THE INFORMATION REVOLUTION IN DEVELOPMENT ASSISTANCE

Executive Summary

June 2001

Institute for International Cooperation
Japan International Cooperation Agency

This report is based on the discussion and findings of the study committee on information and communications technology (ICT) utilization in developing countries organized by the Japan International Cooperation Agency (JICA). The views expressed in the report are those of the members of the Study Committee and do not necessarily reflect those of JICA.

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Foreword

Information and Communications Technology (ICT) was one of the major subjects discussed at G8 Kyushu-Okinawa Summit in July 2000, which adopted the "Okinawa Charter on Global Information Society." In the Charter, ICT was defined as one of the most potent forces in shaping the twenty-first century as well as an important means for human beings to fulfill their potential. The Charter urged all parties concerned, including the private sector, to participate in constructing a global information society in which everyone, no matter where they live, can benefit from ICT.

In its efforts to realize the aims of the Charter, Japan announced a comprehensive framework for cooperation intended to bridge the international digital divide, along with an expected contribution of 15 billion dollars over the next five years. Japan has also established objectives intended to: (1) raise awareness of ICT and contribute intellectually to policy- and institution-building; (2) develop human resources; (3) build IT infrastructure and provide assistance for network establishment; (4) and promote the use of ICT in development assistance.

In accordance with these policies, this research project aimed to make practical proposals designed to encourage aid agencies to adapt themselves to the need for ICT development. The research reviewed international trends in ICT application, especially in Asian countries, and examined the types of assistance that Japan should provide for wider and better ICT application. The focus was on assistance to establish strategic policies for ICT application as well as assistance in the field of telecommunications as the foundation of such application. The research also worked to identify possibilities for assistance in ICT application in education/training, health care, governance, poverty reduction and the environment, as these are priority fields in international cooperation as well as fields in which the application of ICT is expected to be comparatively effective.

Strategies for ICT application need to be comprehensive and consistent, and they must be developed for regions as well as for individual countries. In the field of telecommunications, assistance should address the development of infrastructure as a foundation for ICT application in addition to human resources development and the establishment of policies and systems in this field. ICT can be effectively applied to various fields of assistance, and it is useful for (1) collecting, accumulating, disseminating and sharing information, and (2) conducting remote and follow-up assistance. Moreover, aid organizations can utilize ICT to provide

more effective and efficient assistance.

However, while the quality of assistance to developing countries can be improved with ICT, its introduction does not automatically lead to desirable results. ICT should be applied carefully, and full consideration of the following factors that are common to all fields is required.

(1) Establishment of a well thought out content and systems that are easy to use
(2) Reliability of information
(3) Human resources development and recognition of the need for reform
(4) Operational/management systems and user support systems
(5) Economic feasibility and selection of appropriate media
(6) System improvement and maintenance
(7) Security and privacy protection
(8) Intellectual property rights
(9) Consideration for people who do not have access to ICT
(10) Brain drain
(11) Human resources development in Japan
(12) Private sector participation and cooperation with universities

This report has been prepared through the hard work of a task force headed by Koichi Miyoshi, the Deputy Managing Director of the Planning and Evaluation Department of JICA, and made up of external experts, senior advisers and staff members of the departments concerned in JICA, and consultants.

I would like to thank the members of the task force for their enthusiastic contribution to this research project. It is my sincere hope that this report will prove useful in international cooperation that utilizes ICT.

July 2001

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Outline of This Research

1. Background

In today's world, no matter where people are, they cannot avoid being influenced by events that occur far away. Economic activity in one country has an impact on activities in other countries. And information that was limited to a particular area can now be shared around the world the moment it is placed on the Internet. The expansion of economic activities and the rapid development of information and communications technology (ICT) have combined to become the driving force of economic globalization. This trend has brought about a state of affairs that cannot be dealt with through traditional ways of thinking.

The industrial structure has also changed dramatically. Production technology that created the world of the twentieth century has been replaced by ICT. ICT development that provides lightning-fast communications through such means as the Internet and cellular phones is changing the world's economy and society day by day. This globalization and telecommunications revolution has unlimited prospects that cover every field of human activity.

In the meantime, ICT developments have resulted in disparities between the people, organizations, and nations that can utilize ICT and those that cannot. This situation is referred to as the 'digital divide.' In today's society, information is an essential element in people's lives, almost like food and water. The digital divide has therefore become a serious issue, especially in developing countries. Based on this understanding, development assistance has involved giving support to ICT utilization in such countries. In line with efforts by many other countries, Japan committed itself to active participation in this field at the G8 Kyushu-Okinawa Summit (Okinawa Summit) in July 2000.

Based on a thorough understanding of current trends, this research is intended to examine what Japan, and primarily the Japan International Cooperation Agency (JICA), can do to support ICT utilization in developing countries.

2. Purpose of Research and Questions to Answer

Understanding the trends mentioned above, the Okinawa Summit took up ICT as an area of major concern, and it adopted the "Okinawa Charter on Global Information Society." In the Charter, ICT was defined as one of the most potent forces in shaping the twenty-first century as well as a means for human beings to

fulfill their potential. The Charter urged all parties concerned, including the private sector, to clarify their roles in addressing ICT-related problems, with the understanding that the development of ICT should be led by the private sector. It also urged all parties to join forces in promoting a global information society so that everyone, no matter where they live, can benefit from ICT.

In its efforts to realize the aims of the Charter, Japan announced a comprehensive framework for cooperation to bridge the international digital divide along with an expected public contribution of a total of 15 billion dollars over the next five years, from both ODA and non-ODA budgets. These efforts are intended to (1) make an intellectual contribution toward promoting the recognition that "ICT is an opportunity" and toward establishing policies and systems for ICT, (2) develop human resources through training programs, (3) assist in the building of telecommunications infrastructure and networks, and (4) support active utilization of ICT in actual development assistance operations. JICA, one of Japan's official development assistance agencies, is responsible for promoting cooperation to achieve these objectives.

This research report examines the role of development assistance with focus on the ICT revolution, and proposes practical directions for development assistance agencies in this era of ICT development.

This research attempts to answer the following questions.

(1) How is political discussion of ICT taking place around the world? What are the issues being discussed in major international meetings? What are the ICT policies of developing countries? How are these policies formulated and carried out?

(2) What are the developments in the telecommunications field that provide the basis for ICT? What are the key technical and systemic issues that require consideration in conducting development assistance?

(3) What are the fields and methods adopted for assistance that employ ICT? What are the ideas or concepts governing the implementation of such assistance? What aspects should be taken into consideration in carrying out assistance by Japan?

(4) How should JICA's operations be re-oriented to realize the intentions of "Japan's comprehensive assistance policy to bridge the international digital divide," which was announced at the Okinawa Summit? What are the possible strategies for this?

3. Research Methods

This research was conducted based on review of basic sources and web sites, research reports on project formulation studies (including those of JICA), and project evaluations.

A study committee was formed for the research, consisting of subgroups, each of which dealt with a particular subject, such as strategies for ICT utilization, telecommunications, education and training, healthcare, governance, poverty reduction and environment. The study committee as a whole held several meetings to discuss the reports prepared by each group. This final report was compiled from drafts written by each group.

While no field research was undertaken, some members participated in policy conference missions related to ICT assistance, project formulation studies, or pre-project field research. These members made every effort to include the results of these studies in this research. Members of the study committee were actively involved in the work of the task force groups, and wrote parts of the report based on their professional perspectives. Some members of the task force had experience as project specialists in the telecommunications field in developing countries, which was also incorporated into this research.

ICT is rapidly and continually changing, and accordingly a complete compilation of relevant information cannot be made. The priority for this research was therefore placed on the collection and analysis of international trends and specific previous cases of assistance in the field of ICT, rather than on theoretical discussion. We believe that this report should be useful for aid-related personnel in formulating, planning and conducting projects involving ICT assistance. We also add that care was taken in the discussions and writing of the report to maintain technical neutrality, since the technology in this field is changing dramatically.

