which is now sorely lacking. Further, Japanese language courses and training in Japanese business practices could be added as means for facilitating access to the Japanese market.

(5) Recommendation on Implementing System

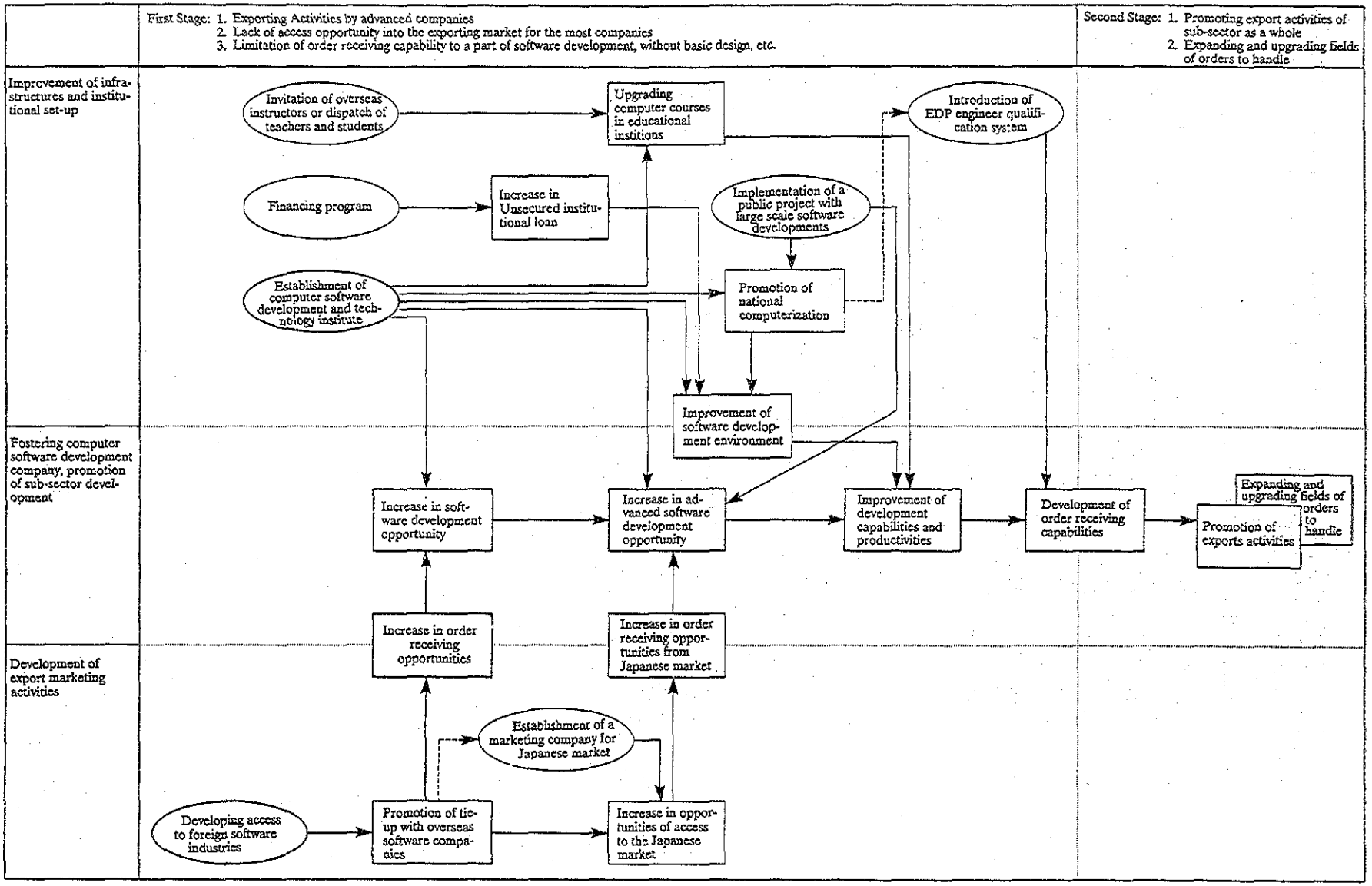
There are numerous steps before implementation and there is linkage among the individual projects. Further, some programs are planned assuming the implementation of other projects. Therefore, in the implementation of programs, it is essential to establish an implementing system with suitable management and coordinating functions. It is necessary that in the system, suitable organizations perform their specified functions in accordance with the overall implementing plan. In the implementation of the programs, the following two organizations are proposed for the implementing system with overall promotion and coordinating functions.

1. General administrative bureau: This would obtain a grasp of the state of progress of the projects and, when necessary, would convene and coordinate related organizations and modify the projects. In the NITP, the NCC functions as the overall administrative bureau, but this program is not aimed at computerization but is aimed at the promotion of the software development industry, so it is preferred that the BOI Industry Group serve as the center of activity on the government side. Further, all programs by nature require that the private sector take the lead or else would not be effective. From this viewpoint, it is necessary to add representatives from the PCS, PSA, and PADEC.

2. Advisory committee: The above-mentioned administrative bureau would convene this periodically. The administrative bureau would report to the committee on the state of the activities and the committee would provide recommendations and support for the activities. The committee would desirably be comprised of representatives of the BOI, DTI Planning Group, BETP, NCC, and DOST and industry representatives drawn from the PCS, PSA, PADEC, ITAP, etc. The representatives would endeavor that the organizations they represent take action based on matters agreed on at the committee.

The implementing system for the individual projects will be explained in Chapter 6.

Figure V-5-1: Computer Software: Development Stage and Expected Effects of Each Project



6. Development Program for Computer Software Industry

Table V-6-1 shows the development programs and their relationships with the recommended projects. The contents of each project as well as requirements and recommendations for their implementation are shown in Table V-6-2.

6-1 Increase of Opportunities for Access to Export Markets

(1) Strengthening of Access to Overseas Software Development Industry

1) Outline of project

a) Outline

Missions of overseas software development industries would be invited to the Philippines and through them Filipino development companies introduced and chances created for business at the private company level. Simultaneously, a base would be laid for export marketing by Filipino development companies. Also, a permanent channel to the export markets would be established.

The following activities would be engaged in to achieve this objective:

1. Organization of Filipino development companies for receiving missions of overseas software development companies and preparation of self introductory materials of individual companies
2. Receiving, mutual introductions of industries, and promotion of business among individual companies
3. Establishment and activities of followup organization

b) Requirements of project

To achieve the objectives of this project, it is considered that at least the following requirements be fulfilled:

1. Assistance by the government to such activities, with the activities determined and organized primarily by the private sector
2. In receiving missions, careful preparations at both the individual company level and industry level so as to enable full publicity of unique features of the Filipino development industry
3. Organization of followup activities and plans for operation of same

c) Reference matters in implementation of project

1. As part of the preparations for receiving missions at the individual company level, it is important that companies prepare the following self-introductory kits on their own. Support in this would be desirable. The kits would not only be used when receiving missions, but would also be necessary when those companies engaged in their own overseas marketing activities.

   a. Company profile: Detailed descriptions including financial data
   b. List of development record: Names of projects, hardware used, summary of projects and others
   c. Skill sheets of key staff

2. In requesting other countries organize and dispatch missions, measures would be

necessary to increase the effectiveness such as sending to the other side in advance materials introducing Filipino members and requesting that the other side send materials introducing its industry.

3. Effective activities of the missions in the Philippines would include:

   a. Introduction of their industries from an overall standpoint
   b. Visits to individual Filipino development companies
   c. Individual business meetings

4. Both the other side and the Filipino side would group the companies according to 1) the hardware handled by the companies (for example, IBM type) and 2) the type of work specialized in (for example, banking, distribution, etc.) and would prepare presentations.

5. Receiving such missions would create business opportunities. These would desirably be continued and developed on and the business expanded. Toward this end, the liaison council made up of the hosting companies and its administrative bureau would remain as permanent organizations even after end of the missions so as to engage in continuous followup activities and marketing activities in export markets. Specific activities could include the following:

   a. Dispatch of missions and participation in exhibitions: Planning of dispatch of missions jointly with CITEM and participation in software related exhibitions. As part of this, holding technical seminars in places where missions are dispatched and where exhibitiosn are held so as to publicize the Filipino industry
   b. Cooperation in receiving missions to the Philippines from other countries
   c. Strengthening of exchanges with other countries: Positive participation in international conferences relating to software and, further, promotion of exchanges with industrial organizations of other countries through the ASOCIO (Asian-Oceanian Computing Industry Organization)

6. When receiving missions from Japan, it might be possible to require that the JIPDEC serve as the channel for organizing the industry, the JISA serve as the administrative bureau for this, and that JETRO or another organization serve as the channel for communication of the Japanese side in the Philippines.

2) Recommendation on implementation

a) Implementing system

1. Promotion of project: CITEM desirably would handle the planning and proposals. However, it would be necessary in planning of contents of activities that the private sector make the preparations or that the private sector positively participate in the implementation.

2. Implementation: Companies agreeing to receive missions would be solicited from among the software development companies of the Philippines and organized into a liaison council. This council desirably would serve as the main entity in implementation. Note that an administrative bureau for the activities would have to be set up from representatives of members of the liaison council and the CITEM.

b) Schedule

This would serve as the start of the overall development program and should be commenced immediately.

(2) Establishment of Marketing Company for Coping with Language Barrier in Japanese Market

1) Outline of project

a) Outline

Regarding the possibilities of receiving orders from Japanese companies, as already mentioned, there are areas in which the English language is not required. If trying to secure long term, sustained orders from Japan, however, then a study must be made of establishment of a marketing company which function to serve as a bridge between Japan and the Philippines.

The basic function of the marketing company would be to receive orders for software development work generated in Japan and consign part of the processes to Filipino companies. Further, the marketing company would obtain a grasp of the fields in which Filipino software development companies were good in and effectively allocate work received. Through such work, it could be expected to be helpful in accurately publicizing the state of the Filipino industry and its companies.

The marketing company basically should be operated as a private company, but at the time of its establishment some government participation could be considered. To enable the company to function effectively in both Japan and the Philippines, positive participation by private companies of both Japan and the Philippines would be necessary. In this respect, a joint venture type of company could be considered.

b) Requirements of project

To achieve the objectives of this project, it is considered that at least the following requirements be fulfilled:

1. Positive participation by Filipino software development companies (several) or private companies (several) with close ties to the software development industry

2. Positive participation by Japanese software development companies or private companies with close ties to the software development industry

3. Operation as a private company of the profit oriented

4. Presence of Japanese system engineers able to serve as a bridge between the Japanese side and Filipino side

c) Reference matters in implementation of project

1. At the launching of the company, desirably starting with development work where there is relatively little chance of problems arising due to the Japanese language. The following could be considered as such work:

    a. OS conversion
    b. Communication protocol
    c. Development of control systems (NCU, CIM)
    d. Design systems (CAD/CAM etc.)

2. It is important that the marketing company, in commissioning out work, consider the cost analysis given in 3-5(1) of Chapter 3 and strive to reduce costs, gradually expand the portion of work commissioned out over the long term, and work to enhance the effect of technical transfers.

2) Revenue and expenditure of a marketing company

Table V-6-3 shows a trial calculation of the revenue and expenditure of the marketing company for enabling analysis of the problems in operation. The trial calculation was based on the results of the cost comparisons of software development between Japan and the Philippines described in 3-5(1) of Chapter 3. As seen by the differences in case 2 and case 3, as the areas which the Philippines can develop increase, the marketing company will be able to enjoy that much more the merit of the low development costs in the Philippines and the profitability of the project would rise. Further, at the same time, the total amount of orders of the Philippines would increase. From this viewpoint, it is important that effort be made to improve the development technology on the Filipino side.

However, as seen in the comparison of case 2 and case 2' and the comparison of case 3 and case 3', if all of the portion of the development work in Japan for the software ordered were handled by the marketing company, there would be limits to the amount of orders which could be handled, and full use would not be made of the Japanese SEs and SAs with the ability to coordinate between Japan and the Philippines. Therefore, the Japanese side has to reconsign the majority of its own development work to outside firms as well. To enable this reconsignment, the marketing company must maintain close contact with Japanese software development companies and therefore a joint venture would be desirable.

3) Recommendation on implementation

a) Implementing system

1. Promotion of project: The BETP desirably would handle the planning and proposals.

2. Implementation: Interested companies on the Filipino side would be solicited, business plans prepared, and the Japanese side approached. It would be necessary to form a core group on the Filipino side with the cooperation of the PCS, PSA, or large nonmember companies.

b) Schedule

Preparations desirably would be started when a certain degree of contact has been established between the Philippines and Japan through the project of strengthening access to the overseas software development industry.

6-2 Provision of Advanced Software Development Opportunities for Improvement of Development Technology

(1) Implementation of Public Projects Accompanied with Large Scale Software Development

1) Outline of project

a) Outline

The implementation of a large scale public project accompanied with advanced computer software development work would provide opportunities for improvement of software development technology in the Philippines. For example, consideration may be given to 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.

In addition, 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. Toward this end, it would be necessary for the private software development related industries to work positively to secure cooperation from government organizations.

b) Requirements of project

To achieve the objectives of the project, the software must be developed primarily by the software development companies of the Philippines. When development by Filipino companies alone would be difficult, the development would be performed while receiving technical transfers from overseas development companies.

For example, the following methods must be adopted.

1. Development of all software in the Philippines. Employment of overseas software development companies with suitable experience as consultants of the project owners by international tender.
2. Solicitation, by tender, of local Filipino companies to handle the development. In the tender, encouragement of consortiums of local companies. However, no recognition accorded to consortiums with overseas software development companies as the local companies might rely completely on the overseas companies.
3. Solicitation, by international tender, of overseas software development companies with suitable experience able to assist research and analysis, systems design, etc.
4. Coordination of fields of development handled by companies so as to enable transfer of technology from overseas development companies to local development companies under the guidance of consultants of owners.

