

**Urgent Recommendation
Regarding Information
Infrastructure Strategy**

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<<5 Keywords for the Information Society>>

1) Transparency

Availability and Sharing of Information,
System of Evaluation

2) Downsizing

Removal of Unnecessary Layers,
Standardize "Scrap and Build"

3) Strategy

Adoption of a Strategic Policy Based on a
National Vision

4) Globalization

Adapting for Globalism - Competition and
Collaboration

5) Speed

From "day by day" to "minutes to minutes",
Immediate Response to Rapid Change

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<<Purpose of Urgent Recommendation>>

It has become urgently necessary for Japan and the World to review and transform their organizations and consciousness due to the rapid development of information technology.

In other words, society is transforming from hierarchical structures to network structures, transforming from vertically closed organizations to seamless and open organizations, and becoming smaller and more transparent in order to keep up with the increasing speed of change and the advancement of globalism.

Japan is about to miss the change towards global information society because the often criticized old-fashioned Japanese system.

Even though computer networks have become the lifeline of critical social infrastructures such as the transportation of energy and public transportation and the dark shadow of the threat of cyber-terrorism is approaching, we have done very little risk analysis and management.

The American NII plan, under the strong leadership of President Clinton and Vice President Gore, has led to the currently vitality of their nation. Such initiatives have developed a world where "those who control the information infrastructure control the world." Towards the 21st Century the nations of the world are competing to take leadership through the development and implementation of strong initiatives focusing on high performance information systems for industry, education, national security and welfare. For example, in Asia Prime Minister Mahatir of Malaysia is leading the "Multimedia Super-Corridor" and Singapore has established the "IT2000".

I could be said that if our country does not develop a national strategy regarding information infrastructure and continues to respond in a reactive manner, Japan may not have a future in the 21st century.

This urgent recommendation identifies important issues in various fields and proposes solutions for these issues. The contents are a result of weekly meetings since the end of May with experts from various fields sharing a sense of risk and separate focus meetings with the individuals.

Although this report is based on the opinions of experts, the text of this report was prepared by member of the House of Councilors, Kei Hata who shall take final responsibility for the content.

<<PROPOSAL #1: Establishment of "National Information Strategy Headquarters">>

The importance and the advancement of International Technologies today has influenced our Ministry in widely spread areas and have made it impossible to evaluate and solve all of the problems through one administrative organization.

With the progressing of the Borderless age, it is essential to keep watch on the movement of this international society and implement a policy resulting on the analysis, bearing in mind the cooperation and competing of each country.

To correspond with this situation, a proposal is made to establish the following organizations at senior levels of the ministry without delay:

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| <p>“National Information Strategy Headquarters” Establish a National Strategy Organization for Information Infrastructure within the Cabinet.</p> |
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Details on the “National Information Strategy Headquarters”

- * Considering that there will be a need for high-powered leadership in order to execute this mission, the Prime Minister himself will be the Chairman, but will be aided by ministers of the deputy Prime Minister class, who will actually summarize the affairs.
- * Selection of the members will be made by nomination from the Prime Minister, and will be determined by the knowledge of the individual in Information Infrastructure and strategy, without regards to politicians, ministers or civilians. The selected will be given a title equal to the Prime Minister's Secretary and will be chosen upon his/her qualifications.

* The membership will not be fixed in numbers but will be of ten or more. For us to correspond with this rapid progressing world of Information Infrastructure, it is essential that this membership becomes a task force. With this in mind, the membership will be translucent and will be replaced regularly.

* The acquiring of information for this strategy force will be made through information corresponded from each ministry, and from information and analysis from original staff members. The organization will build a system that will be able to keep up with the rapid changing worldwide environment. By strengthening and consolidating the Cabinet Information Research Office, a structured system will be consolidated to originally educate and secure a required number of information experts.

Establishment of “Total Information Infrastructure Policy Conference”

To proceed the information strategy decided at “National Information Strategy Headquarters”, as the actual job should be shared among plural ministries and bureaus, the coordination organization is required for policy priority ordering and duty framework settlement. Therefore, the “Total Information Infrastructure Policy Conference” establishment within “the Cabinet bureau”, expected newly introduced, is proposed that perform total coordination work among related authorities organized by vice-ministry assistant class members responsible for the information infrastructure policies.

<<PROPOSAL #2: Urgent Subjects within various branches and Countermeasures>>

1. National Security and the Information Network

[Basic Idea]

With the explosive popularization of the Internet, and the impact that it has in various areas of society, the security of the Nation itself is constantly in direct danger.

For this reason, the maintaining of the safety of information; accurate, simple, speedy receipt of information and accurate selection of commands to send the information out in a timely manner, are important factors that must be first taken into consideration for the safety of today's information society.

Additionally, because of the cyber society within today's borderless network of computers, it is essential to deal with this matter from an international viewpoint.

(1) Computer Security

[Current Conditions and Problems]

Along with the rapid increase of computers hooked into the Internet, there is an increase in illegal access to of computers. This not only interferes with the activities of enterprises, but also endangering the safety of the nation. Invading the nation's basic economic functions has the same impact as assaulting the Nation. Even though this may not bring upon an actual war between countries, the possibility of Network War has been pointed out.

Below are some examples from present situations in the US:

- * Theft of information has increased to 250% over the past 5 years.
- * 99% of all large industries have at least once experienced some type of casualty related to illegal computer access.

- * The casualty related to fraud in information correspondence and computers amounts to 10 billion dollars.

The following are examples from Japan:

- * In 1996, there were 755 accounts of computer virus casualties reported.
- * In the past year, there were requests for advice on 380 reports of illegal access.

Today, with the basic sources of the society (telephone, electricity, gas, oil, banks, transportation, water, and hospitals) relying on computers and information infrastructure systems, cyber-terrorism and/or Information War (related to national or organizational matters) is a threat of attack on economic, psychological, and political matters.

For this matter, our government, industries, and our people have very little consciousness in the danger that we are in, even though our country has been a victim of computer hacking by foreign industries, foreign information organizations and by individual hackers.

