CASE (computer aided software engineering) tools which for saving labor and automation of the work of the various processes of software development, which is becoming large in scale and of increased complexity, are being developed by computer manufacturers and software companies.

Data center management represents a small share of the market in systems software, but may be expected to continue to grow at a high rate in the future due to PC-LAN environment management software , intercompany networks, and other products. In systems management, growth is expected in various OS and utilities, in particular OS such as UNIX and OS/2. The standardization of OS, in particular the trend toward open systems accompanying connection of different computers, will increase demand for new generation OS such as UNIX.

5) Promotional measures for software development industry

The advanced computerization in the U.S. has, as is well known, resulted not from promotional measures aimed at direct assistance of the private sector, but from direct and indirect contributions by massive projects such as of NASA in which the government has poured tremendous funds. Much of the research and development had been commissioned to private companies. The federal government also formulated an "Information Disclosure Act" to enable smooth transfer of the results of these projects to the industrial sector and opened up widely to the public much of the scientific and technical information obtained through this research and development. The results were widely disclosed not only domestically, but also overseas, benefiting numerous other countries. However, due to the marked decline in the international competitiveness of U.S. industry, changes have been seen in the policy of promotion of computerization. The U.S. is endeavoring to strengthen and expand its industrial technological base from the long term perspective to restore and maintain its industrial competitiveness. Promotion measures include joint projects between industry and academia, federal government aid and tax incentives, stronger protection of intellectual property rights, and stronger research and development in advanced technical fields.

(3) Imports of Filipino Software in the U.S. Market

1) Markets covered

The software industry of the Philippines is stressing primarily the U.S. mainframe and mid-range computer software markets. In terms of the type of sales, custom software accounts for most of the software development in the Philippines. As opposed to this, development of integrated systems software is being performed in nearby countries. Development of custom software is suited to the software industry of the Philippines because the product lifetimes are long, with systems software in particular having lifetimes of two to 15 years, so there is little need to keep up with rapid changes in software development. Further, the marketing costs are small, which is advantageous to the Filipino software industry. Conversely, packaged software requires large investment in management and marketing, so it would be difficult at the present time for the Filipino software industry with shortage of funds to enter this field.

2) Restrictions on imports

There are low duties assessed on imports of software in the U.S. and duties therefore would not present a problem. This is because the U.S. software industry does not have to protect its market due to its overwhelming competitiveness at home and abroad. To maintain this leadership, however, it is feeling the threat of the import barriers of other countries, the lack of intellectual property rights, government aid in R&D, and cheap labor. What the Filipino software industry must take care in is intellectual property

rights. If pirated development tools are used in software development, the U.S. government might take measures to restrict imports.

3) U.S. evaluation of Filipino software companies

A study was made of the evaluation of Filipino software companies in U.S. companies in the survey of the export market conducted as part of the current survey. These companies all had experience in working with Filipino software companies. The results of the interviews were as follows:

First, the biggest advantage of Filipino software companies in the U.S. market was said to be the low wages of programmers compared to that in the U.S. This is a major sales point along with the superiority of Filipino programmers. Another advantage mentioned was the ability to assemble a large number of programmers in a short time period.

Problems mentioned were the difficulty of research and analysis/basic design at the Filipino side, which requires close communication with the client, and the unease over the ability of the Philippines to manage projects. Filipino programmers are not inferior to American programmers in ability, but are considered to lack knowledge of the latest technology. Another problem mentioned is the difference in productivity among Filipino programmers. It seems to be mainly due to the Filipino management. A large number of capable Filipino software engineers have moved overseas particularly to the U.S., so it is believed that there is a lack of engineers capable in management in the Philippines itself.

Further, the political instability of the country has given a negative image to Filipino software companies. U.S. companies are worrying about another coup d'etat occurring and are careful in dealing with the Philippines.

Regarding marketing, it is believed that Filipino software companies have to sell themselves more positively. In particular, the Filipino software companies should stress their capabilities more. Indian companies are aggressive in marketing, but the existence of Filipino software companies is not that well known in the U.S.

4) Issues in the Filipino software development industry as seen from the U.S. market

Based on the above, the first thing which the Filipino software industry has to do is obtain UNIX and other of the latest operating systems and CASE tools and other development tools. This is due to the need to meet the demands and standards of the U.S., which is the world's largest market, and to increase the productivity of software development. It is also necessary to deal with the weakness in marketing. The Filipino software industry is not that well known in the U.S. and it will be possible to uncover potential demand through future marketing. As a short term solution, consideration may be given to conducting marketing through a partnership with a U.S. company.

It would also be desirable to establish a system enabling new software development technology to be acquired in the future. For example, consideration may be given to independent Filipino study of technology such as new architecture, AI (artificial intelligence) used expert systems, etc. and to transfer of technology from abroad. By taking the above measures, it should be possible to beat other countries in competition and increase exports.

(4) Data Entry Service Market

1) Market

The size of the data entry market, part of the processing service industry, is not known, but the market for processing services as a whole (US$16.8 billion) is expected to grow by over 10 percent a year. In this industry, 2000 companies are offering services, with the top 20 companies accounting for half of the overall earnings.

2) Current state and future of data entry

The work and the clients are the same as with data entry in the Philippines. Along with changes in the U.S. labor market, it is becoming difficult to secure the people for work in the data entry field. In particular, it is impossible to find large numbers of capable people in a short time. Farming out data entry work overseas is becoming increasingly necessary from both the standpoint of slashing costs and dealing with shortages of personnel. Overseas data entry work, in the case of the U.S., is handled in the Caribbean. About 20 information processing companies are already doing data entry work in the Caribbean, which is close geographically and has full telecommunication facilities.

Filipino data entry companies have the advantage of being able to do work in the night time of the U.S. The opinion has been expressed, however, that Filipino data entry companies are not aggressive in marketing in the same way as the software development companies.

The data entry work in the U.S. will probably remain the world's biggest market. The task for the data entry industry of the Philippines will be how to increase its share over competing countries. This will require stronger marketing and establishment of telecommunication facilities. Another important task will be to raise the quality of data entry and make the Philippines different from competing countries.

1-4 Canadian Market

(1) Software Market

1) Market size

The information service market was worth 4,989 million Canadian dollars (hereinafter C$) in 1989. A breakdown of this shows applications software accounting for C$1,237 million, followed by systems software at C$1,140 million, processing services at C$1,067 million, professional services at C$935 million, network services at C$295 million, systems integration at C$180 million, turnkey services at C$85 million, and data entry at C$50 million.

By 1992, the market is expected to grow to C$6,816 million, 37 percent higher than 1989. In this remarkable growth is expected to be shown by the field of systems integration, expected to grow by 16 to 18 percent each year and reach C$290 million by 1992. Next, applications software and systems software are expected to growth at rates of 14 to 16 percent a year and reach C$3,563 million by 1992. On the other hand, data entry will grow at a rate of about 2 percent a year and reach only C$53 million by 1992. Table V-1-6 shows the projections of the information service market.

2) Software development industry

Canada's software market is not dominated by U.S. companies to the extent of the hardware market. Domestic software companies account for about half of the market. In

particular, they hold a large 90 percent share of the market for custom software. American companies hold over a 40 percent of the overall market. Among these, there are hardware manufacturers and large sized packaged software companies. The remaining sales are from companies of Europe and Pacific Rim countries.

Dividing the custom software market further into systems software and applications software, systems software is being developed by large sized companies or at the customer side by contract programmers. Various types of software are included, from that developed by individual programmers to that developed over several years by large sized software companies. Most of the medium sized software development companies which are selling applications packaged software of development tools are American. The few Canadian software development companies which are active internationally earn more from the overseas markets than the domestic one.

The software being developed is mainly telecommunication, network, system conversion, and other systems software and other office automation applications software, mainly accounting applications.

As mentioned earlier, the software market was worth a total of C$2,377 million in 1989, of which packaged software accounted for C$1,710 million and custom software for C$667 million. Looking at the sales of software by supplier, U.S. hardware manufacturers and local custom software houses each held a 28 percent share. After these, American and local packaged software houses accounted for a 20 percent share, small local packaged software houses, said to number over 3000, 14 percent, and other companies 10 percent.

Next, a look at the type of sales of packaged software shows direct sales at a large 70 percent in systems software, showing that VARs and systems integrators do not add much value to the systems software. Further, it is difficult for third parties to providing support and training for systems software. In applications software, direct sales account for 26 percent and sales by VARs and systems integrators for 26 percent. The main vendors are Oracle, Computer Associates, Dun & Bradstreet Software, Cognos, Microsoft, Lotus, Aston-Tate, etc. All except for Cognos are American companies.

3) Data entry services

Demand will continue to remain stagnant, but demand should rise in fields such as the preparation of data bases for companies. Further, part lists, maintenance manuals, government released standards, etc. are being placed in CD-ROMs. Demand for data entry in relation to this is expected to increase.

On the other hand, this type of work will increasingly be handled in-house using general-purpose, small sized computers installed with data entry software.

Few companies deal only in data entry. The majority of the companies also offer services such as management of records, preparation of data bases, conversion, and preparation of market research forms.

4) Systems integration

As mentioned earlier, growth may be expected in the future. In particular, demand is anticipated from the government sector, financing, manufacturing, and public works. Systems integrators include Systemhouse, the DMR Group, the LGS Group, and CGI, of which Systemhouse is the largest.

(2) Import of Software

In 1989, Canada is believed to have imported C$1,156 million worth of software. Of this, the U.S. supplied C$1,013 million, 87.7 percent of the total. This corresponds to over 43 percent of the Canadian software market. Competition is being faced, however, from development companies of other countries.

Next, Europe accounted for C$69 million. Europe's share of the Canadian market is expected to increase with each coming year. One of the reasons for this is the software development in Eastern Europe with its low wages. Western European and Asian development companies are believed to be setting up production centers in Eastern Europe and developing software for North America and Western Europe there.

Taiwan, Hong Kong, Japan, Singapore, R. Korea, and other countries accounted for C$72 million of the imports in total, and the ASEAN countries (Singapore, the Philippines, and Thailand) for C$1 million. These countries are increasing their share of the Canadian market using their low costs. In particular, Taiwan and Hong Kong are believed to have exported C$62 million and C$14 million worth of software (1990). The ASEAN countries will increase their exports from the C$1 million of 1989 to C$9 million in 1992 and become more important presences.

The duty assessed on software is zero for software recorded on floppy disks and magnetic tape, but 9.5 percent for compact disks (ad valorum tax). Note that the Generalized System of Preferences is applied to the ASEAN countries and imports from them are all tax free.

(3) Imports of Filipino Software in the Canadian Market

There are some Filipino software houses which have had past dealings with Canadian companies or are interesting in the same. The already developed custom software is mainly for the manufacturing industries and airline companies. In almost all cases, it is accounting software for minicomputers and mainframes. However, there has been little record of imports of software from the Philippines, so the Philippines is extremely poorly known in Canada. Further, Filipino companies are believed to stress the U.S. in North America and not be working on marketing in Canada. Possible means of raising recognition would be participation in trade fairs and holding of seminars.

The sales points of the Filipino software industry in the Canadian market are as follows:

1. Low costs (1/5 to 1/6 that of the U.S.)
2. Superiority of programming
3. Handling of small modules and noncompetition with Canadian software companies
4. Maintenance of delivery commitments

Further, according to end users, there are problems with the after sales support systems of even U.S. software houses, so it is considered essential to establish a support system.

1-5 Other Export Markets

(1) Western Europe

1) Summary

According to the U.S. research company INPUT, the West European information service industry market is worth US$43 billion (1988), second largest after the US$78 billion of the U.S. of the same year. Looking at this by country, the largest markets were those of France, Germany, the U.K., and Italy, in that order. These four countries together accounted for about 75 percent of the total market.

According to projections of the above company, the market will grow by an average 19 percent a year in the future and will reach US$120 billion by 1994. By delivery mode, professional services will be the largest at US$39.3 billion followed by software products at US$36.6 billion. In the West European countries, VAN services are coming into attention and it is believed that EDI and other network services and systems integration will grow by high rates.

2) Hardware environment

A look at the hardware installed (Table V-1-7) shows France, Germany, and the U.K. having the most hardware, accounting for 60 percent of all types. In particular, the three countries account for 84 percent of all supercomputers. Note that the U.K. leads the pack in terms of personal computers, holding about 6.4 million units, or 28 percent of Western Europe as a whole.

3) Summary of main countries

a) France

The market is estimated to be worth US$8.9 billion, in which professional services accounts for 35 percent, followed by software products, processing services, and turnkey systems.

According to information of CICC of Japan, France has 54,900 software house engineers and 93,500 input staff (1985). The main software vendors are CGI, GSI, Computer Associates, Microsoft, and ANSWARE.

b) Germany

The market is worth US$7 billion, second after France, in which software products account for 30 percent, followed by professional services and processing services. The main software vendors are Software AG, SAP, MBP, ADV-ORGA, and Microsoft.

c) U.K.

The market is worth US$6.3 billion. It is almost the same as that of France in delivery mode, with the most important sectors being professional services, software products, processing services, and turnkey systems, in that order. The main software vendors are BIS, Thorn-EMI IT CAP Group, MSA, and Ashton-Tate.

Table V-1-8 shows the information service industry of Western Europe.

(2) Australia

1) Hardware environment

Not counting personal computers, it is estimated that there were 13,600 computers installed in 1988, of which 1 percent were large sized, 4 percent medium sized, 70 percent small sized, and 26 percent work stations. The number of personal computers installed is not known, but shipments reached 36,000 in 1988.

2) Software market

In 1988, the market was worth 2,279 million Australian dollars (below A$, of which A$494 million was imports), with exports estimated at A$170 million. The domestic market grew by an average annual 30 percent from 1984 to 1987 and is expected to grow by an average annual 20 percent from 1988 to 1994.

There are over 800 software companies which employ about 12,500 workers. The main vendors are the Computer Power Group, Mayne Nickless Computer Service, Paxus Corp., Computer Services of Australia, and AAP Information Services.

3) Measures for promotion of information services industry

Australia announced a strategy for its information services industry in September 1987 in which it call for upgrading the capabilities of the information services industry of that country, strengthening international competitiveness, and promoting exports (in particular of software). Along with this, it became urgent to train manpower in the country due to the shortage of computer engineers.

In July 1988, the Information Industries Training Foundation was established for research and providing advice in training. Due to the shortage of manpower, it may be possible for Filipino software companies to send people to Australia. The Philippines is close geographically and an English speaking country. It is necessary to continue to make use of existing assistance programs of Australia and to work to develop the market.

Table V-1-1:State of Operation of General-Purpose Computers by Industry

Unit: billion yen

	No. of computer	Value	(% of total)
Manufacture	84,041	3,364	(35.5)
Security, Finance	13,375	1,626	(17.2)
Sales	139,380	1,428	(15.1)
Service	55,249	1,296	(13.7)
Communication, transportation	14,390	658	(7.0)
Public	10,672	641	(6.8)
Others	23,148	455	(4.7)
Total	340,255	9,468	(100.0)

Source: Japan's Ministry of International Trade and Industry

Table V-1-2: Trends in Annual Sales by Type of Work in Japanese Market

(Unit: Million yen)

Class	1980		1985			1986			1987			1988		
	Annual sales	Share (%)	Annual sales	Share (%)	Comparison with previous year (%)	Annual sales	Share (%)	Comparison with previous year (%)	Annual sales	Share (%)	Comparison with previous year (%)	Annual sales	Share (%)	Comparison with previous year (%)
Total	669,844	100.0	1,561,829	100.0	112.7	1,915,939	100.0	122.7	2,299,305	100.0	120.0	3,297,341	100.0	143.4
VAN	–	–	–	–	–	–	–	—	33,992	1.5	—	98,032	3.0	288.4
Computing services	204,343	30.5	390,713	25.0	103.4	427,826	22.3	109.5	467,213	20.3	109.2	537,081	16.3	115.0
Software development and programming	153,985	23.0	658,030	42.1	128.4	912,747	47.6	138.7	1,104,504	48.0	121.0	1,799,131	54.6	162.9
Keypunching and other data entry	74,205	11.1	109,650	7.0	101.4	120,324	6.3	109.7	118,740	5.2	98.7	163,723	5.0	137.9
Sale of machine time	15,345	2.3	19,164	1.2	109.7	12,073	0.6	63.0	22,493	1.0	186.3	24,694	0.7	109.8
Services for managing and operating systems etc.	104,103	15.5	117,699	7.5	92.4	144,323	7.5	122.6	115,766	5.0	80.2	171,679	5.2	148.3
Information services	44,059	6.6	100,762	6.5	104.3	114,306	6.0	113.4	—	—	—	—	—	—
Data base services	–	–	–	–	–	—	—	—	43,237	1.9	—	106,311	3.2	245.9
Various researches	38,676	5.8	56,980	3.6	90.3	72,989	3.8	128.1	99,313	4.3	136.1	150,585	4.6	151.6
Others	35,128	5.2	108,831	7.0	131.1	111,352	5.8	102.3	294,048	12.8	264.1	246,105	7.5	83.7

Source: The JIPDEC's "Informatization White Paper" 1990

Table V-1-3: Sales by Mode of Delivery in US

(Unit: US$ million)

	1986	1987		1993	
Apprications Software	8,565	10,590	share 30%	62,400	share 35%
Systms Software	7,600	9,900			
Network Services	3,800	4,900	7%	17,400	10%
Professional Services	10,600	12,700	19%	33,500	19%
Turnkey Systems	7,800	8,700	13%	15,300	9%
Systems Inregration	2,700	3,800	6%	14,700	8%
Processing Services	14,800	16,800	25%	32,900	19%