2) Recommendations on implementation

There may be considered to be existing organizations which should take charge of the implementation of the individual projects. Here, a recommendation will be made of a system for promotion of these projects which would contribute to the improvement of software development technology. That is, the PSA, PCS, and ITAP should engage in joint activities to stress to government organizations and foreign aid organizations 1) how necessary these projects are to the improvement of software development technology and 2) what level of development expertise the software development companies of the

Philippines have. Further, the BOI should provide assistance in these activities from the viewpoint of promotion of the software development industry and similarly work on the relevant government organizations.

3) Reference examples of projects

3)-1 Establishment of Computer System for Documents of Government Organizations

a) Outline

To achieve the objectives of computerization and increased opportunities for advanced software development by the government, government organizations would standardize the format of official documents and content of documents among them and store the same in optical disk file apparatuses. This would enable automatic retrieval and distribution of information and would enable promotion of greater administrative efficiency processing in the organizations. Further, the filing systems of the organizations would be connected through a packet switching network supplied by PT&T and data, text, and images transferred through the same.

b) Requirements of project

1. This project would contribute to software development and would promote computerization. For this reason, a study group made up of representatives from all of the government organizations would be set up to assist in systems design and to gain a consensus among the government organizations.

2. In consideration of budgetary limitations, a study on partial implementation is necessary.

c) Reference example on composition of overall system

1. See Fig. V-6-1 (However, only for one organization)

   a. Ranking of importance of key documents issued within a government organization and electronic filing in optical disks
   b. Assignment of passwords to persons authorized to access electronic files and establishment of security system for maintaining confidentiality
   c. Inputting documents from input stations using scanners and storage through host computer into optical filing apparatus
   d. Allowing only persons with access approval to retrieve documents from a document retrieval station through the host computer. Further, print out of retrieved data upon the request of the accessing party
   e. Grading of information into generally accessible information or information accessible only to limited parties

An estimate of the funds required for one organization based on the reference example of the system is shown in Table V-6-4. When constructing a system for three organizations, it is estimated that the cost would be 2.7 times the cost of the hardware for a single organization. The software cost would be the same as for one organization.

2. As the priority government organization, the first candidate considered is the Office of the President. After a certain period passes, it would be suitable to give build up the system giving priority to the NEDA, DTI, or the National Statistics Office, the National Police Commission, and other organizations with massive amounts of documents and requiring establishment of a data base.

3. The filing systems of government organizations, based around the Office of the President, would be connected through a packet switching network provided by PT&T to enable transfer of data, text, and images.

d) Recommendation on implementation

1. Promotion of project: The NCC desirably would handle the planning and proposals.
2. Implementation of project: The NCC desirably would handle the implementation, but the software development work, including the systems design, should be farmed out to the private sector. Note that a study group should be organized to obtain a consensus among the government organizations and to coordinate opinions on what the government system should be like.

e) Schedule

A study group of government organizations should be launched as early as possible and the project commenced when a certain consensus has been reached on the system.

3)-2. Connection of Large Sized Computers of NCC and UP and Sharing of Systems

a) Outline

Connection of the M-760/6 (Fujitsu), M-160F (Fujitsu), HP-3000/48 (Hewlett Packard), and A-50 (Fujitsu) owned by the NCC and the HP-3000 and IBM-370 owned by the University of the Philippines (UP) by a dedicated high speed telecommunications line would enable sharing of the hardware environments, software resources, and development environments for the purpose of promoting computerization by the government and increasing opportunities for advanced software development.

b) Requirements of project

This project has as its object contributing to software development and at the same time improving the hardware environment in the private software development industry and education. In this sense, an efficient system would have to be set up which sufficiently respects the wishes of the users.

c) Reference matters in implementation of project (reference example of system)

a. A switching center linking the two large centers of the NCC and UP will be established in the NCC.
b. Installation of one fault-torelant computer in switching center and operation of switching software on it so as to switch access from two dispersed centers. This would enable one to call up the machine for which access is desired from the different centers.
c. Introduction, between the NCC center and the switching center, the SNA IBM-standard connection protocol, assuming local line connection.
d. Connection of the computers at the switching center and UP center by packet network based on X.25 protocol. Connection using dedicated telecommunication line with line speed between computers and switching computer of 9,600 bps.
e. Provision of TSS terminals or RCS terminals in software houses, away from fault-torelant computer installed in switching center, to enable them to enter the machines they wish to access. Receipt by the users of the RCS (remote computing service) of the computers of the two centers and their payment

according to CPU time. Connection of the TSS/RCS terminals and software houses by public lins or dedicated lines or connection through Data Net of PT&T.

f. Overall system network based of general concept of LAN and WAN (wide area network)
g. Overall basic concept based on ARPA-NET

- System in NCC center

a. All data stored dispersed in different machines will be stored in a DASD as integrated file. This would enable accessing as shared data file from any terminal (other than TSS/RCS terminals) of overall system.
b. Connecting all terminals under the machines of the center by LAN and placing same under control of TCP/IP protocol based on Ethernet Terminals under the control of the Ethernet would be used for computer education and training for computer staff of the NCC and government personnel. Further, this would have as an object the development of software using the computers in the NCC and the different models of computers in the UP center.
c. Constructing the data base in the NCC center without limiting it to the range of key information in the NCC and government, but expanding it to a general use data base usable by the UP (government statistical data, global statistical data, news services, etc.)

- System in UP center

a. All data stored dispersed in computers of the UP will be stored in a DASD as integrated file. This would enable accessing the DASD as shared data file from any terminal of the UP. However, this would not include accessing from TSS/RCS terminals of software development companies.
b. Connecting all terminals under the machines of the UP center by LAN and placing same under control of TCP/IP protocol based on Ethernet Terminals under the control of the Ethernet would be used for applications for operation of the UP, for example, registering students, recording payments of tuitions, payments of salaries of staff and also would be used for the education and training of students.
c. Opening of widely the academic data bases of the UP for use by the NCC and government personnel and promoting their greater general use.

Figure V-6-2 is a reference view of the overall system.

By this, the following effects may be expected:

a. The hardware and software development environment in the NCC and UP would be remarkably improved. In particular, the state of installation of hardware at the various centers would be remarkably improved and the educational environment expanded.
b. The existing data bases of the UP and NCC would be combined and, simultaneously, access to the data bases from all terminals would become possible, so the size of the shared data base would be greatly enlarged.
c. The TSS/RCS terminals of the software development companies would contribute much to software development in the private sector. This would give the sector as a whole the ability to make up for the marked shortage in general-purpose computers.
d. Considering external connections, the overall system could be connected to the U.S. ARPA-NET. Further, connection to overseas data base suppliers

would be possible.

e. The overall system architecture could be gradually upgraded. Connection with other systems would also be possible.
f. This would be a large sized, independent network of the Philippines and once completed would draw the attention of other countries.
g. Systems using fault-torelant computers as front end processors and handling on-line transactions are a global trend and are highly evaluated for their advanced technology.
h It would also be possible to construct fax transmission and electronic mail networks through connection of general public lines to a packet switching system through the network.

An estimated of the funds required based on the above system is shown in Table V-6-5.

d) Problems in system construction and operation

In this project, the establishment of a computer network not only for UP, but also for the computer systems of the University of Ateneo and De La Salle University would be desirable in that it would aim at a more advanced software development environment. Due to the following reasons, however, as a first step it would be suitable to start with just the UP:

1. There are no data bases which could be shared among the three universities
2. The hardware and software in the three universities are not the same
3. There is no surplus capacity in the current computers

In the future, it would be desirable to upgrade the network to include universities other than UP as well.

e) Recommendation on implementation

1. Promotion of project: It is desirable that the NCC handle the planning and proposals. A promotion committee should be established drawing upon representatives of the UP, NCC, DECS, and other government organizations, universities, the PCS, PSA, ITAP, and other private organizations so as to obtain a consensus on industry needs. Further, this would provide support to proposals handled by the NCC. Also, in the future, it is considered it would be more effective if other universities be connected as well.

2. Implementation: The UP and NCC would handle the implementation, but would require support in operation from the above promotion committee.

(2) Establishment of Computer Software Development and Technology Institute

1) Outline of project

a) Outline

A institute would be established which could handle the following matters required by the software development industry of the Philippines:

1. Provision of basic development technology and advanced technical information
2. In consideration of the shortage of opportunities for advanced software development, provision of a facility for technical training instead.
3. In consideration of the fact that the facilities and the development tools and other

aspects of the development environment are not of a level enabling advanced software development work to be handled, provision of a development environment which meets such requirements.

4. Provision of an R&D function which can contribute to the computerization of the Philippines.
5. Provision of a facility for the language and business training required for doing business in the Japanese computer software development market.

Therefore, the following would be offered:

1. Additional education for graduates of university computer related courses, computer schools, etc.
2. Technical training for engineers in the software industry.
3. Facilities and development tools and other aspects of the development environment suitable for the level of training required.

In the beginning, the main object would be training and the institute would train instructors for development engineers, computer education organizations, the government, and the private sector. At the same time, it would provide consulting services for software development and facilities and development tools for outside use. In the future, further, it would desirably add functions such as:

1. Training of R&D staff able to develop software in the institute
2. Provision of computer-related management education and consultancy services to the industries.

Further, the institute would have to study whether to serve as the center for a system of sharing of mainframes together with the universities, NCC, etc. and whether to serve as the center for running the later mentioned EDP testing system.

b) Requirements of project

1. There are already large number of private computer schools. Further, the NCC is training information engineers for government organizations. Therefore, consideration must be given so that the institute does not compete with these. A cooperative relationship with educational organizations would be desirable.
2. A suitable composition of instructors including instructors invited from overseas.
3. The functions required of the institute would change along with the progress made in computerization in the country, the development of the software development industry, and changes in the international information industry. To enable such needs to be fully reflected in the operation of the institute, it is necessary to organize a suitable operating committee which would include mainly representatives of reflected industries and also of related government organizations.

c) Reference matters in implementation of project

1) Outline of training

1. Training with aim of compensating for deficiencies in and strengthening presently existing educational organizations: The training would be offered to graduates of computer related courses and graduates of computer schools. It would have as its aim training engineers which have sufficiently mastered basic technology and training instructors, which are in short supply in educational organizations, the government, and the private sector. The course would include:

a. Computer architecture (in particular design of basic software and analysis of functions)
b. Advanced programming languages (for example, PROLOG and LISP)
c. The latest related knowledge such as in artificial intelligence and neurocomputers
d. Information network technology
e. Data base technology

2. It would also have as its object improving the abilities of system engineers already having a certain degree of experience in the software development industry and training system designers or system developers. The course would include:

a. Latest knowledge about the businesses of computer users such as finance, distribution, and manufacture.
b. Latest technology in data communications
c. Systems design, specifications and evaluation
d. Specialized knowledge relating to product development in specific fields (MIS, CIM, etc.)
e. Process and quality control technology in software development.

ii) Facilities

What facilities, development tools, etc. are required should be studied in accordance with the nature of the training offered, but desirably the institute would be equipped with not only sufficient mainframes, minicomputers, personal computers, and other hardware, but also would construct a system able to be accessed from the outside with the aim of open utilization of the facilities. Further, suitable plans are required so that the basic software is constantly updated and so that development tools, CAI, and other software can be purchased.

iii) Others

Singapore has several similar computer technology training institutes and R&D centers, an outline of one of which, the Japan-Singapore Institute of Software Technology, is shown in the Annex V-4.

2) Recommendations on implementation

a) Implementing system

1. Promotion of project: It is desirable that the DOST take the lead in the planning and proposals after due consultation with the industry.
2. Implementation: A promotion committee should be established for this project which includes mainly industry representatives and also representatives of related government organizations. The institute desirably would be run by an operating committee evolved from this committee.

b) Schedule

It is necessary to start preparations for this project immediately in view of the fact that numerous preparations are required, such as securing funds, hiring instructors, and purchasing facilities.

6-3 Training of Computer Software Engineers

(1) Invitation of Instructors from Abroad or Dispatch of Instructors and Students Overseas for Training

1) Outline of project

a) Outline

The project would cover students and instructors belonging to the computer science departments of universities. Students would be taught in the fields where there is a shortage of instructors, for example, computer architecture and technologies in which software will be developed in the future (AI, Fuzzy logic). Instructors would learn teaching skills, acquire new techniques and practical knowledge, and learn about the latest technological trends so as to raise the level of education. Network technology, including telecommunications, would be important for this, so the project would have to include training of network engineers able to handle domestic and overseas demand.

As methods for this, there would be the following:

1. Invitation of instructions from abroad to provide concentrated, short-term courses
2. Dispatch of students and instructors to suitable overseas universities as trainees

b) Requirements of project

In the case of invitation outside instructors,

1. It would be important to find suitable experts as required by the Philippines at suitable periods. Concentrated courses offered during the summer vacation season would be very possible.
2. The difficulty would remain of how to maintain the courses after the return of the instructors to their home countries.

c) Reference matters in implementation of project

There are few problems in the program for dispatching students and instructors overseas, but the requisite costs would be high and the number of possible trainees would therefore be correspondingly limited.

Numerous programs are underway by international organizations and aid organizations of various countries. For example, in Japan, there are the programs for dispatch of experts of the JICA and the training of overseas trainees of the Association for Overseas Technical Scholarship. (AOTS).

2) Recommendation on implementation

There is a possible of use of various types of aid programs. To make positive use of these, the DECS and the software development industry must cooperate and form a committee for systematic, sustained invitation of instructors and dispatch of students overseas.

3) Schedule

It will take time before the measures to develop manpower begin to show results, so it is desirable to commence the project immediately.

