communications, reduces redundancies, and is significant in enabling better concentration of corporate resources on core activities. In comparison to large companies, however, the effects relative to "originating new services," and "gaining new customers" were weak, suggesting that further efforts are now needed to make IT contribute to improving business performance.

TABLE 3.4.19 EFFECTS OF ADOPTION OF IT

(RATIO OF SURVEYED COMPANIES RESPONDING "EFFECTS WERE FELT")

	SMEs	Large businesses
Smarter business operations	83.1	90.8
Sharing information in-house	75.7	91.4
Start new services etc.	29.1	55.0
Get new customers	24.3	46.2

Source: Small and Medium Enterprise Agency

4) Mobile Internet

Following on the explosive popularity of Internet access via mobile phones, such as by means of the i-mode, EZ-web and J-sky services, companies have begun to use mobile means to increase business. Accessing the Internet through mobile units is being used for many applications, such as sending mail to field salespersons and receiving mail from them; scheduling; delivery management; routine field reports; inventory checks; placing and taking of orders, and more. Several Internet-enabled mobile phones that have groupware software installed are on sale and the outlook is for the number of companies using such products to increase. Such usage, nevertheless, is subject to limitations such as the area of displays, resolution, ease of input work, memory capacity, risk of loss or theft, and so on.

Further, stylus input, and connection of Personal Data Assistaants (PDA) having Personal Information Management (PIM) functions to mobile phone handsets and Personal Handyphone System devices (PHS), are being given increasing attention as mobile Internet terminals.

3.4.2 Trends in the Venezuelan Information Industry

(1) Information Technology Trends

1) Number of Internet Hosts

The number of Internet hosts in Venezuela, according to the Internet Software Consortium, was 14,281 as of January 2000, and 15,658 as of July of the same year, representing a 9.6% increase in just six months. During the five years through January the annual average growth was 95%.

TABLE 3.4.20 NUMBER OF INTERNET HOSTS IN VENEZUELA

	95/1	95/7	96/1	96/7	97/1	97/7	98/1	98/7	99/1	99/7	00/1	00/7
No. of hosts	529	853	1,165	1,679	2,417	4,679	3,869	6,825	7,912	9,424	14,281	15,658
Growth rate (%)		61.3	36.6	44.1	44.0	93.6	-17.3	76.4	16.0	19.1	51.5	9.6

Source: CAF report, Dec. 2000

2) Use of the Internet

Venezuelans began using the Internet in 1995, somewhat later than most other countries. The level of usage is still in the initial stage. Users are 2% of the population. Classified by place where the Internet is used, the overwhelming majority of users are in private homes. It can be said that the environment for use by companies and the government is yet to be formed.

The two major characteristics of Internet use in Venezuela are:

- Many of (more than 50%)users reside in Caracas.
- Internet providers with the exceptions of T-Net and CANTV Service have fewer than 10,000 users (many have fewer than 5,000).

Up to this time, almost all users connected to the Internet in order to use e-mail. As a result, average time spent online has been only 12-13 hours/month.

TABLE 3.4.21 NUMBER OF INTERNET USERS IN VENEZUELA,1999

Category	No. of users	Ratio (%)
Education	116,000	22.5
Government	45,500	8.8
Large, medium businesses	56,000	10.9
Small businesses	49,500	9.6
Households	247,500	48.1
Total	514,500	100.0
Post-adjustment for double counting	**452,000**	
Venezuela population	**23,710,809**	
Internet user rate (%)	**1.91%**	

Source: IDC Venezuela

3) Goods Purchased Through the Internet

Purchases of goods by means of the Internet shows a concentration in books (64%) and CDs (41%) – types of products that are relatively comfortable to buy by this method.

TABLE 3.4.22 PURCHASES MADE BY MEANS OF THE INTERNET

Product purchased	Ratio (%)
Books	64
CDs	41
Computers, electronic equipment	26
Apparel	23
Travel bookings (tickets, hotels)	19
Toys	14
Home appliances	9
Foods	5
Others	10

Source: Internet World, Aug. 2001

4) Software Development

Venezuela shows a major characteristic with regard to the development of software. As a consequence of the acquisition of computers by the petroleum industry during the 1950s for purposes of scientific and technical calculations and use of simulation techniques, and the early acquisition of computers by the financial sector (mainly at banks) in order to speed up data processing, computer education at Venezuelan colleges began in the 1960s and led to the formation of many companies specializing in software development.

CAVEDATOS (Cámara Venezolana de Empresas de Technologías de la Información) reports that at present there are about 200 companies in Venezuela's

software industry. Almost all concentrate their activities in the Caracas area. This number represents a 9% decline from the number in 1998, indicating a need for policies to promote development of the industry, that is at the core of the enhancement of IT. Up to the present the following measures have been implemented to promote development of the software industry, through collaboration of companies in this industrial sector, and it is hoped that they will come to fruition.

- Plan de Apoyo a Emprendedores e Innovadores "Antonio Jose de Sucre"
- Dispatch of a mission to promote joint software promotion by Venezuelan and Indian companies (promoted by CAVEDATOS)
- Holding of workshops for domestic software development, sponsored by CAVEDATOS and Los Andes University
- Competition and partnering with companies having applications and platforms for e-commerce, such as Oracle and SAP
- Allocation of resources for development of applications for Web.

(2) Present Conditions and Issues in the Venezuelan Information (Software) Industry

1) Present Status of the Software Industry

a. Attitudes of Software House Owners

While many of the software houses visited had been started each by only a handful of owners, the attitudes shown towards being engaged in the software business were thoroughly professional and were not tech-biased. Strict attention was being paid to use of computers for fulfillment, budgeting, and quality assurance in their project management activities, in order to achieve "customer satisfaction."