[Measures]

a) Upgrading the consciousness of the danger in cyber-terrorism and establishing a Task force

In the US, President Clinton stated that the interruption in function and destruction of certain basic social facilities would weaken the nation's defenses and economic safety. Under this understanding, the President is taking measures for a countermeasure. For example, the establishing of PCCIP to investigate ways to defend from cyber-terrorism and the annual one billion dollar budget increase to support investigations against cyber-terrorism.

What our country now requires is to establish an information network, in resemblance to PCCIP and NSA with the center of it being a Task force located within the Cabinet, made up of a staff directly connected to the Prime Minister. This Task force would specialize in planning for the guarantee of the nation's safety. Preferably, the members would be former hackers, responsible industrial agents of information matters, the Japanese Defense Force, and others related to information infrastructure. But considering the rapid changes that occur, it would be wise not to completely organize a force, but to boldly replace the members in a timely manner.

Additionally, our government and ministry have established Web Site on the Internet and recently have had cases of illegal hacking. To have our government Web Site hacked will not only lose the confidence of the people to the government, but is also a very critical matter, and powerful measures must be taken to stop this.

b) Thorough Dispersion Styled Information Management

In our country there are no countermeasure strategy plans in case of cyber-terrorist attack. For example, it has been pointed out that, the decision has not yet been made as to whether the government will be in the center of the control or if it will be controlled in a dispersion style, should there be a cyber-terrorist attack

Being in the center of the management will make it efficient for investigations for cyber-terrorism possible, but this also leaves the negative point of having all information centered and vulnerable, and could be fatal, in case of central attacks. To avoid such situations, we must make management for dispersion of information, and when endangered of such terrorism, make it possible to immediately take action on the spot, and at the same time build a system to receive appropriate support from the center at such critical times.

c) Instructing of technologists to correspond with cyber-terrorism.

In the United States, with the tie up of industries, education, and the government, information security is implemented in graduate course curriculums, and proactively training individuals to oppose cyber-terrorism. In Japan there is an urgent need to also power cooperation between the government and the people, to improve the knowledge of the government, industries and individuals against cyber-terrorism, and to highly educate people to be experts in cyber-terrorism. At the same time, it is preferable to be supple, have a task force and include former hackers.

d) Development of Original Code Technology / Certification Systems

With the spreading of the Information Network, the joint forcing between the military and civilians is being promoted even more. To insure the security of the Defense Force and the privacy of industries and individuals, precise code technology, Firewall technology, and certification systems must be established without delay. At this point our nation must pay attention and not just take in the code and certifications of other countries, such as the United States, but to establish our own original system. Today our nation is very insecure and is much like a "goldfish bowl" where all information is at the access of any hacker who wants to take a look. But to install the coding system of the United States, such as "Key Recovery" we would be even more visible, expanding our glass like transparency.

Information network security and information collection activity is like a "shield and spear" relationship. For that reason, there is a connection in the research and use of Firewall and code systems. We must always keep in mind that we must interact in both ways with Information Infrastructure policy.

e) Consolidating the Law and the System

In the U.S., it is illegal to unlawfully access other's computers. But in Japan, it is not a crime to steal information in this way. In the U.S. it is a criminal offense to retrieve any information concerning security guarantees. But in Japan, there are few laws against information fraud.

On the other hand, legal investigations against the freeness of computer crimes have been suspended since the legislation commission's debate in 1986. Legal adjustments must be made to make the present criminal law, one that will regard computer fraud and disclosure illegal.

f) International Consensus Formation

When debating with other countries about the various areas in the security of the nation, we must format an international consensus to stand up to cyber-terrorism, by making a proactive proposal for an establishment of international law on security. However, while keeping international cooperation in mind, we must also have our own originality as mentioned in d), and remember to possess an attitude to voice our opinion internationally.

(2) Consolidating the Information Infrastructure Function within the Cabinet

[Current Conditions and Problems]

Recently, within the country and abroad, many serious incidents have taken place such as, the suspicion of North Korea's nuclear development, the Formosa (Taiwan) Channel/Senkaku Island issue, the terrorist attack upon the Ambassador Residence in Peru, the Kobe earthquake and AUM-cult crimes, radioactive leak, and oil spills. Behind all of this, we are faced with the urgency of decision making in such situations as, confusion to the International Order through the destruction of cold war structures, the expansion of scientific technology, and neglecting the actual threat upon nature.

In such sudden circumstances, and also to be able to efficiently answer to situations concerning our countries rights and safety, and our peoples lives, we must take a leap in progressing towards the Cabinet's crisis management functions. Depending on how smoothly we are able to effectively and accurately send out crisis information and how efficiently we deal with the situation, will determine the future of many human lives.

[Measures]

a) Consolidating the function of the Cabinet Information Research Office

At present, the Cabinet Information Research Office has over hundred employees and a two billion yen annual budget. Yet, this is still insufficient when progressing to acquiring information and analyzing under the lead of the Cabinet.

Reasons are listed below:

- * The Prime Minister and politicians such as the Chief Cabinet Secretary, are not making the staff resourceful.
- * The right to access to each Agency is not given to the Bureau.
- * The investigators who are dispatched to the Bureau have a very important role in being the pipeline to the Agencies, but their term normally ends in two years, not making much use of human resource.

- * Compared to the scale of thousands and ten thousands of people in other related foreign organizations, our structure is weak.
- * We have no system to appoint analyst specialists at a high level.

For these reasons the following are necessary:

- * A Cabinet Information Research Office should be maintained for a council, in order to establish the thoughts of the information community, to generally summarize and analyze information as a government. At the same time, rights to have access to information of each Agency should be given to the Chairman of the Office, in order to attempt understanding of the information by the Cabinet.
- * Consideration of the length of term and re-appointment of dispatched investigators, depending on their duty and aptitude.
- * Consolidation of the Office as an appropriate function, internationally, for our country.
- * Maintain a system where specialists of each field, are placed at the same level as the Chairman (example: Cabinet Information Analyst Officer/Chief)

Further more, in addition to having a Defense Diplomat reside in our diplomatic establishments, we need to appoint an Investigation Officer also, so as to bring us closer to the three agencies system(Diplomatic Officer, Defense Diplomat, Investigation Officer) of advanced countries. At the Administrative Reform Council, the subject of downsizing of the Public Safety Commission and converting that manpower to the consolidation of Information accumulation activities abroad to enrich the Cabinet's function, was brought up. Immediate examination of this matter must be made.