Source: Information Service Industry White Paper 1990

Table V-1-4: U.S. Software Demand by Equipment Type

Unit: Billions of dollars

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	'87-'91 CAGR
Total software	5.7	8.2	11.6	12.9	14.9	16.9	18.8	21.5	24.2	27.3	13%
Mainframe	2.2	2.5	2.7	2.7	2.9	3.1	3.3	3.5	3.8	4.0	7%
Mid-range	2.7	3.4	4.5	5.2	5.8	6.6	7.3	8.1	8.9	9.6	11%
Workstation	0.0	0.1	0.1	0.2	0.4	0.6	1.0	1.6	2.4	3.8	57%
Personal computer	0.8	2.2	4.3	4.8	5.8	6.6	7.2	8.3	9.1	9.9	11%

Note: CAGR/Compound Annual Growth Rate
Source: de Dios and Associates, Dataquest, U.S. Department of Commerce

Table V-1-5:Software Demand by Mode of Delivery

Unit: Billions of Dollars

	1983	1987	1990	1991	'87-'91 CAGR
Custom Software	2.1	3.4	4.6	5.0	10%
Integrated Systems	1.3	2.3	3.5	4.2	18%
Packaged Software	4.8	11.2	16.1	18.1	14%

Source: de Dios & Associates, U.S. Department of Commerce

Table V-1-6:Projections on Information Service Market of Canada

Unit: C$ million

		1987	1988	1989	1990	1991	1992
Applications Software	Value	876	1,076	1,237	1,417	1,621	1,850
	Growth		22.8%	15.0%	14.5%	14.4%	14.2%
Systems Software	Value	794	978	1,140	1,316	1,503	1,713
	Growth		23.2%	16.6%	15.4%	14.2%	14.0%
Network Servies	Value	270	284	295	307	331	368
	Growth		5.2%	3.9%	4.1%	7.8%	11.2%
Turnkey Services	Value	61	75	85	95	106	118
	Growth		23.0%	13.3%	11.8%	11.6%	11.3%
Systems Integration	Value	127	155	180	210	246	290
	Growth		22.0%	16.1%	16.7%	17.1%	17.9%
Data Entry Services	Value	48	49	50	51	52	53
	Growth		2.1%	2.0%	2.0%	2.0%	1.9%
Total	Value	2,176	2,617	2,987	3,396	3,859	4,392
	Growth		20.3%	14.1%	13.7%	13.6%	13.8%

Source: Anthony & Evans

Table V-1-7: Number of Computers Installed in Western Europe (1988)

	Western Europe	France	Germany	U.K.
Super	74	20	21	21
Large sized	7,991	1,349	2,058	1,624
Medium sized	123,900	21,588	29,915	27,242
Small sized	1,163,340	212,891	209,401	245,930
Personal computers	22,929,000	3,418,200	4,982,000	6,396,700
Work stations	129,050	22,300	34,100	31,700

Source: IDC/Informatization White Paper 1990

Table V-1-8:Information Service Market of Western Europe (1987)

Unit: US$ million

	Western Europe	France	Germany	U.K.
Market size	36,000	8,900	7,000	6,300
Share				
Software Products	27%	23%	30%	26%
Professional Services	30	35	24	32
Turnkey Systems	19	17	21	18
Systems Integration	4	3	4	5
Processing Services	17	19	19	14

Source: Information Service Industry White Paper 1990

Fig. V-1-1: Computer Software Industry in U.S.

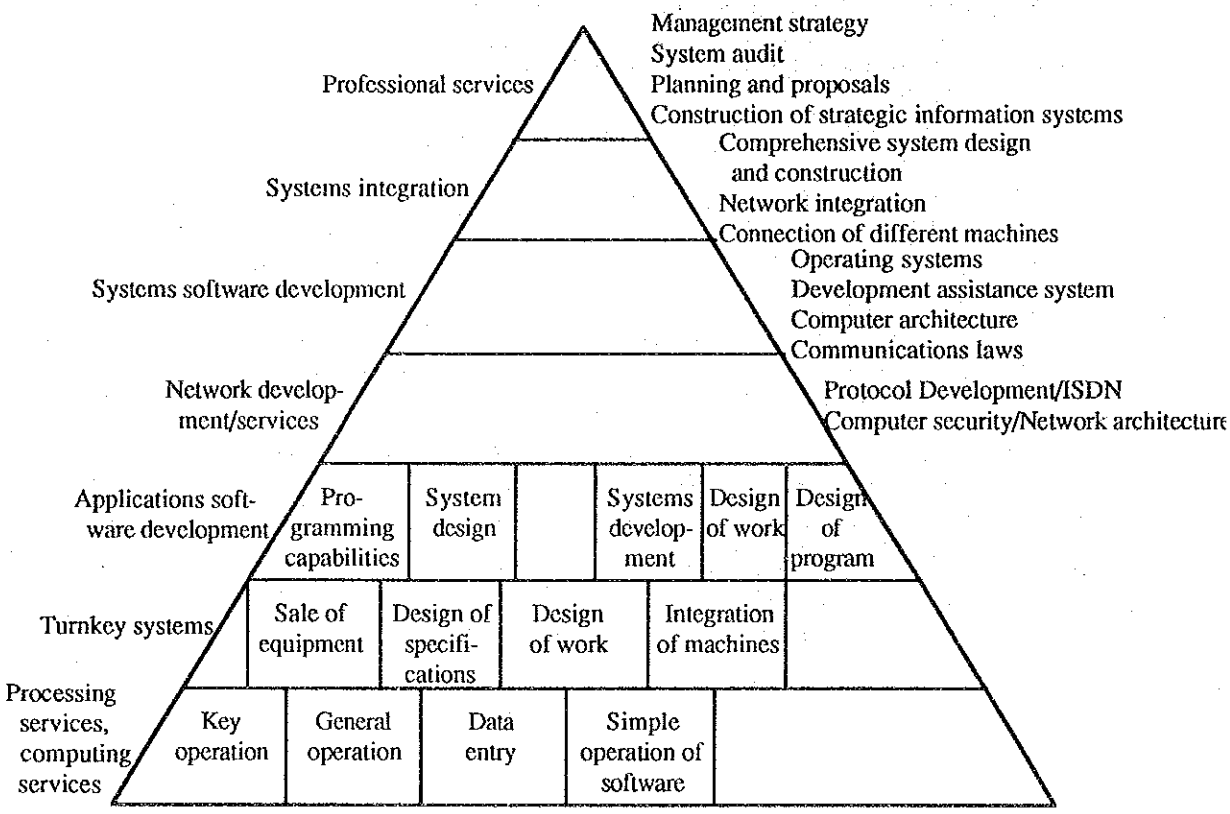
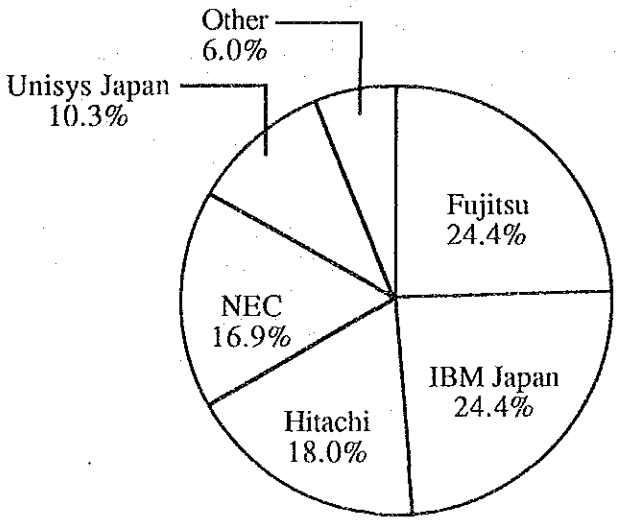


Fig. V-1-2: Shares of General-Purpose Computers by Japanese Manufacturers (Based on price)



Source: Nihon Keizai Shimbun

2. Computer Software Development Industries of Nearby Countries

2-1 Summary

Along with the dazzling industrial development in Asia, there have been calls for promotion of information services industries. Overall, the software industries have been slower to develop than the hardware production technology and exports. In recent years, however, high value added software has come into attention as an export product. Here, a description will be given of countries geographically close to the Philippines like Singapore and India, which are quasi-English speaking countries, and Thailand, which is achieving remarkable industrial growth.

Both Singapore and Thailand have exhibited remarkable economic growth in recent years and have been computerizing at corresponding speeds. Therefore, their software development industries have also been growing. Both countries are endeavoring to computerize and desire to promote their software development industries beyond the level of software development industries able to handle their own computerization to create export industries. Therefore, Singapore provides subsidies for development of export software. Further, Thailand not only is funding the software industry, but is also providing incentives for development of export software, such as reduced import duties for computers.

Among these three countries, however, Singapore is experiencing rising labor costs and lowering its competitiveness. Further, Thailand still cannot meet its own growing domestic demand, so will not be able to create an export industry until some time in the future. As opposed to this, India has high potential competitiveness, already holding a strong position in the world's biggest market, the U.S.

2-2 Singapore

(1) Hardware Environment

Singapore has been pouring the most effort into its information services industry among the ASEAN countries. The government had taken the lead in promotion of the information services industry with the "National IT Plan", which is being pushed forward by mainly the National Computer Board (NCB).

The number of computers installed has been growing steadily reflecting the favorable economic conditions and the strong government measures to promote computerization. There were 3400 minicomputers and mainframes in 1987, but this rose to about 6000 in 1989. The number of microcomputers rose from the 56,000 in 1987 to 90,000 in 1989, with 68 percent of companies with over 10 employees reportedly using computers. Singapore is an international financial market and therefore is particularly advanced in computerization of banks, securities companies, and life insurance companies.

Singapore plays the role of the center of international telecommunication networks in ASEAN. It is already linked with not only neighboring countries, but also Europe and Australia through submarine cables and telecommunication satellite networks and currently is aiming at high speed, large volume telecommunication through optical fiber cables. In 1992, it is scheduled to directly tie up Singapore with Brunei by an optical fiber cable. Further, domestically, it began ISDN (integrated services digital network) services in some regions in 1989. Full facsimile and electronic mail services are also available. This development of telecommunication facilities has contributed much to the

development of the information services industry of this country.

(2) Software Industry

Singapore has about 400 information services companies, of which about 100 are said to be software houses. The information services industry is still young, with 70 percent of the companies being established within the past 10 years. The software industry may be broken down into companies providing packaged software and businesses customizing applications software. Most companies have in-house software development divisions where they improve, develop, and maintain software. When necessary, companies use consultants which belong to small sized software companies and large accounting firms. 30 percent of the software is customized by IT vendors, while 18 percent is developed in in-house divisions. Along with the rising demand for software engineers, labor costs have been rising each year. The average salary of application programmer with under three years' experience is about US$600 a month (1987). The domestic market is limited and international business is essential, but at the present wages are further rising and Singapore is losing competitiveness in labor costs compared with the Philippines, India, and other countries.

(3) Promotional Measures

According to the NCB, Singapore has 8,300 experts in information processing services. Further, the government established training organizations in information technology and has been working since the early 1980s to train expert engineers, in particular experts in the fields of telecommunications, AI, software engineering, etc. Each year, the training organization turns out 1000 experts and by 1990 will have trained 10,000 engineers. According to a recent survey by the NCB, however, it will be impossible to meet the future growing demand with just the current educational and training system, so new promotional measures are being planned. It is possible that the necessary number of engineers will be secured in part by an influx of foreign engineers. Note that a considerable number of Filipino programmers are believed to be working in Singapore.

Singapore has educational organizations teaching information technology which were set up with the assistance of other countries. One of these is the Japan-Singapore Institute of Software Technology (JSIST), which was established in December 1980 with the assistance of the JICA. The JSIST has as its object the training students to become applications programmers, systems analysts, project leaders, and other types of software engineers and is located in Singapore Polytechnic. It currently offers a programming/systems analysis diploma (AP) course (two years, full time) and a systems analysis postgraduate diploma (SA) course. The JSIST also engages in software development jointly with private companies. In 1989, the AD (advanced diploma) course and the AP (diploma) course both won recognition by the Japanese Ministry of International Trade and Industry as corresponding to the levels of the Type 1 and Type 2 information processing engineer examinations.

The NCB has been promoting the computerization of the public sector, has been strengthening the computer education system, and in 1985 announced the NITP. In this way, it has been promoting the information services industry and spread of computers. This program has been designed not only to develop an export industry, but also to benefit industry as a whole. The framework of the measures for promotion of computerization are as follows:

1. Promotion of the information services industry
2. Encouragement of computerization in all fields
3. Maintenance of a superior information and telecommunication infrastructure
4. Training of high level expert engineers
5. Establishment of an environment promoting creativity and the entrepreneurial spirit
6. Creation of a cultural foundation for computerization
7. Cooperation and coordination with all related organizations for achieving the overall goals

Specific measures include the shortening of the depreciation period, exemption of corporate taxes for export companies recognized by the NCB, and subsidies for setting up software companies and other IT companies which would promote transfer of sophisticated technology. A point to be noted is the subsidies given to software development as well. This is done under the SDAS (software development assistance scheme) and is meant to promote development by local software companies. The subsidies are given to cover labor costs, educational costs, and computer usage fees and are set in level by the NCB. As a condition of the subsidies, the developed software must be for export use and must be commercially successful.

2-3 Thailand

(1) Hardware Environment

Thailand has about 132,000 computers (1989). This breaks down into 441 mainframes, 1,860 minicomputers, 92 work stations and 130,000 personal computers. In particular, the number of personal computers has dramatically grown due to the rapid development of the Thai economy. In the private sector, financial institutions represent the largest users, but private companies and government organizations are also introducing computers. Almost all of the supply of computers is imported, with 70 percent of the mainframes being supplied by IBM. NEC has a certain share in minicomputers and Apple, NEC, Epson, etc. in personal computers. Further, behind the increase in export of electronic products etc. has been the manufacture of integrated circuits and peripherals in foreign affiliated factories.

(2) Software Industry

The market for software has grown rapidly along with the spread of computers. There are about 100 software companies. The largest company has about 600 workers, but most of the companies are small sized operations. Other companies have in-house system divisions which not only develop software but also sell equipment. The software market may be divided into a market for PCs and a market for minicomputers and mainframes. In particular, in PC software, PC vendors supply software to clients free of charge. Behind this is the lack of laws protecting intellectual property rights in Thailand.

In Thailand, software is usually supplied in the form of a turnkey service of support for hardware customers. Most of the packaged software is imported and sold by computer vendors. Further, applications software for minicomputers and mainframes is developed at the request of customers. Therefore, the main work of software companies in Thailand is believed to be development of applications software and customizing of

packaged software. Due to the large number of small sized operations, it is believed that the development environment of almost all software companies is based on PCs.

The government has 2,000 computer engineers which usually move to the private sector after working in the government for several years. There are about 27,000 computer engineers, of which there are 11,000 programmers and about 2,000 system analysts. Due to the large demand, wages are rising at a fast pace. The wage level of programmers is from US$250 to 600, while that of system analysts is US$500 to 800 (1989).

Software is already being exported by several large software companies. These companies consider the U.S., Japan, and Europe to be future export destinations. They will have to overcome numerous problems in achieving full-scale exports, however, such as the increasing domestic demand, shortages of engineers, rising wages, and language difficulties.

(3) Promotional Measures

1) Hardware

Thailand is aiming at domestic production of microcomputers. To help promote its electronics industry, it has adopted measures to promote foreign investment and has introduce investment incentives such as reduced import duties, corporate taxes, and export duties.

2) Software

Thailand is striving to achieve a domestic supply of applications software. In particular, it is aiming at domestic production of Thai language applications. Further, government organizations are funding the software industry through the National Electronics and Computer Center and the Technology Development Board. The government is moving in the direction of establishing laws for the protection of intellectual property rights. Thailand is also trying to promote the software industry as an export industry and the BOI is providing incentives such as reduced import duties on computers.

2-4 India

(1) Summary

In the past, the government controlled the computer related industry with the aim of achieving domestic production, but eased up on the controls in 1984 and allowed the entry of foreign capital, liberalized imports of computer equipment, and established incentives for manufacture of peripherals. There are many items on which high import duties are assessed, however. According to the Computer Society of India, computer related sales reached 9.8 billion rupees (over US$700 million) in 1988. This breaks down into 5,010 million rupees in computer sales (US$260 million) and 3,060 million rupees in software (US$220 million). In particular, the growth in minicomputers and microcomputers has supported the growth of industry as a whole. As opposed to this, there has not been much growth in large sized computers.

(2) Software Industry

India is aiming at the development of a software industry using its superior manpower and is working to build up a powerful software industry. Domestically, about 350 companies are said to be engaged in software development. Of these, about 150 are

software companies. The small companies of India, with the exception of a few majors, are small in size. 75 percent of them have annual sales of less than US$100,000. These small sized operations have small financial capabilities and are limited in the amount of funds they can borrow from financial institutions. They also lack any ties with companies with large capital. Looking at sales of software by type of computer, PC use software accounts for only 10 percent of the total sales. 75 percent of the software is being developed for mainframes or minicomputers. The products in demand are inventory control, MIS (management information systems), accounting, and CAD. Software production has reached 3 billion rupees in value and exports are exceeding US$100 million. Most of the exports are in the form of use of the abundant, low wage Indian programmers at foreign projects sites. Further, export processing zones have satellite telecommunication facilities and can directly link up with foreign customers.

The problem in exports by the software industry of India is, first of all, the lack of imported computers, peripherals, and development tools. There are no funds for software development and marketing. Also, there is insufficient information on the software markets of the world.

(3) Promotional Measures

Under the administration of former Prime Minister Rajiv Gandhi, the government took steps to establish a satellite telecommunication network, a special investment region for software companies, etc. In addition, the Indian Development Bank established venture capital for supplying small sized companies with the funds for development of applications software, marketing, and maintenance. Further, the government lowered duties on computers etc. and provided subsidies for interests on loans.