(2) Continued Dispatch of Trainees Overseas for Long Periods

1) Outline of project

a) Outline

Trainees would be continuously dispatched to overseas software development companies with the aim of fostering software engineers, in particular SEs and SAs. Two types of trainees could be considered. The first type would be official trainees as are already dispatched through overseas training assistance organizations. In this case, there are certain established programs, so the training could be provided according to those programs. However, programs mostly cover only short periods, the numbers of trainees are limited, and the effects are thus limited. The second type would be trainees sent to private overseas companies directly or through certain channels. In this case, they would acquire development capabilities through making use of the opportunities for development there. If this method is possible, it could be expected to be very effective for training.

b) Requirements of project

To achieve the goals of the project, it is considered that at least the project would have to be continuously implemented and that the industry positively participate so as to ensure smooth reception of the trainees after their return home.

c) Reference matters in implementation of project

1. The dispatch, by individual companies, of trainees overseas for long periods of training would place a tremendous burden on companies. Further, there is a high risk of the trainees changing jobs after returning home. Therefore, it is considered that the industry should solicit trainees and dispatch them overseas with the condition that they engage in development work for a certain period after they return home. In this case, the method may be considered of lending the funds required for the overseas training to the trainees and waiving repayment if the trainees engaged in development work after returning home.

2. Japanese organizations for receiving and training overseas engineers include the Japan International Cooperation Agency (JICA) and the Association for Overseas Technical Scholarship (AOTS). The AOTS was founded in 1959 and receives technical trainees from developing countries through a program sponsored by the Ministry of International Trade and Industry. Further, it receives commissions from the Asian Productivity Organization (APO), the United Nations Industrial Development Organization (UNIDO), and the like for providing training in management, quality control, and the like.

2) Recommendation on implementation

a) Implementing system

1. Promotion of project: Due to its position as the organization supporting industry, the BOI desirably would handle the planning and proposals.

2. Implementation: In the implementation, it would be necessary for the industry to establish a promotion committee. This promotion committee could be the same committee as that for invitation of instructors and dispatching instructors and students overseas so as to raise the quality of education, discussed earlier. The

committee would:

a. Liaison with the channel on the receiving side, arrange for companies receiving trainees, and make agreements on the content of training,
b. Select trainees and take responsibility for personal guarantees in the host countries, and
c. Receive the trainees after they return home and take charge of followup etc.

b) Schedule

It is necessary to immediately establish the promotion committee to start dispatch of official trainees. There are various possibilities regarding dispatch of trainees to individual companies due to the receiving systems in the host countries, such as the institutions there, finances, and consensus of the industries. The industries and governments of both the Philippines and the host countries would have to get together and study the methods of dispatch suited to the situations in the host countries.

(3) Introduction of EDP Engineer Testing

1) Outline of project

a) Outline

The EDP testing system would have the following goals:

1. Establishment of an objective measure for the evaluation of EDP engineers
2. Provision of incentives for engineers to learn on their own knowledge regarding computer software and hardware
3. Possible use as a means for publicizing the level of engineers in the Philippines to other countries through the increase of persons obtaining qualifications under this system

The tests would cover knowledge of computer hardware and software and also general capabilities such as basic knowledge of management and telecommunications. Further, the tests would preferably be opened wider to general software engineers so as to raise the level of the industry as a whole.

b) Requirements of project

To achieve the goals of the project, it is considered that at least the following requirements must be met:

1. Establishment of a suitable operating organization comprised of representatives mainly from industry, but also from the academic world, educational organizations, and the government and government assistance for the operating costs of the same
2. Positive support by industry in promotion and use of the system. At the stage of initial introduction, government EDP engineers, students would be encouraged to acquire qualifications.
3. System of education for acquiring qualifications at stage of spread of system
4. Establishment of followup system to cover situation after acquisition of qualifications

c) Recommendation on Implementation

A summary of Japan's information-technology engineers examination system is in

2) Recommendation on Implementation

1. Promotion of project: The DOST would serve as the administrative bureau and an operating organization would be set up by the industry, academic world, educational organizations, and related government organizations. It is considered necessary for the DOST to prepare a draft law to support its requests for budgetary allocations for this system.

2. Implementation: By the above operating organization

The spread of the system of EDP testing would be helpful in encouraging computerization in a wide range of fields in the Philippines. Further, the tests would establish a firm position for data processing engineers and, if reflected in wages, would lead to improved remuneration. There are not many examples of such a testing system in a developing country and therefore it could be expected to be effective in terms of publicity overseas.

b) Schedule

The preparations and trials will require considerable time, so it is desirable to commence the studies immediately.

Table V-6-1: Objectives and Development Programs for the Computer Software Industry

Industry	Tasks for industrial promotion	Effective measure	Development projects: Program to provide increased opportunities of financing	Strengthening of access to overseas software development industries	Formulation of the marketing company for Japanese market	Establishment of computer software development and technology institute	Implementation of a public project with large scale software developments	Invitation of overseas instructors or dispatch of teachers and students	Continuous dispatch of trainees overseas	Introduction of EDP engineer certification system
		Schedule	D	A	C	B**	C	A	A	D
Computer Industries Overall	- Promotion of national computerization	1. Promotion of usage of computer in government					×			
		2. Development of computer education				×	×	×		×
Computer Software Development Industry	(1) Upgrading software development capability 1. Acquisition of advanced software development technology	1. Provision of advanced software development opportunities domestically			×	×	×		×	
		2. OJT at overseas software companies			×				×	
		3. Continuous contact with the latest technical movement in overseas		×	×	×		×	×	×
	2. Improvement of hardware and software tools	1. Usage of mainframe				×				
		2. Introduction of software tools	×			×				
	(2) Strengthening of overseas marketing activities	1. Receiving and/or dispatching missions		×						
		2. International exchange by industries		×	×				×	
		3. Assistance for overseas marketing		×	×					
		4. Measure to cope with language barrier in Japanese market			×				×	
	(3) Improvement of infrastructure	1. Improvement of communication facilities								
		2. Increase in no. of hardware	×			×				
		3. Secure substitutional power supply source	×							
	(4) Training of computer software engineers	1. Upgrading of computer education in educational institution						×		×
		2. Improvement of hardware and tools in educational institutions				×				
		3. Provision of software development opportunities domestically			×	×	×		×	
		4. Measure to encourage personal technical level		×			×	×	×	×
Data Entry Industry	(1) Strengthening of overseas marketing activities	1. Receiving and dispatching missions		×						
		2. International exchange by industries		×						
		3. Assistance for overseas marketing		×						

Note: "Schedule" symbols: A = Should be implemented immediately B = Preparations should be begun immediately C = Preparations are recommended in accordance with the required preconditions are fulfilled
D = Medium to long-term project ** = Key project

Table V-6-2: Summary of Development Program for Promotion of Computer Software Industry (1)

Program & Project	Project Outline	Requirements of Project	Recommendation on Implementation	Remarks
I. Increase in opportunities for accessing export markets				
1. Strengthening of access to overseas software development industries	1. Inviting missions of overseas software development companies, establishing a basis for export marketing for Filipino through organizing Filipino companies for receiving missions. 2. Receiving of mission, exchanging ideas and opinions of industries and promoting business between individual companies. 3. Establishing organization for follow-up activities.	1. The Project should be planned and organized under the initiative of the private sector. 2. In receiving missions, careful preparations should be made for best results. 3. An organization and a plan for operation for follow-up activities.	1. Promotion of project: Plan and proposal by CITEM. 2. Implementation and coordination: A liaison council should be organized from representatives of participating companies and this will become the implementing body. 3. Schedule: This project would serve as the start of the overall program therefore immediate implementation is recommended.	
2. Establishment of marketing company as means for coping with language barrier in Japanese market	1. Establishing marketing company as a bridge between Japan and the Philippines for promoting long term, continued orders from Japan. The marketing company obtain orders from Japan, prepare the basic design and translations, then consigning out work to Filipino development companies.	1. Positive participation by Filipino and Japanese companies. 2. Operation as a private company. 3. Ensuring Japanese SEs who can serve as a bridge between Japan and Philippines.	1. Promotion project: Plan and proposal by BETP. 2. Implementation and coordination: Private companies of the Philippines and Japan. 3 Schedule: Preparation is recommended in accordance with the required preconditions are fulfilled.	

Table V-6-2: Summary of Development Program for Promotion of Computer Software Industry (2)

Program & Project	Project Outline	Requirements of Project	Recommendation on Implementation	Remarks
II. Provision of opportunities for advanced software development for improvement of development technology				
1. Implementation of a public project with large scale software developments				
(1) Establishment of computer system for government documents	1. Standardization of format of official document among government organizations and storing the documents in system. 2. Connection of filing systems of different organizations through packet network for transfer of data, text, and images.	1. The software should be developed primarily by Filipino software development companies. If necessary, technology should be transferred from an overseas company. 2. A study group formed of the government organizations should be established for making consensus on the computerization of documents filings system. 3. Partial implementation should be considered, in case of budgetary limitation.	1. Promotion of project: Plan and proposal by NCC. 2. Implementation and coordination: Implementation should be handled by the NCC, but the software development should be consigned out to the private sector. 3. Schedule: The study group on the program, comprised of government organizations, should be launched at the early stage and the project should be started when a certain consensus has been achieved.	Estimated funds required at the initial stage: 567.5 million yen (US$4.37 million) For one organization.
(2) Connection of mainframe computers of NCC and UP for sharing systems	1. Connection of the NCC's and UP's computer by a dedicated high speed communications line to share the hardware usage environments, software resources, and development environments.	1. The software should be developed primarily by Filipino software development companies. If necessary, technology should be transferred from an overseas company. 2. The needs of the users should be reflected sufficiently to make an efficient system.	1. Promotion of project, implementation and coordination: Plan and proposal by NCC. Further,a promotion committee comprised of government organizations, universities, and industrial organizations should be formed to support the NCC.	Estimated funds required at the initial stage: 1,345 million yen (US$10.35 million)
2. Establishment of of computer software development and technology institute	Establishing a training institute to provide the software development industry with following services and information: 1. Basic development technology and advanced technology information. 2. Development environment to meet the needs for developing sophisticated software. 3. R&D function contribute to computerization. 4. Training of language and way of business required for tie-up with Japanese market.	1. Avoid duplication of function with existing educational institutions. 2. The suitable instructor set-up. 3. Organizing a operational committee formed mainly of the industry and related government agencies.	1. Promotion of project: DOST 2. Implementation and coordination: The operational committee formed mainly of representatives of the industry and related government agencies. 3. Schedule: Immediate preparation is recommended.	

Table V-6-2: Summary of Development Program for Promotion of Computer Software Industry (3)

Program & Project	Project Outline	Requirements of Project	Recommendation on Implementation	Remarks
III. Training of computer software engineers				
1. Invitation of instructors from abroad or dispatch of instructors and students overseas for training	1. Invitation of instructors from abroad to provide short-term, concentrated courses with the aim of training instructors and advanced engineers. The courses should focus on the fields where more advanced technology is needed and there is a shortage of instructors in the Filipino universities. 2. Dispatch of instructors and students to overseas educational institutions as trainees.	1. Invitation of suitable experts required for the Philippines with a suitable timing sufficient preparations is essential (incl. a concentrated course using summer vacations). 2. Preparation study is required on how to maintain course after the instructors return home.	1. Promotion of project and implementation: The DECS and the software development industry should form a committee for systematic, continued engagement of instructors or dispatch of students. 2. Schedule: Immediate implementation is recommended, when taking into account the fact that considerable time is required before results appear in developing manpower.	
2. Continued dispatch of trainees overseas for long periods	1. Continued dispatch of trainees to overseas software development companies with the aim of training software engineers, in particular SEs and SAs.	1. Continuous operation. 2. Positive participation of the industry to ensure the smooth reception of the trainees after they return Philippines.	1. Promotion of project: Plan and proposal by BOI. 2. Implementation: In the implementation, a promotion committee should be formed by the industry. 3. Schedule: The promotion committee should be formed and operated immediately.	
3. Introduction of EDP engineer testing	1. Introducing EDP test system to give encouragement for self improvement and to inform the outside world of the human resources available in software development in the Philippines.	1. Formation of an operating organization comprised of representatives from industry, academies, educational institutions, and government, and assistance by government for operating expenses. 2. Positive support of industry in promotion of system and active use of the system by the industry. 3. Establishment of system of education for obtaining certificate and system to follow-up persons with certificate.	1. Promotion of project: The DOST should act as an administrative bureau. 2. Implementation: An operating organization should be established by industry, academy, educational institutions, and other related organizations. 3. Schedule: Preparatory study should be commenced immediately.	

Table V-6-3: Trial Calculation of Yearly Revenue and Expenditure of Marketing Company

(Unit: 1,000 yen)

		Case 2	Case 2' *6)	Case 3	Case 3' *6)
Revenue *1)	(A)	54,700	273,705	67,095	335,475
Expenditure	(B)				
Direct personnel expenses *2)		25,500	25,500	25,500	25,500
Overhead costs *3)		17,850	17,850	17,850	17,850
Contracting expenses 1 *4)		8,224	41,120	13,293	66,465
Contracting expenses 2 *6)		--	136,724	--	135,450
Other expenses *5)		4,369	21,845	5,355	26,775
Total		55,943	243,039	61,998	272,040
Balance (A) - (B)	(C)	-1,243	30,666	5,097	63,435
(Ratio of profit to sales (C)/(A))		-2.3%	11.2%	7.6%	18.9%

Notes: *1) The sales are limited to the amount of work which the Japanese SE/SAs can handle. If the working rate of the Japanese SE/SAs is considered to be 70 percent, then
12 months x 3 persons x 70 percent = 25.2 M/M
When taking as an example the software development used for Table V-3-3, in case 2, one project would require 9.8 M/M, so it would be possible to handle 25.2 M/M / 9.8 M/M = 2.57 projects a year. Therefore, 21,300,000 yen x 2.57 = 54.7 million yen.

*2)

Japanese	SE/SA	3	19,500,000 yen
Filipino	SE	2	2,000,000 yen
Japanese	Assistant	1	4,000,000 yen

*3) 70 percent of direct personnel expenses (based on average rate of Japanese software development companies).

*4) See Table V-3-3.
Case 2: Contracting out only program design and program preparation to Filipino software development companies.
Case 3: Contracting out 25 percent of basic systems design, 50 percent of detailed systems design, and 100 percent of program design and program preparation to Filipino software development companies.

*5) Translation costs for documents, transportation and telecommunication costs, etc.

*6) Case 2' and case 3': Case of increase of amount of orders which can be received work by contracting out 80 percent of Japanese side of work to Japanese software development companies (case 2' 12.85 projects/year, case 3' 15.76 projects/year).