Additionally, with the Network being shared by civilians, more measures should be taken to civilian industries that are closer to information. In order to effectively receive the cooperation of civilians, we must establish a system to gather information, regularly and normally.

b) Training and Establishing a Plan Manual for Acquiring Information

Having a system to submit information to the Prime Minister and the Government in a timely manner is essential at such times when the security of the Nation or the lives of many citizens are in danger. At present, there is no system for acquiring information at the Prime Minister Residence, and information most wanted by the Prime Minister and information that has urgent meaning during a crisis have a way of being stopped at each Agency level.

For this matter, efficient plans for acquiring information should be made along with training and an actual Manual. The following points should be focused on when planning:

- * To have the first information delivered to the Prime Minister effectively, a manual should be set with priority in deciding what information the Prime Minister would request and what information may be stopped at the Ministry level.
- * Should a situation arise where decision making is difficult, an environment should be made so that each information will be sent without reserve.
- * Data that may not be important for one area may have great meaning to another. An information database should be established so that anyone will be able to acquire needed information.
- * Establishing a good harmonized man and machine relationship is very important. Time and manpower should be reserved for general decision making, leaving mechanic processing to computers.

- Information is not just for gathering, but must be utilized to make efficient decisions. For this reason, compromising measurements must be made between the two for quantity and time.

c) Composing a Crisis Management Team

The normal gathering and analysis of information will be done at the Cabinet Information Research Office. Information must be readily available for everyone connected with crisis management, but at the same time, should a crisis occur, a Crisis Management Team should be appointed to take immediate action. It is important that this Crisis Management Team be set up within the Cabinet Information Research Office. This team should be separated into at least three groups, an on-the-job group, a training group, and a reserve group. These groups will rotate on a yearly basis, for a three-year term.

The members of these groups should be crisis management specialists from each Agency. An environment for these members should be established so that, when their term is finished, they will be able to return to their original positions without any disorder.

d) Maintaining the Crisis Management Facility of Prime Minister's Official Residence

The information infrastructure connections presently established in the Official Residence and each Agency are analog telephones and FAX, which is very discouraging. The facility itself is so old that should an earthquake the size of the Kanto Earthquake occurs the building will certainly collapse. To have our Nation's crisis management in such an environment is extremely insufficient.

The establishment of a new facility, pushed by the administrative reform, is being delayed, plus the structure itself is being reduced. Even so, in this new plan there should be included a good digital capacity to deal with the information infrastructure, and construction of digital loops should be to enable exchange routes. Additionally, several operation rooms need to be established to manage the crisis information. At non-crisis times these room will be used for training purposes. When a crisis occurs, these rooms will be the front line and the crisis management team mentioned earlier will be established there. Needless to say, the new Official Residence, including the operation rooms, needs to be sturdy enough to withhold a Kanto Earthquake level quake.

e) Maintaining Crisis Management Related Laws

The Crisis Management system could be well organized, whether in hardware or software, a law must be established for all information, to be authorized to the Prime Minister and the Crisis Management Team in a time of urgency. Especially with the existing laws in force and the laws of the Cabinet, the rights of the Prime Minister is not much different from that of other Ministers, therefore primary leadership is very difficult to proceed. It will also be difficult to power the crisis information management system unless a law to empower the Prime Minister's rights, in time of crisis, is put into force through the Cabinet law.

(3) Establishing High Level Information System within the Defense Force

[Current Conditions and Problems]

With the increase of the Defense Force budget over the past ten years, our nations Defense Force is now by no means inferior to other summit participating countries. Compared to this situation, the command/communication system on the Defense Information Network System (C4I), with the establishment of the three-defense forces common Information Office, have just started to set their grounds. Yet still there are the matters of the use of separate wave channels (bends), not having a back up system, and being behind in the world-wide tide of common use of the Network. The development of coding technology is also delayed.

We must urgently progress towards high standards of network information within the Defense Force in order to promote our nations security capability and make effective use of AEGIS ship with it's high technology programming and also AWACS.

[Measures]

a) Seamless Connection of Defense Information and Defense System

Because of the seamless characteristic nature of the information network system, there is no need for a separation between military and public information. An additional merit is the low cost of sending defense information over the Internet. With these factors in mind, the Defense Force's use of networking with the community would be rational.

The network in the United States has already applied this policy, called the Open Architect System, and have secured a wide selection loop and exchange route (or loop) and is content with the overlapping of information between the Government and Defense forces. Our nation should also adopt this Open Architect System once our public network becomes more developed.

While considering the security measures for the defense network information system, we must build a strong firewall against the public and also establish a high power code policy for security. Additionally, we must consider building in the self-defense function within the defense network. We must also prepare a specialist staff for prevention of derangement of defense information that can come from false mail/information and rumors.

b) Single Information System for all Military Forces

The United States has applied a thorough unification of information between all armed forces. Our nation's armed forces are presently using separate wave channels and code systems. It can not be said that this is a rational system, and in an emergency situation, it is very discouraging to think that information might not go smoothly. It is essential to have all defense forces sharing the same wave channels and cryptography as soon as possible. At the same time, it is also important to have the full cooperation of the Ministry of Posts and Telecommunication.

c) Information Gathering Satellite

In January, there was a massive oil spill from the Russian ship NAKHODKA. Our government needed to purchase resource information satellite photo in order to grasp the spread of the oil flow. In order for us to supervise the military forces around us, satellite photographs are essential, and we do not have a guarantee that foreign countries will always let us purchase theirs. Japan is the only Summit participating country without our own resource information satellite. Our nation must establish our own facility or for the time being use the pictures from the resource information satellite.

d) Usage of Diplomatic Defense Information

At present, there are over 30 defense resident officers distributed in diplomatic establishments abroad. In the effort to unite with foreign affairs, information on security is only being transferred to the Ministry of Foreign Affairs, and there seems to be occasions when actual information is shut out on the determination of the diplomatic official. Neglecting of this matter will not only preserve this futility, but a mistake with a terrible loss could come to our nation. An improvement to have an information transmission route for information from defense resident officers to be transferred precisely and timely, is urgently needed.

e) Establishing an Analog System Replacement

We must estimate the possibility of our information network being attacked through Information War, right before an actual Real War, and also the possibility of the hardware being destroyed and shut down during a Real War. In such a circumstance, we must take measures to have other ways of relating information such as a having several motocross or bicycle messenger team secured.