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Direction of Japan's Future Assistance for ICT Utilization

Information and Communications Technology (ICT) was one of the major subjects of G8 Kyushu-Okinawa Summit (Okinawa Summit) in July 2000, which adopted the "Okinawa Charter on Global Information Society." In the Charter, ICT was defined as one of the most potent forces shaping the twenty-first century as well as a means for human beings to fulfill their potential. The Charter urged all the parties concerned, including the private sector, to participate in constructing a global information society so that everyone, wherever they are living, can benefit from ICT.

As part of its efforts to realize the aims of the Charter, Japan announced a comprehensive cooperation package for bridging the international digital divide consisting of non-ODA and ODA public funding with the view to extending a total of US$15 billion over five years. This comprehensive package focuses on such areas as:

(1) Raising awareness of ICT opportunities and contributing intellectually to policy and institution-building;
(2) Developing and training human resources;
(3) Building ICT infrastructure and providing assistance for network establishment; and
(4) Promoting the use of ICT in development assistance.

This research has set its own goals in accordance with these objectives in order to make practical proposals that will encourage aid agencies to adapt themselves to the need for ICT development.

1. Purpose of Assistance for ICT utilization

1.1 Definition and Characteristics of ICT

ICT is a concept that includes both information technology and communications technology. This report defines ICT to include telephones (public switched network), the Internet, satellite communications, optical communications, broadcasting, and traditional mail as well as data storage media such as CD-ROM and DVD, and various applications software. Among the technologies,

this report focuses on network technology and various applications to use such technology, since the rapid worldwide expansion of ICT utilization stems mainly from information networking.

ICT is characterized by the fact that it enables us to much more easily collect, compile, share, disseminate and receive information, and that it consequently facilitates the creation of new information. This has changed the flow of information from being one-way to becoming interactive. Furthermore, the development of ICT has made it possible to communicate beyond limitations of time, distance and space. ICT, like the Industrial Revolution, might bring about economic and social reconstruction.

1.2 Significance and Purpose of Assistance for ICT Utilization

ICT utilization enables us to deal with things promptly and effectively. It also helps us to easily access the information that is needed, and consequently to make appropriate decisions. In the field of international assistance, interactive information exchange - which ICT utilization brings about - leads to a good understanding of the needs and conditions of the beneficiaries. Therefore, it enables us to render carefully considered assistance to them. In addition, ICT utilization can make boundaries between countries, organizations and sectors less significant; so as to promote collaboration among them. It results in effective aid operations. For instance, global information exchange enables those who cannot go to developing countries due to temporal and financial limitations to participate in providing development assistance. As the number of people involved in development assistance increases, the assistance can meet the recipient's needs more specifically. Also, using ICT, those who cannot leave their country or area of residence will be able to join a training program held in the other country or to exchange opinions with others in different countries. In short, ICT utilization seems promising to improve both the quality and the scope of ODA, and may enable developing countries to obtain effective support for their future development.

Assistance for promoting ICT utilization is designed to encourage the developing countries to promote a 'telecommunications revolution' by themselves, and to provide them with the impetus to achieve the take off stage towards an information society. In other words, assistance for ICT utilization is a form of support to formulate and carry out policies and systems in developing countries to deal with the persistent trend of globalization. The application of ICT to ODA will improve the quality of assistance in every sector, and make assistance

more flexible to meet the needs of developing countries.

2. Direction of Assistance for ICT Utilization

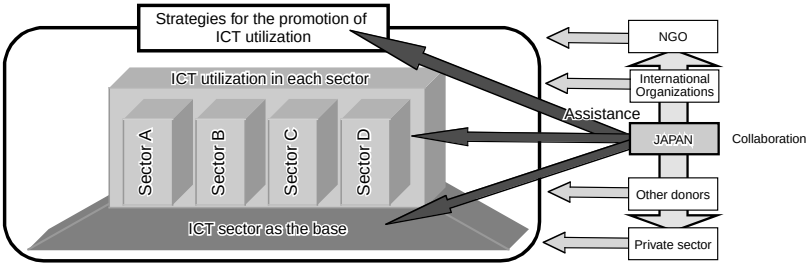
ICT can be applied to any field, and the promotion of ICT requires a comprehensive policy framework. Therefore, it is essential for developing countries to have a set of clear strategies for the promotion of ICT utilization at the national level and then at the regional level like the e-ASEAN Framework Agreement[1]. Such strategies must be comprehensive and consistent.

ICT utilization requires development in telecommunication sector, i.e., the establishment of policies and systems, the development of infrastructure, and human resources development at every level among government officials, engineers and users. It is also important to utilize ICT in other sectors so as to increase beneficiaries as well as to improve the quality of assistance.

Since ICT is a global trend, assistance for promoting ICT utilization should be carried out through collaboration among donors, international organizations, NGOs and the private sector. It is also preferable to cooperate with developing countries that have relatively advanced ICT capacity. It is also useful and can provide a good incentive for developing countries to exchange information and opinions on ICT utilization among each other.

The following figure illustrates the concept of what has been mentioned above.

Figure: Overview of assistance for promoting ICT utilization



[1] The e-ASEAN Framework Agreement was signed by the heads of the Member States of the Association of Southeast Asian Nations (ASEAN) in November 2000 to guide and enhance ASEAN's cooperation in the Information and Communications Technology (ICT) sector.

National strategies for ICT utilization are critically important for developing countries. They should be comprehensive and consistent, and policies and systems for putting these strategies into practice are needed. These strategies should be harmonized with regional agreements such as e-ASEAN.

Strategies for ICT utilization should include the following factors:

- Attaching importance to the participation of the private sector and development of the sector (including promotion of the software industry and venture business);
- Infrastructure development;
- Establishment of systems for the promotion of ICT utilization;
- Establishment of electronic government;
- Development and promotion of tele-applications (distance learning and distance healthcare);
- Human resources development;
- Promotion of e-commerce;
- Protection of privacy and intellectual property rights and the assurance of security;
- Improvement of contents (creation of contents in local languages); and
- Bridging the digital divide.

Support in telecommunications should aim at achieving the following goals:

- Legislative development for ICT utilization (deregulation, network security, data protection and verification);
- Human resources development in political and technical fields to cope with the rapid expansion of ICT;
- Infrastructure development, mainly in rural areas through the expansion of access points such as Multipurpose Community Telecentres (MCTs); and
- Promotion of ICT utilization and private sector development.

In support for telecommunications, careful attention must be paid to the following issues:

- Management and maintenance of the infrastructure;
- Availability of ICT professionals for cooperation;
- Protection of copyrights;
- Coping with rapid technical innovation;
- Cooperation and collaboration with other aid organizations; and
- Assistance in state-of-the-art technology.

Because ICT can be applied basically to any sector, assistance in general can

be improved in both quality and scope through ICT utilization. This research considered the expected advantages of ICT utilization that are common to all sectors as follows:

- to promote the collection, compilation, dissemination and sharing of information; and
- to provide distance assistance and follow-up assistance.

The research examined possibilities for assistance to ICT utilization in education and training, healthcare, governance, poverty reduction and the environment, which are priority issues for international cooperation and in which the utilization of ICT is expected to be useful.

The direction of future assistance for the ICT utilization mentioned above is summarized in the table on the next page.

The following part will discuss support to strategy formation for ICT utilization and support to telecommunications that is the basis of ICT utilization. The utilization of ICT in each sector (education/training, healthcare, governance, poverty reduction and environment) will also be discussed in detail in the following sections.