A software house is a factory that produces an intangible product for sale, making quality assurance essential. Several of the business owners asked questions about quality assurance. The subject they were discussing, basically, was importance of being thorough in carrying out policy and defining objectives, making judgments based on facts, having priorities, repeating the plan-do-check-action cycle, and so on. Such attitudes are indispensable for running a company.

b. Nature of Software House Business

The software companies visited were engaged in consulting, system development and integration, management of customers' information systems, education and training, agency sales of software and computer equipment, repair and maintenance

of computers, and so on. The relative importance of these different lines of business varies from company to company and diversity was standard. Each company had at ready its module program as the core for system development and had adopted a system of modifying it according to decisions derived from customer requirements. The environment is already compatible for introduction of package systems for ERP.

c. Business Conditions at Software Houses

Business was more or less stable at the software companies visited. Many of these companies had as major customers banks and other financial institutions, petroleum-related companies, governmental agencies at local and central levels, and major companies in manufacturing or distributing. They adjust their human resources to meet changes in conditions and continue in a stable manner. The large companies that comprise their major customers continue to be outsourcing-oriented with regard to functionality for development and operation of their own systems. Because the software houses can obtain a certain amount of income from this outsourcing, there is some cause for concern that they will become lax in terms of their drive to develop new customers. But at the same time some companies had established operations in Miami, Argentine, Puerto Rico or elsewhere in order to overcome a handicap associated with product "made in Venezuela," and gave the appearance of being international companies.

d. Finances

Developing software is a business activity within the bounds of a company's own capital resources. Software industry firms generally rely on external finance to a low degree, because the cost of borrowing from financial insitutions is high and the firms tend to lack fixed assets to post as security. Many firms would like to be able to use intellectual assets such as software patents as security in order to obtain funds at low cost for the relatively short periods needed to develop the market for new software products and promote those products.

e. Human Resources Development , and Education and Training

The opinion that "Venezuela possesses ample human resources of good quality in the field of information technology" was expressed by all owners of the companies visited. As evidence of that they cited the practice of the petroleum companies, that since the 1960s have replaced their computers whenever new models came on the market, and the strong efforts being made at education at the

introductory and intermediate levels. Many companies dedicate considerable time and money to education and training in the software industry because the growth and development of the industry at rock bottom depends greatly on the abilities of individual employees. The retention rate of younger employees is short but at the managerial level many employees stay with their companies for about 10 years and the average is 4-5 years. Therefore the curricula for education and training programs has been tailored to the needs of specific job categories and to produce swift results. Some companies, however, have career paths that provide for the advancement of employees over the medium to long term by assigning them to a variety of positions.

f. Utilization of Employees

All of the companies take in entry-level technicians as new hires with the expectation that they will remain with the company for only a few years, but are severely strained concerning the retention of excellent technical personnel who possess advanced capabilities. Reportedly many students at Simon Bolivar University while still in school are given tickets to future places of employment in the United States or Spain. In the estimation of a recruitment firm, graduates of this university the starting salary they can obtain at United States or European software houses, exclusive of recruitment costs, is 2.7 times what they can receive in their own country. Many executives are worried that this pay differential will lower the overall quality of information technology in Venezuela in a hollowing-out process.

g. Equipment

The companies that are commissioned with the work of operating and managing information systems for banks employ large host computers. The network systems employing UNIX, Windows NT and the like are made up of the latest equipment available. The situation is such that it is an easy matter to obtain LAN/WAN and Internet-enabling telecom equipment. Having noted this much it must also be stated that it appears to be a financial strain to replace equipment at a pace matching that of technological innovation.

2) The Three Major Industrial Organizations

The membership of CAVEDATOS (Camara Venezolana de Empresas de Technologias de la Informacion) consists of 72 companies. Half, or 36, are software companies, and all 12 companies visited were members. The remainder are computer and telecom equipment makers, and telecom equipment installation companies.

Holding of symposia, lecture meetings, sponsoring exhibitions, information service and education are the major functions of the organization. Reportedly, the organization advocates policies in statements submitted to the government, but in the future it is seen in the future vision for SME software houses as having a significant role to play in the organization's work with the government in development of SME promotion policy.

There are 48 members of CASETEL (Camara de Empresas de Servicios de Telecomunicaciones). Among the members are the major network companies, CANTV, TELCEL, MCI World.com and others. With a contribution coming from cooperation with CONATEL, a significant contribution is being made to free and fair competition of telecoms.

Seventy-one companies make up CAVECOM (Camara de Comercio Electronicos). Among them are companies doing business related to electronic transactions using the Internet. For e-commerce to become functional, it is necessary for there to be coordinated transaction information networks (information streams) and physical logistics (product flows). This is well represented by members such as DHL Worldwide Express and other parcel and document delivery firms.

3) Features of the Three Related Governmental Entities

CNTI (Centro Nacional de Technologias de Informacion) carries out robust activities on behalf of enhancement of the information literacy of the citizens. It has adopted the objective, in particular, or raising the Internet access diffusion rate from the present 4% to 25% and towards that end has opened information centers in 240 locations where large numbers of people congregate; there the people can have the experience of using the Internet.

It is essential that the pertinent fiscal challenges be overcome, that there be further innovation in information and telecommunications technology so that Internet use is facilitated, and that the economic burden of acquiring a personal-use computer be lighter, in order to achieve this goal.

INE (Instituto Nacional de Estadistica, formerly the OCEI), in addition to collecting and compiling statistical data, works at standardizing the regulations governing the development and operation of information systems as well as their

planning, with the purpose of raising the levels of official statistics. If INE hereafter can work with SMEs in development of a governmental policy direction for information systems and play a guiding role in the areas of computer utilization technology, and the diffusion and popularization of standardization, facilitating a rapid advance in SME computer utilization.