2. Preparing Educational Environment in The Information-Oriented Society

[Basic Idea]

While the society itself is making a great shift to the information age, not only we have to educate people who plays important role of the change, but also it is essential that we implement the computer-centered information science education at all levels so that all the people have computer literacy as well as traditional literacy.

Also a computer is meaningless unless it's connected to the Internet. Because without computer networks, we cannot understand what the information-oriented society really means and its importance. If we understand that, we'll soon realize that it is necessary to think with a new concept and have children of the next generation fully understand the essentials of the information-oriented society at the early stage.

As we consider English education should start as early as possible in the education system, children should be given computer and information related education much earlier to survive in the high performance information-oriented society. Thus it is urgent that we start to prepare for providing information science education at the stages of the elementary and lower secondary schools.

(1) Information Science Education in Elementary, and Secondary Schools

[Current Conditions and Problems]

The current situation of information science education in terms of both hardware and software is far from the ideal in elementary and secondary schools.

The study by The Ministry of Education in March, 1997 shows the lack of hardware as follows; the average number of computers per school is 8.5 in public elementary school, 25.3 in lower secondary school, and 66.6 in upper secondary school. 9.3% of the elementary schools still have no computers.

Also from 1995 to 1999, a five-year project to install computers designed for educational use has been under way, and its goal is to install 22 computers in each elementary school and 42 in secondary school. But even if the project completes its task successfully, the projected number of computers will be enough for only one class in secondary schools and one computer for every two students with one in elementary schools. It has been said that the current situation in Japan is seven years behind that in the United States.

Also the percentage of the computers connected to the Internet in May, 1997 is only 7.3% in elementary schools, 12.5% in lower secondary schools and 17.3% in upper secondary schools, which is extremely behind the 78% completion in the United States.

In addition to the lack of computers at schools, the guideline and curriculum of information science education do not always get enough recognition. For example, lower secondary schools provide "Basic Information" as a new area in the subjects of "industrial arts" and "home economics", and students can learn the basics about computers in this elective course. And as a part of the general education course, upper secondary schools provide a similar subject on information-related study, which includes a variety of elective topics to satisfy students' interests. However both courses in lower secondary and upper secondary schools are not compulsory. This is causing the quality gap in information science education among schools and the gap is in the way of enhancing the entire school system.

Furthermore there is a serious problem regarding the lack of teachers with the ability to teach computer literacy. The study by The Ministry of Education, Science, Sports and Culture in March, 1997 shows that only 16.7% of the teachers in elementary schools, 22.7% in lower secondary schools and 23.8% in upper secondary schools are able to teach computer literacy.

[Measures]

a) Preparation of The Classroom Environment

Although The Ministry of Education plans to install 22 computers in each elementary school, and 42 computers in each secondary school by fiscal year 1999, the target numbers of installation are too small regarding that the environment with computer networks should exist as a part of student's life and the ministry still has no solid budget plans for after fiscal year 2000. Also if we think about expanding the use of computer in other various subjects, we need to upgrade the classroom facilities.

The followings are the new targets to improve the current situation of the classroom environment for computer education.

- * Install at least one computer in all classrooms
- * Set up one classroom in each school with one computer for every student
- * Provide a port for network connection and a projector in all classrooms so that students and teachers can easily use computers in class and for presentation. Also allow students to use computers as extracurricular activities in order to give them an opportunity to get used to computers as much as possible.
- * Advance the current plan to connect all the computers at schools to the Internet by 2003. Promote the project of making a homepage of each school (Expand "100 School Project").
- * Schools should accept the donations and cooperation of hardware and software from local communities, businesses and universities on their own decision so as to carry out the plan of building information infrastructures.

- * Introduce the assistant teacher system which will send staff from upper secondary schools and universities nearby for solving the problems regarding the computer use in class.
- * Build LANs in school and store up educational databases so that in the future, students can learn via the computer in addition to the ordinal textbooks.
- * Though most of the computers in school are currently purchased by schools, we should start raising the ratio of computers on lease and reduce the leasing period from the present six years to three years in order to keep students from learning with outdated equipment.

b) Curriculum Preparation

What children need in this high performance information-oriented society is to cultivate an ability to make a good use of computer and information network. Thus it is essential to provide them with the systematic information science education depending on the stages of children's development in elementary and lower secondary schools.

On 17th November 1997, the Ministry of Education announced an interim proposals on the revision of the educational guidelines for the next term (which is supposed to be in effect in 2003) based on the response of the already organized "The Consultative Committee for The Research and Surveys Regarding Promotion of Information science education". The revision proposals are as follows;

- * In elementary schools, "Comprehensive Learning Hour" will be established newly to let students become familiar with computers.
- * In lower secondary schools, "Basic Information" will be detached from "industrial arts" and "home economics" and become a required subject.

* In upper secondary schools, the subject "Information" will be required to all students as a part of the general education course so that the students can acquire the knowledge and skill to interpret and analyze information properly.

The proposals seem to be ambitious as remedies for the future information science education, but it will be too late to start in 2003, which is six years from now. We should put it into effect at least in 2001, the first year of the twenty-first century.

On the other hand, the computer education in professional and technical schools tends to have a top priority in building skills and it lacks in teaching the philosophy of how to survive in the high performance information-oriented society. Also it is necessary that such schools put more effort into cultivating student's creativity to develop software.

Besides building curriculum, we should solve the legal problem involving connecting computers to the Internet in schools and each school should be able to make a safe and flexible connection.

c) Training Teachers

It is needless to say that we have to make a great effort to educate and train the teachers specializing in information-related courses. Training current and future teachers of other subjects is also very important. Following measures should be taken.