2.1 Formulation of ICT Strategies

In order to promote ICT utilization in developing countries, the governments of these countries should recognize the importance of ICT and establish national strategies for ICT utilization. Policies and systems should then be formulated and implemented in accordance with the strategies. The policies and systems must be comprehensive and consistent, and furthermore, must be coordinated well with regional agreements such as e-ASEAN and with global standards. Since the private sector plays a leading role in the development of ICTs, the role of the public sector is to provide premises of the ICT utilization strategies such as creating an ICT-friendly environment and supporting communities and people that might be left behind in ICT development due to the lack of profitability for the private sector. These are the premises of the ICT utilization strategies.

Strategies for ICT utilization should include the following factors:

- Attaching importance to the participation of the private sector and also to the development of the private sector itself (including promotion of the software industry and venture business)
- Infrastructure development
- Establishment of systems for the promotion of ICT utilization
- Establishment of electronic government

Table: Direction of future assistance for ICT utilization

		Priority items for support	Issues to be concerned with
Strategies for ICT utilization		• Establishment of comprehensive and consistent strategies for ICT utilization	• Cooperation with international organizations, other donors and countries such as Singapore
Telecommunications		• Legislation for ICT utilization (deregulation, network security, data protection and verification) • Human resources development (policy makers, engineers, teachers and lecturers, users) • Infrastructure development in rural areas • Activation of ICT utilization and development of the private sector	• Management and maintenance of infrastructure • Competence of ICT professionals for cooperation • Protection of copyrights • Coping with rapid technical changes • Cooperation and collaboration with other aid organizations • Appropriateness for assistance in state-of-the-art technology
ICT utilization in each sector	Education/training	• Improvement of existing training programs • Support for overseas projects • System development for distance training • Support for distance learning in developing countries (networking for distance learning, electronic libraries, system development) • Support for basic education (database on education, ICT training in elementary and secondary education)	• Institutional reform of JICA (organizational structure suitable for ICT cooperation, lecture fees, copyright protection) • Management and maintenance of 'IT centers' • Appropriate contents (lecturers and materials) • Proper types of media for training • Capacity of communication lines • Collection of tuition fees
	Healthcare	• Improvement of the quality of medical staff and data collection for healthcare • Efficient consultation • International consultation	• Economic efficiency • Operation and maintenance of equipment • Confidence among healthcare professionals • Quality of medical care • Security and privacy protection • Legislation (reliability, health insurance coverage)
	Governance	• Efficient administration • Information disclosure • Support for democratization • Development of legislation	• Digital divide • Human resources development and raising people's awareness • Security and privacy protection • Use of the resources and know-how of the private sector
	Poverty reduction	• Transparency of policies and reflection of local needs • Provision and exchange of technical information and daily life information • Empowerment of the poor by meeting their needs	• Equipment that is easy to introduce and operate • Language selection (use of images and voices) • Reasonable user fees • Consequent increase in income and living standards • Maintenance-free system and back-up systems • Terminals that are readily available
	Environment	• Environmental monitoring and management • Integrated cooperation • Information for the judgment of policy makers and citizens • Dialogue and agreement among stakeholders	• Compilation of basic data • Introduction of appropriate technology • Appropriate contents • Management and maintenance of systems • Human resources development • Digital divide

- Development and promotion of tele-applications (distance learning and distance healthcare)
- Human resource development
- Promotion of e-commerce
- Protection of privacy and intellectual property rights and the assurance of security
- Improvement of contents (creation of contents in local languages)
- Bridging the digital divide

As for the private sector, to foster Internet access provider is also important.

The factors mentioned above have been discussed at several international conferences and their importance is widely recognized. These factors should therefore be considered in the formulation of ICT strategies. Moreover, the current conditions and needs of each recipient country should also be taken into account. As for infrastructure, for example, some of the developing countries are trying to establish a basic network of telecommunications while others are striving to improve their infrastructure to establish high-speed telecommunications networks. Japan should carefully define the assistant objectives (what kind of assistance should be provided at what level) for each country and for its issue.

Although comprehensive strategies are necessary for the promotion of ICT utilization, it is difficult to put all the policies into practice at the same time. Japan should therefore clarify priorities based on the capacity and needs of each developing country, and establish a feasible action plan for each country. (Development of policies and systems for ICT utilization in various sectors will be discussed in Section 2. 3 below.) Since developing countries tend to have weak implementation capacity, Japan should be considerate in helping to develop such capacity.

Assistance for policy formulation should be carried out in cooperation with experienced international organizations and cooperation agencies[2] rather than by Japan alone. Any assistance should consider the recipient governments' opinions on what and how policy is formulated.

2.2 Telecommunications

Telecommunications are the foundation for ICT utilization. Japan's support in this sector can include:

[2] For example, the United Nations Commission on International Trade Law (UNCITRAL) lists systems necessary for e-commerce at http://www.uncitral.org/en-index.htm.

- Legislation for ICT utilization;
- Human resources development in administrative and technical fields in order to cope with the rapid expansion of ICT utilization;
- Infrastructure development, mainly in rural areas including the expansion of access points using Multipurpose Community Telecentres (MCTs); and
- Promotion of ICT utilization and private sector development.

Legislation

ICT-friendly policies and a regulatory environment are essential for the active utilization of ICT. The development of legislation includes deregulation, network security, and data protection and verification systems. For this purpose, Japan should collaborate with other donors that have substantial experience in legislation development, and countries such as Singapore where ICT utilization has already reached advanced levels.

Human Resources Development

The development of human resources capable of responding to the demand of the information age is indispensable. 'Human resources' covers a wide range of people; not only engineers but also policy makers and ordinary users. 'Development' here does not simply mean to enhance learning skills but understanding that ICT helps people, organizations and the nation to fulfill their potential. The level and extent of necessary skills certainly depends on each country. For example, in Japan, there is great demand for telecommunications engineers who have knowledge and skills in both networks and systems, besides consultants, integrators and creators of contents. On the other hand, in countries where the telecommunications industry has not developed much, information engineers and telecommunications engineers at the basic level are still much in demand. Thus it is important to obtain a clear view of the actual situation of the recipient country and to decide what skills are most in demand. In countries that have relatively advanced ICT capacity, a qualifications examination system for information processing engineers will be useful in promoting the cross-border employment of engineers. Policy makers will be required to have the ability to develop ICT strategies in addition to their economic and legal knowledge. Education for teachers and instructors is also necessary.

Such a wide variety of human resources should be developed through formal education, professional training and seminars. For example, the JICA Okinawa

International Centre provides a group training program called the Training Course for Information Processing Personnel. The program is aimed at educating engineers who will be engaged in the development and operation of information systems used in the governmental agencies of developing countries. Such programs should be expanded and improved flexibly so as to meet the diversified needs of developing countries. The dispatch of experts from third countries that have a mature ICT industry and overseas training programs are a possible option to take. Multipurpose Community Telecentres (MCTs) described below can provide good places for overseas training. To improve ICT literacy among local communities, the dispatch of volunteers and cooperation with NGOs might be effective. For the education of engineers, cooperation with the private sector should be considered.

Infrastructure development

The actual conditions of the recipient country determine the type of ICT that accommodate the condition. For countries with a low ICT diffusion rate, the development of basic infrastructure for telecommunications should be given top priority in ODA, and in such countries, media such as TV and radio should be utilized as well. Especially in rural areas, the weak infrastructure constitutes a serious problem. The wireless communications technology of Japan (including third generation mobile phones) can be used effectively for the telecommunications infrastructure in rural areas. Introduction of the forthcoming standard (3G:IPv6), not the existing one (2.5G:IPv4), should also be considered. The latter has little address left available, while the former has plenty and allows for high-speed communications.