3. Current State and Issues of Filipino Computer Software Development Industry

3-1 Summary

Computers reportedly were first introduced to the Philippines in 1959 for use in preparing land ledgers. The period of initial introduction was therefore much earlier than in other Asian and nearby countries. At the time, the mainstay model of IBM, the 1401 series, was announced and so-called second generation computers using transistors instead of vacuum tubes were taking over. From this standpoint too, computers may be said to have been introduced into the Philippines at an extremely early period. Behind this may be considered the American influence. The fact that the Philippines is an English language speaking country and could make use of computer applications without any changes at all may be considered to have been a major factor for early introduction. Computers continued to be introduced after that and by 1970 the Philippines had become the country with the highest level of use of computers in Asia except for Japan. In particular, in 1982, it newly introduced about 100 small sized and large sized general-purpose computers, the total value of which was US$11 million. Due to the economic recession, however, the total value of new computers installed in fiscal 1984 fell to US$5.5 million.

In general, the small, medium, and large sized general-purpose computers are mainly used, like in the U.S., Japan, and elsewhere, for corporate accounting, personnel management, inventory control, management of data bases, and specialized development applications used by software development companies. What should be noted here is the system making up the continuous use of these computers, the processing system. Compared with Japan, the U.S., and other advanced computer-using countries, almost all computers in the Philippines are used for stand alone batch processing, not for on-line processing linked with several other machines. This is due mainly to the facts that there is only a very small amount of information processed by computer and insufficient telecommunication facilities for connection of computers. Further, in numerous cases, a single general-purpose computer is being used as the operating machine for business and as a specialized machine for software development.

Personal computers began to be used in 1980. This was just after IBM entered the market with its IBM-PC. Behind the start of introduction were the same factors as with the above-mentioned large sized computers. Statistical materials are not available and so this is only an estimate, but as of 1990 there were probably about 100,000 personal computers being used in the Philippines. Close to 100 percent were so-called IBM-PCs or compatibles made by numerous companies in the U.S., Hong Kong, Taiwan, Japan, etc. There were also some products with no brand labels or nationality and even some domestic makes, which, however, circulate in limited areas. The applications used are the application packaged software circulating in the U.S. such as for word processing, spread sheets and operation of data bases.

The software development companies and data entry companies of the Philippines constitute one of the most active sectors of industry and will probably continue to grow at a phenomenal rate in the future. This is because there is already considerable orders for work placed from the U.S., Canada, Australia, and other English language speaking countries and the volume of these orders may be expected to expand in the future. The desire to avoid increasing personnel costs in the advanced computer-using countries and to make up for shortages of computer engineers should be key factors in causing companies in these countries to place orders for work overseas. The Philippines, with its low personnel costs and large pool of software development staff, is relatively well set up to receive orders. According to the PSA, the Philippines exported a total of an estimated

US$5 million in software in fiscal 1987. The PSA set its sights on boosting the size of the market to US$100 million by 1990.

The software development companies and data entry companies, however, face numerous issues. First, in the software development sector, numerous companies concentrate on development of applications using personal computers. Only a very small number of companies develop software for large sized, general-purpose computers. Further, among the development processes, only the program development portion is ordered. The all important part of system design, which requires sophisticated technical expertise, is already prepared by the orderers in most cases. As to the data entry sector, while it is continuing to grow as an export industry, the Philippines offers the same conditions of low wages and entry of the English alphabet as in India, Jamaica, Sri Lanka, and other competing countries and these countries will have to be watched in the future.

The Philippines government has, as a national plan for computerization, the NITP (National Information Technology Plan). The NITP calls for promoting the establishment of a information processing system for improving the administrative capacities of government organizations, educating government workers in computers, stimulating the information processing industry, and promoting the computer and software development industries. The NCC (National Computer Center) is taking the lead and establishing detailed programs for the plan, budgetary shortages in the government, shortages of computer engineers in the government, the lack of suitable educational materials about computers, and other problems have piled up and led to the cancellation of initially scheduled programs and various other problems in implementation.

Global computerization is being supported by not only the software development sector, but also the manufacture of the silicon used as semiconductors, manufacturers of semiconductor manufacturing apparatuses, the liquid crystal and plasma used for display terminals, and even the manufacturers of the paint applied to the computers - a broad spectrum of fields. On the other hand, the software development industry is supported by systems designers, programmers, and systems analysts. The software development industry of the Philippines today is strongly considered an export industry for earning foreign exchange. In many cases, the export demand is for programmers or systems engineers for performing work of a relatively easy level. It is necessary, however, to get the engineers who work with computers to build up sufficient knowledge and experience so that they do not remain as mere programmers, but can handle professional services - the highest level of work in the information processing industry. This would demand sophisticated knowledge of the basic architecture and hardware of computers, an understanding of data telecommunication systems, and a wide range of other knowledge, and specialized knowledge of the practical work of applications to be developed. This would not only contribute to the expansion of the export market, but could also be expected to contribute greatly to progress in the future hoped for computerization of the Philippines itself.

3-2 Hardware Environment

(1) Foreword

The Philippines is not locally producing any computer hardware or peripherals, therefore it is relying on imports for almost all of the same. Some Japanese companies or U.S. and European manufacturers have established manufacturing lines in the Philippines for floppy disk drives, mounting of components on printed circuit boards, mounting of ICs/LSIs, etc., but these are all for export purpose. There are almost no local final production processes for computer equipment. Further, some large companies are producing personal computers for their own use or distributing some IBM-PC

compatibles produced domestically, but these are extremely limited cases when viewed from the computer hardware market of the Philippines as a whole. Therefore, the Filipino computer industry may be basically comprised of computer users and software development companies supporting the same.

As the general methods of classification of computers, mention may be made of classification by list price, model (large, medium, small, and mini), purposes of use and usage environment of the end users, the basic software used, and the capacity of the main storage built in. In the Filipino domestic computer distribution market, in the method of classification of ITAP (Information Technology Association of the Philippines), use is made of the cross-section classification systems based on type (mainframe and minicomputer), the main memory, and the external storage capacity. Below, computers will be divided into general-purpose computers and personal computers and general-purpose computers (general-purpose computers for handling multiple applications) into mainframes and minicomputers so as to clarify the computer distribution markets of the Philippines from the viewpoint of the usage environment.

(2) Installation of Hardware

According to an October 1989 survey of the ITAP (Information Technology Association of the Philippines), there are 1,025 computer hardware installations, not including personal computers, in the Philippines industries, including government and educational institutions (converted into number of units of CPUs (central processing units)). Further, a 1988 survey of SGV, a private research organization, estimated that there were 850 installations of hardware, worth 2,450 million pesos (about 14.7 billion yen). The difference between the ITAP and SGV statistical data is believed to be due to differences in the classifications and definitions of hardware and the date the surveys were run, but whatever the case it is estimated that there are about 1000, plus or minus 100, hardware installations in the Philippines.

There is no official statistical data on the number of personal computers installed and so the number is not known, but it is estimated from information of this survey that there are about 100,000 units.

According to a survey of the ITAP, the shares of the markets held by manufacturers of general-purpose computers are exhibited in Table V-3-1.

IBM, which monopolizes the general-purpose large sized computer market everywhere in the world except Japan, holds an overwhelmingly large share of the market in the Philippines as well. The sales strategy of the company focuses on all industrial fields and aims at the installation of upper class machines, including medium sized types, in Filipino banks, manufacturers, distributors, transport companies, and other large sized companies. Close to 60 percent of the small sized machines and the upper class models in the Philippines are said to be used machines. This is due to the numerous cases of computer vendors other than IBM importing used machines from the U.S. and Australia for resale. These vendors only sell the machines and leave the maintenance and operation to the local IBM affiliate. It is estimated that the majority of the medium sized and larger sized machines installed at the users are used machines.

UNISYS, which holds the next largest market share after IBM, has increased its share after the merger of Univac and Burroughs and now holds a relatively strong position, but IBM is engaged in a strategy to take over the UNISYS market. Further, it is being pressed by other companies with even smaller shares and thus in the future is expected to be forced into a bitter competition for its market share.

The high share of Fujitsu in the IBM dominated Filipino market is due to the

former company's selection of the Philippines as the base for its Pacific Rim software market strategy. The company may be expected to follow through with a future oriented strategy with its small sized computer, K series and the 10 or so types of software running on the same.

NCR has been pursuing a sales strategy aimed at banks and other financial institutions using its wide range of applications. The company's models are used as switching machines for BancNet, a bank ATM network. As a result, the company has held a relatively high share of the market.

DEC switched from its old strategy based on OEM sales to a dual one of both direct sales and OEM sales several years ago in an attempt to stage a recovery in the Filipino market. It may be expected to increase its share in the future.

Other manufacturers which may be mentioned are Siemens (Germany), Hewlett Packard (U.S.), AT&T (U.S.), and NEC (Japan), but almost all of these are competing in the market for small sized machines and minicomputers.

(3) Utilization by Field of Industry

The utilization of general-purpose machines (excluding personal computers) in the Philippines by field of industry is as follows:

There are diverse fields of application of computers in the manufacturing sector, including everything from work attendance control systems for employees, payroll systems, and other comprehensive personnel management systems to inventory adjustment and control systems and process control systems. No example, however, was seen of use at the level of computer integrated manufacturing (CIM).

The main applications in the government sector are data base management systems, in particular constructions of files of individuals, including vasts amounts of data. Computers are also used for the work of personnel and salary control for government employees. The softwares for these applications are not developed originally by the government sector. Rather, data bases are being constructed based on software which has already been developed and is being marketed.

In the distribution sector, typical applications are inventory control systems for sales lines and comprehensive store control systems including sales statements. However, no POS (point of sale) systems comprising a host computer, sales registers, and terminals connected on-line were observed. The main system used was to upload the individual data after the completion of work.

Among all the industrial fields, the most advanced form of on-line networking was seen in banks and other financial institutions. Here, the systems as a whole, including host computers, are becoming larger in scale. The applications include everything from comprehensive control systems connected to manned teller operation to preparations of files of customer accounts, transactions, loan management systems, ATM network systems, and other work of a broad range in a systemized form. While there are various problems faced which require resolution, so as the need for improvement of the quality of network lines, shortening of the response time, and systemization of work in nonurban areas, this may be said to be the field which will lead all industries in the Philippines in the future in computerization.

In educational institutions, including universities, the two main applications are 1) management of course registrations of students and comprehensive management work for the employees and 2) education of the students in computers. Computer manufacturers

contribute hardware and therefore the hardware installations, including large sized machines, in the universities and other educational institutions are advanced, but there are many problems such as maintenance and replacement of machines.

In the other fields of industry, the most important user share of general-purpose computers is that of the software development companies. The utilization are as specialized development machines, as machines for education and training of employees, and as system environments for employee personnel and salary management. There are, however, rather few software development companies owning general-purpose machines. The majority of the companies use development environments based on personal computers.

3-3 Software Development Industry

(1) Summary

The services provided by the computer software industry of the Philippines are not specialized in content as in the U.S. The U.S. computer software industry is defined as a type of business in the information processing industry. The information processing industry is defined as the industry which processes all sorts of information by computers. This includes even the information services provided by VAN businesses etc., for example, news services and stock information services. The Japanese software industry also has not yet specialized to the degree seen in the U.S. A look at recent trends shows that systems integration work has picked up in activity and is gradually becoming recognized as an independent business.

In a survey of software companies in the Philippines run as part of this survey, the software development companies replied as follows regarding the services they provided (unit: number of cases, multiple answers):

	Domestic orders(A)	Overseas orders(B)	(B/A)
1. Applications software development	44	33	0.75
2. Systems software development	19	18	0.95
3. Network services and development	30	12	0.40
4. Systems integration	28	12	0.43
5. Professional services	46	23	0.50
6. Turnkey systems	27	7	0.26
7. Data entry	21	23	1.10
8. Others (processing services, sales of equipment, etc.)	27	10	0.37

The above data should be concerned in that 1) there was no clear definition of delivery modes and they differed according to the respondent and 2) no clear breakdown was given of sales by delivery modes, so there were cases where some similar services were provided. It is difficult to believe that the software companies of the Philippines can handle all of delivery modes as they responded. Taking the ratio B/A of the number of responses regarding domestic orders (A) and the number of responses regarding overseas orders (B), a figure of over 1.0 is obtained for data entry, showing that there are numerous companies handling more overseas orders than domestic ones. As opposed to this, the figures for applications software development and systems software development are 0.75 and 0.95, respectively, showing that close to the same number of companies can provide services overseas as those which can provide services domestically. However, in the case of other services, the number of companies responding that they receive overseas orders is one-half or less those which handle domestic orders, showing that there are

limited numbers of companies which can handle these types of services required in other countries. Further, as mentioned earlier, the services of 3, 4, and 6 extends in requisite technical level from the same level as development of applications software to extremely high technical levels. This is believed to have resulted in the responses obtained.

In the case of the Philippines, with the exception of applications software development, development services are generally limited. Further, only certain parts of development are handled in most cases. Basically, the services offered by software development companies in the Philippines may be considered to be limited to applications software development and some systems software development, not considering data entry, with other development being offered only in partial form.

The applications software development is a service which systemizes work in accordance with user specifications by use of the programming languages of generally used computers. This work is diverse in range and requires various levels of technical expertise depending on the industrial field, the type of stand-alone installation of the computers, whether the business is on-line or batch in type, and other user characteristics and demands.

There is no official statistical data regarding software houses engaged in the work of applications software development in the Philippines, so the number is uncertain, but it is estimated from various types of information and materials that there are about 300 such houses. Further, judging from the companies registered with the industrial organizations, i.e., the PCS (Philippine Computer Society), PSA (Philippine Software Association), and PADEC (Philippine Association of Data Entry Corporations) and the BOI and the companies placing advertisements in industry magazines, about 150 of these are substantial ones. It is difficult to obtain an accurate grasp of the state of the remaining software houses, but it is imagined that they are run by individual capital and engage mainly in development of batch applications using personal computers standing alone.

There is a large amount of development of applications for personal computers in the applications software development in the Philippines because of the small number of general-purpose machines installed and in operation in that country.

Further, it should be noted with regard to the development of applications for personal computers that "development of applications for personal computers" in the Philippines refers not only to software development using computer programming languages commonly used in Japan, but also programming on application packaged software (dBASE, Lotus 1-2-3, WordStar, etc.) generally marketed and distributed. In these general-purpose software packages, it is possible to develop applications software using languages called macro-commands. The operation of these packaged softwares is part of the data entry business and falls under the scope of general office work in Japan.

(2) Markets for Computer Software

1) Domestic market

According to the PCS, the domestic market for computer software in 1988 was estimated US$10 million. Of this, 65 percent was for packaged software, and the remaining 35 percent was for customized software. Orders were received from diverse places including the government and government organizations, local governments, financial institutions, distributors.

The most prevalent orders were for software developmetn for accounting, financial management, sales and inventory control, salary and personnel management. A larger sized orders are as follows;

1. Software for billing of electric power charges (B)
2. Hospital systems for recording patients and treatment costs (C2): Has supplied system to nine domestic hospitals and to hospital in Saudi Arabia as well.
3. Production control software for paper manufacturing company (A)
4. Software for registration of driver's licenses and statistics on same in Bureau of Land Transportation and software for land registration and collecting taxes of local autonomous bodies (C1)

Note: The A, B, C1, and C2 appended to the examples of orders indicate which of the groups of software development companies (mentioned later) the company receiving the orders belongs to.

2) Export market

Orders are received from a wide range of countries including the U.S., Canada, Europe, Australia, Hong Kong, Singapore, etc. Marketing in the export markets comes in two forms: 1) overseas activities by Philippine companies and 2) marketing activities by parent companies, with the orders received being passed on to the foreign capital subsidiaries or joint ventures. The latter case is based on the price superiority of development in the Philippines.

Some local Filipino companies are working positively to develop overseas markets. Among them is one which has set up a software development office in New Jersey in the U.S. and dispatched several people there to handle development of software for banking work. In addition, there are companies with branches and agents overseas.

Among the foreign affiliates, a joint venture with a French company has won an order for an airline cargo revenue system for a German airline after competing with an Indian company. The price and technical expertise were the keys to the success in winning the order. The company is considering selling the software to airlines of Singapore, Hong Kong, and Japan as well.

A subsidiary of a British company with bases in 26 countries around the world is doing 70 percent of the company's R&D in Manila. This consists mainly of development of software for finance and telecommunications. The company established a local subsidiary in the Philippines due to the low costs, high educational level, and English language ability of that country. It considers that Filipino engineers have a high level of ability in programming, but that there are few which can handle SE and SA level work.

One branch of a Japanese company is receiving orders from the Japanese market for development of software for office automation, accounting, and sales analysis. The specifications are brought over from Japan and the coding handled in Manila. The link tests, total tests, and debugging are handled in Japan. There is a language barrier in the case of work for the Japanese market, but three Japanese work in the Philippines, one of which provides Japanese language support to the Filipinos as the project manager and the other two handling the translation of the specifications.

(3) Structure of Production in Software Development Industry

1) Forward

Software development companies in the Philippines may be classified into the following three groups, in general, from features such as the development environment, technical capabilities, technical capability sources, marketing activities, etc.

1. Group A: Companies affiliated with foreign capital
2. Group B: Companies affiliated with large domestic companies
3. Group C: Companies affiliated with independent capital

Further, independent capital affiliated development companies may be classified into large-sized companies (Group C1) and small and medium-sized companies (Group 2) from the size of capital and the development environment, including hardware possessed.