* Make it compulsory for teachers on the job to take a computer training course every year, and a substantial budget for the training should be appropriated to each school. The budget is to include the cost of the training and personnel expenses to hire substitute teachers.

- * Start requiring college students in the teacher training course to take computer literacy classes. Incorporate the teaching assistant curriculum at elementary and lower secondary schools prior to the teaching experiences so that the new teachers can become the driving force to prepare the computer environment at schools.
- * Retain information processing technicians who specialize in computer science as part-time teachers and have them teach in class and train full-time teachers to improve their teaching skills. Although local governments have already started "The Project to Appoint Information Processing Technicians", its staff and budget are just started to grow. From now on we have to expand the project especially in cooperation with the companies that provide technicians and try to get them as volunteers or on loan.

(2) Information Infrastructures in Universities and Research Institutions

a) Improvement of The Science Information Network (SINET)

[Current Conditions and Problems]

The Science Information Network (SINET) run by The National Center for Science Information System is used for distributing science information among universities and it has enabled universities to distribute research information and to share computers. The network is spread out to foreign countries (USA, UK, and Thailand), not to mention all the national, public and private universities throughout Japan. Although the main domestic links connecting Tokyo, Osaka and Tsukuba have the speed of 150Mbps, which is as fast as the links in the United States, other branch links are still at only 50Mbps or 6Mbps. This problem keeps us from fully providing science information that is becoming highly technical and complicated.

Also the databases regarding science information are not completely established because of the delay in electrifying university libraries which are the core to support science research at universities.

[Measures]

In order to implement the Science Information Infrastructures, the following measures must be taken.

- * Upgrade all the links including branch links of The Science Information Network to the same level as in USA (150Mbps) as soon as possible and try to move the transmission speed up to gigabit level after that.
- * Prepare university libraries as database libraries and help universities and research institutions build their own database.
- * Promote information research comprehensively since information science is the fundamentals of various studies and it is expected to affect other academic fields and create new research methods.

b) Promoting Venture Business through The University-Industry Cooperation

[Current Conditions and Problems]

In the United States, the information infrastructure industry has grown due to a number of the venture businesses established mainly in association with Stanford University in Silicon Valley. It is the technologies transferred from the research at universities to private enterprises that have produced a lot of new founders and businesses and revived American economy.

Recently in Japan, there is a movement to bring out the potential research abilities of universities and strengthen the ties between universities and industry so as to create new businesses and innovate new technologies. In April 1997, for instance, the regulation toward national university professor's holding other jobs is eased and this enables universities to send their professors to private enterprises to conduct joint research. Also to support scientific research funds, some universities have set up an internal foundation for venture businesses and started to attempt new businesses using their ideas and technologies.

However the most important thing is to consider how we float the intellectual property rights such as patents and transfer the results of university research to industry. Unfortunately Japanese measures are still behind those of the United States and Europe.

[Measures]

The following measures must be taken to fully float the intellectual property rights of universities and promote new businesses through the cooperation between universities and industry.

- * American "Bayh Dole Act" (1980) enables universities to distribute their patent royalties within themselves and to reward patentees with certain amount of money depending on how successful their projects are. In Japan, we need to make such a law urgently so that Japanese universities can make a good use of their patents and balance the budget using their patent royalties, and we can energize Japanese industry.
- * Another reason for American success in industrializing the technologies of universities is the existence of "Office of Technology Licensing" run by each university. Following the American example, Japan must try hard to prepare personnel and organization to implement technologies smoothly beyond the limits and differences in the fields of study.

(3) Establishing The Evaluation and Selection System

[Current Conditions and Problems]

It is important to establish the evaluation and selection system in information science education since each school will soon be connected to the world via the Internet and education will be done in the global environment. This system needs to be build effectively due to the rapidly advancing information technology. In other words, we must move with the quick sequence of planning, evaluating, planning, and changing.

The ideas are yet to come out that the Japanese education system of information science needs drastic outsourcing and each school has to establish its own mechanism of evaluation.

[Measures]

- * Organizing educational curricula and guidelines needs to be carried out with flexibility in order to catch up with the rapidly advancing information technology and computer science. Currently the process takes ten years to revise the educational guidelines and to publish and adopt a new textbook. We should not only speed up this process but also evaluate the curricula in the past properly and make use of the feedback of the evaluation to revise the guidelines.
- * The recipients of education as well as schools should take part in revising the contents and the systems of education by building in a proper mechanism of evaluation and selection to the public education system. In the information-oriented society, we should not allow education recipients to have passive attitudes as they did before.

* It is impossible for schools to keep up with the rapid change in the information technology unless they not only maintain their independence in dealing with information science education, but also associate with the information-related industry and local bases of information services. As seen in the American success, we need to retain information processing technicians as trainers and should not hesitate to have outsourcing service from businesses and local communities on setting up curricula and selecting textbooks.

3. Establishment of Information Infrastructure

[Basic Idea]

35 years ago, total number of automobiles in Japan was only in the neighborhood of 5 million. Now roads are flooded with about 70 million vehicles. According to an estimation, though it was made several years ago, annual economic loss due to traffic congestion exceeds 1 billion yen. Thinking about the amount will accumulate year by year, it will reach an astronomic number. There are various factors involved, but the first to blame is the failure of road policy which had miscalculated the future demand and could not take appropriate measures to cope with it.

It may be inadequate to discuss telecommunication infrastructure in information society on the same plane as roads in car society. Still, not to mention about the increasing number of Internet users, there is no doubt that we are now facing coming explosion of communication demand. It shall be too late to race around once the situation do occur. If Japan fails to build up information infrastructure which shall be the basis of every industries in the 21st century Japanese economy, it may result in not only serious but fatal damage in the future. A strategic program shall be proceeded now.

(1) Domestic Infrastructure

[Current Conditions and Problems]

The current problems are lack of strategy in building infrastructure and high service rate.

Firstly, infrastructure, NTT is now leading FTTH (Fiber To The Home) Plan to connect each home with fiber optics network by 2010. However, thinking about rapid growth of communication demand, nobody knows whether the plan will be completed in time. In case the demand shall explode before the completion of the network, it might turn out to be a hamper which hinders Japan from taking the opportunity of growth, the opportunity to take the leading role in the international society.