At present, 'universal access' is far from the reality in most developing countries. It is necessary to build access bases such as MCTs. In Rajkot, Gujarat Province, India, for example, twelve MCTs are now under construction through the joint efforts of the Department of Telecommunications, the state government of Gujarat and ITU (International telecommunication Union). These MCTs will become the places to publish administrative information and to provide telemedicine and distance learning. Facilities constructed through project-type technical cooperation can also become access bases. As for MCTs, it will be preferable to adapt a strategic approach; i.e., to prepare several models that suit various types of rural areas, conduct pilot projects for each of them, and replicate the successful cases in other areas. Cooperation with the private sector is also important for infrastructure development.

Promotion of ICT utilization and private sector development

In developing countries whose scale of ICT market is still small, and whose private sector is therefore not strong enough to lead ICT utilization, Japan's assistance should start with the government-led introduction of ICT into public services such as electronic government, distance learning and telehealth. In this process, the government should encourage private companies to join in ICT development, lead ICT utilization in the private sector, and foster an ICT-friendly environment, including deregulation. For this, Japan should provide assistance for policy formulation and implementation. It is important for Japan to cooperate with other donors that emphasizes the private sector development as well as other countries such as Singapore that have advanced levels of ICT utilization.

In providing support to telecommunications, careful consideration must be given to the following issues:

- Management and maintenance of the infrastructure;
- Competence of ICT professionals for cooperation;
- Protection of copyrights;
- Coping with rapid technical innovation;
- Collaboration with other aid organizations; and
- Assistance in state-of-the-art technology.

Management and maintenance of infrastructure

Infrastructure development in ICT is important especially in rural areas, where profitability is generally low. For this purpose, it is necessary to select reasonable, cost-effective network facilities and technology to match the actual conditions of the areas. The participation of stakeholders such as the government, the communities, the private telecommunications industry and NPOs should be encouraged in order to maintain good operations and management.

Competence of ICT professionals for cooperation

ICT professionals for cooperation should be aware of state-of-the-art technology and market trends, understand traditional technology and its basic ideas, and moreover, be able to act practically bearing in mind cost effectiveness. In order to employ such ICT professionals, appropriate fees should be considered.

Protection of copyrights

Increasingly, materials and references will be digitized and used in the form of

multimedia. Thus, it is necessary to protect copyrights related to digitized material and to establish a policy on royalties.

Rapid technological innovation

Recently, the life cycle of ICT equipment has become extremely short because of the rapid technological innovation. The depreciation period should therefore be revised to reflect the reality. On the other hand, even if hardware and software can be replaced in a timely manner, a serious problem tends to arise since staff and materials can not catch up with the new model.

Collaboration with other aid organizations

Collaboration among stakeholders such as donors, NGO/NPOs and the private sector will be absolutely essential for the diffusion of ICT. However, we should be careful about severe competition for international standards, as seen in mobile phones, mutual checking between aid agencies, and conflicts with the private sector in network infrastructure development.

Assistance in state-of-the-art technology

State-of-the-art technology is in great demand by developing countries. This is an important industrial field involving severe international competition for Japan. The final judgment as to whether Japan should provide assistance in this field or not is a highly political issue.

2.3 ICT Utilization in Various Sectors

By its nature, ICT can be applied to every sector of assistance, which can improve the quality of Japan's assistance and expand its scope. ICT is useful in every field for (1) collecting, compiling, disseminating and sharing information, and (2) implementing distance assistance and follow-up assistance.

(1) Information collecting, compiling, disseminating and sharing

Collecting, compiling, disseminating and sharing information have become remarkably easy by using ICT. Needless to say, the collection and analysis of information is essential for taking appropriate measures regardless of the sector. With ICT, it is possible to collect and compile a vast amount of information for analysis very efficiently and effectively, and the collected information can be disseminated to and shared with people all over the world without difficulty. This encourages cooperation across organizations, sectors and countries.

Especially, in global cross-sectoral issues such as environmental problems, ICT can facilitate valuable cooperation between different sectors. ICT networks promotes information sharing and communication, and contributes to strengthening organizations by resolving problems due to vertical divisions, improving efficiency, and encouraging successful cases to be applied in other sections.

ICT used in governance to disseminate information and service can improve the quality of public service. When ICT is used to collect the opinions and wishes of citizens, their needs can be more precisely assessed, and the quality of service will further improve. When people are able to access useful information without difficulty, they will have the chance to increase their skills and income, which is significant for poverty reduction. Assistance to such information provision will therefore facilitate capacity building in administrative agencies, and contribute to public welfare and the empowerment of the people in recipient countries.

(2) Distance assistance and follow-up assistance

As ICT has developed, information transmission to distance places has become remarkably easy. This has promoted various services to distance areas including distance learning/training and telehealth. In other words, assistance to ICT utilization can extend services to those who have not had a chance to access them.

It must be clearly noted, however, that such services cannot take the place of traditional face-to-face services completely, and that in some cases, the former may be inferior to the latter in quality. For example, in distance medical consultation, examination by touch is impossible, and smell cannot be conveyed. Cost is another problem. Distance learning and telemedicine require not only initial investment (communication facilities and other equipment) but also considerable maintenance and operation costs (communications costs, equipment maintenance costs, etc.). For example, Japan has a network system among universities called the Space Corroboration System (SCS). It costs 223 million yen to build hub stations, 70 million for building the earth station, 10 million per year for maintaining the stations and 150 million for the fees for satellite communications. These amounts are not small for developing countries. So, in conducting distance assistance, it is necessary to examine carefully whether the recipient country has the capacity to maintain the system once the assistance has been provided.

As for follow-up activities for assistance, ICT can be a very powerful tool. Follow-up through the Internet is very effective in terms of information provision and continuity of communications. Opinions can be exchanged by e-mail between, for example, a lecturer in Japan and a trainee back in his/her country, or between an expert back in Japan and a counterpart in a developing country. Moreover, a knowledge database can be established to provide the information and knowledge that is needed by trainees and counterparts.

In the following sections, the possibilities for ICT utilization in each sector will be discussed in detail.

2.3.1 Education and Training

Human resources development is one of the most important factors in nation building, and ICT has great potential to effectively promote this. JICA should therefore put priority to ICT utilization in education and training. However, it should be noted that distance education cannot replace traditional face-to-face education, and it is rather a supplementary tool, e.g., for preliminary training and follow-up training or a substitute when face-to-face education is impossible. Distance learning is mainly used for knowledge learning, and is not suitable for practice or on-site training. For the purpose of disseminating knowledge, distance learning can effectively provide training to a large number of people, even to those who are in isolated locations. Assistance for distance learning should be provided based on an understanding of both its advantages and disadvantages.

The utilization of ICT in education is not new; it actually dates back to the late 19th or early 20th century when correspondence education began. In accordance with the development of various media, distance learning has advanced to include the utilization of various means of communication such as the Internet, satellite communications, CD-ROM, TV, video and radio. The most appropriate media must be selected considering the goals and cost effectiveness.

The possibilities for ICT utilization in education and training can be seen as in:

- Improvement of existing training programs (preliminary training and follow-up training through the Internet and by satellite communications, and participation of those in remote places in training programs);
- Support for overseas projects (video-conferences between overseas project sites and the supporting committees in Japan);
- System development for distance training (production of materials and establishment of a media center for lecturer training); and

- Support for distance learning in developing countries (networking in higher education, system development for distance learning, and compilation of information on education).

Improvement of existing training programs

The utilization of ICT in existing training programs makes it possible to have achievement tests installed on websites for preliminary and follow-up training (using e-mail to answer queries), and satellite video-conferencing systems for distance training. In the training course for audio-visual technology at the JICA Okinawa International Centre, preliminary instruction and follow-up for trainees using the Internet is now being actually considered. In the Municipal Solid Waste Management Course for South Pacific Forum Countries at the Centre, trainees had to prepare an respective action plans for waste management for their home countries, and after their return they have to send progress reports on the plan to the server at the Centre by e-mail for mutual reference. They also participate in a dialogue and forum using the Internet.