Subsequent to the privatization of telecommunications in November 2000, CONATEL (Comisison Nacional de Telecomunicaciones) has played a leading role in maintaining and supporting the international competitiveness of Venezuela's telephone and telecommunications business. It is expected that the company will be an aggressive player in the market, and take up policies and strategies that promote competition.

(3) Problems in the Information Industry

a. The Limited Adoption of Information Systems Among SMEs

Taxation, in the form of import duties and indirect taxes, account for 50% of the purchase price of computers and peripherals, so that the financial burden on SMEs that establish in-house information systems is substantial. Because, further, some SME owners do not as yet possess much knowledge about information technology, they are short in terms of appreciating the value of using computers for purposes of rationalization in a business. The SME sector tends to be shunned by the software industry as being high in risk and presenting a small market relative to the industry's major customers, the petroleum-related companies and large financial institutions. There are some software houses desirous of catering to the SME market, but they lack clearly defined direction for making SMEs into their customers.

b. Weak Relationships Between Software Companies and Between Software Companies and Universities

It would be desirable for SMEs, in their efforts to make better use of information technology, to enter into relationships with knowledge centers that can offset or overcome the SMEs' weaknesses in information and managerial know-how, and technology, thereby strengthening managerial resources. It is extremely important, moreover, to have a platform for information interchange in the area of IT for the Internet to be used so that transactions between companies can be done smoothly and for the benefit of SMEs. In particular, because it would be necessary for there to be participation by many SMEs in activities on behalf of creating supply chain groupings, or regional groupings, affiliations of one form or another are essential. It

would be appropriate for software companies to play the role of coordinator in achieving just this.

c. Absence of Measures That Would Prevent Emigration of IT Specialists

Loss of a significant percentage of its skilled human resources would hurt Venezuela's information industry, but at present there are no policies in place that are intended to keep IT specialists from relocating to other countries. Some of the company owners met, however, expressed the opinion that there should be policies to promote the return to home of these workers from nearby countries as it would contribute to development of the information industry.

It would seem that what is needed is creation of an environment that motivates IT personnel to achieve their best, and not adopt the problem of salary differentials, that is one of the reasons for emigration. Recognition of the value of intellectual assets and giving fair compensation to those who create the assets would be one of the employment criteria that should be met.

d. Support Policies Favoring Independent Efforts by SMEs to Improve Management Are Lacking

It is vital for progress to be made in rationalization of management through use of information technology in an SME that the persons managing the company lay out a sharply defined managerial strategy, take the initiative, and advance in a steady and planned manner. It is necessary at the same time for the employees to possess information literacy (ability to use information) and employability (possess the skills needed to get the job done).

SME managers, even when they understand the necessity of making use of IT, tend to lack sufficient knowledge and experience to use IT. From this viewpoint it is desirable for software houses to team with SME managers and provide supporting services at reasonable prices. It is necessary for them to act as if they themselves were running the SMEs.

The understanding exists in the Venezuelan government that use of IT by SMEs will contribute to energizing the Venezuelan economy, but it is necessary to establish a system that will overcome shortcomings of human resources, capital, information and so on that hamper this process. At the same time the government must lower telecommunication costs, expand telecommunications capacity, speed up

communications, and improve the telecommunications infrastructure as essential steps for SMEs to make greater use of IT.

e. Need for Improving Conditions to Facilitate Electronic Commerce

For there to be smooth progress in the expansion of electronic commerce, it is necessary to make such activity by SMEs easier by efforts in the inter-related areas of access to credit information, approval of credit, settlements, processing of complaints, insurance for transactions, authentication and other functions particularly as they apply to e-commerce.

It is necessary for there to be government—private cooperation in such measures for improving the e-commerce infrastructure as adoption of standardized product codes, and adoption of business protocols, as well as the development and diffusion of software.

f. Lack of Application Packages Easy to Use at SMEs

Easy-to-use information network systems that deploy the latest information technology are indispensable for SMEs if they are to make managerial improvements through the use of IT while they conquer the challenge of a shortage of capital. Inexpensive information systems that are at the same time highly reliable are of great importance. Availability of package programs with business modules usable by SMEs in general is necessary.

The following are exemplary of this.

- As a marketing system, programs for management of order booking and shipment; control of sales performance data; inventory control; purchasing; salesperson commissions and incentives as well as performance; demand forecasting; sales statistics.
- As a financial system, master ledger control; accounts receivable control accounts payable control; fixed assets management; preparation of financial statements; budgeting and budget management; financial statistics.
- As an administration system, workers' timesheets; salary computation; employee record keeping

An Internet search discloses that there are some software companies offering application package programs for SMEs, but such companies are few in number. Unfortunately they are playing major activities in the market outside of Venezuela.

(4) Potential of the Information Industry

1) Availability of Outstanding Human Resources

In Central and South America, Venezuela excels in the library number of the establishment. The process that Information centers of ONTI are made mainly in the library indeed hits the mark. The human interest and the merit above handling a typewriter should appear about all citizens learning the information literacy.

2) Emergence of Young Entrepreneurs

There are already many instances of software professionals who succeeded in making a company with the cooperation of just a few other people, and much hard work. Now this process is being repeated with the emergence of young entrepreneurs who are using Internet-enabled network technologies for e-commerce applications.

Network systems, for B to B, B to C, B to E (Business to Employee), B toG (Business to Government), and G to C (Government to Citizens) are first steps in establishing relationships of trust. What is required of these young entrepreneurs, then, is maintenance of trust, and fairness in relationships, as they deploy IT in business. The youth of Venezuela in this context can be said to possess great potential.