It is also very important to think how to combine other communication methods, such as satellite, radio, CATV (coaxial cable), though it is not so popular in Japan, ADSL (Asymmetrical Digital Subscriber Line) which uses existing telephone line, to maximize their advantages and complement their disadvantages to use as bridging or alternative infrastructure before completion of fiber optics network. However little discussions have been made from this point of view.

On the other hand, installation of fiber optics network is proceeded not only by NTT, but other plans are now being carried out simultaneously, such as the plan led by Construction Ministry and one of NCCs, the plan by KDD which uses sewage line of Tokyo Metropolitan Government. These movements will contribute to prohibit NTT's monopoly in local communications service, but considering the large amount of money involved, it has to be made sure to avoid useless double investment.

Secondly, high communications rate, according to an estimation by Telecommunication Technology Council, the monthly communication bill in 2010 will be 7,800 yen for high-speed line service of 20 megabits/s in home on flat rate basis. Even thinking about that the line speed will increase, no one will be satisfied with the fact that the charge will remain virtually the same as current average monthly payment of 7,400 yen after vast investment. To realize the price with international competitiveness, investment shall be made considering comprehensive effectiveness, including alternative infrastructure discussed above.

Though the service rate is considerably coming down as a result of deregulation, comparing with the rate in the U.S., there is a significant gap not to mention in local service, but also in leased line service. It mainly comes from the fact that full-scale competition between NTT and NCCs has yet to take place.

The demand for mobile communication is now skyrocketing, and good circulation has been observed that competition leads price cut down, which leads new demand. However, limited frequency suitable for mobile communications might hinder further price reduction.

[Measures]

a) Settlement of Comprehensive Strategy for Information Infrastructure

On establishment of infrastructure, the following points will be critical;

- * Proceed the plan as fast as possible. However, short-term demand forecasts shall be carried out at intervals, and according to the results, flexible modifications shall be made to the plan to eliminate unnecessary investment. Policies shall be made with consideration to overall consistency between multiple fiber network programs, satellite communications project and CATV network which are being proceeded at the same time.
- * Depending on situation, intensive investment to specific infrastructure, similar to priority production system, may be effective.
- * Other types of infrastructure than optical fiber network has its own advantages and disadvantages. Reasonable consideration shall be given as bridging infrastructure before completion of fiber optics network, or as an alternative in case of delay in optical fiber network plan.

- * It is difficult to say whether all communication demand will be satisfied with fiber optics network. Other communications technology shall also be considered as complementary infrastructure using their respective characteristics.

b) Introduction of Full-scale Competition

The problem of price of high communication rate lies in inefficiency of current system where class I telecommunications carriers shall take responsibility in infrastructure and provision of communications service. So-called type 0 carriers who don't provide communications service but concentrate on installment of infrastructure shall be created and competition shall be introduced into that business category.

However, as for installment of optical fiber network, since the work shall be completely the same in each project, it might be a good idea to form a joint venture by government and private business to build up infrastructure according to MPT plan, and consign its operation to multiple private companies.

The allocation of frequency to mobile communication has not been carried out with sufficient clarity so far. Therefore, the following two measures shall be taken;

- * At least for allocation of frequency hereafter, open bid system shall be employed to make the process clear.
- * However, administrative guidance shall be required to avoid the problem that newly entered companies bid too high price and fail to pay the money which has been occurring in the U.S.

In the field of telecommunication, it has been said that the change for past 10 years occur in 3 years, but these days the terms has shorten to 1 year. With increasing speed of changes, both clear strategies and flexible response toward changes shall be essential in building information infrastructure.

(2) How to Cope with International Competition

[Current Conditions and Problems]

In the field of communication infrastructure worldwide, not only the United States, but European countries and Asian countries such as Malaysia and Singapore are in severe competition for initiative. The power structure is now being settled by mega carriers of the U.S. and Europe. Japanese companies are one step behind in this situation.

Also in the field of satellite communications, the United States has initiative in both technological and political terms, and even the territories are divided at its will. As for Global Star Project and Iridium Project, it will be difficult for Japanese companies to participate in these programs with their own independent will.

[Measures]

However, there is some hope for Japan to catch up. Japan has financial assets as much as 1200 trillion yen, and by making best use of these assets and technological capabilities which maintain predominance over other countries Japan might be able to lead the world. To enter into the mega competition in international communications market, essential factors are taking advantage of these strength, cooperation between NTT, KDD, JT, DDI, etc. and national vision.

In the field of satellite communications, the next generation satellite communications, the large capacity communications project has been under to launch service in the early 21st century. This project is also let by U.S. military industries, but there is still enough space left for Japanese companies to take part in from the viewpoint of funds and technologies, so the strategic and aggressive efforts shall be made.

4. Information System in Private Industries

[Basic Idea]

The United States has obtained overpowering status in global information industry and financial industry by dramatically developed Information Technology (IT) and Financial Technology (FT) in recent years, which are accelerated by application of military technologies to private industries due to disarmament movements and Information Superhighway, and the dynamism is likely to grow even further.

As a result there is a significant gap between Japan and the U.S. and Japan might lose its competitiveness not only in information industry as providing side, but in entire industries as receiving side.

[Problems and Tasks]

- * Japanese industries are losing relative competitiveness with foreign companies, and at the same time maturing.
- * To compete with Asian countries which have been gaining competitiveness due to their low wages, Japan has to shift to high value adding industries.
- * As shown in lack of young labor, acceleration in aging of society, decrease in ratio to take job in manufacturing industry, collapse of lifelong employment system, and lack of loyalty to company, the mental structure and environment of workers has been changing.
- * Rapid progress in economic internationalization and open competition will lead severer international competition.

(Disparity between Japan and U.S. shown in information-related indexes)

* Information-related investment in private investment (1996)

U.S. 32% Japan 16%

* Prevalence ratio of personal computers (1996)

U.S. 39.8% Japan 13.3%

* Number of Internet hosts (1997)

U.S. 10,113 Japan 734

To overcome this situation and establish the industrial infrastructure which can support Japanese economy in the coming century, IT/FT revolution is urgently required by appropriate government's guidance.