Table V-6-4: Estimated Funds Required for Computer System for Government Documents

	Item	Quantity
Hardware	Input stations	10
	Retrieval stations	20
	Host computer	1
	Interface boards	5
	Document backup equipment	1
	Optical file disc drive	1
Total estimated value of hardware		358 million yen (US$2.75 million)
Software development	Analysis and research	6 man-months
	Basic design	11 man-months
	Detailed design	25 man-months
	Program design	20 man-months
	Program development	63 man-months
	Unit/link tests	15 man-months
Total estimated value of software development		210 million yen (US$1.62 million)
Total initial introduction costs		568 million yen (US$4.37 million)

Note: Assumptions on which the above cost estimate is based are as follows:

1. A rough estimate based on Fig. V-6-1
2. Estimate as of November 1990
3. The cost of machines and equipment mentioned above were computed on the basis of ex-factory prices for major machines and equipment in addition to packing, transportation and other costs up to arrival at the installation site. It is assumed that installation is undertaken by the Philippines side. The need for power receiving facilities should be studied carefully prior to implementation.
4. Foreign exchange rates used are:
   P=¥4.82, US$=P27, US$=¥130

Table V-6-5: Estimated Funds Required For Connection of Large Sized Computers Between NCC and UP and Sharing of Systems

Item		Quantity
Hardware (including OS and other basic software)		
	1. Fault-torelant computer for switching	1
	2. Protocol converter	2
	3. TSS/RCS terminals	100
	4. Others (cables, connection equipment)	
	Estimated costs	730 million yen (US$5.62 million)
Software (packaged used)		
	1. Switching software (only kernel portion)	1
	2. Ethernet (Software for LAN)	2 centers
	Estimated costs	300 million yen (US$2.31 million)
Software development		
	1. Analysis and research	10 man-months
	2. Basic design	30 man-months
	3. Detailed design	40 man-months
	4. Program design	30 man-months
	5. Program development	80 man-months
	6. Unit tests	10 man-months
	7. Total tests	10 man-months
	Estimated costs	315 million yen (US$2.42 million)
Initial introduction costs		
	Total	1,345 million yen (US$10.35 million)

Note: Assumptions on which the above cost estimate is based are as follows:

1. A rough estimate based on Fig. V-6-2
2. Estimate as of November 1990
3. The cost of machines and equipment mentioned above were computed on the basis of ex-factory prices for major machines and equipment in addition to packing, transportation and other costs up to arrival at the installation site. It is assumed that installation is undertaken by the Philippines side. The need for power receiving facilities should be studied carefully prior to implementation.
4. Foreign exchange rates used are:
   P=¥4.82, US$=P27, US$=¥130

Fig. V-6-1: Optical File System for Government Documents

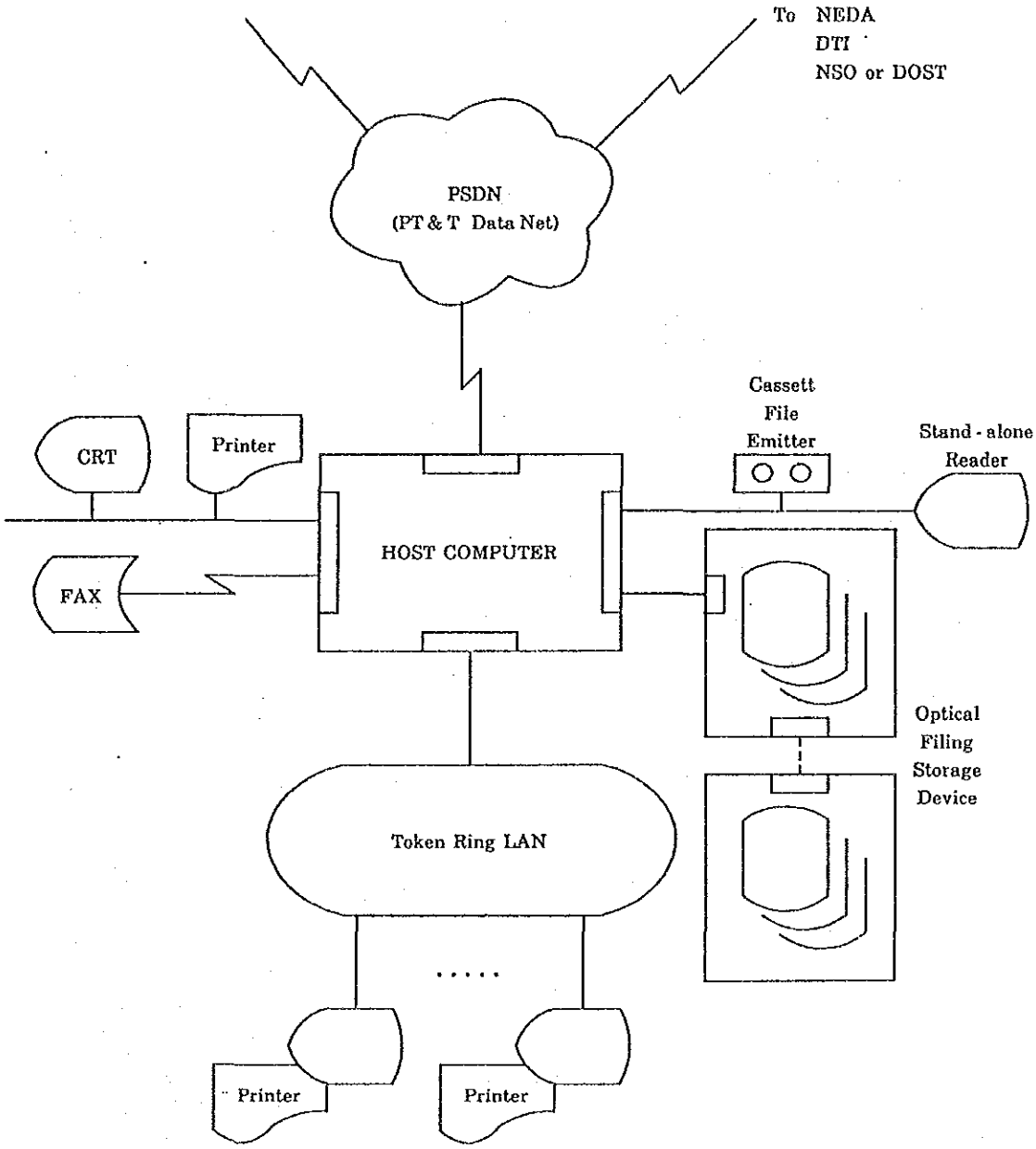
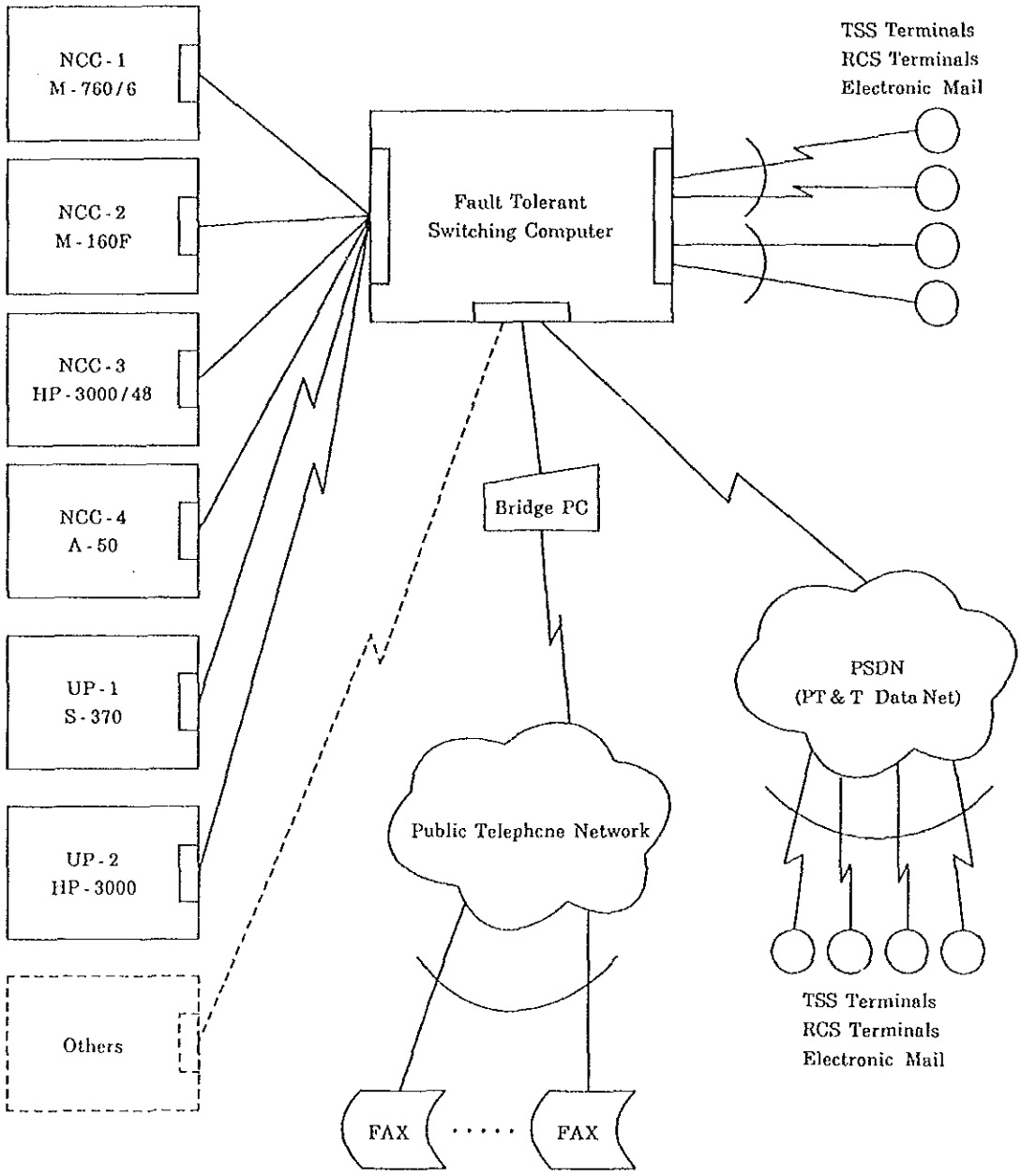


Fig. V-6-2: Connection of Large Sized Computers of NCC and UP and Sharing of Systems



ANNEX

ANNEX

V-1. Summary of Survey on Intentions of Computer Software Development Companies in Japan

(1) Possibilities of Business With Japan

In the current survey, it was found that System For, TSD, SGV, Ayala Systems, Pasco-Certeza, and the like were already engaged in business with Japan. Quite a few of the Filipino companies had not interest in Japan in terms of developing the market there despite the barrier of the Japanese language. On the other hand, the number of companies in Japan which are studying farming out work to other countries and which are attempting to farm out work, due mainly to the shortage of labor, is increasing as a general trend.

Here, results of the survey on interest in Japanese companies, primarily in software, in doing business overseas will be disclosed and a study will be made of the possibility of business in the future.

(2) Business With Asian Countries

First of all, 25 (38.5 percent) of the 65 responding companies answered that they had experience in transactions with the Asian countries, while 40 companies (61.5 percent) responded that they had not.

By number of employees, the larger the number of employees the greater the experience in such transactions. Among the small companies (less than 50 employees), one company reported that it had had experience, while 10 reported that they had not - with an overwhelming majority of the companies thus not having had experience in such business. As opposed to this, in medium sized companies (50 to less than 300 employees), 11 companies reported they had had experience and 14 that they had not, and in large sized companies (300 or more employees), 13 companies reported they had experience and 15 that they didn't, with slightly less than half of the firms therefore having some experience in such transactions.

Looking at the companies which responded they had had experience with overseas firms, most of the transactions by these companies consisted of "receiving trainees". Broken down by region, there were seven cases for China, followed by two cases for Republic of Korea and one each for Taiwan, Thailand, and the Philippines (number of responses is higher than number of responding companies due to several countries being mentioned in some cases, same below). Next most numerous was "commissioning of work", in eight cases, broken down into five cases of "software development", two cases of "data entry", and one unknown case. By region, there were two cases of software preparation in R. Korea and one each in China, Taiwan, and the Philippines and one case of data entry each for R. Korea and the Philippines.

In addition, looking at the details of the transactions in the order of greatest response, there were seven cases of "export of software" and "technical transfers", five cases of "employment of staffs", and two cases of "joint development".

The regional distribution of such transactions reflects the development stage of experience in transactions between Japan and other countries and regions.

The fact that the number of cases of "receiving of trainees" from China was the highest reflects the stance taken by companies of training China as a future contractor to undertake orders for software development unable to be handled in Japan, due to China's

large population and abundance of superior engineers. The companies actually receiving of trainees from China are looking at future potential rather than immediate firepower.

On the other hand, in "commissioning of work", local companies offering information processing services such as software development are already being given orders for software development, data entry, and other work. In particular, work is being commissioned to R. Korea at a resultant quality and cost level not that much different from the case of contracting out the work in Japan. The current survey also turned up a case of program preparation and system design commissioned to a R. Korean company.

One case of software preparation and one case of data entry were seen in work commissioned to the Philippines as well. These were by the same company. This company is a major company in the field of measurement and has established a software house venture with a local firm. The Japanese side has sent expert staff to provide technical guidance and take charge of management. The majority of the work is entry work by digitizers - a labor intensive type of work requiring many workers. The program preparation work is limited to simple jobs relating to data entry.

In addition, there were cases of commissioning, one each, in China and Taiwan. Both these cases were of joint ventures established by Japanese companies and local companies and commissioning of program development and other work generated in Japan.

China has an abundant labor force and low labor costs, so is being taken note of as a base for computer production. The Chinese government also considers the computer industry to be a key industry and is encouraging the training of computer personnel so as to increase future production, in software as well, making use of the large population. It is sending trainees to companies in Japan through the industrial organizations. The Japanese side is being cooperative in the training of personnel in view of the merits of commissioning out the labor-intensive work of programming and compensating for the domestic shortage of manpower. According to the companies which are actually commissioning work to China, there are many superior Chinese personnel, so there are almost no problems.