3.4.3 Recommendations for Promotion of IT Utilization by SMEs

It is believed that Venezuela's small and medium enterprises must undertake at their own initiatives managerial reforms through pro-active use of IT, for which the following measures should be of value.

(1) Basic Topics in Promoting IT for SMEs

1) Recognition of the Effects of IT

There are two major areas where the effects of IT use by SMEs can be expected: the improvement of productivity, and the expansion of business opportunities. Because use of IT makes it possible to collect, store, and utilize great quantities of data and information, it makes it possible to speed up decision making, improve the effectiveness of managerial organizations, more speedily comply with customer requirements, reduce the cost of buying and selling, reduce inventory levels, shorten delivery times, and improve the efficiency of the production—distribution—sales chain. It becomes possible, as a result, to fundamentally reform traditional business organizations and processes, improve productivity, and make sales and profits grow.

Further, it is possible to originate one-to-many communications, and to both collect and engage in interchange of a great diversity of information and data. This makes it possible to open new channels for distribution of goods and services, so that it becomes possible to do business with many companies and individuals who could not be contacted previously, so it is possible to look forward to entering new markets, developing and expanding sales channels, and greatly increasing the number of opportunities to do business. This is not a simple matter of strengthening sales or marketing activities; it is a marketing revolution made possible by the Internet.

2) Revolution in Managers' Awareness

In progressing with the application of IT to their businesses, managers must acquire a good understanding of how it will influence the company's business activities, and while undertaking the relevant managerial reforms, engage in study of how to proceed so that IT is beneficial to sales, to profits and to progress in the improvement of management. Once the decision has been made to make use of IT, it is necessary to succinctly define the managerial strategy concerned, and the mangers must take the initiative in exploiting IT in a steady and well-planned manner.

In order to support the analysis, decision making, and activities of the managers, it is also necessary for the government and information (software) industry to cooperate

in order to prepare and deploy advisors who can facilitate the use of IT by working from the viewpoint of and with the SMEs, open offices where support can be offered to SMEs, and organize and present information showing examples of the use of IT.

3) Improvement of Organizations and Human Resources

Employees must work at improving their own IT literacy for there to be success in use of IT by the companies. It would be effective in this regard to arrange for in-house group activities, and have as many employees as possible participate, and to maximize the number of persons who have access to a computer.

Also of importance is pro-active interchange of information with suppliers and other companies in the same industry; the building of systems suitable for management reforms in each company; and adoption of inexpensive, easy-to-use software and hardware. Contacts with universities, research institutes, government agencies and others also are important.

In order to achieve this it is necessary for there to be collaboration by the government and the information (software) industry; improvement of public education and training institutions; and building of human networks.

(2) How to Proceed with IT Adoption in the SME Manufacturing Sector

1) The Purpose of Using IT Is Solutions

a. Management Topics at Small and Medium Manufacturers

i An SME Fundamental: Ensuring Q-C-D for Customers

A manufacturer, no matter of what size, must be customer-oriented, and provide the Quality, the Delivery, and the Cost (Q-C-D) those customers want and expect. Moreover, in these days of revolutionary change, the keyword is often “faster,” and it is necessary to shorten the time required to reach managerial decisions, and to implement them.

ii Management Challenges Small and Medium Manufacturers Face

At any given time, SMEs are in a perilous environment, and this is now even more the case as the shift towards a borderless economy proceeds. The SMEs are obliged by this change to radically change production schemes in order to control product types, quantities, and delivery times with greater agility, reduce costs in order to protect profits, cope with effects of parent company restructuring, improve product development capability, and cope with new, comprehensive

production, sales and distribution logistics. The managerial problems that SMEs face can be ordered as follows. In addition to being driven to cope with rapid change, it is mandatory for the SMEs to acquire and maintain flexible production schemes, shorten delivery times, and meet the customers' delivery requirements.

- Elimination of defective products. Thorough attention is needed to prevent defective products from being passed on to the next stage in production. The quality control function must be assiduously enforced.
- Designs must be changed so as to provide add-on capability, permit parts to be more widely used across product lines, and costs to be lowered.
- Thoroughgoing review of the design—procurement—production—delivery process and procedures is needed, and times must be shortened.
- By means of network type, flatter structures, a hierarchy in decision making should be eliminated.

2) Objectives of IT Use by SMEs

In order to achieve the above tasks, there must be a unified, integrated reform of business activities, the production floor, and information systems, and it is through the use of information as the greatest strategic tool of the organization by utilizing high-performance personal computers as well as information networks through LAN, WAN, and the Internet, that the corporation becomes information-savvy. The objective of making small and medium manufacturers information-savvy can be varied according to the present condition of volition of top management level, accumulated management resources, the crisis recognition degree of outside environment. In general, the following sequence is suggested.

- Solving problems of office procedures and administration – Prevention of delays in clerical work, prevention of errors, improvement of accuracy
- Progressing in rationalizing and improving the efficiency of business procedures – Simplification, shortening of work cycles, standardization; assuring conformity to regulations
- Progressing with effective use of information – Discovery of managerial problems, speeding up the making of decisions
- Building structures for control through strengthening the managerial base – Raising control levels of the company to above those of competitors, increasing the trust customers and suppliers have in the company

3) Progressing With Information Programs from the Viewpoint of "5W + T + S + Q + C"

"Information for solutions" means making effective use of information in view of "who," "why," "what," "when," and "where."

"Effective" means meeting criteria for "Timing," "Speed," "Quality," and "Cost."

4) Five Keywords for Using IT

Information technology associated with computers and information networks is a tool for the improvement of management to the extent that the reform of management cannot be imagined with the use of the latest technology available. For small and medium manufacturers in particular, becoming information-savvy through adoption of the latest IT available affords an opportunity to narrow the information gap between themselves and large companies. The keywords for use of information technology in order to contribute to the improvement of the efficiency of corporate administration, and to shortening of business cycles, are as follows.