2) Group A (foreign capital affiliated development companies)

These are companies established and operated by private software or hardware related companies of the advanced industrialized nations as local subsidiaries, branches, or joint ventures with local companies. Among the lines of business of the parent foreign companies are software development and similar work, or the manufacture of machinery requiring the development of process control systems. The subsidiaries or branches are all established for the main purpose of software development work. The parent companies order the development work, so few places suffer from delays in payment of work, insufficient orders of work, and other problems. On the other hand, these companies are susceptible to changes in management policies of the parent companies.

These companies are relatively well equipped with the hardware, software, and development tools, so work is performed in a well equipped development environment. This is a major feature of these firms. This is due to the supply of funds or development systems from the parent companies. Upper class models of development systems and peripherals (printers etc.) are provided, and these are being used so as to establish an advanced development system and secure the staff necessary for the same.

Since the operating systems of the parent companies or end users are installed outside of the Philippines in almost all cases, so the total tests, or the final process in development (test conducted in the overall system environment) cannot be performed domestically. The staff which worked on the development is therefore dispatched to the site where the computer is installed, either at the parent company or the end user, to install the developed software in the system and run tests.

This is an extremely large incentive for the development staff. In other words, they can take pride in the fact that the software they developed is running in an overseas systems and are given the chance to travel overseas. Since the systems are large and the development work is performed in that development environment, the development staff must be considerably skilled in technology and ability. To secure engineers of a high level, the companies offer better conditions of employment to their employees than the software development companies classified in other groups. The wage levels set are different from those of the parent companies, but far higher wages are being paid than in the software development companies belonging to the other groups.

There are also full in-house educational and training systems. The in-house education and training are provided both locally and at the site of the parent companies. While there are differences in the educational and training environments and facilities at the respective sites, the specific methods and procedures used are all based on courses set

by the parent companies and well rounded training given in computers and application development.

The telecommunication infrastructures in the computer development environment are also considerably well equipped. The local development systems and the systems of the parent companies or end users are linked by dedicated telecommunication lines and use made of data transmission, file transfer, remote accessing, and RJE (remote job entry) processes. Further, voice, facsimile, and other telecommunication lines and equipment are available.

These companies export close to 100 percent of the software products they develop, so can easily enjoy the incentives of the BOI. Further, this group can expect continuous orders for work from their parent companies and can expect stable growth both technically and operationally.

The following issues face companies belonging to this group:

1. Positive participation in management by local employees: The managers of the local companies are in most cases foreign staff dispatched from the parent companies. The local employees almost all participate only in projects of the local level. It is necessary to establish a system for fostering a sense of positive participation in management by the local employees so as to enable thoroughgoing managerial control and project control. This would make possible an increase in the scope of responsibility of the local staff and positive motivation with regard to work.

2. Entry into domestic market: At the present time, these companies rely on orders from their parent companies or overseas end users, but the sale of developed software products in the Philippines or the receipt of orders from domestic companies would enable more effective utilization of human resources and development systems. This would also be necessary to stabilize operations envisioning the case of a stagnation in orders from the parent companies or current end users due to changes in the external economic environment.

3. Promotion of diversification of content of development work: The application development work being performed by the local development companies is limited in content to specific industrial fields. Promotion of diversification into other fields would be preferable to help stabilize operations and improvement technical capabilities.

3) Group B (large domestic companies affiliated)

These are software development companies affiliated with leading large companies in the Philippines. In many cases these companies were established by breaking off systems divisions from the parent companies. This case is similar to the case in Japanese, American, and European companies where systems divisions are detached and made independent operations. The work of the large parent companies include finance (banking, securities, property insurance, etc.), electric power, distribution, and transportation. Since these companies have ties to large capital, they have abundant manpower and well equipped development environments and are the leading group of software development companies in the Philippines.

These companies enjoy numerous advantages as they are affiliates of large capital companies, the first of which is possession of a good development environment received

from the parent companies and well equipped maintenance and operating systems for the same. Most of the software development companies in this group have large sized, general-purpose computers and abundant peripherals. They are also well equipped with software and tools for development and thus have development environments enabling them to deal easily with development of applications ordered from their parent companies.

The main software development work they handle is for preparation of ledgers for accounting, personnel and wage control systems, inventory control systems, and the like ordered from their parent companies. Further, they handle the development of sophisticated networks accompanying the larger size of systems, such as the development of on-line systems between systems and subsystems, as seen in banks. The size of the systems handled is not as same as that of a medium sized local bank in Japan, but ATM/CD networks of considerable complexity are also being developed. Another feature of this group is the development of large sized systems such as systems for charging for use of electric power, as seen in electric power companies, systems for assessing telephone charges, as seen in telecommunication companies, and systems for management of users.

Another major feature of this group of companies is the large amount of manpower. Unlike with small sized software development companies where the tendency is for the same engineer to handle the entire series of development processes, including the basic design of the development work, the detailed design, the program design, and the programming, system engineers, system analysts, programmers, and the like are suitably disposed and the work is executed divided into small pieces and suitably organized. The abilities of the individual staff members are drawn out and put to use only after through in-house education and training after employment.

Orders for development work are received as comprehensive, integrated jobs. For example, orders are not received for partial development work as seen in the case of Group A and Group C companies, but are received for package development projects covering everything from the analysis and basic design to the detailed design, program development, and total tests. Almost all of the development work is performed under large, general-purpose computer environments.

The wages paid to the workers are, it is estimated, the highest in level except for the case of the software development companies of Group A. In almost all the companies, about the same level of wages is paid as in the parent companies. Therefore, these firms have relatively stable staff retention rates and lower rates of emigration of staff to other countries compared with other companies.

Many of the companies not only handle the development of applications software ordered by the parent companies, but also sell computer hardware. These software development companies sell computers (mainly personal computers and minicomputers) and their peripherals and also sell the software packages for the same. They therefore function as sales agents, VARs (value added resellers), and VADs (value added distributors) of large computers and their peripherals. The merit of this business is that the parent companies purchase large amounts of equipment through their subsidiaries and therefore the companies can earn large profits. The market for this business may be expected to grow in the future.

Companies belonging to this group also enjoy continuous orders from their parent companies, abundant system development environments, abundant manpower, and other advantages. The following issues face these companies:

1. Greater activities in domestic and foreign markets: These companies should work to develop domestic and overseas markets by merchandising the abundant development software assets accumulated through processing of orders from parent companies. It is important to make use of the technical capabilities nurtured through in-house software development up to now, if only for contracting, and launch marketing activities in the international market.
2. Existence as opinion leaders: It is necessary to play a leading role in establishing the image of the Philippine software development industry in the international market. Toward this end, the companies should make full use of their abundant funds and advanced development capabilities so as to inform the international community of the high level of software development capabilities in the Philippines. Further, it is necessary to positively participate in international computer symposiums, conferences, and user meetings.
3. Opening up of development systems and development environments to local companies: It is necessary to consider opening up the development systems and development environments of these companies to local companies as a means for making up for the shortage of mainframes, said to be the biggest problem in the software development industry of the Philippines. Already, an RCS (remote computing service) is being offered which rents out some CPUs to users on a time basis. By further expanding similar services, it would be possible to contribute much more to the development of the domestic software industry. Further, it will be necessary to work to ensure the personnel for the software industry by opening up to the general public the in-house education/training systems of these companies.

4) Group C (independent capital affiliated)

The software development companies belong to this group may be classified into two subgroups according to the size of their capital and their development environments, including the hardware owned. The first is the group of companies (C1) of a relatively large size. Sometimes the managers of these companies previously worked in the systems divisions of large domestic companies or software development companies affiliated with large domestic companies and later went independent. The second group (C2) is that of medium and small sized software development companies established by individual entrepreneurs. This group of companies accounts for a large portion of the estimated 300 software development companies in the Philippines. Among these, the group of companies established by individual entrepreneurs (Group C2) accounts for a large share.

The most striking feature of the Group C1 companies is the systems development environment. These companies have their own general-purpose minicomputers or else are supplied by their customers. Further, in many cases, they focus on their software development for minicomputers or larger sized machines. In many cases, they maintain contact with computer manufacturers and distributors and receive orders through these manufacturers and distributors. One advantage of these companies is that they are independent software development companies, and therefore are relatively easy to place orders to by manufacturers which wish to avoid favoring any particular company in its business.

The development environment of the Group C2 software development companies differs from this. Most of the companies use personal computers as their main development machines and combine commercially available applications packaged software and development tool kits in their development wofk. This software is prepared using commercially available relational data bases or spread sheets with macro commands. There is diverse demand for this, such as in offices with relatively few workers for personnel management, salary management, and working record systems and in hospitals for patient management systems and gasoline stations for sales management systems.

The general characteristics of development companies classified under Group C are as follows:

1. Prevalence of orders for secondary subcontracting development work from foreign affiliated software companies or large domestic software development companies or secondary subcontracting development work from large domestic and foreign computer users .
2. Mainly work of a level of programming or program coding based on specifications and designs provided from customers.
3. Lower level of wages compared with companies of other groups.
4. Employment of graduates of computer schools as workers and lack of thorough education or training after entry into company.
5. Relatively low development costs and low overhead.
6. Quick delivery of products

The software development companies of this group are, with the exception of some companies affiliated with large-size capital (Group C1), considerably unstable in operations compared with the companies of the other groups. Considering the fact, however, that the companies belonging to Group A and Group B rely on customers of specific corporate affiliations, the promotion of this group, particularly Group C1, has important significance in the future development of the software development industry of the Philippines. The companies of this group face the following issues in their future development:

1. Raising salaries and benefits to level of companies of other groups: The current salary scale kills any motivation of employees to positively tackle work and therefore makes it difficult to secure employees with sufficient ability.
2. Establishment of in-house education/training system: It is necessary to establish a system providing not training concentrating on programming languages, operation of applications software, etc., but training able to be applied to large-scale system development, this training being based on computer architecture and focusing on system design, system development, construction of network systems, etc.
3. Participation in places of industry exchanges: It is necessary for these companies to positively participate in industrial organizations, associations aimed at collecting information (including both domestic and foreign).
4. It is necessary to escape from development work aimed mainly at personal computers and, if possible, to work to improve development capabilities to the level of general-purpose machines. At the very least, it is preferable to begin development work of the workstation level, for which remarkable market growth is expected in the future.
5. Launching of multilateral sales strategies: These companies should not be locked into development of single products as they have in the past, but should work to diversify their work. At the very least, it is necessary for each company to strive to sell at least three products.
6. Escape from "ordinary" software houses: It is considered important that these companies not limit their strategic products to just development of applications, but, for example, to strive to develop themselves as Value Added Resellers and Value

Added Distributors, which can sell packages of hardware and software.

7. Targeting as system integrators: The demands of users for integration of different models of computers have been increasing due to the increasingly greater degree of computerization. Therefore, it is expected that development work for different protocols will increase in the future. This global trend will strike the Philippines as well, and the business of system integrators is expected to grow further from now. It is necessary to improve technical capabilities to be able to deal with this. (See Fig. V-3-1)

3-4 Data Entry Industry

(1) Summary

Data entry involves mainly the work of digitalizing large amounts of typed or handwritten data and inputting data into magnetic disks or floppy disks for delivery to the customer. When requested by the customer, it also includes the work of preparing computation programs or formatting. The Philippine data entry industry enjoys the advantages that 1) the industry is extremely labor intensive and the Philippines has the ability to supply abundant labor at relatively low labor costs and 2) it is possible to secure abundant labor familiar with the English language and keyboards.

The companies in the Philippines engaged in data entry work can be classified into the following three groups by type of work:

1. In-house data entry divisions
2. Data entry companies
3. Offshore data entry companies

1. refers to the divisions of large companies, government organizations, etc. specializing in data entry work generated in-house. Food companies, electric power companies, and other companies which generate large volumes of data entry have such divisions. These divisions are estimated as employing about 15,000 workers.

2. refers to independent data entry companies, which primarily provide services to local companies. There are about 1,000 workers of this category.

3. refers to independent data entry companies which primarily serve overseas companies. These are mostly registered with the BOI. There are about 3,000 workers in such companies. The large number of joint ventures is a characteristic feature of offshore companies.

(2) Data Entry Service Market

In the domestic market, cases are seen of preparation of master lists of eligible voters, input of data on university entrance examinations, and preparation of data bases for managing driver's licenses, but overall the industry is very export oriented. In general, the export ratio in the sales of data entry work is from 80 to 100 percent. The main clients are the U.S., Canada, Australia, New Zealand, Singapore, Malaysia, and the countries of Western Europe.

The entry work extends over a wide range of telephone books, newspapers, hospital records, library registration and book cards, court records, consumer surveys, etc. The data entered is almost all in alphanumerics.

Orders from Japan are not handled in general due to language difficulties. A special case involving input without Japanese language occurred with a Japanese affiliate

established in 1989. The company was motivated in doing this due to the shortage of labor in Japan and used digitizers for entry by X-Y coordinates and prepared filing tables for simple map data bases. The symbols on the maps were converted into numerals to enable entry even without understanding the Japanese language. For inputting the Japanese language, Roman letters were input under the guidance of Japanese or the work was brought back to the Japanese head office.

The company's customers were local governments and private companies in Japan and the export ratio was 70 percent. Three percent of demand in Japan as a whole is handled in the Philippines. Even in the Philippines, the company has received inquiries over work from government organizations, local governments, and public works companies (telephones, waterworks companies), etc. and expects demand to increase in the future.

The merit in the company's handling work overseas is the reduction of costs and the shorter delivery times. Compared with handling everything in Japan, the costs can be slashed 40 percent and the delivery time can be cut in halve due to the ability to work 24 hours a day.

(3) Hardware Environment

There are two types of data entry machines used by data entry companies. One type is a specialized data entry machine with several terminals. The other is a personal computer using data entry software. Specialized data entry machines are seen in relatively large sized companies. Many companies are using old types of specialized machines. Specialized data entry machines feature fast processing speeds and large memory capacities, but are high in price and are limited to data entry in their processing capabilities. Compared with this, personal computers are low in price, so are used a lot irregardless of the size of the companies. It is estimated that there is sufficient numbers of hardware for data entry work.

Transactions with clients are almost all by magnetic tapes or floppy disks. There is one large data entry company, however, which is sending its overseas clients the data through international lines. This company is a joint venture with foreign capital and receives all its work from abroad.

When the U.S. places an order, there is a bottleneck in that it take time for the product to be delivered. It is preferable to introduce international telecommunication facilities to resolve this problem. Introduction of such telecommunication facilities would also have the merit of receiving orders by the time difference with the U.S. In particular, it is considered that this would be helpful in receiving orders for work requiring immediate delivery such as news data bases.

(4) Productivity and Accuracy

The Philippines has an abundant pool of workers able to speak English and the workers are quick to become familiar with keyboard entry. Further, to raise employee capabilities, companies are establishing in-house training systems. In addition, private schools offer courses in data entry. Companies are also paying salaries in accordance with ability to raise productivity. PADEC requires that operators be at least graduates of junior colleges and requires English ability as a condition for employment .

Filipino data entry companies perform matching checks based on double entries and checks based on special software programs. The accuracy of work depends on the type of data, but after matching checks and visual checks, it is considered that the industry on the average achieves an accuracy of from 99.95 percent to 99.99 percent.

The offshore data entry companies of the Philippines stress the high educational level and high quality of the final product as sales points. In particular, it is considered that the quality of the final product is at a high level compared with the Caribbean countries, the main competitor for the U.S. market.

Data entry is labor intensive by nature and initial investment can be kept low, so there is a possibility that competition would be posed by not only the Caribbean countries, which already receive many orders from the U.S., but also by India and Sri Lanka. On the other hand, it is expected that the appearance of OCRs, high speed scanners, and voice recognition apparatuses with advanced processing capabilities will input data into computers accurately and at high speeds and promote mechanization of input by making code conversion, editing, and retrieving possible. In this way, the Philippine data entry industry will become threatened from the intenser competition from other countries and mechanization of input. From this viewpoint, it may be unwise to rely merely on cheap labor costs.

3-5 Issues in Computer Software Industry

(1) Necessity of Improvement of Technical Capabilities and Productivity

1) Target for improvement of technical capabilities

The most advanced work in the software industry at present is professional services. This work requires extremely advanced business management, corporate strategy plan, and accounting capabilities and further knowledge of computers, knowledge of telecommunication technologies, and capabilities of system auditing. Therefore, it is necessary for the Philippines to improve technical capabilities step by step so as to reach this level, considering the targeted markets, the size of the Filipino software development companies, the employee system, and the currently provided work.

The short and medium term goal for achievement by the software development industry of the Philippines is the improvement of the level of applications software development. This means further upgrading the current development products such as payroll, inventory control, and personnel management systems handled at present and also making products with much greater added value. The range of work which can be upgraded is broad, including for example increasing the speed of processing of existing development software products, coloring of screens from the viewpoint of human engineering, improving and adjusting the blinking state of the cursor, increasing the speed of access accompanying computing, shortening the response time, and automating the check of data errors. To make these improvements to mechanisms and structures, consideration may be given to 1) training of human resources and 2) use of AI software, expert systems, etc.

In the long term, it will be necessary to make possible the provision of systems integration services. This, in particular, is a new business concept of the software development industry which has arisen in recent years in the U.S. It is a business which should targeted and achieved by software companies in Japan as well. Systems integration is a comprehensive business encompassing all previous mentioned businesses and entails everything from the conceptual design of the system to the program development, connection of different models of computers by different protocols, and maintenance and operation of the changing overall system. The business cannot be performed just by learning the program language, but requires broad, deep knowledge from understanding and applications of computer architecture and protocols to understanding of the physical structure of hardware. In the U.S. and Japan, a steady increase is expected in software companies entering this field. This field should also be targeted in the future by the software development industry of the Philippines.