There is a plan called J-Net in which Japan is providing thirty ICT stations (called 'IT Centers') around the world that function just like the GDLN of the World Bank. J-Net intends to cooperate with the World Bank mainly in relation to the contents.

It is desirable for J-Net to prepare separate contents for real-time systems and for non-real time systems to meet the trainee's convenience. The latter systems should be designed to target not only at those who can gather together in a designated classroom for a lecture but also at those who study individually by downloading the contents. For this purpose, systems to forward the contents from ICT stations should be considered. Both systems need to have resource persons and contents available in the target area before preparing the hardware. The 'IT center' in each country should evolve to become the future ICT core for the country, and should provide distance training to rural areas in local languages.

Support for overseas projects

Through a video-conferencing system using satellite communications, opinion exchange is possible between the local implementing institution and the experts or committee members in Japan. The 'IT Centers' developed under the J-Net plan should be used for this purpose as well.

System development for distance training

Special materials and teaching methods are both indispensable for distance training, which is impersonal and needs to be made attractive to trainees. Effective distance training is not possible if the development of materials and methods are left to the efforts of individuals. The establishment of a media center is preferable for this purpose since it can have the function of producing materials and of giving training to lecturers on special teaching methods. This will make it possible to establish systematic distance training.

Support for distance learning in developing countries

With respect to support for distance learning in developing countries, assistance for building a distance learning network in higher education, as seen in the Project on Networked Multimedia Education System in Malaysia, can be considered. In the future, a regional network for distance learning among universities in Asia will come under consideration. Such a network will play an important role in academic exchanges and advancement of research within the region. Establishment of electronic libraries is also beneficial for information sharing.

Educational systems suitable for ICT utilization must be established. In Japan, for example, one reason why distance learning in higher education has not developed well is because Japan's educational system does not give credits for classes on the Internet. To promote distance learning, such systems should be modified to fit the ICT era. It is also necessary to cooperate with other donors that are promoting similar forms of assistance, together with Singapore and other countries where the application of ICT is already advanced.

In addition, ICT can be applied to basic education. The significance of basic education has been recognized internationally, and ICT is useful for educating the younger generation. Examples of ICT utilization are the establishment of Education Management Information Systems (EMIS), the installation of PCs in elementary and secondary schools, and ICT training. In EMIS, basic information such as the number and location of schools, and the complement of students and teachers, is compiled in the form of a database, which is then used for problem analysis and simulation. Such a system is important for understanding the educational situation and to formulate educational policies. Several countries have already established EMIS.

The following points should be carefully considered in promoting the utilization of ICT in education and training:

- Institutional reform of JICA (organizational structure suitable for ICT cooperation);
- Management and maintenance of 'IT Centers';
- Appropriate contents (contents, lecturers and materials for training) ;
- Proper types of media for training;
- Capacity of communication lines (balance between requirements and cost); and
- Collection of tuition fees.

Institutional reform of JICA

In order to conduct distance training such as through J-Net, the organization of JICA should be reinforced by defining the jurisdiction and adjusting the structure and size of sections in accordance with the volume of the work. Rules should be set concerning fair lecturers fees in distance training as well as copyright for digital materials.

Management and maintenance of the 'IT Centers'

In the management and maintenance of the 'IT Centers', it is necessary for JICA to decide on operational rules and standard specifications for the systems that form the network. This includes the establishment of a media center that produces contents and support to the satellite centers constructed in developing countries.

Appropriate contents

Distance learning requires more sophisticated contents and teaching methods than traditional face-to-face education. In order to provide appropriate contents, it is necessary for the program contents to meet the trainee's needs with qualified lecturers with technical knowledge and good language ability, and excellent materials. In order to employ good lecturers, proper fees are required.

Proper types of media

In accordance with the purpose of training or education, appropriate media for training must be selected. There can be combinations of synchronous and asynchronous forms as well as different media. As for materials, CD-ROM is useful and cost effective when real-time provision is not necessary.

Capacity of communication lines

High resolution, and high-speed communications require large capacity lines.

Since larger capacity means higher costs, the capacity should be determined on the basis of a preliminary examination to assess the capacity that the trainees can afford.

Collection of tuition fees

The collection of tuition fees is worth considering, since it can provide a motivation for trainees. The collected tuition fees can be accumulated and used for purposes such as the operation of hub centers in the developing countries.

2.3.2 Healthcare

In healthcare, ICT has possibilities for applications in:

- Improvement of the quality of medical staff (by education and training through distance communication systems) and data collection for healthcare through distance information provision and/or exchange
- Efficient consultation (through distance assistance to local healthcare facilities)
- International consultation (consultation for key hospitals from supporting hospitals in Japan)

Distance information provision or exchange in the healthcare sector means the provision and exchange of health information between distant places, which typically occurs in health education. Telemedicine means clinical consultations through distance communication systems. Generally, ICT utilization in healthcare is imagined as distance consultations using sophisticated equipment. However, past cases show that installation of such equipment can result in many problems of operation and maintenance as well as high initial investment. On the other hand, distance information provision and exchanges can provide a means of educating people to carry out actual medical procedures that developing countries are most in need of. Information provision and exchanges will benefit a much higher number of patients than telemedicine.

Improvement of the quality of medical staff

The priority for ODA should therefore be for human resources development through distance information provision and exchange. In actual implementation, JICA can support hospitals that have received its assistance to become the bases for distance learning and to provide lectures and meetings to the key hospitals in each area through a videoconferencing system. Support for information provision by administrative bodies is also important to improve their healthcare services.

Especially in developing countries, where healthcare statistics have not been developed, there is a need for database development. It is also important to develop a system that provides the health information of WHO and developed countries to every part of the country.

Distance Consultation

Considering the actual situation of the healthcare and telecommunications infrastructure in developing countries, telemedicine should not be confined to distance pathological diagnoses and distance radiological diagnoses that require sophisticated equipment and benefit a limited number of patients. Rather, it is more practical to support distance consultation in areas where no doctors are available through video telephones, e-mail and videoconferencing systems. In projects designed to reinforce the functions of key hospitals in developing countries, it is possible to connect the key hospitals to a support hospitals in Japan using ICT, so that the hospitals in Japan can provide consultations to the partner hospitals. In this case, the partner hospitals must have a sufficiently high technical standard and be able to afford the cost of ICT (including communications costs).

In conducting telemedicine, there are several problems to be expected. Because information will be exchanged across the boundaries of administrative divisions that determine the qualification and licensing of medical services, questions arise as to who is to assume liability, or what is the extent of insurance coverage. These issues must be defined clearly in law, and assistance is needed for the development of legislation. Here again cooperation with countries that have taken up ICT utilization will be valuable.

Matters to be considered in this sector include:

- Economic efficiency
- Operation and maintenance of equipment and materials
- Confidence among healthcare professionals
- Quality of medical care (the quality of telemedicine tends to be inferior to that of face-to-face medical care)
- Security and privacy protection
- Legislation (medical reliability, health insurance, etc.)

Economic efficiency

Economic efficiency must be carefully examined beforehand. Telemedicine

requires a substantial initial investment and involves continuing expenses, such as communication costs. Consideration should be given to cost effectiveness and expenses required in future by the implementing organization of the developing countries, especially after the completion of assistance.

Operation and maintenance of equipment and materials

The people who use ICT in healthcare practice are not always ICT specialists. Thus, a system for the operation and maintenance of equipment and materials becomes important. Equipment that is easily handled by non-professionals should be selected. Moreover, training should be given for the operation and maintenance of the equipment.

Confidence among healthcare professionals

For effective distance communications, the people who exchange information must have confidence in each other. Because medical practice often involves a high degree of liability, medical professionals cannot make decisions based on figures and images alone if the source could be unreliable.