Sharing of information (horizontal sharing and vertical sharing) – Horizontal sharing is promoted by LAN to create databases that spread horizontally in the organization, and vertical sharing is promoted by use of e-mail, bulletin boards and other means of making company information available.

E-mail – This form of communication overcomes organizational hurdles, increases the generation of information of value, speeds up the making of decisions, and promotes reform of the corporate culture. Attachment of files and graphic data is possible.

Groupware – By use of e-mail, online conferencing, and schedule coordination, production planning and progress monitoring, as well as project monitoring, are made more efficient.

Client-server type LAN – End-user computing is enabled by dispersed processing and sharing of information. Ability of individuals to work with information as they themselves require will serve to improve the efficiency of operations and speeding up of decision making.

Information literacy – Information literacy makes it possible for individuals to make use of information at their own initiative and according to their own needs, thereby improving their work. By information literacy is meant ability to work with Excel, Word, Power Point and other programs.

5) Improving Communication Infrastructure

It is important for small and medium companies to review problems and subjects in actual manufacturing sites. It is desirable, moreover, to use e-mail and groupware in order to continuously monitor progress toward specific subjects of factory and administrative reform. Communication tools based on e-mail are also effective in providing customer service with integrated efforts by production and marketing divisions. Rather than irrational reaction to sharp changes in demand, emergency demand, or unforeseen demand such as may strain production processes, production schemes should be kept flexible.

6) Sharing of Information Enabling All Parties to Be Informed About Production

a. Eliminating the "Don't Know" Factor Regarding the Production Floor

Some persons offer the opinion that because the production floor is closed to them they do not know what is going on there. With responsibility for managing production delegated to supervisors on the shop floor, confusion in solutions for production problems will generate more confusion. It is necessary to prevent collateral damage. In order to solve production problems, data must be gathered from the point of production, and made accessible, production management must be such as to prevent confusion.

b. Thorough Use of Barcodes at the Production Floor

Barcodes can be useful as a means of ascertaining conditions at the production site. They help indirect work to be made more efficient by the swift and easy collection of accurate data. Sharply focused information must be used to control the Q, C and D of production, which behave like mobile living things, and be used to speed up the pace of business. In the categories of barcodes used in manufacturing, apart from final consumption goods, Code 39, ITF and NW-7 are common. Code 39, which uses combinations of 43 English letters, Roman numerals and special symbols, is the most common.

7) Centralized Control of Bills of Materials

A bill of materials (BOM) is a basic form of information used in such divisions of a company as design, production management, purchasing, production technology, production, cost management, business operations, services and so on. To avoid the need for redundant BOM maintenance, it is desirable that a company set up a "BOM Management Group" for centralized BOM management.

8) Harmonizing “Push” Production and “Pull” Production

It is desirable for small and medium manufacturers to enable themselves to fill orders to customer specifications with short lead times. To make a monthly production plan incorporating a forecast or estimation of anticipated specifications (Materials Requirements Planning, MRP) is to engage in “push” production. When there is a firm plan with *n* days lead time, MRP is done on a net change basis and this is “pull” production.

9) Use of High-Speed MRP for Procurement Simulation

Changes in production plans, whereby the number of items produced is unchanged but the quantities of different items are to be changed, are sometimes required. If the company can deploy high-speed MRP it can determine where there will be bottlenecks or constraints, enabling decisions to be made on production planning changes. MRP is ordinarily thought to require time.

10) Use EDI for B to B Transactions

It is necessary to deploy or implement improvement of infrastructure for in-house communications, and interchange of information with suppliers by means of e-mail, VAN and the Internet. Even if some costs are incurred, the shortening of lead time for procurement enables reduction of inventory, and is an area suitable for the attention of SMEs. It would be suitable to start with receipt and dispatch of information on orders, deliveries, and inspections, orders organized by customer, invoices, etc.

11) Maximizing Use of Software Packages

Software packages suitable for SMEs are quite diverse in their variety and functions, and now are generally of good quality, but some SMEs have the opinion that “There are no packages that match our specs.” It is important in such instances (when the statement is accurate) to re-engineer the company’s administrative style to match packages. For SMEs, that tend to experience difficulty in engaging good systems personnel, it is important to select a vendor who has a strong support arrangement in place, and to seek to minimize information-related investment, achieve early start-up of information systems, and benefit from reduced maintenance costs.

12) Signing “Basic Contracts” with Customers

SMEs should sign basic contracts with major customers covering fulfillment and quality, such as by giving the quality standards for products, as well as the methods

of coping with product defects or other eventualities, standards for acceptance and for payment, penalties for delays in fulfillment, packaging and packing, mode of transport and so on. Unit prices and period of validity for quotations etc. can be agreed upon on an as-needed basis.

3.4.4 Recommendations for Support for Information Technology for SMEs

(1) Purpose of IT Support for SMEs

The target is for about half of the nation's SMEs to have Internet access for e-commerce within five years. As an objective that the SMEs themselves must individually address, need exists to deploy a management strategy that will re-make the awareness of managers, and enable smooth progress in making each company information-savvy.

(2) Directions for SME Support

Necessity exists for establishing a support center for SMEs that can act in a comprehensive manner on behalf of this sector that is capable of contributing much to the economy and society of Venezuela in the 21st century. Such an organization would assist start-ups including venture businesses as well as existing businesses that wish to make improvements.

It is conceivable that such an organization could effectively have the objective of helping companies in their initial stage, such as through "start-up support," "support for business expansion and management reform," "expansion of tax incentives for angel investors*," "acceptance of intellectual assets as security," while also providing support in connection with finance through opening new channels for funding including utilization of venture capital, and taxation.