[Measures]

<Measures to be taken by companies>

To achieve IT/FT Revolution in the 21st century, it is essential that each company shall be "armed with information" to improve competitiveness.

Here "armed with information" has following two meanings;

* Reduce cost by more efficient communication inside/outside company to realize drastic restructuring and BPR.

Note BPR =Business Process Reengineering

: To achieve objectives such as improved profitability ratio and customer satisfaction, conduct a thorough review on operations and its flows to reform organizations and operations.

* Encourage investment to information industry to enhance competitiveness and creation of new industries in telecommunication.

These strategies will produce excessive manpower, and absorption of these manpower to new industries will make a reform not only in individual industries but in whole industry.

It can be expected that advanced information technologies over entire industries represented by electronic commerce will create various new business in information processing service industry and software industry which utilize new information technologies and considerable growth in employment in these fields.

These effects are estimated in various governmental councils as below;

(Development of Information Industries)

* Forecast of market scale

1996 : 38 trillion yen → 2010 : 126 trillion yen
(estimated by Industrial Structure Council)

1993 : 56 trillion yen → 2010 : 155 trillion yen
(estimated by Economic Council)

* Forecast of employment scale

1996 : 1,25 million → 2010 : 2,44 million
(estimated by Industrial Structure Council)

1993 → 2010 : 1,53 million (new employment)
(estimated by Economic Council)

The scale greatly exceeds that of automobile industry, the current key industry, which indicates that information industry will be one of key industries in the 21st century.

The steps for this information armaments are described below;

a) Increase communication efficiency, information sharing within company

* Introduce groupware such as e-mail, electronic bulletin boards, group scheduling, etc. to improve productivity.

* Introduce intranet to share documents in the form of electronic data within company to improve management efficiency.

b) Increase communication efficiency, information sharing with suppliers/customers

* Introduce electronic commerce via Internet to improve business productivity and efficiency.

* Introduce electronic transaction systems EDI, CALS, etc. to improve efficiency in transactions and quality of products. In addition to that, encourage paper consuming reduction to cut down cost.

Note EDI (=Electronic Data Interchange)

: Transfer business documents related to sending/receiving orders, transportation, payments etc. through computer network

CALS (=Continuous Acquisition and Lifecycle Support. Currently also said as Commerce at Light Speed)

: Integrating information regarding to product life cycle from procurement to design, development, production, operation, management, and maintenance into integrated database for centralized control/sharing for smooth information exchange.

c) Increase communication efficiency, information sharing with customers

- * Enable to purchase almost everything in home by just accessing cybermarket.
- * Establish a system to purchase from cybermarket in place of consumers and provide information necessary for consumers via network.

d) Outsourcing of information department

- * Establish an information base system at higher networking level and with enhanced efficiency and outsource information department to increase efficiency.

e) Telecommuting such as SOHO and satellite offices

- * Establish flexible working styles and encourage telecommuting to provide workers with quality of life, to increase workers' productivity in order to enhance corporations' efficiency and profit.

Note SOHO (=Small Office, Home Office)

: Small-sized offices and home offices equipped with computers and telecommunications devices, which have realized by recent rapid development of information and networking. The U.S. is now progressively encouraging these SOHOs.

Satellite office

: A new type of offices located not in metropolitan area, but in suburb areas which are close to residential area, which makes great use of Internet and other telecommunications technologies.

<Measures to be taken by government>

a) Deregulation and establishment of market rules

The measure expected to government to proceed informatization in industries is introduction of full market mechanism, in other words, thorough deregulation. The key factor of extended informatization in American companies with excellent business performance is full-scale competition in the U.S. market. Each company has to be desperate to enhance their operation efficiency including communication.

To name methods for deregulation, every regulation shall be reviewed on zero-basis so that regulations can be limited to social ones in serious needs. The government concentrates on monitoring regulations and rules, and make rules and penalties to economic crimes more strict. To achieve this goal, reinforcement and expansion of Fair Trade Commission and establishment of a fair and neutral supervisory organization will be required.

b) Make incentive in tax system

To encourage companies' incentive to information investment, clear strategies such as exemption of consumption tax and customs duties for electronic transactions and other measures as certain tax deduction and accelerated redemption for companies' information investment will be effective.

Besides, preferential tax treatment for venture businesses which will be the key of next generation industries in Japan shall be created.

c) Ensure network security

To ensure the security of electronic transactions, so-called "authentication business" is expected to grow in private sector. International collaboration between these organization is also important.

d) Introduction of information infrastructure in administration system and 24 hour administrative service

Business activities and administration system which is in charge of supervising and approval and licenses process are bound with a strong tie. Even if individual companies install highly advanced information systems, they won't sufficiently be able to develop their potentials when they will be divided by administrative systems.

Therefore, introduction of information structure on the same level and at the same speed as private companies and 24 hour administrative service is critical.

5. Provision of Financial System in The Information Society

[Basic Idea]

Provision of a healthy financial system is necessary in order to establish the economy that stays vital in the 21st century.

In last November, Prime Minister Hashimoto set forth the plan called Japanese financial big bang with "free," "fair," and "global" as its keywords. Under this plan, Japanese financial system is now undergoing radical deregulation and reformation, and the drastic amendment of the Foreign Exchange Control Law will soon be happening. As this financial reformation takes place, the economy of our country is confronted with a great deal of difficulties due to revelation of evil business practices that prevail in Japanese financial industry, and due also to Asian monetary crisis and the decrease of effective demand under a reduced budget. However, this difficult situation is only taken care by establishment and thorough implementation of fair and internationally acceptable rules, is Japanese financial market able to reach true global standards. Therefore, our foremost endeavor must be devoted to successful enforcement of the financial big bang.

However, deregulation and establishment of rules to global standards are only bottom lines to construct a transparent and vital financial market. In order to accomplish the goal, disclosure policy to assure transparency must be thoroughly implemented, and the financial information system must be reformed at a drastic scale to help financial institutions develop more complex and advanced products.

[Current Conditions and Problems]

The financial market of our country is very much outstripped by its American and British counterparts.