Quality of medical care

It must be recognized that the quality of telemedicine is sometimes inferior to that of face-to-face medical care. In distance clinical consultation, professionals cannot touch or smell in examinations and thus may lack certain critical information.

Security and privacy protection

Most medical information consists of private information on patients that needs to be handled very carefully. With ICT, such information could be widely distributed instantaneously. While it is necessary to take advantage of this convenience for proper purposes, security and privacy must be strictly protected by such means as legislation.

Legislation

As for legislation, most conventional systems of qualification and licensing and health insurance do not take into account telemedicine. Assistance must be provided with caution so as not to cause confusion in these systems.

2.3.3 Governance

As for governance, this study focuses on the establishment of electronic government. The goal of ICT utilization in governance is the improvement of administrative services. Towards this goal, ICT can be applied to:

- Efficient administration;
- Information disclosure (information publication on the Internet about development plans, statistics, legislation and administrative services, and establishment of a portal site);
- Support for democratization (ICT utilization for elections and community participation); and
- Development of legislation (revision of regulations that conflict with ICT utilization such as requirements for written papers, and establishment of appropriate systems for ICT utilization, such as the prevention of network crime).

Efficient administration

To promote efficient administration, it is necessary to establish systems for the digitization and systemization of all office procedures, and to build networks within and among administrative agencies. If, for example, the procurement service is digitized and published on the Internet, the transparency of the service will improve, its cost can be reduced and the whole process can be accelerated. Digitization of the registration of local residents will also improve administrative efficiency. The Japan Electronic Open Network Trade Control System is a good example. The system electronically deals with import/export permit formalities and other procedures for the Ministry of Economy, Trade and Industry. With this system, contractors do not have to come to the office of the Ministry since they can make inquiries on the Internet. This system has an error checking function, and mistakes in entries can easily be corrected. If contractors connect this system to their own internal system, they can simplify their work. That means that such electronic application systems improve efficiency for both the administration side and the contractor side. In most developing countries that are in the process of decentralization, capacity building of local governments is an urgent issue. Thus, digitization and systemization of local government operations should be facilitated by using ICT to improve efficiency and to reinforce the organization. At the same time, decentralization requires the central government to develop greater policy-making capacity. ICT will again be very useful for information collection and analysis for policymaking, and strengthening

the government organization.

Information disclosure

The application of ICT to information disclosure includes digitization of various types of administrative information and its publication on the Internet. In countries whose ICT related industry is not well developed, it seems difficult to create contents immediately with the efforts of the private sector alone. If there are insufficient contents, the motivation to use ICT becomes weak. Thus, administrative information (development plans, statistics, laws, administrative services, announcements, etc.) should be digitized and published on the Internet in order to facilitate ICT utilization. Furthermore, in countries where the adoption of ICT is relatively advanced, 'one-stop services' should be considered. This means the unification of various services from different authorities. If people can access the information they want easily, the rate of utilization may increase proportionally. For example, the Singapore government set up a portal site called 'e-Citizen' which handles a range of administrative services related to life events from childbirth to retirement. Japan, too, has established a portal site called the 'General Window on Electronic Government' in order to increase accessibility.

Support for democratization

Possible ways of supporting democratization include assistance to elections and the promotion of local participation using ICT. In developing countries, elections are a major event, which sometimes involves bribery and bloodshed. It takes too long to count the total vote and the total is often unreliable. It is therefore very worthwhile providing assistance for the establishment of systems and networks for fast and accurate vote counting. In countries where the Internet is widely used, it is also possible to identify local needs and to ask opinions about development plans by using the Internet. Assistance for such efforts will contribute to governance that reflects citizens' opinions.

Development of legislation

The development of legislation is critical to creating an appropriate environment for ICT utilization. It is necessary to revise regulations that do not match ICT utilization (for example, requirements for paper application), and to establish new systems that facilitate the adoption of ICT (for example, information disclosure and prevention of network crime). For ICT utilization at the local government level, it is also necessary to transfer more authority to local

governments. Cooperation with other donors that have considerable experience in legislation development as well as other countries such as Singapore that have advanced ICT capacity will be effective in developing legislation to facilitate ICT utilization.

Matters to be considered in governance include:

- Digital divide (public services must be available even to those who cannot access ICT);
- Human resources development and raising people's awareness;
- Security and privacy protection; and
- Use of the resources and know-how of the private sector.

Digital Divide

In developing countries, especially in rural areas, the telecommunications infrastructure is often not yet developed, and many people have no access to ICT. Since administrative services must be provided equally to all citizens, the utilization of ICT to public services must take into consideration of those who have difficulties in accessing ICT.

Human resources development and raising people's awareness

Human resources development and the raising of people's awareness is the driving force for ICT utilization. Since ICT has the potential to change traditional ways of working, many people would resist new technology or have a negative attitude. It is therefore important to raise officials' awareness of the purpose and advantages of ICT utilization, and to provide ICT training.

Security and privacy protection

Security and privacy protection is a prerequisite for ICT utilization and information disclosure. Measures to deal with network crime and to protect personal information must be carefully designed and taken.

Use of the resources and know-how of the private sector

In order to make e-government work, governments need to change their role from official administrators to better customer service providers, like the competent private firms. Thus, private resources and know-how should be fully harnessed for the establishment, operation and management of e-government systems.

2.3.4 Poverty Reduction

A comprehensive approach is the key to poverty reduction. The implementation of such an approach requires capacity building for officials and organizations at all levels, from the national and local governments to rural villages, and also requires the enhancement of mutual cooperation among stakeholders. Based on this, the possibilities for ICT utilization can be found in:

- Improvement of transparency of policies and reflection of local needs;
- Provision and exchange of technical and daily life information (agricultural technology, rural development, commodity prices, healthcare, etc.); and
- Empowerment of the poor by meeting their needs (provision of access points, training and services).

Improvement of transparency of policies and reflection of local needs

ICT can be used to improve the transparency of policies and also to identify local needs. For example, governments can use ICT for the announcement of development plans and the publication of plan formulation processes to promote local participation. A suggestion box can be set up on the network to identify local needs.

Provision and exchange of technical and daily life information

ICT can be used to introduce agricultural technology and successful examples of rural development activities to other regions, as well as provide distance training and information services for those responsible for rural development. ICT can also provide various kinds of information related to agriculture, fisheries, commodity prices and healthcare. Moreover, ICT can promote communications by using bulletin board functions. One actual example is "the Project on Strengthening Sulawesi Rural Community Development to Support Poverty Alleviation Programmes in Indonesia". In this project, a trial ICT service called 'Desa maju' has been introduced. The Desa maju system enables villagers to easily access various kinds of information related to agriculture, fisheries and healthcare. The system provides voice data (in the Indonesian language and local languages) through the selection of symbols on the terminals connected to the server through telephone lines. In projects aiming at poverty reduction, such a system for information provision and exchange is worth considering.

Empowerment of the poor

In order to use ICT for the empowerment of the poor by meeting their needs, it is necessary to provide access points to receive the information, services and training that are required. This includes education and training at MCTs. In the case of the 'Village Phone' in Bangladesh, female members of the Grameen Bank buy a cellular phone and retail the telephone service to other villagers. The members can earn money from this activity (about 300 dollars a year (in 1999) while the average annual income per capita in Bangladesh is 286 dollars). The villagers obtain access to the telephone system and can easily make contact with family members working away from home. This is a very significant service in this country where people's income depends largely on such migrant work.

In order to improve the poor through ICT utilization, the following must be closely investigated:

- Equipment should be easy to introduce and operate;
- Language used in ICT should be carefully considered (use of images and voices);
- User fees should be reasonable;
- ICT should raise income levels and living standards (If everybody can realize the advantages of ICT, this can be an incentive for ICT utilization);
- Equipment should be maintenance-free and have proper backup systems; and
- Terminals should be available close at hand.