(3) Organization of the Center

The "Small and Medium Business Support Center," in order to promote the use of IT and assist in the start-up of new and improvement of existing companies, will employ IT professionals as advisers to SMEs in addition to corporate consultants, tax accountants and others.

The Center would do away with the confusion and redundancy in SME support that now exists. At present, such support is provided by many organizations and offices in the national and regional governments, chambers of commerce and industry, industrial associations and the like, without adequate coordination. The new Center would be

* "Tax Incentives for Angel Investors" means special tax deduction allowed for an individual who invests in a venture capital that satisfies a set of requirements, i.e., the investor is permitted to deduct loss incurred by such investment from his income over several years. The angel refers to such individual investor.

under the umbrella of the Ministry of Industry and Trade. INDI would be the part of the ministry most directly concerned with the Center, and would function at two levels, the national and regional. Activities at the latter would be through regional centers, one in each state, opened by INDI. At the center, INDI would support small and medium businesses until the time that they can offer shares to the public. Regional centers would assist companies that have relationships with the special characteristics of the region in question. They would offer easy access for start-up and going concerns that were small in sale and that were interested in obtaining assistance.

Similar to small business training centers in the United States the regional centers would primarily serve venture businesses. They would offer one-stop support for seekers of investment, seekers of subsidies or grants, tax counseling, technical development, managerial assistance, financial affairs assistance, help in developing human resources and so on, including, further, information services.

(4) Financing for Information Investment

Investment for information hardware and software should be financed by a new "IT loan system," support through taxation measures, approval of accelerated depreciation, facilitating of leasing, and use of venture capital.

3.4.5 Recommendations on Promotion of the Information (Software) Industry

(1) Targets for the Information (Software) Industry

During the coming five years, there will be formidable expansion both of solutions business and in information networking. Marketing strategy, with sharply defined parameters for the Four P's of marketing (Product, Price, Place and Promotion) must be formulated in accordance with this. In the solutions business, there will be continuous change and development in order to accurately satisfy the requirements of individual users.

(2) Development and Wide Distribution of Many Applications Packages for SMEs

It is recommended that efforts be made to upgrade the quality of applications packages available from Venezuelan sources. These packages would be for use in the areas of sales management and automation using POS, accounting, financial management, tax management, production and purchasing management, office work automation, corporate management, and personnel management. Development of ERP packages suitable for small and medium manufacturers also would contribute to the improvement of management. IT personnel would benefit from their work on development of this software as the work would make them become involved in the affairs of management; the work thus would have an OJT side-effect.

(3) Creation of E-marketplaces

A large number of e-marketplaces will be opened during the coming one year or two years, in keeping with the shift towards global businesses. Among the e-marketplaces that already exist are some organized by major automobile assemblers, to facilitate and improve their own procurement of parts and supplies. What has begun since the creation of the first e-marketplaces, however, is creation of more comprehensive e-business marketplaces, because there is only low value added by the intermediary function of the early e-marketplaces. These newer websites therefore cover not only the procurement of goods but also delivery, settlement, payment guarantees, export procedures and so on.

(4) Opening of ASP Portals

It is recommended that ASP portals specifically for the SME sector be opened. ASP companies can have a large market in the SME sector. In order to satisfy the requirements of SME customers, ASPs have to offer attractive applications at

acceptable prices, and expand offerings of software through partnering with, acquiring, or other measures relative to systems sellers and others who are influential in or even outside of Venezuela.

(5) Compilation of IT Success Stories

It is recommended to compile examples of successful experiences of SMEs in utilizing IT, and make them accessible through the Internet. The compilation can be made, for example, using a form such as the one below.

TABLE 3.4.23 SURVEY PLAN ON USE OF IT

Survey item	Benchmarking standard	Questions (To be developed)
1 Specific reason for IT adoption	Is IT in your company backed by technology and to what extent?	
2 Competitive advantage and merits of use	What advantages did you obtain through use of IT in your company such as development of proprietary assets or competitive advantages?	
3 Outlook for IT technology within the company	Does IT offer promise for the future for your company's systems, products or services?	
4 Content of IT adoption support from the IT industry	What support have you had from the IT industry in your acquisition and use of IT?	
5 Specific content of future IT industry activities development	What would be the desirable development of the IT industry from the viewpoint of your company?	

Source: JICA Study Team

(6) Human resource development for the IT industry

1) Sophisticated skills required for IT engineers

As the mainstream of information systems becomes web-centric, IT engineers specialized in networking and Internet technologies are increasingly on demand. Furthermore, IT engineers are expected to have a variety of associated skills, including presentation, communication, general management, team management, leadership, problem solving, and creativity.

With the rapid pace of technological advancement, however, IT engineers feel difficulty in catching up with skills required in the changing business environment. They are less and less confidence about their professional skills and have a fear of being lagged behind in knowledge on hardware and networking, presentation skills, management capabilities, and expertise on database. As a result, the IT industry cannot always find required skills despite of ample demand to attract IT engineers.

2) Need for human resource strategy

The rapid development of information technology and diversification of the needs of IT users demand the major changes in skills development, education and training of IT engineers, increasing the importance of developing human resources that meet the diverse needs and ensuring the effective use of available skills. To this end, companies are required to establish and implement an effective human resource strategy. Such strategy must address the needs for the recruitment and retainment of competent skills, the development of human resources that are competitive in the open market, optimum allocation of human resources including flexible rotation and adequate career path, and the establishment of a performance-based personnel management system.

3) Strategic direction of human resource development

IT engineers that are highly demanded and need to be trained intensively are system engineers specialized in network computing, system consultants, system analysts, system engineers with experience in business application development, Web content programmers, and business consultants. As the business focus shifts to solution business, consulting and management skills are required to expand opportunities for IT engineers in their late 30s and over. The new working environment requires career management that allows each IT engineer to apply their skills with maximum productivity over a long period of time.