Taiwan has achieved remarkable development in its computer industry in recent years and has reached a high technical level on a par with R. Korea.

R. Korea and Taiwan, however, have experienced rising costs in recent years and the cost merits of direct investment or consignment production are gradually fading. When doing business with these countries, rather than expecting to be able to produce at low costs, companies seek partners which will enable them to finish domestic orders within deadlines and therefore look for quality levels equal to those of domestic contractors.

None of the companies responding to the survey indicated they had commissioned work to Hong Kong, Singapore, and other countries or regions known as the NIEs. Industry experts believe that this is due to the small absolute numbers of the people there, which results in a shortage of even enough engineers to meet domestic demand. In particular, in Hong Kong, there has been a flood of people emigrating to other countries since the Tiananmen Square Incident. Among these are believed to have been many of the elite class of Hong Kong, including information processing engineers, making the shortage of engineers extremely serious.

The ASEAN countries, including the Philippines, differ from China and the NIEs in situation. They still have not yet formed the foundations for the computer industries in terms of technical level. This is reflected, it seems, in the responses to the questionnaire.

The Philippines is no exception. The Philippines still has a low level of software preparation expertise. The cases of business seen in the responses were investments made in anticipation of future growth. The basic intent is securing labor for data entry. The quality of the people locally employed, however, is considerably high and the staff in charge of the investing companies judged that with such material, they can expect the people to be strategically valuable in the future with training and practical experience.

(3) Problems in Business

In response to the question of "are there any problems in doing business with the Asian countries", 12 of the 25 companies with business experience there indicated there were no problems, while 13 indicated that there were. About half of the companies therefore felt there were some sort of problems in doing business there.

When the companies responding that there had been problems were asked for specific examples, it was found that most of the problems were due to language, customs, and other matters relating to communication and culture. Six of the 13 companies felt there were problems in communication arising from the differences in language and customs.

In particular, companies which had actually commissioned work there seem to have encountered miscommunication problems arising from differences in social customs and business practices. What they are looking for is that the engineers be extremely superior in quality, high in technical expertise, and fluent in Japanese and further that they could commission work expecting that in the performance of the work the delivery schedules would be strictly observed and quality would be controlled etc. in the same way as when the companies placed orders to Japanese firms.

In this regard, they consider that there are almost no problems in the case of R. Korea, but there have been cases where they have trained Koreans in Japan and sent them back only to find the workers changing jobs in search of higher salaries. There is a problem, therefore, in the working environment, which is not conducive to technicians staying at the same job. In particular, in the case of commissioning development of application programs, the loss of the engineers in charge due to changes of jobs means that the companies cannot expect quick response to requests for later changes or additions or dealing with trouble, so such work cannot be safely entrusted. Therefore, some companies avoid as much as possible commissioning work in regions where work is affected by differences in language and culture and limit their orders overseas to work of a basic technical level such as maintenance, control, and renovation of basic software using peripheral programming skills.

Mentioned next most frequently after problems due to differences in language and culture were immigration procedures, COCOM restrictions, and other legal restrictions.

According to the staff in charge in the companies questioned, the COCOM restrictions require that the companies notify the Security Export Control Office of the Ministry of International Trade and Industry even for noncommunist countries, so considerable time is taken for procedures, which is felt as being extremely inconvenient. In the case of commissioning work such as software preparation to overseas companies, Japanese firms lend out their own machines as development tools, but each time they do this, they have to prepare various documentation and make frequent calls to government offices. Some companies specifically asked for the procedures for noncommunist countries to be streamlined as much as possible. Further, some companies mentioned that it took a long time to obtain visas for trainees they wish to bring into the country and asked that the Ministry of Justice shorten it.

In addition, there were several companies which mentioned political instability, peace and order, and other factors of country risk. Among these were the companies which are now commissioning work to the Philippines.

(4) Shortage of Software Engineers

The biggest problem now facing Japan in becoming an advanced computerized society is considered to be the shortage of software engineers, whose supply is not keeping up with the increasing demand for software. This gap between the supply and demand for software is known in Japan as the "software crisis" and, it is feared, will becoming increasing severe.

In the statement of the Information Industry Committee of the Industrial Structure Council of 1987, it was predicted that if matters continued as they then were, Japan would have a supply of 1.18 million software engineers compared to a demand for 2.15 million, for a shortfall of 970,000.

This shortage of software engineers has already surfaced. Even in the responses to the present questionnaire, a shortage was clearly seen, with 65 of the responding companies indicating there was a shortage.

In particular, 100 percent of the small companies with less than 50 workers felt there was a shortage, showing the increasingly severe shortage of manpower at software houses, which tend to be very small in size and cannot rely on subcontractors and other outside firms for help.

A breakdown of the shortage of engineers was sought by the multiple response format in the questionnaire. As many as 58, the highest number, of the companies indicated that there was a shortage in systems engineers (SE). This was followed by 47 companies mentioning programmers. As opposed to this, very few companies indicated there was a shortage of keypunchers or operators, reflecting the increasing sophistication of needs in the information processing industry.

A look at the breakdown by company size shows that the shortage of SEs was felt by 100 percent of the medium size companies, the highest rate, but there was some difference in the perception of shortage of programmers according to company size. A full 90.9 percent of the small companies felt there was a shortage of programmers, but the larger the company size, the less the perception of a shortage of programmers, i.e., 78.3 percent of the medium size companies and 66.7 percent of the large ones felt there was a shortage. This probably reflects the fact that large size companies tend more and more to handle sophisticated areas of development such as systems design on their own, but farm out labor intensive work such as actual programming.

It was learned from the findings of the questionnaire that, even in this industry, there is a growing division of labor between contractors and subcontractors and that small and medium size software houses, which cannot farm out work, are feeling an increased pinch in programmers.

In view of this situation, it is believed that there will be increasing moves to start overseas production and promote an international division of labor as a means of dealing with this software crisis.

(5) Interest in division of labor with Asian countries

To cope with the shortage in software engineers, a division of labor with the Asian countries may be considered. Forty-eight companies responded that they were interested

in this. Compared with the 15 companies indicating no interest and the two not responding, there was an overwhelmingly larger number of interested companies, i.e., three out of four responding companies were interested in a division of labor with Asian countries.

Compared with the responses to question 1, where it was found that 38.5 percent of the companies had had experience in business with the Asian countries and 61.5 percent did not, the conclusion may be drawn that there are a considerable number of companies which do not currently have contacts with the Asian countries, but are interested in forming them.

In particular, a look at this by the number of employees shows that 88 percent of the small companies, 100 percent of which suffer from shortages in SEs, indicated that they were interested, revealing a substantial correspondence between the feelings of shortage of manpower and the interest in a division of labor with the Asian countries.

Next, regarding the countries possibly considered, the most frequently mentioned country was China, in 31 cases. Next came Taiwan with 26, Singapore with 24, and R. Korea with 23.

China was mentioned most frequently due to the existence of an abundant labor force, the reputation spreading through the industry of the large number of superior personnel available, achieved through the receiving of trainees, and the fact that China is a culture using familiar Sino-Japanese characters.

The NIEs were listed after China probably because they were evaluated as possessing high technical capabilities and having high educational standards in their societies - creating a business environment similar to that of the Japanese. The low 12 companies interested in Hong Kong among the NIEs, according to related parties, is probably due to the fact that Hong Kong is a commercial city and is not suited to somber work like programming. Also, it is believed that companies are well aware of the fact that the absolute number of engineers there is low and not enough to handle even the software demand generated in that region.

Among the ASEAN countries, the highest response rate, 18 responses, was scored to the Philippines. This is believed to be due to the fact that it is an English speaking country and that labor costs are low there.

After the Philippines came Malaysia with 10 responses, Thailand with seven, and Indonesia with three. In general, the ASEAN countries are enjoying brisk investment from Japanese companies, mostly in the manufacturing sector, at the present time, but companies tend strongly to stay away from the software industry due to the strong perception that the technical level there is low and further to the underdeveloped state of the electric power, telecommunications, and other industrial infrastructure.

Note that other Asian countries mentioned were India, in seven cases, and Sri Lanka, in one.

(6) Degree of Interest in the Philippines

In response to a question "do you want to know more about the software houses and data entry companies in the Philippines", 37 companies, over half, responded that they would like to know more.

The number of companies responding that they would like to know more exceeded the 18 companies which indicated they might consider a division of labor with the

Philippines, indicating that over half of the former companies were not considering the Philippines concretely, but just wanted to know more for the future.

The larger the company size, the less interest was shown, with 13 large companies responding they would like to know more, compared with seven small companies and 17 medium size ones. The medium and small size companies were seemingly more interested in their counterparts in the Philippines.

Of the 37 companies, in response to a question as to what in particular they wanted to know, 100 percent of the companies responded the "technical level". Next most desired to be known was "details of the companies", in 27 cases, "price", in 26 cases, and "transaction record", in 22 cases. In particular, 92.3 percent of the large companies were interested in price, it should be noted.

A profile of the 18 companies which responded that they would consider the Philippines as a potential partner is given below.

In business, most were engaged in software development. In annual sales, among the companies with sales of over 5 billion yen, there were three making less than 10 billion yen and four making more. Including these, there were 11 companies with sales of over 1 billion yen, the majority of the 18 companies indicating interest in the Philippines, but seven companies had sales of less than 1 billion yen. The relatively smaller size companies, it is believed, tend to have a higher degree of interest in the Philippines.

Free responses were solicited as to what the companies would like to know about the Philippines other than the items mentioned earlier. The following requests were made:

- Market information
- System of guarantee on products delivered
- Personnel costs
- Industrial structure
- Political stability
- Form of wages
- Daily customs
- Number of university graduates and social views of same
- State of business with Japan and examples of failures
- Japanese language abilities and quality assurance

(7) Possibility of Business with the Philippines

A full 92.3 percent of the companies surveyed were engaged in the business of software development. Among these were several which began with commissioned work such as data entry and gradually moved to higher value added work such as software development. This may be considered a common trend in many software houses which, thanks to the increasingly smaller size and price of computers and the spread of distributed processing, have adapted to growing demand by shifting their emphasis to software development work along with the increased demand for systems development from the users.

Therefore, the employees of large software houses, which have tried to employ massive amounts of SEs and programmers, in units of several hundreds a year, to deal with the growing demand for software development, are mostly young workers with less than five years in their companies. Even so, the supply of manpower cannot keep up with the growing demand. There is a chronic situation where there is plenty of work, but the companies can't handle it.

As a result, companies are farming out orders which they cannot handle in-house to medium and small software houses, accepting staff dispatched from other firms, and taking other steps resulting in the formation of a division of labor between the large and medium sized enterprises. It is not at all unusual to find that over half of the SEs and programmers working at the large software houses are employees of outside firms which work has been farmed out to or medium and small software houses which have dispatched them there.

This spread and entrenchment of a division of labor have resulted, in effect, in the shortage of supply in the industry being shifted to the medium and small software houses, creating headaches over shortages of software engineers, in particular SEs, in the medium and small companies. Therefore, these firms lack the ability to secure orders for systems development through their own sales forces and have chosen to secure stable orders by becoming parts of the subcontracting structures of the large companies.

Due to this situation, the large companies enjoy higher growth rates than the small and medium size companies, resulting, it is considered, in a polarization within the industry.

As seen in the "Specific Service Industries Survey", the information service industry includes numerous small sized firms and has a low productivity. The annual sales per business establishment was 586 million yen, for a per capita worker sales of just 9.88 million yen.

The largest company in the companies surveyed this time had annual sales of 71.8 billion yen, employed 6,127 workers, and had a per capita annual sales of 11.72 million. As clear from this situation, the securing of large quantities of manpower is the quickest way to growth in this industry and a hot topic in meeting the future growing demand.

Effort is being made to improve productivity, but if priority is given to dealing with the increasingly sophisticated and diversified demands of the users for increased complexity of systems, expansions of overall scales, dealing with the shift to distributed processing and networking, and ensuring of security, then the number of programs increase on their own and the companies have to concentrate on labor intensive work.

Due to this situation, it is only natural that companies are looking toward the Asian countries with their abundant labor forces as potential sources of supply of manpower. As seen from the results of the questionnaire, interest may be said to be very high in farming out work to the Asian countries. Of particular note among them is China. This is due to the following reasons.

1. Due to its vast population, China has numerous superior persons and there are vast numbers of engineers which would like to study or work in Japan.

2. Technically advanced countries like Taiwan and R. Korea have experienced rising personnel costs in recent years and the cost merit is therefore gradually declining, but there is no such fear of that happening in China for the time being. This is an important point as the industry is highly labor intensive.

3. Regions like Singapore and Hong Kong, which have the technical expertise, suffer from poor supplies of manpower in software and cannot be expected to be of much help in the future.

4. The Philippines and other ASEAN countries still do not have the foundations for a software industry and there are apprehensions as to the

technical ability of the local firms. Further, there are apprehensions about the state of the infrastructure, such as the power and telecommunications, making the risk high.

Considering all of the above conditions together, most software companies showed the greatest amount of interest and expectations in China. While the leading candidate under consideration, the country risk is high. In particular, in the computer industry, there is the large problem of COCOM restrictions. There is a tendency to be wary about whether stable business can be ensured due to differences in the social system.

Due to these circumstances, the Philippines is given as the next best candidate for consideration after China and the NIEs in terms of future long-term investment.

The reasons are as follows:

1. R. Korea, Taiwan, Hong Kong, and Singapore cannot be expected to have surpluses in manpower in the long term. In the case of transactions with these countries, reduction of costs cannot be the prime objective.

2. The Philippines is an English speaking country, so language problems, it is thought, would be less than in other ASEAN countries.

The above two points are assumed intentions of the companies listing the Philippines as a candidate for business in the questionnaire survey and hearings. Neither of them is positive.