Among these requirements, language is a critical factor. Since many poor people in developing countries are illiterate, it is worth considering the introduction of systems using voice information rather than text information.

2.3.5 Environment

Current environmental problems tend to be related to complicated global issues that involve a wide range of people from governments, private companies, NGOs as well as ordinary citizens. Under such circumstances, the proper monitoring and management of the environment and adequate sharing of information and processes are important for cooperation among these stakeholders. ICT is a very good tool for this. More precisely, it can be used in:

- Environmental monitoring and management (geographical information systems (GIS) and remote sensing);
- Integrated cooperation (fusion of rural development and environmental

assistance);
- Provision of information for the judgment of policy makers and citizens (environmental information provided through Internet and/or multimedia); and
- Promotion of dialogue and agreement among stakeholders (opinion and information exchange using ICT).

Environmental monitoring and management

Remote sensing systems and geographical information systems (GIS) can be effectively used for accurate environmental monitoring and analysis, which is the basis for effective countermeasures. "The Project for Environmental Management Center in Indonesia" and "the Study on Coastal/Marine Habitats and Biological Inventories in the Northern Part of the Red Sea Coast in the Kingdom of Saudi Arabia (development research)" are good examples of ICT use in environmental monitoring and management. The integrated management system for water supply in Japan is another example of ICT utilization for environmental monitoring and management. "The Forest Fire Prevention Management Project in Indonesia" is an example of a regional activity which provides information to other countries such as Singapore and Malaysia.

Integrated cooperation

In JICA's assistance to the National Institute for Biodiversity in Costa Rica (dispatch of an individual expert), project staff were selected from among residents of the target region and taught how to use a camera. They took pictures of animals for processing and storage in a database. This program was successful not only in collecting data on biodiversity but also in providing job opportunities for local people and promoting environmental awareness. This is a good example of ICT promoting integration between the environmental conservation and the rural development (poverty reduction) sector. Due to the complexity of current environmental issues, a single project cannot always solve the problem. ICT can be a powerful tool for cross-sectoral cooperation that is essential in such fields as rural development.

Provision of information for judgment

GIS and multimedia can provide information for judgment to policy makers and citizens. Using ICT, the results of analysis can be visualized and provided to policy makers and citizens in easily understandable forms, which can promote

the unification of scientific views and policies.

Promotion of dialogue

Network technology is an effective tool in facilitating dialogue and agreement among stakeholders. In the process of reaching agreement, network technology can be used for information disclosure to citizens, ministries and NGOs concerned to enable them to exchange opinions. The significant factor is the use of multimedia to make such information visual and easily understood. For example, the United Nations Environmental Programme (UNEP) has developed a database of its environmental information and research results, and provides it as international public goods.

Key issues to consider in the application of ICT to the environment field are:

- Compilation of basic data;
- Introduction of appropriate technology;
- Adequate contents;
- Management and maintenance of systems;
- Human resources development; and
- Digital divide.

Compilation of basic data

Lack of basic data is a serious problem in developing countries. There is an urgent need for the compilation of such data. Without data, constructing databases or networks is impossible.

Appropriate technology

For the introduction of practical and appropriate technology, careful consideration should be given to the financial conditions, human resources, technical standards, current situation of data compilation and other conditions in the target country for assistance.

Adequate contents

Adequate contents also need to be created on the basis of a clear definition of the timing, purpose and subject of the sharing.

Management and maintenance of systems

When introducing ICT, it is important to properly explain the need for and

expected outcome of ICT utilization and to define the role and purpose of any new system. Especially when establishing a cross-border network, the difference in the technical level of the countries involved requires careful planning for the management and operation of the system.

Human resources development

The major problem in human resources development is the shortage of skilled personnel who have experience of working in cross-sectoral, cross-technical or cross-organizational environments. Although ICT has made cooperation across sectors, organizations and nations quite easy, there are not so many people available who are able to address environmental problems from diverse points of view. There is an urgent need to develop such human resources.

Digital Divide

The introduction of ICT should address the digital divide. People who are to be targeted for environmental cooperation are often left behind.

3. Toward a Global Information Society

As already mentioned, ICT can improve the quality of assistance to developing countries. The introduction of ICT, however, does not automatically lead to desirable outcomes. ICT should be applied carefully, and the following factors that are common to all sectors need to be fully taken into consideration in future assistance:

- Informative contents and an easy-to-use system;
- Reliability of the information;
- Human resources development and raising of people's awareness;
- Operation and management systems and user support systems;
- Economic feasibility and selection of appropriate media;
- Legislation;
- Security and privacy protection;
- Intellectual property rights;
- Consideration for people who do not have access to ICT;
- Brain drain;
- Human resources development in Japan; and
- Private sector participation and cooperation with universities.

In the following section, each of these factors will be explained.

3.1 Informative Contents and an Easy-to-use System

For the widespread use of ICT by ordinary people, the contents must be created in local languages that people use in their everyday life. Needless to say, the contents must also meet the needs of the users. In order to reflect their opinions, it is desirable to involve the users in creation of the contents. On the other hand, where global communication is required, the content should be in English.

In establishing any system, it is again necessary to encourage user participation from the planning stage, and to design the system by adopting their views as far as possible. The system must be easy to use even for beginners. Few people will use a system if it is difficult to operate or hard to find the necessary information. For easy access to the essential contents, the use of search engines and portal sites is effective. Particular attention should be paid to disabled people.

3.2 Reliability of the Information

When ICT is used in collecting, analyzing and sharing information, the reliability of basic information is another key issue related to the appropriateness of the content. In the environmental protection, for example, the lack of basic environmental data is a more fundamental problem than network formation. As for the Internet, individuals can disseminate information without any verification of the quality, and there is no way of knowing whether such information is reliable or not. If the reliability of information cannot be established, the systems will not be used extensively. Therefore, securing the quality of information is an urgent need.

3.3 Human Resources Development and Raising People's Awareness

Human resources development is important in the utilization of ICT as well as in every aspect of assistance. The required skills include not only the ability to operate ICT but also the ability of utilizing ICT in accordance with the purpose. The lack of this kind of awareness often inhibits ICT diffusion. ICT has the potential to change traditional working styles. Many people hesitate to use new methods that involve the risk of failure as long as they can handle their work in the traditional way. Moreover, networking, by its nature, requires people to expose their knowledge through publishing and sharing information for the purpose of improving efficiency as a whole. People tend to resist revealing the knowledge and know-how by which they have been able to preserve their position. This often hinders the promotion of ICT utilization.

The important issue here is how to stimulate the strategic utilization of ICT and to make people fully aware of the advantages of ICT. The organization should clearly express its will to apply ICT and demonstrate the advantages of ICT. In addition, the organization needs to provide ICT training and support for ICT utilization.

ICT often changes traditional processes and the skills required. For example, distance learning requires the participation of many kinds of experts such as project managers, system managers, programmers, photographers and graphic artists. Teaching methods, too, need to involve more dramatic presentation and a structure that takes advantage of interactivity. Lecturers must be trained in such methods.

3.4 Operation and Management Systems and User Support Systems

Once ICT is introduced, its management and maintenance is critical. A system for ICT operation and management must be firmly in place.

For most people in developing countries, ICT is unfamiliar, and the speed of technological innovation is so fast that people find it hard to follow. Thus, good support systems to maintain the equipment are indispensable. Help desks are good examples of such support systems.

3.5 Economic Feasibility and Selection of Appropriate Media

ICT requires not only an initial investment but also significant operational costs. Especially, satellite communication costs are expensive. Besides this type of expense, there are costs for the replacement of equipment and employment of management personnel. Recently, ICT has been developing so rapidly that equipment becomes out of date in a few years and thus needs regular upgrading. Failure to upgrade hardware often means that the latest software cannot be run. It is therefore very important to decide in the planning phase how costs such as of communication, the replacement and maintenance of equipment, and personnel employment can be met after the completion of assistance. As a matter of course, the suitable means should be selected in accordance with the purpose and feasibility (traditional face-to-face form or ICT form? Satellite or Internet or CD-ROM? What is the capacity of the line?). In areas where the network infrastructure is still weak, CD-ROM can be a suitable tool.