4) Strategic direction of the HR management system

The primary goal of HR management should be placed on "pay for performance" according to the employee's goal, role and job title (responsibility). To motivate individual workers and vitalize the entire organization on a continuous basis, multi-faceted efforts are required, including the establishment of clear-cut management philosophy, definition of management goals, presentation of score-based evaluation of management efficiency and follow-up programs, feedback of performance evaluation results, and performance-based promotion and wage systems. Also, management is required to increase transparency in corporate management by disclosing business data (profits, etc.) to employees.

5) Training of engineers as IT facilitators

Education and training of IT engineers as facilitators for internal IT projects should be carried out in the following steps.

a. To define skills required for each task and job.

(1) It is desirable to document tasks and jobs, which are carried out to standard procedures and rules commonly applied to the entire organization, as a formal standard, agreement or regulation, which should cover job title and description.

(2) A task or job that is custom designed for a specific work or technology or often modified within a relatively short period of time should be documented in the form of a standard, agreement or regulation, which can be controlled by a method that is recognized by related departments or other work units concerned and needs not to be a formal document.

(3) It is desirable to take into account the management philosophy, policy and goal, together with the business environment and trends. In this sense, required skills should be reviewed according to the organizational policy making process.

b. To plan and implement education and training programs

(1) An inter-disciplinary educational curriculum should be developed as a guideline for development of an organizational education system, which defines what education and training is required for what type of worker. Thus, the education system should preferably be prepared for each type of job and title (hierarchical position).

(2) Education and training plan

The education and training plan contains the name of an education and training program, its content and implementation period (periodical or as required), tasks and jobs/employees covered, category (mandatory or selective, held internally or by an independent organization), and eligibility (qualification). Also, an education and training plan should be considered for a specific project according to the specific needs and the results should be described in the project plan.

(3) Implementation of education and training according to the plan

- To notify employees subject to (or eligible to) the education and training plan and conduct the education and training program.
- The progress of the program should be checked periodically (say, twice per year) and the plan may be modified to reflect the actual results.

c. To evaluate effectiveness of education and training

(1) To determine input information, the unit of evaluation, an evaluator, the time and method for evaluation, and reporting procedures for the evaluation results.

(Example of evaluation method)

- To check each participant by means of a written report and/or test.
- To conduct a questionnaire survey of supervisors of participants to check if training helps them to improve their performance.

- To make each participant report how he has applied what he has learned to his job.

(2) Effectiveness of education and training is evaluated by taking into account the following viewpoints:

- Whether education and training complies with its implementation policy;
- Whether the results of education and training are used for actual work; and
- Whether education and training is suitable in terms of skill (knowledge) level of participants.

d. To develop and implement the method to improve recognition of the education and training program

(1) Promotional activities such as a campaign should be conducted to make IT workers understand relevance and importance of the education and training program, and its contribution to the accomplishment of quality goals.

(Example of promotional activity)

- A special education program to focus on such promotion
- Announcement by top management that education and training is part of management policy
- Publication and advertisement, including posters and brochures
- A special campaign including a special month for promotion
- Public discussion at the internal committee or other employee meetings

e. To establish the method for recording education and training, skills and experience into a knowledge base.

(1) To determine what information is recorded, how and where.

- To determine a recording unit(s) (e.g., individual, education program, project or department) and a recorder.
- As for education and training, the content and implementation period is specified. In addition, comments of participants, including what they have learned, and comments of supervisors should preferably be collected as the basis of reviewing and modifying the education system and plan.
- As for skills, a “skill map” should be developed to cover each person according to a specific skill he is required to or want to learn. Also, skill levels should be specified according to standard criteria. They can be used as the basis of selecting project team members and identifying future training requirement for each person.
- As for experience, it is desirable to record the details of experience (e.g., type of system, role and duration).

- The format of recording contract workers and their skills should also be established as the basis of determining task assignment.

(2) The record should be edited and maintained to allow it to be used as reference for task assignment.

- In particular, as the record contains personal information and the scope of disclosure and the access method should be established. (e.g., access may be limited to the supervisor, or the supervisor is required to keep the record by himself.)

6) Introduction of the national certification system for IT engineers

It is recommended to introduce a national certification system for IT skills to measure the skills levels according to various job qualifications. Tentatively, the following five job qualifications are defined according to the position related to the information system, the expected role and skill level.

a. Knowledge and skills required for playing a leading role in the basic flow of the information system development process (categories of specialists: system analyst, project manager, application engineer, and software development engineer)

b. Knowledge and skills in specific IT fields required in the information system development process (technical engineer, network engineer, database specialist, system management engineer, embedded system engineer)

c. Knowledge and skills required for promoting the effective use of information technology for the benefit of information system users (information security administrator, senior system administrator, system administrator)

d. Knowledge and skills required for evaluation of an information system by a third party (system audit engineer)

e. Basic knowledge and skills related to information technology (basic information engineer)

3.4.6 Recommendation for development of the IT-integrated government system

(1) Objective of development of the IT-integrated government system

In line with the policy set forth under Decree No.825, the Internet-based e-government will be established within the next five years. The Internet-based e-government will consist of information networks linking the ministries of the central government, local governments and organizations and is designed to improve public service for people and businesses significantly.

The e-government is not merely integration of administrative services and functions into an online system. Rather it will continuously pursue the simplification and streamlining of public service and the minimization of tax and other burdens on people and businesses by means of business reengineering, consolidation of similar services and projects carried out by different ministries or departments, and modification of the institutional and legal frameworks and infrastructures. The e-government is therefore a complex process of redesigning the government's service delivery system, which will face a number of challenges, including information security and protection of privacy.