The 18 companies which responded that the Philippines was a country of possible consideration may be divided into the following three groups:

1. Companies which selected it along with China, Taiwan, and R. Korea

2. Companies which selected it along with Singapore, Malaysia, Thailand, and Indonesia

3. Companies which mentioned almost all countries and gave the Philippines as one of the same

Extracting the characteristic features of these three types of companies:

1. There was no company which selected the Philippines alone.

2. Over half, ten companies selected at least three countries aside from the Philippines.

3. The companies responding with many countries selected included many companies with no business experience with the Asian countries.

That is, no positive reason was observed as to why the Philippines was selected as a country for consideration. The trend was for the Philippines to be selected randomly as one of many countries.

There were three companies which selected the Philippines and just one other country in their responses. These all had business experience with Asian countries and it may be deduced that this had something to do with the selection.

Table AV-1-1 shows part of the responses of these companies.

Of these, company A had once considered investing in the Philippines, but gave up on the idea due to the unstable political situation. It was aiming at contracting out mostly maintenance work arising in Japan and had as its primary condition low labor costs. Company C had already established joint ventures in four countries: China, R. Korea, Taiwan, and Hong Kong, and was planning to positively increase its overseas production bases.

A common point among the three companies was a desire for all types of information including technical level, details of companies, delivery performance, and prices. Looking at this from another angle, this may be said to illustrate their lack of information on companies in the Philippines despite their consideration. If these three companies are considered ones with a certain intent of investment in the Philippines, then the knowledge on the Filipino information industry of the responding companies which selected the Philippines as just one of the countries for consideration may be deduced to be vague, i.e., picturing the Philippines as just having low labor costs and being English speaking. Among such companies was one which actually established a joint venture in the Philippines. As mentioned earlier, this is a subcontractor handling mostly data entry. The Japanese side has been providing full technical guidance in advance. According to the staff in charge of this company, "the foundation for specialized education does not exist". While the aptitude is there, reportedly handling of preparation of software will not be possible for a while.

In addition to the above, the companies which have had no experience in doing business with Asian countries and which selected three to five countries, including the Philippines, as countries for consideration may be deduced as having almost no knowledge of the Filipino information industry and could not be expected to give a clear reply if asked why they selected the Philippines.

In view of this situation, the following is considered necessary to determine the possibilities of business between Japanese companies and the Philippines:

1. Introduction to Japanese companies of information such as the level of the industry of the Philippines. In particular, 100 percent of the companies were interested in the level of technology. In the past, PCS had exchanges with Japanese industrial organizations, but in the future the PSA and PADEC should also become active in exchanges.

2. The cooperation of the Philippine Embassy in Japan, JETRO, etc. should be obtained in dispatching software inspection missions to the Philippines.

Table AV-1-1: Examples of Japanese Companies Interested in Doing Business in the Philippines

	Experience in business with Asian countries	Countries selected others than the Philippines	Matters desired to be known about Filipino companies	Size of company
Company A	R. Korea: Data entry China: Receipt of trainees	China	Technical level, details of companies, past experience, prices	Large
Company B	R. Korea: Technical transfers	Taiwan	Same	Medium
Company C	China, R. Korea, Taiwan, Hong Kong: Software preparation	Indonesia	Same	Large

V-2. Summary of Survey on Computer Software and Services Companies in the Philippines

(1) Object of Survey

The survey was conducted with interviews of representative companies to clarify the state of software and data entry companies in the Philippines and to obtain a grasp of the requirements to enable promotion programs to assist the growth of the industry and export promotion.

The main matters surveyed were as follows:

- Company General Information
- Company Information
- Corporate Environment
- Relationship with Japan

(2) Survey Method

The survey was commissioned to a unified administrative bureau for the survey set up by the BOI and three computer industrial organizations of the Philippines, the PCS, PSA, and PADEC.

PCS prepared the list of companies and distributed the request for cooperation in the survey and the questionnaire form by mail to 140 companies in late June 1990.

Of the 140 companies, 73 responded in the questionnaire survey. PCS considers that these 73 companies were the leading companies in the Philippines in this industry and accounted for a 90 percent to 95 percent share of the workers and annual sales of the industry.

(3) Company General Information

1) Location

The distribution of locations of the 73 companies was as follows:

Metro Manila	72 companies	(99 percent)
Makati	57 companies	(78 percent)
Quezon city	4 companies	(5 percent)
Other than Metro Manila	1 company	(1 percent)

In Metro Manila, the companies concentrate in particular in Makati.

2) Year of Establishment

The years of establishment of the companies were as follows. The average was 1982, meaning there were many young companies.

Established before 1970	5 companies	(8%)
Established 1970 to 1980	13 companies	(20%)
Established 1981 to 1985	22 companies	(33%)
Established 1986 to 1990	26 companies	(39%)

3) Number of Employees

The distribution of the number of employees of the 71 responding companies was as follows. The average number of employees was 135, with a large number of companies will small numbers of employees.

Number of employees		
1 to 24	23 companies	(32%)
25 to 49	14 companies	(20%)
50 to 99	14 companies	(20%)
100 to 199	9 companies	(13%)
200 or more	11 companies	(15%)

Of the companies with 200 or more employees, seven engaged mainly in data entry business.

4) Number of Branches

Of the 73 responding companies, the following had domestic and overseas business:

Domestic	28 companies	(38 percent)
Overseas	17 companies	(23 percent)

Of these, 11 (15 Percent) had branches both domestically and overseas.

5) Capital

The distribution of the size of the capital of the 66 responding companies was as follows:

Capital		
Less than 1 million pesos	20 companies	(30%)
1 million pesos to 5 million pesos	32 companies	(48%)
5 million pesos to 10 million pesos	7 companies	(11%)
More than 10 million pesos	7 companies	(11%)

About 80 percent of the companies were small in size with less than 5 million pesos in capital.

6) Details of Business

The following was learned by questioning the companies as to the nature of their business (multiple responses allowed):

	Domestic	Overseas
1. Applications software development	44 (60%)	33 (45%)
2. Systems software development	19 (26%)	18 (25%)
3. Network services and development	30 (41%)	12 (16%)
4. Systems integration	28 (38%)	12 (16%)
5. Professional services	46 (63%)	23 (32%)
6. Turnkey systems	27 (37%)	7 (10%)
7. Data entry	21 (29%)	23 (32%)
8. Others (processing services, sales of equipment, etc.)	27 (37%)	10 (14%)

In domestic business, professional services were carried out most frequently, while in overseas business, application software development was carried out most often. For data entry, there were more companies which received work from overseas than from domestic companies. This shows the export orientation of the work.

(4) Company Information

1) Annual Sales

The annual sales from 1986 to 1990 (projected) were as follows:

	1986	1987	1988	1989	1990 (projected)
Average annual sales per company	7.8	8.7	9.4	13.5	21.9

(unit: million pesos)

showing steady annual growth. However, these figures include earnings from other work such as sales of equipment and do not reflect that actual state of just the information processing service industry only. The projected annual sales for 1990 are optimistic, indicating a 62 percent growth over the previous year.

2) Equity Composition

a) Structure of Ownership

The responses of the 73 companies to the question as to if their equity was Filipino or foreign were as follows:

Filipino equity	57 companies	(78%)
Foreign equity	2 companies	(3%)
Joint venture	12 companies	(16%)
No response	2 companies	(3%)

indicating that Filipino capital accounted for just under 80 percent of the companies. Of the 12 joint ventures, five were data entry companies. Overseas investment is increasing in this field.

b) Form of Foreign Equity

The relationships with the parent companies in the case of companies (foreign equity and joint ventures) managed by foreign companies were as follows:

Division	0 company
Subsidiaries	14 companies
Others	0 company

All of the companies which responded were therefore subsidiaries in form.

3) Breakdown of Employees by Type

The employees working in the information processing services may be broken down as follows:

Sales and marketing staff	332
Maintenance and support	532
Systems administration	332

Programmers	1,377
Research and development staff	124
SEs and SAs	333
Others (administrative etc.)	3,452

(73 companies providing effective responses)

Of these, there were a total 1,710 programmers, SEs, and SAs. There are believed to be a total of 2,000 to 4,000 programmers, SEs, and SAs in the private sector when adding on the numerous engineers working in software companies which did not respond to the questionnaire, banks, and large corporations. The reason why the large number of employees of the "others" group was that it included data entry operators.

4) Hardware

The hardware used was as follows:

Mainframes	25 companies	(35%)
Minicomputers and superminis	29 companies	(41%)
Work stations	26 companies	(37%)
Personal computers	69 companies	(97%)

(71 companies providing effective responses)

Almost all the companies were using personal computers. Of these, 28 were using only personal computers.

(5) Corporate Environment

1) Current Situation

Regarding problems in current companies, many companies mentioned a shortage of SEs, SAs, and other engineers and difficulties in overseas marketing. Conversely, few companies considered shortages in computer related knowledge or shortages in operators a problem.

2) Projected Problems

Regarding problems which might arise in the future, no great difference was obtained from the responses of 1), but an increased number of companies considered that shortages of operators might be a problem, while the number of companies which considered difficulties in raising funds a problem declined.

3) In-House Training

a) Methods of In-House Training

The methods used by companies in training employees were as follows:

Use of training schools	33 companies	(46%)
Dependent on computer manufacturers	16 companies	(22%)
Use of industry association	20 companies	(28%)
In-house training courses	64 companies	(89%)
On-the-job training	60 companies	(83%)
Others	4 companies	(6%)

(72 companies providing effective responses)

Most companies used in-house training, on-the-job training, and their own training

methods.

b) Evaluation of Training Organizations

Among the training organizations, the following were evaluated highly:

Computer schools	22 companies
NCC	27 companies
Universities	55 companies
Others	9 companies
(multiple responses allowed)	

In particular, universities were highly evaluated.

c) Personnel Required in Future

The types of engineers believed to be necessary in the future, according to the results of this survey (multiple responses allowed) were as follows:

Sales and marketing staff	32 companies
Maintenance and support	26 companies
Systems administration	17 companies
Programmers	37 companies
Research and development staff	33 companies
SEs and SAs	42 companies
Project managers	40 companies
Others	6 companies

The jobs considered most necessary were SEs and SAs, project managers, and programmers, in that order.

(6) Related Infrastructure

1) Sources of Overseas Market Information

Related organizations	26 companies
Local trading firms	11 companies
Tieups with foreign-capital corporations	25 companies
Overseas sales representatives	28 companies
Foreign buyers	21 companies
Others	12 companies
(multiple responses allowed)	

2) Infrastructure

The infrastructure considered the most problematical at the present time were:

Unstable power supplies	62 companies
Lack of adequate communication network systems facilities	59 companies
Shortage of mainframes and other equipment	35 companies
High tariffs on mainframes	46 companies
Others	12 companies
(multiple responses allowed)	

The most frequent problem mentioned by the companies was the unstable power supply. This was due, however, to the frequent occurrence of blackouts during the period of the survey.

(7) Tax Benefits

In response to a question as to if tax benefits had been used in the past, the following was obtained:

Yes 26 companies No 43 companies

26 companies therefore had made use of tax benefits. These were BOI incentives and therefore will not be explained here.

(8) Fund Raising

The main sources of fund were as follows:

Banks	37 companies
Development Bank of the Philippines	0 company
Venture capital	21 companies
Cooperatives	2 companies
Relatives and friends	13 companies
Leasing companies	11 companies
Others	18 companies
(multiple responses allowed)	

with banks being the most frequently used, but there were also loans from sources other than financial institutions. Further, Development Bank of the Philippines was not being used at all. In response to a question on interest rates, collateral, and loan periods, the companies responded that the interest rates (yearly) were from 19 to 36 percent, less than 40 percent of the loans required no collateral, and 60 percent of the periods were short terms.

(9) Relationship With Japan

1) In response to a question as to if orders were being received from Japan, the following was obtained:

Yes 13 companies No 53 companies

with more companies not having received such orders. Even the companies which received such orders in the past, but may not receive any now.

2) In response to a question as to what was blocking orders from Japan, the following was obtained:

Language barrier	29 companies
Complicated procedures	12 companies
Lack of Japanese-speaking employees	12 companies
Small profit margin	4 companies
Others	12 companies
(multiple responses allowed)	

Twenty-nine companies answered that the Japanese language was an obstacle.

3) In response to the question of whether there had been inquiries from Japanese companies, the following was obtained:

Yes	29 companies	No	35 companies

There was a surprisingly large number of companies which indicated there were inquiries.

4) Information on Japanese Computer Software

When asked where they obtained information on Japanese computers, the companies indicated most frequently, 21 companies, Japanese affiliated companies. Conversely, few companies mentioned PADEC, ITAP, and JETRO, four companies each, and NCC, three companies.

5) Information on Japanese Computers

Of the most interest in information regarding Japanese computers were trends in system development, followed by standardization, data bases, lists of software companies, and office automation. (See Table AV-2-2.)

6) Support from Japan

In response to a question as to what kind of support was sought from Japan, many companies requested education, training, and seminars. In addition, there were numerous requests for marketing and financial assistance. (See Table AV-2-3.)

(10) Group Analysis

The 73 companies which responded to the questionnaire survey were divided into foreign capital affiliated firms (group A), large capital affiliated firms (group B), independents (group C1 and group C2), and companies mainly engaged in data entry (group D) and an analysis was made of the numbers of employees, capital, problems, and methods of fund raising for each.

Group A	8 companies
Group B	9 companies
Group C1	4 companies
Group C2	35 companies
Group D	17 companies

1) Number of Employees

	Total	Max.	Min.	Ave.
Group A	261	108	2	33
Group B	3,433	2,220	25	429
Group C1	577	247	60	144
Group C2	1,251	300	2	38
Group D	4,033	1,500	20	237

The group A companies were smallest in average size, followed by the group C2 companies. The group B companies were the largest in size due to the large divisions other than software development. The group D companies had the large number of employees per company due to the large number of operators engaged in data entry work. The average number of workers per company other than in group D was 98. The total for group C1 and C2 was 46, showing that there were many companies with extremely small

sizes.