2) Development costs and necessity of improvement of technical capabilities

A simple comparison of the labor costs in the Philippine software industry with the case of Japan shows that Philippine costs are about one-fourth to one-fifth those of Japan. (see Table V-3-2)

There are two ways in which prices are set for development orders for computer software in the Philippines. One is the method used when receiving domestic orders and the other is the method used when receiving orders from overseas, in which export prices are set.. The export prices are set on an average 50 percent higher than the prices in the case of domestic orders.

Table V-3-3 shows a trial computation of the total costs of development of software for a model project based on these export prices. Here, the case of an order placed from Japan to the Philippines for software development is envisioned and a comparison is made of the total costs of the same and the total costs in the case of development in Japan. In the first case, it is assumed that the main work performed by systems analysts, that is, the consultation, basic design, detailed design, and production of program specifications, is performed by the Japanese side and that the management of the project is performed in the Philippines by project managers of the Japanese side. The Philippine side only performs the program design and the program preparation.

The results of the trial computation show that commissioning the work to the Philippines would enable the program design and preparation costs to be slashed from 8 million yen to 3.2 million yen. However, the commissioning of the work to the Philippines required the additional expenditure of 4.5 million yen for translation of the designs and manuals, transportation and communication costs, etc. As a result, the total cost in the case of commissioning work to the Philippines becomes 21 million yen, meaning that only 300,000 yen could be cut compared with the case of development in Japan (1.4 percent of total costs). This difference is within the range of error of the precision of this trial computation and means that there is almost no difference between commissioning development to the Philippines and development in Japan. Rather, there is the chance that the costs would be higher depending on the method of management on the Japanese side or after-sales service etc.

In this example, the reduction in costs achieved through development in the Philippines is cancelled out by the additional costs accompanying the commissioning 45 percent of the additionally incurred costs (just under 10 percent of the total costs) is due to translation from Japanese into English. Therefore, in the case of transactions with English language speaking markets, it would be possible to slash a corresponding amount of

costs.

In this example of a project, it is assumed that the order for the project is placed from Japan, the company receiving the order is a Filipino software development company, and it is the first development project contracted for between the two. Further, it is a case where the content of the development work is fairly sophisticated and complicated portions are reflected. In Japan such works have been increased. The repeated placement and handling of orders for such similar projects between Japanese and Filipino software development companies would enable the above-mentioned translations of specifications and manuals, communication costs and travel costs to be cut and the overall project costs and operating expenses would be reduced by at least 15 percent. (the second case)

Further, in orders between the two countries, portions most related to the computer hardware, for example, the basic software, in particular conversion of operating systems, development of utilities, etc., do not require the Japanese language in considerable portions, so the development work could be done relatively smoothly. Further, development of numeral control systems, as used typically by industrial robots and CAD/CAM, includes little Japanese language related work, as seen from the Filipino side, so expenses could be slashed by proper management of the development work.

It is clear from the above cost computation that, as seen also in the case of orders received from the U.S. etc., the basic portions of the software development, such as research and analysis and system design, are handled by the ordering side, limiting the range of services provided by the Philippine side. As a result, costs can be slashed by only about 17 percent even by cutting the additional costs 25 percent of case 1. In the case of orders from the Japanese market, the language problem would make it difficult to commission the Philippine side with portions requiring contact with customers and basic design. In the case of orders from English speaking countries, however, if advanced development technology could be acquired, there would be a possibility for a further expansion of the range of work handled by the Philippine side. For example, if 25 percent of the basic design and 50 percent of the detailed design could be handled in the Philippines (case 3), costs could be slashed by 22 percent and, further, the value of orders would increase over 30 percent compared with case 1.

Further, if the situation continues where the Philippine side's work is limited to the program design and program preparation in the processes of projects ordered from abroad, then it would be difficult to improve the technical expertise of the local development staff. At the very least, it is necessary that the range of work be expanded to include the fields of basic design and detailed design.

From this viewpoint, the improvement of software development technology may be said to be extremely important for the future growth of the software industry. Further, it is necessary to improve telecommunication facilities and hardware installations so as to cut the costs required for communications and to expand the range of work handled in the Philippines by allowing direct on-line access from the local site of part of the finishing tests.

3) Necessity of increase of productivity and improvement of quality control

At the program design and preparation level, productivity of software development in the Philippines is considerably high. Productivity in software development is determined in many cases at the initial stage of development, the stage where the demands of the users are analyzed. That is, productivity in development is determined by how efficiently the work demanded by the user can be systemized.

In the foreign affiliated (Group A) and small and medium sized independent (Group C2) software development companies, the software development processes handled by the Filipino staff mainly consist of program design and program preparation. The research and analysis, the basic design of the system, and the detailed design are almost all handled by the foreign parent companies or, in the case of the independents, the companies ordering the work. Also, the development work is being performed under the project management of the parent companies or ordering companies. As a result, the Filipino side is able to maintain the high productivity such as currently seen even without sufficient technical expertise in productivity.

In the case of orders received from abroad, among the various tests performed as the final stage of the development process, only unit tests are performed in almost all cases. This is because the system operating environment is overseas.

The large capital (Group B) and independent large sized (Group C1) software development companies have system operating environments in the Philippines, so can easily also perform further tests.

The software companies of the Philippines perform enough quality control to satisfy the users. Users highly evaluate the repairs performed along with the occurrence of bugs in the software and the manuals and documentation prepared for software operation.

Considering future development services, for Filipino companies to improve their technical capabilities and gradually become able to handle the research and analysis field as well on their own, it will be necessary to sufficiently increase awareness of these areas of production, upon which the Philippines now rely on the companies placing the orders.

(2) Necessity of Improvement and Establishment of Infrastructure

1) Necessity of improvement of hardware environment

From the viewpoint of software development, what have to be increased are large sized general-purpose computers.

Demand for software development for small and medium sized general-purpose machines may be expected to increase in the future. Almost all companies of a medium or larger size, are using small and medium sized general-purpose machines for development purposes. This is because they are cheaper than large sized general-purpose machines and enable operating costs to be kept considerably low. Also, most of the requests for development from the clients of these development companies are for small and medium sized general-purpose machines. In particular, there is promising demand for development of software for small and medium size general use machines using as the basic software UNIX, for which the market has been growing in recent years and demand is expected to increase in the future as well.

The number of personal computers in use is not clear due to the lack of an official statistical data, but at least it may be said that there are already sufficient personal computers for handling software development work.

Looking at general-purpose machines, almost all the foreign capital affiliated software development companies (Group A) and large domestic company affiliated software development companies (Group B) have, due to their abundant capital raising abilities, installed large-scale general-purpose computers and use them for their general business systems and development systems. The usage environment, however, is still far from one in which specialized use is made for customer information systems, general

ledger systems, international information systems, specialized development machines, etc., as usually seen in users of general-purpose machines in Japan and the U.S. or specialized backup machines are owned as seen in hot standby systems. Almost all users use a single computer for all the work. The capacities of the main storages built in the large-sized general-purpose machines, the capacities of the external memory, and the performance of the external memory of the printers and other devices should be made sufficient to deal with the type of work for which the users are currently using the computers. Considering the expansion of the volume of work which might occur in the near future and the construction of expanded systems to handle the same, an increase in the number of CPUs of specialized machines and, in particular, the installation of specialized development machines, is preferable. Further, the time has come where it is necessary to consider a system using a fault-tolerant computer as the front end processor of a large-sized general-purpose machine as seen by recent global trends.

The introduction and installation of specialized development machines are particularly highly needed. This would give companies machines for their own development work and at the same time would be effective as a means for making up for the shortage of large-sized general-purpose machines of the independent software development companies (Group C companies), mentioned later. That is, by using the remote computing service (RCS), it is possible to rent CPU time to independent small and medium sized software development companies. It is also possible to give approval fo using computer sites to them.

There are few cases of even the large-scale development companies among the companies of independent capital affiliations belonging to the Group C purchasing general-purpose machines on their own and engaging in development work using their own machines. There are companies which use some general-purpose machines, but even in this case almost all use development environments of computer manufacturers and large users which request the development. Therefore, if the tolerances of the business systems of users are exceeded, there is a danger of major hindrances to the development work and from this point there is a necessity for companies to own their own machines. Even in the case of such companies, it is conceivable for the development environments to be opened up for use, at a charge, to other development companies not having general-purpose machines.

The biggest problem when installing a large sized general-purpose machine is the tremendous amount of money required. In addition to the hardware cost and its peripherals, large investment is required for the licensing fees for the basic software and development software tools, the air-conditioning facilities, the cooling facilities for the machines, the power facilities, maintenance, and operation. The current development environment, however, is not sufficient at all for handling greater future work. It is necessary to consider making decisive investment.

2) Necessity for establishment of development software and tool environment

The basic softwares carried in the large general-purpose machines are not of the latest specifications, but mostly of specifications of two to three years of age, i.e., one to two generations back. Therefore, the software development is also being performed with this old basic software. The tendency is seen in particular among users purchasing and using used general-purpose machines. The capacity and other functions of the main storages of used general-purpose machines may become insufficient in terms of performance if one considers use of recent basic software, application work, and development work all together, but these can be expanded. Basic software is upgraded by the manufacturer at a rate of once a year. It is necessary to make the software and tool environment for the development work of general-purpose machines the latest specification together with this.

As opposed to this, in the case of small and medium sized general-purpose machines, the development software and tools are being sufficiently obtained. One of the main reasons for this is that the smaller the machine, the lower the cost of upgrading. The same may be said for the development environment of personal computers.

3) Necessity for establishment of telecommunication lines and related environment

Infrastructure of telecommunication network systems are examined in order to obtain a grasp of the state of the general public line network (including telephones and facsimiles), telex line network, and dedicated line network.

The general public line network is relatively well established in Manila. When newly installing a telephone, however, it takes one to two years from the date of application to installation in the case of companies and four to five years in the case of individuals. This is because the telephone switching systems still use old systems like the step by step or crossbar and therefore cannot cope with the increase in people desiring telephones. The same situation exists with respect to the facsimile network, which uses the general public network. Facsimile communication is convenient in allowing the transmission of texts and continues to be important as a means of telecommunication not only domestically but also with other countries. In 1987, there were 700,000 facsimiles installed in the U.S., 500,000 in the EC, and 800,000 in Japan. By 1988, this had risen sharply to 2.5 million in the U.S., 1.7 million in the EC, and 3.1 million in Japan. Further, Hong Kong experienced about 40 percent growth in international telecommunications from March 1987 to March 1989, of which facsimile alone grew by about 300 percent. In the case of the Philippines too, it will be necessary to change the telephone switching from the old type, step by step and crossbar to electronic digital switching systems so as to enable it to cope with the rapidly growing amount of data communication.

The telex has been made wide use before the development of facsimile. Telexes are still important means even now in small and medium sized companies in the Philippines. Further, telex terminals are used in many cases as means for international telecommunications. In the future, however, the trend will be for growing use of facsimiles as means for international telecommunications and it is expected that telex communications will rapidly decline.

Next, regarding dedicated lines, the large companies in the Philippines, in particular banks and other financial institutions, are establishing dedicated lines. Dedicated lines are lines borrowed by companies like the PLDT (Philippine Long Distance Telephone) and PT&T (Philippine Telegraph and Telephone) for use in transmission of voice, data, and images. Not counting personal computers and work stations connected by LAN (local area networks), it is estimated that there are presently about 60 to 70 computers of the medium size or larger installed as line terminal units connected to dedicated line terminals. This number corresponds to the number of units connected in a network in a single large Japanese company. Only about 7 percent of all computers in the Philippines are connected on-line. Almost all are used as stand alone type systems, it may be said.

Leading computer networks in the Philippines are the bank ATM networks, i.e., Megalink and BancNet. In the future it should become necessary to establish industry network systems for distribution, credit, and control systems. Further, there will probably be many network systems built inside individual companies. It will become increasingly necessary to improve the infrastructure to enable this to happen.

The public telephone line network, telex line network, and dedicated line network

of the Philippines all suffer from 1) the problem of the quality of the lines and 2) the problem of the poor response of the telecommunication carriers in the case of disconnection. Regarding the quality of the lines, the quality of public telephone lines is still poor in particular and improvements are necessary in sound quality and accessing speed. The same applies to facsimile transmissions, i.e., improvements in image quality should be made. The quality of dedicated leased lines may be said to be considerably good compared with the public telephone line network, but when transferring data between computers, it is pointed out that data errors and blurring of data occur. When a dedicated leased line is disconnected, the telecommucication carriers are slow to restore the line, often taking two to three hours. Telecommunication carriers must make improvements so that they can deal with disconnections immediately (not later than one hour).

The best equipped telecommunications network in the Philippines at the present time, from the standpoint of connection of computers and transfer of data, is the packet switching network supplied by PT&T. This is based on a global standard for transfer of data among computers. This switching network, known as Data Net, has only recently been completed, and only a few computers have yet to be actually linked up and put into operation, but future developments are being watched. Also, in preparation for an increase in the numbers of computers connected in the future, considerable leeway has been given in expansion slots in the packet exchange of PT&T, the switching center.

If assuming enough capacity to deal with future sophisticated computerized society, then the packet switching network alone may not be able to take up the load and it may become necessary to establish high speed digital lines or an ISDN.

The following are necessary for resolving the problems in telecommunication network systems mentioned above and constructing networks sufficient for the future "information" society:

1. Improvement of the quality of the existing telecommunication networks
2. Upgrading switching systems
3. Installation of digital networks exclusively for computers
4. Construction of networks exclusively for facsimiles
5. Improvement of gateway systems for international networks
6. Standardization of protocols in computer-to-computer networks

4) Necessity of stabilization of power supplies

The power supply is extremely unstable and companies need counter measures against blackouts. Therefore, almost all users of general-purpose machines in the Philippines have installed emergency power generators and use as temporary power sources. There are few examples of users of medium-sized and smaller sized computers which have installed spare power supplies, so work is cut off during blackouts. The efficient use of computer resources requires the installation of emergency use generators by almost all the users.

(3) Necessity for Export Promotion Activities

Computer software and data entry were recognized by the DTI in 1987 as new products for export promotion. The BETP (Bureau of Export Trade Promotion) of the DTI has been handling planning and proposals for export promotion and the CITEM has been implementing programs, such as participation in trade fairs and dispatch and receipt of missions.

Unlike furniture, garments, food, and other traditional export products of the

Philippines, there has been little experience in the exports of these items, so the BETP has been working to publicize the current state of the Filipino industry through the commercial attaches overseas. In addition, the BETP is engaged in the following programs:

1. Provision of information to potential exporters
2. Preparation of brochures and VTRs (brochures are distributed through overseas commercial attaches or during participation in trade fairs or dispatch of missions)
3. Preparation of market guides on export destinations
4. Participation in trade fairs and dispatch of missions
5. Promotion of joint ventures
6. Processing of inquiries from overseas
7. Contact and coordination with industrial organizations (PSA, PADEC, etc.)

The main targeted export markets are the U.S., Australia, the U.K., Germany, Sweden, and Japan. Among these, Japan is given a high priority, but due to the language difficulties, no special program has yet been implemented.

The BETP and CITEM both lack sufficient funds for export promotion, but are making use of foreign aid available in this area. Examples of the aid provided are given below, by country:

1. Australia: ASEAN-Australian Economic Cooperation Program, in implementation as a two year plan covering 1989 to 1990. This is a comprehensive program involving surveys of Filipino suppliers, dispatch of export promotion missions overseas, and visits by buyers to the Philippines.

2. Germany: The Phil.-German Agency for Technical Cooperation provided assistance for the participation of one hardware manufacturer, one software company, and one data entry company in the CeBIT'90 fair (March 21 to March 28, 1990) held in Hanover, Germany. Also, in the Phil.-German Export Development Project, a survey was conducted of 24 Filipino suppliers.

3. Netherlands: The Center for Promotion of Imports from Developing Countries (CBI) provided assistance for participation in the Europe Software '90 (May 29 to May 31, 1990) held in Utrecht, the Netherlands. Ten Filipino software companies and PADEC exhibited products at the fair.

4. In addition, the U.K. and Sweden are both cooperating, through their aid organizations, in the dispatch of missions and market surveys.

Taking CeBIT as an example, the specific assistance provided was as shown in Table V-3-4.

Obtaining information on overseas markets, reinforcing marketing activities for business with overseas companies, and further increasing export opportunities are also important in that they would, further, provide stimulus for the improvement of the development capabilities of the Philippines. It is necessary to strength export promotion activities such as dispatch of missions and participation in trade fairs.

(4) Necessity for Strengthening Computer Education

1) Foreword

For the Filipino computer software industry to continue growing in the future, it must secure enough information processing engineers. It is necessary to train engineers not only sufficient in terms of numbers, but also of a high quality.

The following three organizations are providing computer education and training in the Philippines:

1. Universities
2. Private computer schools (specialized schools)
3. NCC (National Computer Center) etc.

According to the Manpower Development Plan and Training Program for Electronics Industry 1988, 25,000 to 30,000 students undertake computer courses each year, of which 4,500 complete programming courses. This large number of students study computers because there is a high employment rate in this industry, overseas as well, and the wage levels are higher than in other industries.

2) Computer education in universities

More than 20 universities and colleges offer formal courses in computers in the Philippines. The University of the Philippines, the Ateneo de Manila University, and the De La Salle University all have master's courses. In the universities, as of 1989, more than 12,000 students were learning computer programming and in 1989 over 1,400 students were graduating from computer related courses (BS Computer Science, BS Computer Engineering, BS Math/Computer Science, Business Computer Data Processing Management). The number of such students has been rising each year. The Departments of Computer Science of the universities offer everything from basic computer knowledge to computer languages, telecommunications, and the education in the advanced technology required for systems analysts.