The U.S. financial industry drastically increased its competitiveness after the Cold War, because the Wall Street was flooded by a number of talented scientists and engineers who lost their jobs in the military industry. These people developed innovative financial methods such as ALM (Asset Liability Management) and derivatives using their knowledge in mathematics, physics, and computer technology. New York financial market has rapidly expanded by introducing these new financial methods that were also reinforced by the overwhelming amount of investment in information technology. Compared to the successful U.S. financial industry, Japan is far behind in its quality of people, technology, and equipment in the industry. The disparity between Japan and the U.S. financial industries all results from the above stated facts.

More specifically, problems listed below are becoming more critical.

- a) Japanese institutional investors do not function as a financial intermediary because they lack adequate know-how in investing private assets worth 1,200 trillion yen that they are entrusted with.

Japanese industrial analysts are not as capable as their Western counterparts. Fund managers and asset managers that are able to provide investors with appropriate portfolio management are not readily available in Japan.

Therefore, Japanese funds are being invested in foreign infrastructure, causing the funds lose its value due to a foreign exchange loss.

- b) Japan is lacking the capital market that smoothly provides for the field of information technology with risk money.

It is fatal that there is no markets, accessible particularly to venture companies at their early stages and to the information industry, that deal with corporate debentures, stocks, and junk bonds.

- c) Investment in the information systems by the financial institutions is delayed because disposition of nonperforming loans is prolonged.

At some institutions, because of time consuming disposition of nonperforming loans, they are behind of setting up personal computers, while they are equipped with state-of-the-art workstations.

[Measures]

Financial institutions in our country will be left behind with the rapid change of the financial industry, unless they acquire the function as a financial intermediary as strategic as that of the Western institutions.

To resolve the above listed problems, the following measures are essential.

- a) Early implementation of the financial big bang

Information disclosure by the financial institutions and the principle of self responsibility must be ensured in order for Japan to get rid of what is called a convoy system. The successful implementation of these plans all relies on steady enforcement of the financial big bang now promoted by the government.

Among others, the following points are especially important.

- * Capital market that provides for venture companies with risk money needs to be established. As a first step, the old method of determining a stock price upon listing has been already revised, and borrowed stock was unbanned. These actions enforced this year must become established in order for the over-the-counter stock market to grow into more competitive one.

- * Stock companies have been given permission to promote investment in unregistered and unlisted stocks, which used to be one of the factors to prevent venture companies from growing. Limitations imposed upon the target of pension trust and stock investment trust were also abolished. Circulation of unregistered and unlisted stocks in the market must be promoted by making the most of these deregulation measures.
- * Wide range of competition among financial institutions are expected to create a certain mechanism by which the most efficient way of raising capital is realized. During this process, the Antitrust Act must be strictly applied to ensure fair competition.
- * Investment opportunities must be diversified by deregulating investment by insurance companies and investment of corporate pension funds, and by easing regulations concerning development of new financial products.
- * Upon the implementation of the financial big bang, Japanese financial institutions must immediately acquire the most advanced financial technology and know-how by becoming strategically aligned with, or even by purchasing, foreign financial institutions.
- * Stock transaction commission must be immediately liberalized to reduce the dealing costs and improve the function of the capital market.

b) Supporting venture business

In Hollywood, outstanding visual contents are continuously produced. This is made possible because capital from the private sector is effectively devoted to venture business.

This rising trend of small to medium-sized enterprises including such venture companies has been supported by NASDAQ, the U.S. OTC market. The number of companies registered with NASDAQ far exceeds that of Japan. It is worth noting, among others, that information-related companies such as computer software houses and semiconductor companies are making great strides in their business right upon registration with the OTC market.

In supporting such venture business, the following is quite important.

- * Environment that allows stocks of venture companies to be listed at an earlier stage must be prepared. Possible measures to realize such environment include vitalization of the second OTC market in which companies in the red are allowed to list their stocks as long as more than 3% of the sales is devoted to their research and development. Another possibility could be complete abolition of regulations concerning the standards of listing such as the number of issued stocks and the amount of profit.
- * It is necessary to promote investment in venture companies by institutional investors by training venture capitalists that are specialized in investing in and loaning to venture companies.
- * Securities other than government securities and stock investment trust must also become available at the window of ordinary commercial banks, in order to put venture funds within the reach of individual investors.
- * Venture capitals, which provide venture companies with investment and consultation on business strategies and management, must be vitalized to the level of their Western counterparts by preparing an appropriate environment.
- * Professional venture capitalists capable of providing venture companies with investment and loan must be trained to the Western level.

- * Access to the capital market by information infrastructure projects must be expanded. In other words, issuance of corporate debentures and stocks by information companies must be promoted.
- * The junk bond market equivalent to that of the U.S. must be furthered, and the listing standards must be eased.

c) Reformation of taxation system

The following reformation measures concerning the taxation system must be taken to resolve problems that our financial industry are now faced with.

- * The security transaction tax and the stock exchange tax must be abolished. It is essential for Tokyo Stock Exchange to increase the number of its deal, because abolition of these taxes will reduce the dealing costs and ensure the competitiveness of the domestic market against foreign markets.
- * Investment loss redemption for up to one fiscal year back must be institutionalized to give companies incentives to make an investment in information infrastructure.
- * To get rid of growing anxiety about the financial system and to restore the function as a financial intermediary, Japanese financial institutions must finish disposing of nonperforming loans as soon as possible. Earlier resolution of this problem becomes possible by implementation of the taxation system more favorable to financial institutions.

For instance, in the process to dispose of nonperforming loans under the current taxation system, the loss of financial institutions is not acknowledged unless they prove in a very time-consuming manner that their loans can no longer be paid off. The taxation system must be more flexibly applied to financial institutions to give them incentives to expedite disposition of nonperforming loans.

d) Development and spread of electronic payment and electronic money system

Although Japan has been a little behind in development of electronic payment system and electronic money system, the gap between Japan and other countries is being narrowed rapidly since some financial institutions and credit card companies started to take an active part in the development process.

These systems, however, still need further advancement as they are the very foundation of the economy that continues to be heavily oriented toward electronic transactions. Continuing endeavor and dedication of both public and private sectors are essential, and deregulation needs to be actively done so that the principle of competition contributes to successful and effective completion of the process.