2) Capital

Regarding capital, no particularly special characteristics were seen in any group. One of the reasons is believed to be that the size of companies is not tied in with the size of capital. For example, in one case a company with 30 employees (group C2) had a capital of over 10 million pesos, while a company with with over 100 employees (group C1) had capital of only less than 5 million pesos. (See Table AV-2-4.)

3) Lines of Business

A look at the ratio of business from the domestic market and the overseas market shows there was a strong trend toward emphasis on the overseas market in Group A. Group B companies were also doing large amounts of overseas work. This is believed to be due to the fact that companies belonging to group B and their parent companies which were going forward with business overseas. On the other hand, looking at the lines of business, overall, there were many companies which were engaged in applications software development, but there were considerably fewer companies engaged in systems software development. In particular, in each of groups B and C1, there was one company which was engaged in systems software development domestically and overseas. In the 35 companies of group C2, 13 were engaged in systems software development. In group C2, the group of small sized companies, it is questionable if the companies have the ability to handle systems software development. This was probably due to a lack of clear understanding of the definition of systems software development. The same may be said of systems integration. Overall, the large number of companies engaged in professional services is believed to have been due to their starting with relatively little capital as consultants etc. In group D, all 17 companies were engaged in data entry work for overseas clients. Group D companies include many which stress the high margin overseas market, it may be said. (See Table AV-2-5.)

4) Hardware

This question concerned what hardware was being used, so answers did not necessarily mean that that hardware was owned. There is a large possibility that the companies were borrowing CPU time from other firms or considering that development of programs for mainframes by PCs also meant "being used". In particular, in group D, it is believed that there were few companies which actually owned mainframes.

(Unit: Number of Response)

	Mainframe	Mini	WS	PC
Group A	3	5	3	7
Group B	5	5	2	9
Group C1	4	4	3	4
Group C2	6	8	13	33
Group D	6	7	5	16

The group A and B companies used very similar hardware. That is, they made large use of minicomputers rather than work stations (WS) and did not necessarily use mainframes. Several companies used only personal computers (PC).

The group C1 companies almost all used hardware. This is believed to be because the companies in this group had the ability to do a wide range of work.

The group C2 companies included many which based their work on personal computers. Thirteen used only personal computers. Work stations are used in large numbers because they are cheaper than minicomputers and are superior in cost performance.

The group D companies probably were using specialized data entry machines or personal computers and also using minicomputers and work stations for editing.

5) Problems in Management

In groups A, B, and C1, the shortage of SEs and SAs is the most serious problem. In group D, there were many companies which considered marketing difficulties a problem. This shows that the data entry companies are export companies and marketing overseas is difficult. In groups A and B, other than the problem of the shortage of SEs and SAs, opinions were divided and no special characteristics could be found. However, comparing the two, the group A companies did not consider marketing to be that much of a problem, while the group B companies consider it to be somewhat of a problem. In group C2, companies considered marketing to be a problem on a par with the shortage of SEs and SAs. Also, in group C2, companies considered as problems the shortage of overseas information, the lack of infrastructure, and fund raising, not considered much of problems in other groups. Group C2 companies may be said to require business foundations to be laid for them. (See Table AV-2-6.1 to 3.)

6) Infrastructure

All of the groups considered the instability of the power supply as they biggest problem. This was largely an effect of the frequent occurrence of blackouts during the survey period. Overall, there was a large number of companies which mentioned the lack of telecommunication equipment as in second place. Some of group C2 companies considered the lack of mainframes as in first place, but other groups did not consider it as much of a problem. Aside from these, there was no major difference overall. (See Table AV-2-7.)

7) Fund Raising

All the groups borrowed from the banks to some extent. Many companies in groups C2 and D made use of venture capital. However, in the Philippines, venture capital is not well developed, so it is difficult to believe that these companies are really borrowing from venture capital companies. Loans from relatives and friends were common in group C2, but had no counterparts in groups A, B, and C1. This is due to the difficulty in formal fund raising in group C2 and the small amounts raised. There were numerous companies making use of leasing in group D. This is believed to be due to the large number of terminals required for data entry. (See Table AV-2-8.)

Reference: Method of Grouping

The grouping here was based on there responses to the questionnaire survey.

Group A includes companies responding as foreign capital subsidiaries in the

questionnaire survey.

Group D companies engage in data entry work and have less than 10 total SEs, SAs, and programmers.

Group B companies are those deduced from their names or which clearly indicate they are divisions of large corporations.

Group C companies are all others, those which have a total of 50 or more SEs, SAs, and programmers being designated as C1 and those with less than 50 as C2.

Table AV-2-1: The Current and Future Problems

(Unit : Number of Response)

	The Current Problems					The Future Problems				
	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5
Shortage of hardware	6	3	4	5	5	6	8	5	4	5
Shortage of operators	3	2	2	1	7	8	3	4	0	6
Shortage of skilled engineers (SE's/SA's)	23	3	5	5	6	20	7	3	11	8
Shortage of suitable software	3	7	8	7	2	1	4	9	8	4
Shortage of knowledge	2	5	6	10	6	3	8	3	3	13
Difficulty in raising funds	4	6	7	4	5	3	8	3	3	13
Shortage of information	8	16	7	9	5	4	18	6	6	4
Lack of infrastructure	9	4	12	7	7	9	10	9	5	6
Difficulty in marketing	20	7	8	3	4	20	6	4	4	7
Others	4	0	2	3	1	3	0	3	2	1

Table AV-2-2: Information concerning Japanese Computerization

(Unit: Number of Response)

	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5
Standardization Trend	8	3	5	6	2
Systems Dev. Trend	18	9	7	3	2
Interconnection	1	4	5	3	8
CAI	1	4	0	0	2
Database	8	8	0	6	2
Network	4	3	2	6	6
Software Distribution	4	6	7	6	2
Office Automation	8	4	7	3	3
Factory Automation	5	5	1	0	4
R & D	4	1	3	0	1
Commercialization	0	2	0	4	3
Home Automation	0	0	0	1	2
CAD/CAM	0	1	5	2	2
VAN	0	0	2	0	0
List of Software Houses	7	4	2	0	2
Hardware Distribution	3	2	2	1	2
Others	4	0	1	0	3

Table AV-2-3: Assistant Types

	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5
Education, Training	25	8	7	5	2
Dispatch of Consultants	8	8	13	9	2
Education Campaign	4	11	7	13	1
Upgrading of Facilities	14	18	11	3	0
Others	8	0	0	1	0

Table AV-2-4: Paid-in Capital

(Unit: Number of Response)

Capital (Pesos)	Group A	Group B	Group C1	Group C2	Group D	Total
Less than 1M	3	0	1	13	3	20
1M to 5M	4	4	2	12	9	32
5M to 10M	0	2	1	2	3	7
More than 10M	1	2	0	2	2	7

Table AV-2-5: Specific Business Areas

(Unit: Number of Response)

	Group-A		Group-B		Group-C1		Group-C2		Group-D		Total	
	Local	Abraod	Local	Abraod	Local	Abraod	Local	Abraod	Local	Abraod	Local	Abraod
Application Software Development	1	5	7	6	4	2	25	15	7	5	44	33
System Software Development	1	4	1	1	1	1	13	9	3	3	19	18
Network Development and Services	1	2	5	3	3	0	16	5	5	2	30	12
Systems Integration	1	2	5	2	2	0	16	5	4	3	28	12
Professional Services	2	4	8	4	4	3	26	9	6	3	46	23
Turnkey System	1	1	6	1	2	1	13	4	5	1	27	8
Data Entry	0	1	1	1	2	1	7	3	11	17	21	23
Others	2	2	5	0	0	0	16	2	4	6	27	10

Table AV-2-6.1: Current Problem Areas (Group A and B)

(Unit : Number of Response)

	Group-A					Group-B				
	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5
Shortage of hardware	1	1	2	0	0	0	1	0	0	1
Shortage of operators	0	0	0	0	2	0	0	0	0	1
Shortage of skilled engineers (SE's/SA's)	4	0	2	1	0	5	0	0	2	1
Shortage of suitable software tools	0	1	2	1	0	0	0	2	2	1
Shortage of compute-related knowledge	0	1	1	2	0	0	0	1	1	3
Difficulty in raising funds	0	1	0	1	1	0	1	2	1	0
Shortage of overseas information	0	0	1	0	1	0	2	1	1	1
Lack of proper infrastructure	1	0	1	3	0	1	0	1	0	2
Difficulty in marketing overseas	0	0	0	1	2	2	0	3	0	0
Others	1	0	0	0	1	0	0	0	0	0

Table AV-2-6.2: Current Problem Areas (Group C1 and C2)

(Unit: Number of Response)

	Group-C1					Group-C2				
	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5
Shortage of hardware	2	0	0	2	0	3	1	2	2	4
Shortage of operators	0	0	0	0	0	1	1	1	0	4
Shortage of skilled engineers (SE's/SA's)	1	1	1	0	1	12	2	2	1	2
Shortage of suitable software tools	0	0	1	0	0	2	5	3	4	1
Shortage of compute-related knowledge	0	0	0	0	0	1	4	4	5	3
Difficulty in raising funds	0	1	0	0	0	4	3	4	2	1
Shortage of overseas information	0	1	1	1	1	6	5	2	6	2
Lack of proper infrastructure	0	0	1	0	0	5	2	4	2	4
Difficulty in marketing overseas	1	1	0	0	1	8	4	5	2	1
Others	0	0	0	0	0	2	0	1	2	0

Table AV-2-6.3: Current Problem Areas (Group D and Total)

(Unit: Number of Response)

	Group-D					Total				
	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5
Shortage of hardware	0	0	0	1	0	6	3	4	5	5
Shortage of operators	2	1	1	1	0	3	2	2	1	7
Shortage of skilled engineers (SE's/SA's)	1	0	0	1	2	23	3	5	5	6
Shortage of suitable software tools	1	1	0	0	0	3	7	8	7	2
Shortage of compute-related knowledge	1	0	0	2	0	2	5	6	10	6
Difficulty in raising funds	0	0	1	0	3	4	6	7	4	5
Shortage of overseas information	2	8	2	1	0	8	16	7	9	5
Lack of proper infrastructure	2	2	5	2	1	9	4	12	7	7
Difficulty in marketing overseas	9	2	0	0	0	20	7	8	3	4
Others	1	0	1	1	0	4	0	2	3	1

Table AV-2-7: The Major Problems with the Current Infrastructure

(Unit: Number of Response)

Group-A

	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5
Unstable power supply	3	1	1	0	0
Lack of communication network	0	3	0	1	1
Shortage of mainframes	0	1	1	2	0
High import duties	1	0	2	0	1
Others	0	0	0	0	0

Group-B

	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5
Unstable power supply	4	2	1	0	0
Lack of communication network	1	3	3	0	0
Shortage of mainframes	0	0	0	3	2
High import duties	2	1	3	0	0
Others	0	0	0	0	0

Group-C1

	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5
Unstable power supply	2	1	1	0	0
Lack of communication network	2	1	1	0	0
Shortage of mainframes	0	2	1	0	0
High import duties	0	0	0	2	0
Others	0	0	1	0	1

Group-C2

	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5
Unstable power supply	14	6	3	2	0
Lack of communication network	9	7	4	3	1
Shortage of mainframes	5	3	8	3	1
High import duties	4	5	5	3	1
Others	0	3	0	0	1

Group-D

	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5
Unstable power supply	8	0	1	0	1
Lack of communication network	1	5	3	1	0
Shortage of mainframes	1	1	2	1	0
High import duties	0	3	1	1	0
Others	1	2	0	1	0

Total

	Rank-1	Rank-2	Rank-3	Rank-4	Rank-5
Unstable power supply	31	10	7	2	1
Lack of communication network	13	19	11	5	2
Shortage of mainframes	6	7	12	9	3
High import duties	7	9	11	6	2
Others	1	5	1	1	2

Table AV-2-8: Main Sources of Raising Funds

(Unit: Number of Response)

	Group A	Group B	Group C1	Group C2	Group D
Banks	3	6	2	18	8
Development Bank of the Philippines	0	0	0	0	0
Venture Capital	2	1	1	10	7
Cooperatives	0	0	0	2	0
Relatives and Friends	0	0	0	11	2
Leasing Companies	1	2	1	1	6
Others	3	2	2	7	4

V-3. Smmary of Japan's Information-Technology Engineers Examination System

(1) Establishment of the Examination System

1969 The system is launched as the Information-Technology Engineers Equivalency Examination.

1970 The system is made into a national test based on the Law on Facilitation Information Processing.

1969-1970 The Senior Programmer Examination and the Programmer Examination are implemented.

1971 The Systems Engineer Examination is added.

1982 The number of applicants exceeds 100,000.

1984 The Japan Information Processing Development Center (JIPDEC) is commissioned to administer the examinations.

1985 The number of applicants exceeds 200,000.

1986 The Systems Auditor Examination is added.
The frequency of the Programmer Examination is increased to twice a year.

1988 The Informatique Systems Engineer Examination is added. The number of applicants exceeds 400,000.

1989 The Senior Programmer Examination period is changed from fall to spring.

(2) Details of the Examination System

1) Objectives of the Examination

— to enhance information processing technology by providing goals and incentives for information processing engineers.
— to contribute to the establishment of standard information processing-related education programs by defining the various skill levels required by information processing personnel;
— to foster a broad awareness of the information movement among the Japanese populace by providing them with the opportunity to sit for the information-Technology Engineers Examinations.

The main feature of these examinations is that, unlike many other national examinations for doctors, lawyers, etc., no business qualifications are granted, nor are corporations required to employ qualified examinees (e.g., the Electric Chief Engineer Qualification Examination, etc.)

Instead, the examinations might be regarded as a system for improving technologies, etc.