The majority of the universities have IBM PCs or compatibles. There are few universities with mainframes, minicomputers, or work stations. However, UP, Ateneo, and the De La Salle University which have installed mainframes, work stations and have relatively large amounts of hardware. The Philippines has sufficient numbers of PCs, but the number of mainframes is extremely small in all universities, so it is difficult for students to become accustomed to mainframe environments. Further, even in universities with mainframes, there are many problems, such as insufficient support and maintenance of equipment or insufficient updating of operating systems (OS), utilities, development tools, and the like due to tight university budgets.

The insufficient amount and quality of the computer education in the Philippines are important issues. Universities with low pay scales find it difficult to employ the necessary number of instructors. Further, even in other universities, there is a shortage of instructors with the latest technical knowhow in telecommunications, systems software, etc. Numerous universities conduct seminars and work shops and offer scholarships to improve the abilities of their staff, but in practice the staff do not have enough time for self-improvement.p

3) Computer education in private computer schools

There are numerous computer schools in the Philippines which aim at teaching a limited range of courses in a short time. Among these, STI (System Technology Institute)

boasts the largest number of students (22,000) and operates 32 centers spread through the Philippines. I/ACT is smaller in size than STI, but holds a much more important position in computer education for companies. These two computer schools are the leaders and are well equipped in both hardware and instructors.

Both STI and I/ACT have IBM mainframes. Most other schools have only IBM PCs or IBM compatibles. Further, almost all instructors hold BAs. Few instructors have master's degrees.

STI offers courses covering up to systems design and training of analysts, but in general the computer schools mainly teach programming using COBOL and packaged software such as WordStar, Lotus, and dBase. The training periods are shorter than in the universities too.

A considerable number of students attend the schools, but few students finish all the courses. The quality of the graduates is considered to be inferior to those from the universities. The computer schools tend to stress increasing the quantity of students rather than raising their quality. The training periods are short and both the instructors and the curriculum inferior.

4) Other training organizations

a) NCC (National Computer Center)

The NCC was established by the government for the purpose of providing computer education to its employees. It is equipped with mainframes made by Fujitsu and Hewlett Packard. The NCC lacks a sufficient budget, so suffers from many problems, e.g., cannot employ many instructors and cannot purchase CAI (computer aided instruction) and other tools.

b) Other training systems

Software companies have training programs for their own employees. In particular, they set aside a training period for their new employees as needed. In one typical software company, a one to three month intensive training course is given to new employees. Further, computer vendors providing training to customers and others as part of their service and marketing.

5) Issues in development of human resources

The following issues may be pointed to in the training of software engineers in the Philippines:

1. In general, there is a tendency to give priority to securing numbers of engineers and to be neglected to improve quality.
2. In school education as well, there is a quantitative and qualitative shortage of instructors in in-house education.
3. There is no policy-making process regarding training of personnel with cooperation of government and industry. In particular, it is necessary to study and realize educational goals and curriculum based on the future strategies of companies or needs in line with national priorities.

(5) Issues in Fund Raising for Augmentation of Facilities

It is considerably difficult to raise funds for improvement of facilities in the software and data entry industries of the Philippines. The reason is that most of the

companies have only just been established. Further, the other reason is that a large amount of funds is not necessarily required for establishing a software company, most of the companies are undercapitalized. In addition, the level of their products and engineers is difficult to be observed from the outside and therefore lenders have trouble in examining loan applications.

The features of fund raising of software companies are as follows:

1. Commercial banks are the most often used sources of funds. The larger the company, the more the frequency of borrowing from banks. There are relatively large numbers of unsecured loans. Most of the loans are made less based on the credit of the companies, than on the credit of the individual managers. The reason for this is believed to be that loan applications can only be examined based on the repayment ability of the individual managers. Further, almost all loans are short term ones.
2. Leasing companies are also frequently used. Their interest rates are not low by any means and the companies use leasing for machinery required for specific projects for short periods of time.
3. Not much use is made of government affiliated institutional financing. This may be because the application procedures are troublesome and too much time taken for examination.
4. In many cases, companies do not use financial institutions, but raise funds from the relatives and friends of their managers.
5. In the case of software development work in the Philippines, the general practice is advance payment or installment payment, so loans are not considered necessary for operating capital.

At the present time, Philippine software development companies do not consider fund raising to be a problem, at least on the surface. This is probably because they avoid long-term investment in capital which would be accompanied by too much risk under the current high interest rates. In the future, however, it will be important to secure suitable funding sources to enable positive business growth. In this case, the software companies will be hindered by their lack of physical collateral. In Japan, since the software industry lacks sufficient physical collateral, a debt guarantee system has been established to compensate for this problem. This system is part of the measures for promotion of the information processing industry and can be utilized for guaranteeing debts when borrowing funds required for introducing computers, developing programs, training information processing engineers, etc. Further, all sorts of funds, including personnel costs, expenses, and contracting costs, required for development of programs can be obtained at low interest rates under the computerization promotion financing system of the Japan Development Bank. In the case of the Philippines, the availability of long term project funding will become a key issue in the future. It would be preferable to study a debt guarantee system.

Table V-3-1: Market Share of General-Purpose Computers by Manufacturer in the Philippines

(Unit: %)

Manufacturer	Mainframes	Minicomputers
AT&T	1	2
Dataprep	--	3
DEC	--	9
Fujitsu	10	5
HP	--	7
IBM	46	58
IBM (used machines supplied by CEC)	23	7
NCR	2	5
TI	--	3
Unisys	18	--
Others	--	1
Total	100	100

Source: ITAP

Table V-3-2: Cost Comparison of Japan and the Philippines

Content of work	Prices (per hour)	
	(Export price of PSA member companies)	(Japan)
Programmers (elementary)	US$10 to 12 (¥1,300 to 1,560)	US$21 to 27 (¥2,730 to 3,510)
Programmers (intermediate)	US$13 to 15 (¥1,690 to 1,950)	US$30 to 33 (¥3,900 to 4,290)
Programmers (advanced)	US$16 to 19 (¥2,080 to 2,470)	US$33 to 38 (¥4,290 to 4,940)
Systems analysts (elementary and intermediate)	US$20 to 24 (¥2,600 to 3,120)	US$33 to 42 (¥4,290 to 5,460)
Systems analysts (advanced)	US$25 to 30 (¥3,250 to 3,900)	US$38 to 54 (¥4,940 to 7,020)
Documentation	US$10 to 12 (¥1,300 to 1,560)	US$30 to 35 (¥3,900 to 4,550)
Consultation	US$50 to 100 (¥6,500 to 13,000)	US$50 to 63 (¥6,500 to 8,190)

Note: US$1=¥130
Source: PSA/JICA study team

Table V-3-3: Comparison of Software Development Costs in Japan and the Philippines

(Unit: 1000)

Cost element	Case of entire development by Japanese side (A)	Case of consigning part of development to Filipino side(B) <Case 1>			<Case 2>			<Case 3>		
		Japanese cost	Filipino cost	Total	Japanese cost	Filipino cost	Total	Japanese cost	Filipino cost	Total
1. Cost of development work										
1-1. Research and analysis	4,200	4,200	–		4,200	–		4,200	–	
1-2. Basic system design	3,600	3,600	–		3,600	–		2,700	360	
1-3. Detailed system design	3,300	3,300	–		3,300	–		1,650	660	
1-4. Program design	2,400	–	960		–	960		–	960	
1-5. Program preparation	5,600	–	2,240		–	2,240		–	2,240	
1-6. Installation	550	550	–		550	–		550	–	
1-7. Unit/total tests	550	550	–		550	–		550	–	
1-8. Documentation (manuals)	1,100	1,100	–		1,100	–		1,100	–	
Subtotal	21,300	13,300	3,200	16,500	13,300	3,200	16,500	10,750	4,220	14,970
2. Additional costs accompanying consignment										
2-1. Translation of basic/detailed design specifications	–	1,200	–		300	–		300	–	
2-2. Translation of manual	–	800	–		400	–		400	–	
2-3. Communication costs (telephones and facsimiles)	–	500	–		250	–		250	–	
2-4. Traveling expenses	–	1,000	–		500	–		500	–	
2-5. Other management expenses		1,000	–		250	–		250	–	
Subtotal	–	4,500	–	4,500	1,700	–	1,700	1,700	–	1,700
Total	21,300	17,800	3,200	21,000	15,000	3,200	18,200	12,450	4,220	16,670
% of (A)	(100%)			(99%)			(85%)			(78%)
Assumptions		1. First order for development between two parties 2. Ordering only program design and program preparation			1. Repeat order for similar development work 2. Ordering only program design and program preparation			1. Repeat order for similar developme work 2. Ordering 25 percent of basic systen design, 50 percent of detailed syste design, and 100 percent of progran design and program preparation		

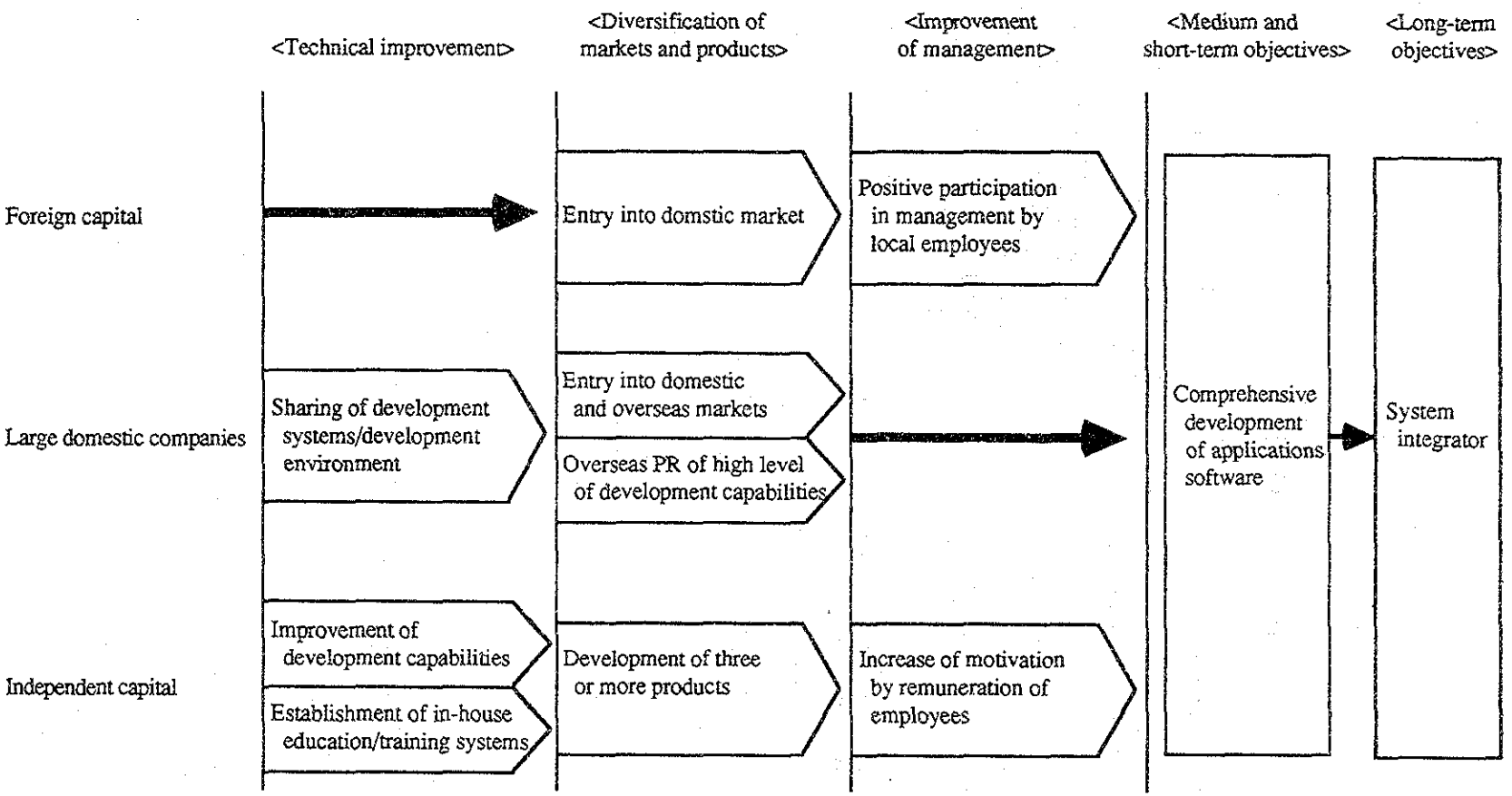
Note: Assuming development of protocol interface for connection of ATM/CD-host computers.

Table V-3-4: Example of Aid for CeBIT

Aid from CITEM (Note)	Burden of exhibitor
Booth charge	Participation charge: 4,000 pesos
Basic booth design, assembly, and decoration	Deposit: 4,000 pesos
Durables	Airline ticket and travel taxes
Employment of booth attendants and interpreters	Hotel charges and meals
Preparation of buyers' catalogs	Part of cost for preparation of brochures
Travel arrangements and other advice	Catalog of own company
	Packaging and shipment costs of samples
	Cost of food, beverages, and communications supplied at booth

Note: The assistance from Germany (total of DM 25,000) was used for booth charges and booth construction costs.

Fig. V-3-1: Targets to Be Achieved by Software Companies



4. Development Policy and Development Programs for Computer Software Development Industry

4-1 Foreword

Up until now, no promotional measures have been established based on clear development targets set for the computer software development industry as a subsector. The computer software development and data entry industries were designated in 1987 as nonpioneer status for investment, whereupon the government tackled promotion of these sectors. In 1988 and 1989, subsector surveys were performed in numerous subsectors to provide information on a sectoral approach to promotion. The computer software sector was surveyed together with the electronics industry and information service industry to obtain a grasp of the actual situation and study necessary measures for promotion.

No new policies have been developed, however, based on this subsector survey (put together as the 10 Year Sectoral Development Plan in 1990). Separate from the sector survey, the PCS, representing the private sector, proposed in 1988 the NITP (National Information Technology Plan) as a computerization plan for the country. This plan was approved by the President and survives as the basic concept for the country's computerization. Its implementation, however, has been considerably delayed due to lack of funds and lack of manpower.

4-2 Development Policies and Development Programs for Computer Software Development Industry

(1) Investment Incentives

Both computer software development and data entry were designated as nonpioneer status in the 1990 Investment Priorities Plan (IPP) based on the 1987 Omnibus Investments Code. To make use of investment incentives, a company must first register with the BOI. The requirements for registration of the BOI are as follows:

1. Computer software development: Over 50 percent of the sales of Filipino companies must be exported, while over 70 percent of the sales of foreign affiliates (companies with over 40 percent foreign equity) must be exported.

2. Data entry: The export ratio must be 100 percent.

The incentives offered after registration with the BOI are as follows:

1. Exemption from the income tax
2. Duty-free imports of machinery and equipment
3. Tax credit for purchases of domestic machinery and equipment
4. Exemption from the contractor tax
5. Streamlined customs procedures etc.

Table V-4-1 shows the companies registered as of July 1990. Of these, foreign affiliates or joint ventures account for five of the 16 computer software development companies and six of the 13 data entry companies.

(2) National Information Technology Plan (NITP)

1) Summary

The NITP was planned as a national computerization project for the Philippines

and is now in the implementation stage. The basic ideas incorporated in the project have existed before. Actual implementation is being performed under the NITP-UPDATE of 1989.

The basic objective of the NITP is to establish a national level of information technology in the Philippines so as to contribute to the development of the Filipino society and economy. The NITP has the following three general goals:

1. Establishment of an infrastructure for information and telecommunication as part of a national project
2. Improvement of productivity over all economic and industrial fields
3. Establishment of a support system for promotion of the development of the information service industry

Further, the NITP establishes programs for the following four fields:

1. IT (information training) in Government
2. IT in Industry
3. IT Education and Training
4. Telecommunication Infrastructure

2) IT in government

"IT in Government" is the project for promotion of computerization in government offices. The objectives of establishing information systems within government are to improve the government's service to the people and to improve its planning and implementation capabilities. The government expects to use information systems to provide necessary information for use in the policy-makng process.

The priorities in the IT in Government project are, first, promotion of the construction of a comprehensive information system at the government level and, second, promotion of computer networking among offices and sharing of data bases through the introduction of data communication technology. From the viewpoint of development of human resources, it further has the goal of promoting an increase in the employment rate of computer personnel and improvement of wages along with the construction of the information service system.

The NCC (National Computer Center) is developing software for computers for use in government offices and training of manpower and also has a role to promote the IT in Government project. The software it has developed includes wage payment systems for government workers, personnel management systems, accounting systems, and real estate management systems. It has already made progress in implementation of the program for educating government workers in computers.

While some plans under the NITP have been established and implemented, various problems are being faced overall. For example, a look at the number of personal computers in government offices shows there were 1,000 in 1986. The number installed as of 1989 rose to 5,000, but in total there is an absolute shortage of machines. Also, the personal computers are used standing alone with no mutual telecommunication functions. They are running just with word processing and simple spread sheets software. Up until now, computer resources have not been used effectively. At the very least, data and text should be transferred and converted by a LAN (local area network) connection to share data bases.

Further, as of 1988, there were 100 general-purpose computers, but almost all of these were medium or small in size. These systems are equipped with telecommunication

functions, but software resources cannot be used sufficiently. In terms of points of improvement, the most priority should be given to sharing data bases constructed among government offices.

The biggest problem facing the NCC will, again, be the shortage of manpower. In particular, there is a shortage in the absolute number of instructors for providing computer education to government workers. This is because the wages of instructors is much lower than in private companies and thus a sufficient number could not be secured and because even if the manpower could be obtained, there is no place to learn further advanced computer technology, so capability of instructors could not be improved. A second problem which should be noted is the lack of software for computer education (CAI: Computer Aided Instruction).

Further, in the process of software development in the NCC, there are not enough people capable of systems design and preparation of specifications. Another serious problem is the lack of absolute numbers of project managers for managing projects as a whole.