(2) Basic concept of the e-government

Development of the IT-integrated government system is considered to be a major vehicle to improve quality of public service, simplify and streamline government operation, and improve its transparency. The process should start from public disclosure of government actions and decision-making processes, which warrants that the government will conduct public administration in an effective and efficient manner and for the best interest of people whom it serves.

For this reason, the IT-integrated government system should be developed and built under a clearly defined policy. And the implementation of the e-government - the most advanced form of the IT-integrated government system, as conceived at present – should be initiated by two IT initiatives, namely information networking of the government, people and businesses, and information networking of the government organization.

(3) Information networking of the government, people and businesses

1) Electronic information dissemination and gathering

Today, most ministries, agencies, local branch offices and bureaus, national universities and other educational institutions, and testing and research organizations have their own Web pages, which make a variety of information known to the public, including laws, regulations, decrees, public notices, press releases, statistical data and information, results of research and study, and educational materials. Information networking of the government and private sectors will provide, in addition to the existing information base, value added information service that serves the best interest of users.

2) Development of the portal site for government information sites

To facilitate access to government information by people and businesses, a portal Web site that serves as a "general information desk" will be required to guide and link visitors to Web sites of government organizations and their contents.

3) Promotion of one-stop service

One-stop service means the provision of government services at a single location or through a single application. This can be implemented in two forms, a "comprehensive government service system" and "one-stop service in a specific field." The former means a service delivery system using the Internet, which must be preceded by the development of a simple and easy-to-understand mechanism to provide public service by redesigning and rebuilding the existing business processes. To achieve the goal, each ministry and agency is required to augment and enrich information published on its Web site, including public procedures and electronic forms of application. On the other hand, the latter enables the integrated processing of inter-related application procedures by linking the existing systems. Primary examples are export/import licensing and related permits, and customs clearance and other related procedures at the port. It is important to build the infrastructure for the one-stop service in the form of joint research projects with the private sector, such as the development of a general electronic application system and experimental operation of a user-operated public information terminal to check reliability and operability.

4) Electronic procurement process

Implementation of the electronic procurement process is expected to contribute to improved transparency of government procurement together with cost reduction. At

the first stage, it is recommended to provide procurement information in an electronic form, including quick access thereto, develop an integrated system for prequalification review and listing of potential bidders, and develop a procurement system to manage bidding, evaluation and contract award procedures. In particular, for public works projects, the entire procurement process should be disclosed to the public, while an order placement and processing system using electronic data should be developed.

5) Promotion of public information disclosure

To ensure that information owned by government offices is properly disclosed to serve the best interest of people, large amounts of documents held by various ministries and agencies need to be properly managed for prompt access and accurate retrieval. For this purpose, it is recommended to develop and operate an integrated document management system shared by all government offices. Now, it is strongly recommended to define system requirements and configuration to allow integrated management of documents prepared or obtained by different organizations by using information and communication technologies.

(4) Information networking of the government organization

1) Ministerial information networking

First of all, IT infrastructure should be built up by developing the "one PC at every desktop" environment plus a local area network to link all PCs within each ministry. Then, groupware will be introduced to allow workers to exchange and share information by using e-mail, electronic board, electronic documentation, meeting room reservation and other functionality. At the same time, back office functions, such as HR and payroll management, budget control, and inventory management, will be incorporated into the ministerial system.

As most administrative work performed by government offices has common elements, information networking should be implemented simultaneously to maximize efficiency and effectiveness. At first, each ministry and agency identifies business processes that can be standardized in the information networking process. These business processes are then classified into five categories, "communication type," "information sharing type," "consultation and coordination type," "standard application/permit type" and "non-standard application/permit type." Then, for each type, network infrastructure (e.g., ministerial LAN and inter-ministerial LAN),

an inter-ministerial electronic data exchange system, and an integrated document management system should be developed and customized.

2) Inter-ministerial information networking

As the final stage, the intranet connecting LANs operated by all ministries, agencies and other government organizations should be developed. For this purpose, various application systems should be installed to streamline inter-ministerial business processes, including an inter-ministerial communication system, a government license/permit database, a statistical database, a legal database, and an inter-ministerial legal coordination system.

(5) Infrastructure development for e-government

1) Protection of personal information

As information networking progresses, personal information is exchanged, distributed and published over the network and a risk of abuse (theft, misallocation, etc.) increases. It is important for the government to take appropriate action to protect personal information, including legislation and protective measures. Personal information should be handled with extreme care to protect privacy and according to strict rules.

2) Security measures

The e-government should have reliable security measures that can be trusted by people. Comprehensive and advanced security measures should be introduced to effectively prevent intrusion by hackers. In particular, mission-critical networks and systems should be protected from a threat of cyber terrorism by introducing adequate monitoring and contingency plans.

3) Major issues

In developing the e-government by means of information networking, there are a number of hurdles to be cleared. For instance, an authorization mechanism between an applicant and a government office should be installed, as well as an accounting mechanism over the Internet, the establishment of a deadline for the application and reporting through the network, and originality of an electronic document. Various institutional frameworks, laws and regulations will be required to reflect the changing needs of society and economy in the e-government system in a flexible and dynamic way.

4) Outsourcing

Ministries and agencies are expected to focus on policymaking and planning functions, while entrusting operational functions to outside organizations. Outsourcing should include operation and management of information systems. Information networking of the government system aims to perform administrative service more efficiently and effectively, and outsourcing is a powerful tool to achieve the goal so long as the contractor is selected through fair and appropriate procedures. In particular, major portions of work related to development, operation and management of information systems can be outsourced, while only key planning functions should be retained with information system department of ministries.