2) Examination Categories, Targets and Levels of Expertise

Category	Level of Expertise
Systems Auditor Exam	This test targets systems auditors engaged primarily in the auditing of information processing (IP) systems. Systems auditors should possess general knowledge equivalent to that of college graduates, have five or more years of actual work experience, possess specialized knowledge in the planning, developing, operating and auditing of IP systems, as well as in their specialized fields, and be capable of auditing IP systems.
Systems Engineer Exam	This test targets systems engineers engaged primarily in the design and analysis of IP systems. Systems engineers should possess general knowledge equivalent to that of college graduates, have three or more years of actual work experience, possess specialized knowledge in a number of fields, including computers, and be capable of designing and analyzing IP systems.
Informatique Systems Engineer Exam	This test targets informatique systems engineers engaged primarily in the analysis, design and evaluation of on-line systems. Informatique systems engineers should possess general knowledge equivalent to that of college graduates, have three or more years of actual work experience, possess specialized knowledge of informatique systems, including information processing, and be capable of analyzing, designing and evaluating on-line systems.
Senior Programmer Exam	This test targets senior programmers engaged primarily in the design and preparation of advanced programs and the supervision of other programmers. Senior programmers taking this test should possess general knowledge equivalent to that of college graduates and have three or more years of actual programming experience.
Programmer Exam	This test targets programmers engaged primarily in the preparation of programs based on program design charts. Programmers taking this test should possess general knowledge equivalent to that of high school graduates and have at least one full year of actual programming experience.

3) Examination Subjects and Testing Methods

Category	Subjects	Testing Methods
Systems Auditor Exam	1) Knowledge of organization and functions of information processing systems 2) Knowledge of planning, development and operation of information processing systems 3) Information processing system auditing skills 4) Related knowledge	(Length of exam: 6 hours) Multiple choice questions Fill in the blanks Short answers
Systems Engineer Exam	1) Knowledge of computer hardware 2) Knowledge of computer software 3) Information processing system designing skills 4) Related knowledge	(Length of exam: 6 hours) Multiple choice questions Fill in the blanks Short answers
Informatique Systems Engineer Exam	1) Knowledge of computer hardware 2) Knowledge of computer software 3) Informatique systems designing skills 4) Related knowledge	(Length of exam: 6 hours) Multiple choice questions Fill in the blanks
Senior Programmer Exam	1) Knowledge of computer hardware 2) Knowledge of computer software 3) Program designing skills 4) Program preparation skills 5) Related knowledge	(Length of exam: 5 hours) Multiple choice questions Fill in the blanks
Programmer Exam	1) Knowledge of computer hardware 2) Knowledge of computer software 3) Program preparation skills 4) Related knowledge	(Length of exam: 5 hours) Multiple choice questions Fill in the blanks

4) Qualifications for Examinees

• Systems Auditor Examination

Examinee must be 27 years of age or older as of April 1 in the year of the examination.

• Systems Engineer Examination

Examinee must be 25 years of age or older as of April 1 in the year of the examination.

• Informatique Systems Engineer

Examination, Senior Programmer Examination and Programmer Examination

Free (regardless of education, sex, age or nationality)

5) Number of Applicants and Successful Candidates (through 1989)

	Total Applicants	Total Successful Candidates	Average Rate of Success (percent)
Systems Auditor	39,557	1,502	3.8
Systems Engineer	184,984	11,220	6.1
Informatique Systems Engineer	47,708	1,311	2.7
Senior Programmer	604,796	52,443	8.8
Programmer	1,976,299	209,423	10.6

6) Examination Fees

Each category of examination: ¥3,600

7) Qualification Certificates

Examinee numbers are published in an official gazette, and the Minister of International Trade and Industry presents qualification certificates to successful candidates.

V-4. Information on the Japan-Singapore Institute of Software Technology(JSIST)

(1) MILESTONES OF JSIST

1) Phase I

The Japan-Singapore Institute of Software Technology(JSIST) was established in December by 1980, by the Singapore Economic Development Board, in line with the 1979 Economic Restructuring Plan.

Under an agreement signed between the Governments of Singapore and Japan, the Government of Japan provided technical assistance through the Japan International Cooperation Agency(JICA), to Singapore for the planning, establishment and operation of the Institute via a resident team of Japanese software experts. This first agreement lasted 5 years.

The aim of the Institute was to train information technology(IT) professionals to fulfill the computer services industry needs. Through the Diploma in Programming and Systems Analysis and the Post-Graduate Diploma in Systems Analysis, IT manpower was provided to Singapore at 2 levels- Analyst/Programmers and Systems Analysts.

Donations of hardware and software amounting to S$8 million were made to the Institute, and 24 training fellowships to Japan were provided for local lecturers.

2) Phase II

The first five-year agreement of cooperation and technology transfer was so successful that a second agreement lasting another 5 years was signed in January 1986. A second group of 12 Japanese software experts were attached to the Institute. Another 22 training fellowships to Japan were provided to local lecturers.

Under the second phase, an Advanced Diploma course was introduced to allow existing JSIST Diploma holders and other

experienced IT professionals to further upgrade themselves. New hardware and software donations were made amounting to more than S$7 million.

3) Regional Training

The Institute not only provided training courses for company sponsored and self-financing students but also to participants from other countries. Individuals from countries such as Philippines and Indonesia have been sponsored by JICA for training in JSIST since 1987, under its Tripartite Training Programme. International organizations such as the United Nations Development Programs have also sponsored overseas participants for training in JSIST. Foreign governments have also sponsored their own staff for training at JSIST.

4) Top Management Seminars

JSIST regularly conducts in-house seminars, in collaboration with JICA, with invited speakers from Japan and other countries. Public seminars for top management in the IT industry are held yearly with speakers of international renown. JSIST became a windows through which Singapore IT professionals could look at the latest IT technological developments in Japan.

5) MITI Accreditation

On 1st August 1989, the Diploma in Programming and Systems Analysis, and the Advanced Diploma in Software Technology courses received accreditation from the Japan's Ministry of International Trade and Industry(MITI) for their Information Technology Engineers Type II and Type I examinations respectively.

(2) Major Diploma Courses

JSIST offers diploma courses at 3 levels:

1) AP Course

The Diploma in Programming and Systems Analysis(AP) course, aims to train 'A'-level students to become Analyst/Programmers. Covering more than MITI's Programmer Examinations syllabus, this course is taught full-time over 2 years. During this course, students are also taught Japanese Language.

2) SA Course

The Post-Graduate Diploma in Systems Analysis(SA) course, aims to train non-computer science university graduates to become Systems Analysts, this course is taught both full-time over 9 months and part-time over 21 months.

3) AD Course

The Advanced Diploma in Software Technology(AD) course, allows JSIST Diploma holders and other experienced IT professionals to upgrade themselves. Advanced techniques in programming, Systems analysis and software engineering are taught. This course is equivalent to with MITI's senior Programmer Examinations. This course is taught both full-time over 1 year and part-time over 2 years.

4) Practical Oriented Courses

All diploma courses offered by JSIST incorporate at least 50% 'hands-on' training. Students are required to participate in in-house projects working as a group and they must also spend the last 3 months of their course on a full-time individual industrial project.

(3) THIRD COUNTRY GROUP TRAINING PROGRAMME

1) Third Country Group Training Programme(TCTP)

In August 1989, JSIST became a regional training center for group JICA the Third Country Group Training Programme(TCTP) was launched. The Institute conducted the first full-time

Third Country Group Training on Computer Software Technology in January 1990. In this way, JSIST shared her knowledge and experience gained through the years of cooperation with Japan, with countries in the region.

(4) SPAWNED ACHIEVEMENTS

1) Aim

By 1986, JSIST was ready to share the knowledge and experience which had been gained from the cooperation by offering con-sultancy and development services to the industry.

2) Consultancy & Development Laboratory

The C & D Laboratory was set up in 1986, and provides services in the form of:

1. Joint Software Development
2. Management & Advisory Consultation
3. Customized Training

Fig. AV-4-1: Organization Chart of the JSIST

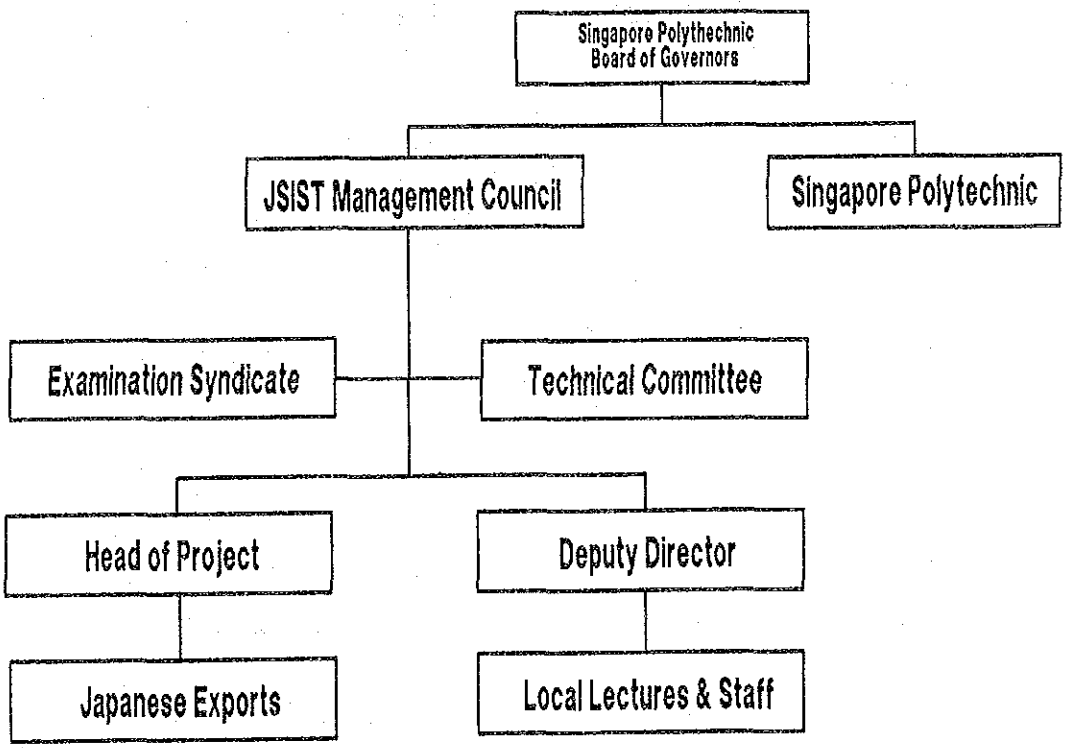
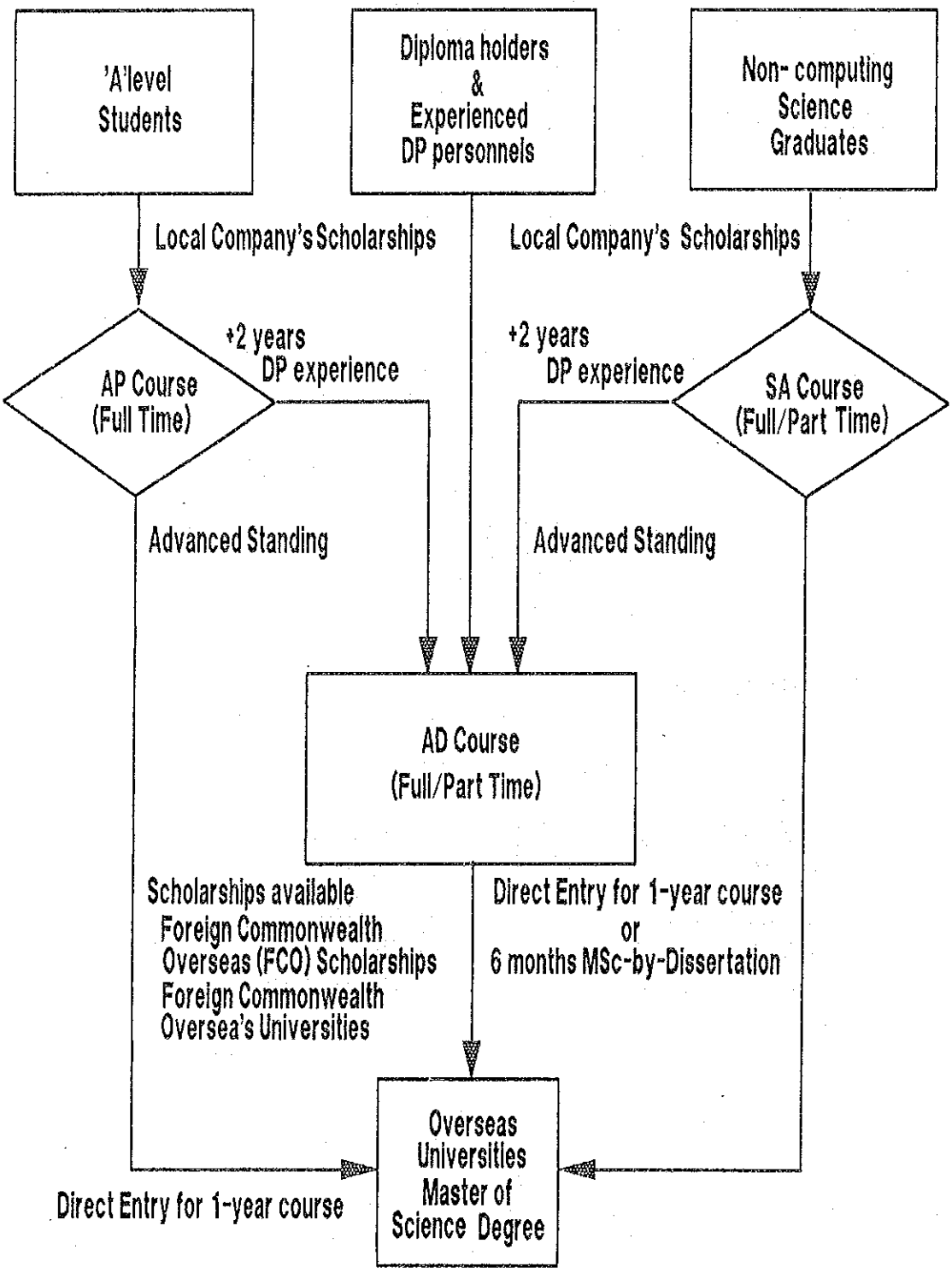


Fig. AV-4-2: JSIST's Educational Path



JICA