3) IT in industry

IT in Industry is the project in the NITP for building up general bases of, in particular, the computer hardware and software industries. This calls for promotion of the following industrial fields:

1. Manufacturer of hardware such as computers and telecommunication equipment
2. Software industry and consulting service companies
3. Data service companies
4. Hardware and software distributors

The overall goals of the project are:

1. Stimulation of the domestic market for information technology and development of an overseas market
2. Expansion of the scale of production of local companies
3. Fostering and promotion of domestic entrepreneurs

The biggest gap in the concept of the IT in Industry project is between the orientation of government policies and the perception of industry in general. These are considerably different. The companies may be ignoring the plans and policies, which they see as impractical, and want to go their own ways. That is, the perception among managers of software companies, in particular, seems to be that government is talking too much and doing nothing, that up until now, no specific projects have existed for promoting the industry, and even if there were specific projects, these would almost all be mainly for the large sized companies.

4) IT education and training

The basic concepts and goals of this project are as follows:

1. Training IT leaders in the government offices and private sector.
2. Improving the quality and increasing the quantity of IT engineers
3. Raising awareness of IT among the general public.
4. Raising the level of R&D in educational organizations
5. Promoting the Philippines as a regional center for IT education and training

At the present time, not much is being do to push forward with these projects.

This is because, as already mentioned on the functions of the NCC, a sufficient operating budget has not be obtained. The biggest issues are the striking shortage of manpower to serve as instructors in the educational organizations and the lack of computer education material. In particular, a big issue is considered to be the low wages of computer personnel and instructors in government offices and therefore the low retention rate of such personnel.

5) Telecommunication infrastructure

This project is based on the assumption of a plan for constructing a telecommunication network (voice and data communication) system covering the entire Philippines and has the following main concepts:

1. Establishment of a telecommunication system at the national level over all regions
2. Promotion of telecommunication service industries and support service industries
3. Laying of a digital trunk line and establishment of a switching center
4. Development of manpower in the field of telecommunications
5. Immediately establish appropriate telecommunication services in currently unserved area

Looking at the current stage of implementation, it may be said that almost nothing has been realized in this project either. The information HUB concept of making the NCC a switching center (see Fig. V-4-1) is the only project which has progressed. It will cost US$3 to 4 million for constructing the HUB and US$20,000 per trunk line for connection of the HUB and switching centers. Part of the infrastructure, the telecommunications sector, for the completion of this project may be set to be built.

4-3 Issues in Development Policies for Computer Software Development Industry

The NITP may be considered to be the basic plan of the Philippines for computerization. In it, the software development industry is designated as a key for promotion of IT in the government and all other sectors and is supposed to be promoted as a means for saving and earning foreign exchange. According to the Official Position Paper of the PCS, which proposed the NITP,

1. Due to the lack of experienced human resources, the optimum methods should be used. Therefore, the government should set up overseas based export companies to provide assistance in export promotion.
2. Incentives should be given for development of exportable software.
3. Certain restrictions should be placed on the entry of foreign capital, in particular, so as to prevent foreign capital from using existing human resources and not investing in training personnel.

The NITP itself is a national plan for promotion of computerization. The NCC, which has as its main function the computerization of the government, has a core role of implementation. However, it is considered necessary to clarify the following two points from the viewpoint of the promotion of the software development industry in the Philippines:

1. The Filipino computer software development industry should be encouraged to play a key role in the computerization of the country. At the present time, however, the software development industry is at a level higher than required for the computerization of the Philippines. Also, it is developing as an industry aimed at exports rather than the domestic market.

2. The delay in computerization in the Philippines, however, is hampering the improvement of the technical capabilities of the software development industry. There are limited companies equipped with the development capabilities of the high levels demanded by export markets. Computerization of the Philippines will only become possible with vital activity of the economy as a whole. The promotion of the software development industry, however, cannot be delayed until the promotion of computerization as a whole. Plans for promoting the industry are necessary from this viewpoint.

Also, from this perspective, study is necessary as to whether the implementing authority for this promotional plan should be the NCC. That is, an organization is necessary which can propose basic policies on the following and monitor their progress:

1. Export promotion
2. Investment promotion
3. Promotion of small and medium sized enterprises
4. Promotion of software development as an industry

It is necessary to study whether a single organization would be suitable. The NITP calls a high level inter agency organization called the ITIB (Information Technology Industry Board) rather than the creation of a new organization. In regard to coordination, an organization like the ITIB is necessary, but it is considered that a single government organization which have responsibility over sustained implementation of policies and moniter implementation is necessary.

4-4 Government Organizations and Industrial Organizations

(1) Government Organizations

The main government organizations relevant to the computer software industry are the NCC, which serves as the administrative bureau for the NITP, the Industry Group/BOI, an organization in the DTI, the BETP, and DOST in the aspects of industrial technology. The DOTC is also involved in respect to telecommunications.

None of these government organizations, however, are in a position to take the lead in planning or proposing policies for this industry. Each is responsible only for its own fields. In this sense, it is necessary to have organizations responsible for the sectoral approach mentioned previously, which would propose comprehensive policies for the long term visions of the subsectors and would monitor and correct the policies. The Industry Group of the BOI, which has inherited the organization of the Ministry of Industry, may be most optimally positioned in this respect, but at present it is organizationally insufficient and requires strengthening particularly in the following respects:

1. Obtaining a grasp of the state of the entire computer software industry, not just companies registered with the BOI: It will be necessary to obtain a grasp of the state of the industry periodically in the future as well based on results of the previously conducted subsector survey and this survey.
2. Collection of industrial statistics
3. Establishment of a system enabling analysis of the socioeconomic effects of policies planned and proposed, including trade and small business policies
4. Establishment of a system serving as the overall administrative bureau for coordinating industry and related government organizations in matters relating to the computer software industry

(2) Implementation of Industrial Development Plans and Industrial Organizations

1) Current state of industrial organizations

Industrial organizations relating to the computer software industry sector include the PCS, PSA, PADEC, and the ITAP. The objectives of these organizations differ with the respective organizations.

The PCS considers itself to be a professional organization of managers or key staff of the information technology industry and draws members from not only the software industry, but also suppliers, users, and the educational sector. The PCS was launched in 1967 as the Data Processing Management Association of the Philippines and was reorganized to the PCS in 1978. The PCS has about 400 members and focuses on 1) exchange of information, 2) mutual training, and 3) activities representing the industry. The PCS is recognized as the official representative of the industry in the Philippine's computerization and formulation of programs. The NITP, the overall plan for development, was proposed by the PCS.

The PSA is an industrial organization of software development companies. It has only a small 11 members out of an estimated total of 150 software companies. However, the PSA estimates that its member companies perform about 70 percent of all activities in the software industry.

The PADEC is an industrial organization of data entry companies and was established in 1987. It has 14 members, again a low rate of membership, but estimates that it represents 80 percent of all the data entry companies.

Both the PSA and the PADEC primarily engage in the exchange of information and representation of their industries. The PSA, as mentioned earlier, however, not only has not sufficiently organized the small sized enterprises, but lacks participation of the foreign affiliates and several large companies in the field, which are considered the leading software development companies in the Philippines.

In general, in the computer software industry, small sized enterprises are able to start up business relatively easily and it is extremely difficult to raise the rate of membership for businesses centered on individuals. Further, among the foreign affiliates and large sized firms there are many companies which are able to secure enough customers even without participating in industrial activities to jointly promote the industry. This makes organization of the industry even more difficult.

The PCS is the organization representing the computer industry of the Philippines, but has only a few members engaged in the software development industry. Further, this industry is very individualistic by nature and it is difficult to obtain a single consensus of the industry.

2) Implementation of industrial development plans and industrial organizations

At the present time, the following are performed by the organizations:

1. Summarization of opinions of industry and submission of proposals
2. Implementation and coordination of programs jointly with related government organizations

The PCS, PSA, and PADEC act jointly in matters relating to the software industry. The cooperation for the subsector survey run in 1987 and 1988 was channeled through the PCS. The three organizations, further, jointly undertook the corporate survey run as part

of the study implemented by JICA Study Team.

To strengthen the software industry in the future as an export industry, it is considered that the industry must further study activities covering the following:

1. Statistical surveys for obtaining grasp of state of industry
2. Tieups with corresponding overseas industries, exchange of information, surveys, and feedback of results to members
3. Formation of foundations for financial guarantee or mutual benefit system

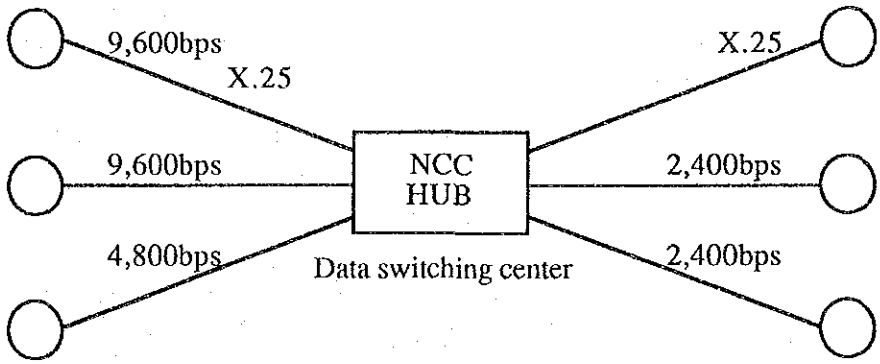
These would be considerably difficult under the present conditions, however, and it is considered that government encouragement would be necessary for a while.

Table V-4-1: BOI Registered Companies

(Computer software)	(Data entry)
1. AYALA SYSTEMS TECH., INC.	1. ASEC INFO SERVICES, INC.*
2. COMPUTER SOFTWARE SERVICES, INC.	2. ASEC INTERNATIONAL, INC.*
3. DATA SYSTEMS SERVICES, INC.	3. ASIAN DATA ENTRY CORPORATION
4. EGB SYSTEMS, INC. (PHILS.)*	4. CIBI-ARDY INTERNATIONAL (PHILS.)*
5. MAGNACAD DESIGN TECH., INC.	5. DATASCOPE COMM., INC.*
6. PACT GROUP, INC.	6. DATA SOLUTIONS, INC.
7. PASCO-CERTEZA COMP. MAPPING CO.*	7. EQUIDATA PHILS., INC.*
8. PHIL. BUSINESS AUTOMATION SYSTEMS	8. FIRST INTERNATIONAL DBASE CORP.
9. PROGRAMMING IMPACT (PHILS.), INC.	9. GLENPRO DATABASE CORPORATION
10. SARTE, TEODORO & ASSOC. CO., INC.	10. LITIGATION INTL. TECH. ENT., INC.
11. SERVITECH, INC.*	11. SAZTEC PHILS., INC.*
12. SOFTWARE VENTURES INTL., INC.	12. SOFTWARE VENTURES INTL., CORP.
13. SGV & CO.	13. UNIDATA COMPUTER CORPORATION
14. SYSTEM FOR PHILS., INC.*	
15. SYSTEMS RESOURCES, INC.	
16. TSD SOFTWARE, INC.*	

NOTE: ASTERISKS INDICATE FOREIGN AFFILIATES

Fig. V-4-1: Data Communications HUB Concept of NCC



5. Framework of Development Program for Computer Software Industry and Recommendation on Implementation

5-1 Framework of Development Program

5-1-1 Computer Software Development Sector

(1) Establishment of Targets of Development Program

In general, a software development sector develops in tandem with that country's computerization. Therefore, the development targets for the software development sector often are studied as part of that country's computerization plans. In the case of the Philippines, however, the country has not made sufficient progress in computerization itself and, rather, computer software development has gone ahead with the aim of meeting export demand.

The computer software development sectors of Japan and the U.S. are, on the other hand, suffering from severe shortages of engineers. This shortage is expected to further worsen in the years ahead, forcing companies to farm out as much work as possible overseas or improve their hardware environments and software development environments so as to deal with the shortage.

In view of this situation, the Philippines must establish a development program which focuses on this overseas demand.

In the short term, the following points should be stressed:

1. Positioning the industry as one of the key export industries and raising the share of the Philippines in the U.S., Canadian, and Australian markets to an extent where the presence of the Philippines in the market is fully recognized. Further, laying a stepping stone for entry into the Japanese market in the future.
2. Targeting the improvement of software development technology, in the short term, to raise the level of development of applications software. That is to raise the technical level of the industry as a whole so as to enable the Philippines to handle the parts of development work now being handled by the companies placing the orders.
3. Establishing an educational system to supply computer engineers of a high level of expertise so as to be able to handle any future expansion of demand.

In the medium and long term, the following points should be stressed:

1. Establishment of a strong position in the U.S., Canada, and Australia. Aggressive entry into the Japanese market.
2. Further improvement of software development technology and achievement of a level of expertise enabling orders for development of applications software to be obtained independently. Further, for the long term, working to improve technical capabilities so as to enable entry into systems integration.

(2) Estimate of Export Demand

As already mentioned, it is extremely difficult to obtain a grasp of the actual export amount for software development due to the large number of small sized companies and the use of international data communications and the mail for business.

1. According to estimates of the PSA, exports stood at US$5 million in 1987. Also, the PSA set a target of US$100 million for 1990.

2. The BOI registered companies (16) recorded total exports of about US$3.5 million (1989), but there are numerous cases of software development companies not registered at the BOI receiving orders from abroad, so the actual amount of exports may be several times that figure.
3. Further, from the results of a questionnaire survey, there are an estimated total 2,000 to 3,000 programmers, SEs, and SAs. If the per capita export is US5,000, then total exports would come to US$10 to 15 million.

Judging from the above, current exports are estimated at US$10 to 20 million.

If 70 to 80 percent of the US$10 million is orders from the U.S., this would be only less than a 0.05 percent share of the U.S. software development market. In this way, from the viewpoint of the market share, it is considered well in the realm of possibility to increase orders from the U.S., but considering the current number of workers, the level of development technology, and productivity, there are, rather, problems in the ability of the Filipino software development industry to receive orders.

(3) Basic Perspective in Development Strategy

1) Basic perspective in strategy

The Philippine computer software development sector already has a certain degree of export experience, but has not taken full advantage of the good opportunity posed for export expansion by the shortage of engineers seen in the industrialized countries. As a reason for this, it may be mentioned that the development capabilities of the Philippins and the state of the Philippine companies which should be contacted are not clear to overseas customers due to the lack of marketing effort. Activities for dealing with this must be launched immediately.

With just strengthened marketing efforts, however, the limit would immediately be reached in expanding exports. The shortage of software development engineers in the industrialized countries, mentioned earlier, is serious at the SE/SA level, in particular upper and middle level SE/SAs. If the Philippine industry does not develop for itself the technical capabilities necessary for meeting such needs, there will not be any increase in demand which could be met by exports from the Philippines.

For the international competitiveness of the software development industry, in addition to factors such as technical expertise and development costs, nonprice competition factors such as the strict observance of delivery schedules demanded by users, careful response to requests for changes of specifications of diverse designs from the customers are important. This would be difficult to achieve without support to the industry through improvements in policy and institutions, such as establishment of the infrastructure, i.e., improvement of the telecommunication facilities and provision of a stable power supply, and ease of transfer of documents and devices.

The development program for the software development industry proposed below would:

1. Make the export markets aware of the presence of the software development industry of the Philippines through export promotion activities,
2. Increase the opportunities for participation in export software development work and raise the interest of software development companies in improving their technical level,
3. Mobilize all possibilities to increase the opportunities for participation of the Filipino software development companies in domestic software development projects as well, and

4. Improve in areas of infrastructure, the support system of policy, and institutions and the system of education for supplying engineers.
   This type of backup by the government could not at all be excessive in view of the high potential for exports by the industry.

Japan presents the next largest market after the U.S. and is promising as an export market. However, when considering expanding exports to the Japanese market, measures must be taken to overcome the language barrier. The level of Japanese language used in the process of research and analysis in software development and the basic design process of systems is considerably sophisticated and it would probably take many years for a foreigner to acquire that level of Japanese. It is important to overcome this by some way or another.

2) Importance of creation of opportunities for accessing export market

Software development companies in the U.S., Canada, Japan are strongly interested in farming out software work to the Asian region, but the Philippines is just one of the many countries in the Asian region, as already mentioned. On the other hand, judging from the companies which already have business relations with the Philippines, the advantageousness of the Philippines with its high educational level, English speaking ability, and inexpensive labor force has been confirmed. Nevertheless, overseas software development companies which have tried to set up contacts up until now feel, from their experience, it fairly difficult to find suitable channels in the Philippines. Further, software development companies in the Philippines feel it difficult to find suitable clients as well.

In this way, the objective situation is thus: the industrialized countries are suffering from shortages of manpower and are facing growing software demand, so the conditions for software development exports by the Philippines are falling into line, but there is extremely insufficient access to the export markets. It is important that this problem be quickly resolved. If the business opportunities among individual companies increase as a result, awareness by companies of the needs of the export markets will also grow and the effect of greater incentive in improving technology could be expected.

3) Importance of opportunities for development of advanced software domestically

For the software development companies of the Philippines to win high marks in the export markets and increase the scope of orders they receive, they must by all means try to improve their development capabilities. Improvement of capabilities in development technology would be made possible for the first time by participation in much sophisticated development work. As already mentioned, however, the Philippines is still insufficiently computerized and has not yet reached the stage where it provides, on its own, sufficient opportunities for technical development. Considering this point, it would be extremely effective if the government would create such opportunities by launching large scale development projects, which would contribute to raising the level of software development companies.