3.6 Legislation

In order to promote ICT utilization, it is essential to modify social systems to facilitate the information society. These modifications include the revision of regulations that inhibit the adoption of ICT (for example, the requirement for paper application), and the establishment of new rules that provide a basis for the introduction of ICT (for example, accreditation systems for distance learning, definition of liability and health insurance coverage in distance healthcare, and laws to control network crime). Without an appropriate regulatory environment, ICT cannot be introduced smoothly, and inappropriate systems may become barriers to the promotion of ICT utilization.

3.7 Security and Privacy Protection

Security and privacy should be protected especially in networks. Protection against hackers and computer viruses should be considered carefully in network systems. Personal information and privacy must be strictly protected especially in telemedicine and the digitization of residential registration.

3.8 Intellectual Property Rights

As ICT spreads, more and more materials are becoming digitized and made available on the Internet. The number of the people who can access to such materials is increasing exponentially. This is desirable on the one hand, but can create a problem of intellectual property rights on the other hand. Because digitized materials can be copied or altered easily, rules and systems must be set up to protect the related rights.

3.9 Consideration for People Who Do Not Have Access to ICT

Special attention must be paid to those who cannot access ICT and who may be excluded from the information and services. Administrative services especially need to be equally provided to all the citizens, and there should be no one who fails to benefit from such services.

3.10 Brain Drain

Due to the rapid development of ICT, every country is suffering from a shortage of ICT professionals. Many developed countries have provided work opportunities to skilled engineers from overseas. Although Japan should cooperate on the training of ICT engineers, if these engineers leave the country, the objective of human resources development in the target country cannot be achieved. To

prevent such a brain drain, there must be a system that remunerates ICT engineers at an international level in any country in the world.

3.11 Human Resources Development in Japan

In order to provide appropriate assistance for ICT utilization, Japan also needs to urgently develop its own human resources. ICT is now rapidly spreading throughout Japan, and workers with ICT skills are in high demand. Not only ICT specialists, but also experts and workers in every sector should be trained to have some level of ICT skill so that they can use it in their assistance operations. An appropriate level of ICT training should be included in their pre-dispatch training programs.

3.12 Private Sector Participation and Cooperation with Universities

ICT is normally led by the private sector, which possesses the relevant know-how and resources. Japan's assistance should not rely on government resources alone, but should fully mobilize private sector expertise and resources. Especially in areas where projects can be profitable, such projects should be left to the private sector. Approaches such as the Private Finance Initiative (PFI) are worth considering.

Cooperation with NGOs is also important in developing a wide variety of users including ordinary people. Universities, which have an advanced capacity in ICT research and utilization, can be designated as clearing houses for the dissemination of knowledge. Cooperation and joint projects with universities will become more important, especially in the distance education.

In ICT cooperation, effective collaboration among all stakeholders is indispensable.

4. Need for the Reform of JICA's Assistance System

In promoting ICT cooperation, JICA is expected to ensure faster and more flexible decision-makings through the transfer of responsibility to its overseas offices. In addition, JICA should strengthen cooperation with other aid agencies, NGOs, private companies and universities. Reforms such as shortening the redemption periods is also necessary in order to adapt to the current conditions of the ICT industry. Building knowledge databases and setting up websites for the publication of each project are significant not only for strengthening JICA's activities but

also for providing international public goods. Since ICT assistance needs more expenses of telecommunication and creating contents, it is necessary that JICA's expense breakdown is changed to be applicable to ICT utilization. All actors related to ICT assistance, including JICA staff, need to appreciate the utility of ICT and come to a consensus on the beneficial use of ICT as an essential tool for the development of developing countries.

In the following sections, each of these issues will be discussed.

4.1 Fast and Flexible Decision-making and Assistance Operations

The recent rapid development of ICT makes equipment obsolete quickly. On the other hand, ICT makes impossible things possible. In order to cope with such rapid changes, every stage in cooperation, from project identification, formulation, and implementation to evaluation, must be speeded up. Unless the time schedule from project identification to implementation can be shortened, installed ICT equipment becomes obsolete, and the project will be totally ineffectual from the beginning.

4.2 Effective Cooperation between Aid Agencies

ICT is a global trend, and JICA should cooperate with other aid agencies in ICT assistance. For effective cooperation, JICA should hasten the transfer of more responsibilities to its overseas offices so that they can make decisions within the stationed countries. As mentioned in 4.1 above, the rapid development of ICT requires prompt decision-making, and so the overseas office should be able to make a commitment at donor meetings and decide the best and orchestrated means of cooperation without delay.

It is notable that JICA is not the only agency in Japan to provide ICT assistance, and other organizations such as Japan Bank for International Cooperation (JBIC), Japan External Trade Organization (JETRO), Japan Overseas Development Corporation (JODC), The Association for Overseas Technical Scholarship (AOTS) and The Center of the International Cooperation for Computerization (CICC) are participating in ICT related assistance. To provide effective assistance, JICA should contact these organizations and seek cooperation with them.

In addition, cooperation with the private sector, NGOs and universities becomes more important. For more effective collaboration, organizational reform of JICA should be considered. It is necessary to utilize Private-proposed Project Formulation Studies and the Community Empowerment Program in which JICA

and NGOs can cooperate together, and to investigate the potential for new means of cooperation with the private sector and other related actors.

4.3 Reform in accordance with the Actual State of the ICT Industry

As mentioned above, ICT is developing rapidly and Japan's assistance should take into account this characteristic. In particular, the amortization period set for the equipment donated under JICA's assistance is currently defined as 30 years, which is completely contrary to the actual state of ICT equipment. In the reform of the taxation system in Japan in 2001, the depreciation period for PCs will be amended from 6 years to 4 years. Projects should also be designed to accommodate the life span and depreciation period of such equipment. The operation of projects should also cope with technology that is continually becoming obsolete.

4.4 Establishment of Knowledge Databases and Information Dissemination through Websites

Substantive contents are essential for ICT promotion. For greater efficiency in assistance and its wider diffusion, JICA needs to publish the outcomes of its cooperation by setting up a website for each project and by building a knowledge database. For this purpose, full-time personnel should be employed for the collection and compilation of data and for supporting the utilization of such data. The websites for each project should be designed well in terms of their purpose, users, subjects, content, form and methods. A uniform guideline should be developed within JICA to ensure appropriate contents.

4.5 Cost Structures

Since ICT cooperation needs a different cost structure from traditional face-to-face assistance, for example, communication costs and content creation costs, the cost structure should be reviewed to match ICT utilization. For example, costs for dispatching experts or for inviting trainees are a major factor in the cost structure of traditional assistance. In ICT cooperation, a higher proportion of the project costs are covered within Japan, such as costs for content creation, communications, establishment and maintenance of knowledge databases and websites, royalties, etc. The idea that development assistance is always implemented in foreign countries should be changed. The necessary expenses within Japan have to be properly estimated and appropriated in the budget.

4.6 Raising People's Awareness

Another important issue to be addressed is raising the awareness of ICT within JICA. ICT is developing very rapidly, and its impact is unpredictable. It is therefore difficult to determine the outcomes of ICT cooperation before the project is implemented, and it is often too late to start the project after the outcomes become clear. Thus, constant monitoring of ICT trends and anticipation of the possibilities of ICT become important even if the outcomes are still uncertain. All the staff of JICA need to be willing to adopt such an approach and try to make the most of its advantages in order to provide better assistance using ICT. In addition, we should consider more efficient decision-making systems in response to the continuously changing technology.