The implementation of such projects would also be effective in promoting the overall computerization of the country and thereby could be expected to further increase the software development opportunities. This synergistic effect of promoting computerization and increasing software development opportunities make a balanced development method. The creation of opportunity by the government is important. If it is difficult to create such development opportunities, then consideration may be given to establishment of a facility offering training in advanced development technology. In the future, such a facility would have to offer training and be able to contribute to the promotion of the computerization of the country as well.

(4) Recommendations on Development Programs

1) Framework of development programs

As mentioned above, measures in the following key areas are important for the effective promotion of the computer software development industry as an export industry:

1. Increase of opportunities for access to export market
   a. Strengthening of access to overseas software development industry
   b. Measures to cope with Japanese language barrier so as to promote receipt of orders from Japanese market
2. Opportunities for development of advanced software to improve technical capabilities
3. Improvement of infrastructure
4. Training of Engineers

2) Increase of opportunities for access to export markets

The software development companies of the Philippines are still only engaged in a limited range of overseas marketing activities. In the case of foreign affiliaetd software development companies, the parent companies handle the marketing activities and cannot be said to be engaging in activities to introduce Filipino companies to the overseas markets. In particular, the independent development companies, which it is hoped will serve as the centers of development of the software development industry of the Philippines in the future, are still in many cases passive when it comes to overseas marketing activities.

On the other hand, the survey of Japanese software development companies, run during this study, found that 37 of the 65 companies responding desired information on the state of the Filipino industry, the information they requested being "technical level", "details of companies", "prices", "transaction records", "system of guarantees for products delivered", and "personnel costs", stretching over a wide range of matters. One cannot say, therefore, that the state of the Filipino industry is widely known in the potential market.

Therefore, in the short term, it would be effect to try to make maximum use of the current export capabilities through receiving missions of software development companies from export destinations and through such activities establishing a system enabling systematic and sustained overseas marketing activities, which have up until now been carried out piece meal. The following activities would be effective to achieve this goal:

1. Creation of opportunities for contact with individual Filipino companies by receiving missions of software development companies from export destinations to the Philippines

2. Establishment of system for overseas marketing activities by Filipino side during this process

   a. Establishment by government and private sector of organization for sustained and systematic overseas marketing activities
   b. Preparations and support to individual companies to enable them to handle tieups with and inquiries on orders from overseas companies

In promoting orders from the Japanese market, first of all consideration may be given to orders for work in fields not requiring the Japanese language, for example, CAD/CAM, numerical control systems, OS conversion, and utility software. Also

possibility would be orders for software development work from Japanese affiliates situated in the U.S. and other English speaking countries. To exploit the Japanese market in earnest, however, it is essential to take measures to overcome the language barrier, as mentioned later.

That is, when receiving orders from the Japanese market, conversion from the Japanese language to English language is necessary at some stage in the specifications. The Japanese language ability required for research and analysis and for basic system design is extremely advanced and it would be almost impossible to reach this level of ability with just short term Japanese language training. Translation of documents written in Japan into English, however, would be possible with just a certain level of Japanese language training.

On the other hand, the Japanese side has limited manpower which could provide instruction in English to the Philippines. Having this limited manpower made common use of by numerous companies in the Japanese and Filipino software industries so as to reduce the current obstacles must be considered over the long term.

Therefore, in the future, a marketing company with such a function should be set up as a joint venture and made to serve as a bridge between Japan and the Philippines. At the same time, Filipino staff able to handle this work should be trained and the range of development work handled by the Filipino side gradually expanded.

It should be noted that this type of thinking has recently appeared in relations with Japan and China. According to the January 21, 1990 issue of the Nikkei Sangyo Shimbun, the largest computer software company in China, CS&S, is formulating detailed plans for establishing a joint venture in Japan and developing the Japanese market in cooperation with private Japanese firms. In the past, there have been more than 30 examples of Japanese companies setting up operations in China in search for manpower, but this will be the first time that the Chinese set up operations in Japan. In past investments by Japanese companies in China, the Chinese joint venture partners had previously formed relations with specific Japanese companies by working on development projects for them. Through the new companies, they have increased the software development work from Japan, bringing the work back to China for development there.

3) Improvement of technical capabilities through implementation of large scale software development projects

Leaving aside special cases of orders from affiliates, overseas orders for software development already come with a considerable amount of specifications at the stage where they are given to Filipino development software companies. This means that considerable systems analysis and design are performed by the original orderer. As already stated, however, the industrialized countries are suffering from increasingly severe shortages of software development engineers such as SEs and SAs of a high technical level able to handle the work now being performed by the original orderers.

Regarding the types of software development services, demand will probably increase for work such as development of network services and systems integration, which require a higher level of technical expertise than the development of applications software now being ordered.

It is important to raise the level of technology to enable these needs of the market to be met. In particular, the independent large sized software development companies (Group C1), which will probably become the centers of software development ordered to the Philippines in the future, and independent small and medium sized software

development companies (Group C2), which must shoulder the role of supporting such services as subcontractors, must strengthen themselves so that they can fully handle development of software used in mainframe and minicomputer level environments.

To improve technical capabilities, it would be most effective to actually participate in software development of a high technical level. This may be seen in the experience of many advanced countries. In the case where there is insufficient opportunity for software development domestically, as in the Philippines, it is necessary to establish such large scale projects themselves and create such opportunities. That is, it is necessary to conceive of projects for development of large sized systems which might be useful in the Philippines and develop technical expertise through the participation of private sector software development companies in such projects. From the projects now being envisioned among computer related people in the Philippines, mention may be made, for example, of 1) establishment of a computer system for official documents of government organizations and 2) connection of large sized computers of the NCC and UP and sharing of systems.

There are many other projects as well and effort is required in the study of these jointly by the public and private sectors, the selection of suitable projects, and the implementation of the same. These projects in many cases would be very difficult to realize as they require massive funding. On the other hand, regarding the software development work accompanying aid projects from other countries, it is necessary not to rely on overseas software development companies, but to give as much development opportunities to domestic companies as possible.

4) Improvement of infrastructure

The main infrastructure required for software development work include 1) the hardware environment, 2) telecommunications environment, and 3) power supply. A software development and technology institute mentioned later should be availed for this purpose.

Among these, the hardware environment could be improved by 1) establishing individual companies, 2) sharing certain facilities, 3) lending out existing facilities for use, and other methods. The project for connection of large sized computers by the NCC and UP and sharing of systems would also be effective for this purpose.

Stabilization of the power supply is important for improvement of productivity in the software development industry and for observance of delivery schedules. Right now, what companies can do to deal with the problem is to install emergency power supplies. If necessary, assistance for this kind of investment should be considered.

Regarding the telecommunications environment, recently PT&T has laided a packet switching network, enabling communications between computers by the X.25 system. The completion of the network has meant considerable improvement.

5) Training of engineers

The future development of the software industry requires the systematic and sustained training of engineers. Training of engineers would include:

1. Training in universities, computer schools, and other educational institutions
2. Improvement of quality of staff of software development companies

Particularly important in the training in universities, computer schools, and other educational institutions would be the improvement of the quality of the education. This

would require

1. Improvement of the hardware environment of educational institutions
2. Invitation of instructors from abroad or dispatch of instructors overseas for training so as to raise the level of quality of instructors

To upgrade the technical capabilities of staff already working in the area of software development, actual participation in sophisticated development projects to build up experience would be best, as already mentioned. Further, introduction of an accreditation system to provide the incentive for self improvement would also be effective in the sense of setting goals for improvement of technical expertise. Further, this could be used as a means for publicizing to the outside the human assets of the software development companies of the Philippines. To achieve these objectives, the following are proposed:

1. Improvement of technical capabilities through implementation of large scale projects (mentioned earlier)
2. Establishment and operation of organization for the continuous dispatch of trainees overseas

3. Establishment of computer software development and technology institute (mentioned earlier)

4. Establishment of EDP testing system

5-1-2 Data Entry Sector

The data entry sector is one whose great advantage weapon is its low cost labor force. In addition, in the case of the Philippines, there is the further attraction, for the clients, that the workers are familiar with English and keyboards. There is still insufficient marketing activity to inform the potential markets of these features of the Philippines.

The Philippines is not the only country with these advantages in data entry. In the case of the U.S., the most important market for the Philippines, there are already competitors with similar conditions such as Jamaica and India. It is not considered that labor costs will soar in these countries in the near future. Further, those countries continue to make effort to strengthen their competitiveness. Therefore competition will be increasing fierce in the future. In such a case, in addition to cost competitiveness, improved telecommunications facilities would be an important factor in strengthening competitiveness. The existence of the telecommunication facilities necessary for transferring the work would, it is considered, be extremely effective in drawing the attention of companies to the Philippines. It is necessary to establish the infrastructure for this. Note that in the data entry industry, it is considered that there will be rapid progress made in the use of OCRs, voice recognition entry, and other forms of mechanization and the demand for human entry will not grow that much. Therefore, massive public investment should not be made to provide the support to the data entry industry alone.

Regarding data entry for the Japanese market, there is a language barrier. To increase orders for data entry work from the Japanese market, a plan to have the operators learn Japanese is questionable in terms of costs due to the difficulty in mastering Japanese. Further, the biggest sources of data entry work, the banks and securities companies, do not like to release data outside due to the need to maintain confidentiality. From this viewpoint, it is considered very hard to develop the Japanese data entry market as a new market. However, there have already been cases of orders from Japan of data entry work not hampered by the Japanese language problems. It is necessary to have marketing effort to look for such kind of work in the near future.

The implementation of the following development plan is proposed in line with the above:

- Strengthening of overseas marketing activities

5-2 Recommendation on Implementation of Development Program

(1) Foreword

As already mentioned, the NITP is accepted in the public and private sectors as the basic plan for computerization of the country, but has been considerably delayed due to the lack of budget and manpower. It is extremely important how successfully the plan is implemented.

First of all, in the implementation, it is necessary not to focus on individual projects, but to obtain a sufficient grasp of the roles to be played by the individual projects in the overall plan and to implement them tied together.

Next, it is necessary to establish a system of responsibility over the implementation. A system is required to ensure the various preparations and coordinations go smoothly. Such organizations given responsibility would have to positively work to ensure activities go smoothly for raising the necessary funds.

Below, a discussion will be made of the relationship among the project functions and a proposal made on how to bring out the overall effect by the implementation of the programs. Further, a proposal will be made of the order of implementation and schedule of implementation. Finally, a proposal will be made on how the implementing system should be set up.

(2) Stages of Development of Computer Software Development Industry and Necessity for Implementation of Program in Accordance with Stages

The current stage of the software development industry of the Philippines may be summarized as follows:

Advanced companies which have acquired development capabilities through domestic software development and orders for software development from abroad are becoming actively engaged in export activities, but the majority of the companies have little opportunity of access to export markets and do not have sufficient business chances. Almost all of the development work for which they receive orders is not complete orders from the final customers, but orders except for the basic design portions.

On the other hand, the Philippines is still not sufficiently computerized and computerization has not yet reached the stage which it can function to induce a higher technical level in the software development industry.

The most important task at this stage is to facilitate access of companies to export markets and to increase opportunities for development work so as to spur the buildup of experience in development work by companies and raise their technical level. Further, in the initial stage, implementation of a public project, including software development, aimed at increasing opportunities for development work would be effective.Alternatively, if implementation of such a public project were considered difficult or insufficient, it would be worthwhile to study the establishment of a training institute aimed at transfer of advanced software development technology.

At the stage where export activities of individual companies pick up on a commercial basis, it will be necessary to 1) improve the infrastructure affecting the export competitiveness of individual companies and 2) ensure a supply of the engineers required for an expansion in the volume of work. When the first stage has gotten underway, it will be necessary to establish the fund raising system required for companies to renew and introduce new machinery and equipment to meet with the increase in business opportunities. (Fig. V-5-1)

(3) Necessity of Bringing Out Comprehensive Effect by Efficient Implementation of Related Programs

1) Increase in opportunities for market access

The first requirement which may be mentioned for increasing market access opportunities is the clear designation of a suitable channel on the Filipino side for starting contacts with suitable organizations in the target countries. After this, the opportunities secured must be effectively organized and made use of. The "strengthening of access to the overseas software development industry" is in line with this. Further, contacts among individual private companies may be expected to become more frequent as a result of these activities. To deal with the language and other problems faced when approaching the Japanese market, however, desirably there would be an organization which could serve as a bridge between Japan and the Philippines. If private companies cannot come up with the investment for such a commercially high risk organization, however, the government and private sector would have to take the lead and establish that organization. The "establishment of a marketing company as a means for coping with the language barrier in the Japanese market" is a suitable project for this purpose. Further, the implementation of a "public project accompanied with large scale software development" and the "establishment of a computer software development and technology institute" would serve to boost the development capabilities of the Philippines and could be expected to have indirect effects as well.

2) Improvement of development capabilities of software development companies

The most effective measure for improving the development capabilities of private companies and individuals would be to increase the opportunities for software development work requiring advanced development capabilities. "Strengthening access to overseas software development industries" and implementation of a 'public project accompanied with large scale software development" would also contribute to the increase of such opportunities. The "establishment of a marketing company as a means for coping with the language barrier in the Japanese market" could be expected to have similar effects through the expansion of opportunities for receiving orders for development work from the Japanese market. Further, at a stage like the present where there little opportunity for work, the "dispatch of personnel overseas for long periods of training" should be taken note of from the viewpoint of acquiring development capabilities through development work overseas. The establishment of a "computer software development and technology institute" takes the difficulty of creation of opportunities for development work into account and would attempt to realize development opportunities through training instead.

3) Improvement of system of supply of engineers

Regarding the preemployment training for the supply of engineers, judging from the fact that more advanced engineers are required at present than mere programmers, it is necessary to stress education at the university level. That is, it is recommended to improve the level of computer education in the universities and train better instructors through the "invitation of instructors from overseas for computer education in universities or the dispatch of instructors overseas for training" there.

Further, the "establishment of a computer software development and technology institute" would train such instructors, and training advanced engineers in private sector and simultaneously would help improve the environment for access of university students and engineers in software development companies to computers. As mentioned earlier, under present conditions where there is a shortage of advanced development work, it would be effective to "dispatch personnel overseas for long periods of training" so as to train computer software engineers. An EDP engineer testing system, it is considered, would stimulate the self improvement of technical level by individuals aiming at a higher technical expertise by the use of the opportunities mentioned above.

4) Improvement of infrastructure

The infrastructure considered most necessary for software development in the Philippines at the present time is access to mainframes. The establishment of a "computer software development and technology institute" would enable access by software development companies to hardware owned by the institute and therefore would establish the conditions for this.

(4) Recommendation on Implementation Schedule and Priorities

1) Foreword

Below, short-term programs are programs for which it is desired to start work or start preparations for immediately, and projects for which it is desired to start preparations for immediately are those which presume further consideration as to necessity, feasibility, profitability, etc. in the process of preparation. Medium and long term programs are programs for which immediate commencement of work or commencement of preparations are not deemed necessary at the present time, but which are recommended to be started along with the development of the computer software industry.

In addition, separate study is required as to the new establishment of a financial guarantee system for small and medium sized companies and a development financing system.

2) Short-term programs

a) Projects for which immediate implementation is recommended
1. Strengthening of acess to overseas software development industry
2. Invitation of instructors from abroad or dispatch of instructors and students overseas for training
3. Continued dispatch of trainees overseas for long periods

b) Projects for which immediate preparation is recommended
- Establishment of computer software development and technology institute

c) Projects for which start of preparations after proper conditions are established is recommended
1. Implementation of public project accompanied with large scale software development
2. Establishment of marketing company as means to cope with language barrier in Japanese market

3) Medium and long-term programs
- Introduction of EDP engineer testing

4) Priority projects

The programs mentioned above are all projects which are considered could play important roles in the various stages of development of the computer software industry. Considering fund raising and the current state of the implementing system, however, it is possible that only a limited number of projects can be implemented. In such a case, projects must be limited to those which would be the key to future development and hopes must be placed on the autonomous effort of the private sector along with the subsequent industrial development.

From this viewpoint, it is considered that the project for strengthening access to the overseas software development industries should be first tackled as the key to future development of the industry. This project would publicize to the overseas computer software development industries, which are suffering from marked shortages of personnel, the possibilities offered by the Filipino development industry, and would be important in laying the foundation for future growth such as by promoting orders and dispatching trainees. With regard to the implementing system, the industry could be fully expected to be eager to tackle the project.

The following two projects are important for the development of the industry, but, as mentioned earlier, there is a problem in that not much can be expected in terms of establishing a plan promoting system for helping realize the project or positive activities for realizing the project.

1. Establishment of marketing company as means to cope with language barrier in Japanese market: This project could be expected to help maintain continuous relations with the Japanese software development industry and promote computer software development in the Philippines. To realize the project, it is necessary to find Filipino and Japanese companies or organizations which were the center for establishing the marketing company. At the present stage where the existence of demand still cannot be confirmed by both Japanese and Filipino sides, it would be difficult to expect individual companies to embark on such a project, so consideration should be given to having the industry as a whole deal with it with some government participation. In the future, based on this precedent, similar companies could be expected to be established at the private level.

2. Implementation of public project accompanied with large scale software development: This project has as its main goal the provision of advanced software development opportunities to software development companies. This would contribute to the improvement of the level of technology and partially upgrade the software development environment, thus helping raise the ability of software development companies to win orders. However, a financial support is necessary to realize it. This type of project would provide software development opportunities and simultaneously would be very meaningful in the computerization of the Philippines. Further, it would lead to upgrading of the software development technology of the Philippines. Considering these points, relevant organizations must positively study how to implement this plan.

Preparations for these projects desirably should be started after the requisite conditions for the same are established.

Considering the difficulties involved in implementation, the "establishment of a computer software development and technology institute" desirably should be made a priority project. This project has as its object the training of engineers with advanced software development technology in the Philippines, where there is insufficient computerization, and contributing to the establishment of a proper hardware environment,