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STUDY GROUP REPORT

Report of Study Group on R&D Human Resources Development in the ICT Sector

Introduction

MIC set up the Study Group on R&D Human Resources Development in the ICT Sector (Chair: Prof. HARASHIMA Hiroshi, the University of Tokyo) in November 2006 to investigate what measures should be taken, through cooperative efforts between industry, academia and the government, to develop R&D personnel who would bring about innovation in the ICT sector. The group compiled its report and made its announcement in June 2007.

The current situation and issues for R&D human resources development in the ICT sector

While on the one hand, ICT has widely permeated every day life for everyone in Japan, the business environment for the ICT sector has become extremely severe due to a number of reasons including the opening of markets, the advance of global competition, growing price competition and the

reduction in product life cycles. Against such a background, corporations need to anticipate sudden changes and to innovate in order to survive.

Along with the worsening of competition, corporations are more and more being required to produce broader-ranging, more intricate and higher quality research and development. This means a sharp increase in the range of skills necessary for R&D personnel, along with a broader range and higher quality of specialized technical skills. It is important to address these changes in environment adequately and to secure R&D personnel capable of innovation that fully utilize ICT.

There is already a proper awareness of the importance of human resources development and corporations, the state, universities, graduate schools and research organizations have all been tackling the situation, but there are still issues.

CONTENTS

STUDY GROUP REPORT

Report of Study Group on R&D Human Resources Development in the ICT Sector 1

TOPICS

Looking Ahead to Building Ubiquitous Communities - From the Investigation of the Panel on Revitalization of Local Community and Ubiquitous Network Society - 7

**International Policy Division,
International Affairs Department,
Telecommunications Bureau,
Ministry of Internal Affairs and
Communications (MIC)**

1-2, Kasumigaseki 2-chome, Chiyoda-ku, Tokyo 100-8926, Japan
Fax: +81-3-5253-5924
Tel: +81-3-5253-5920

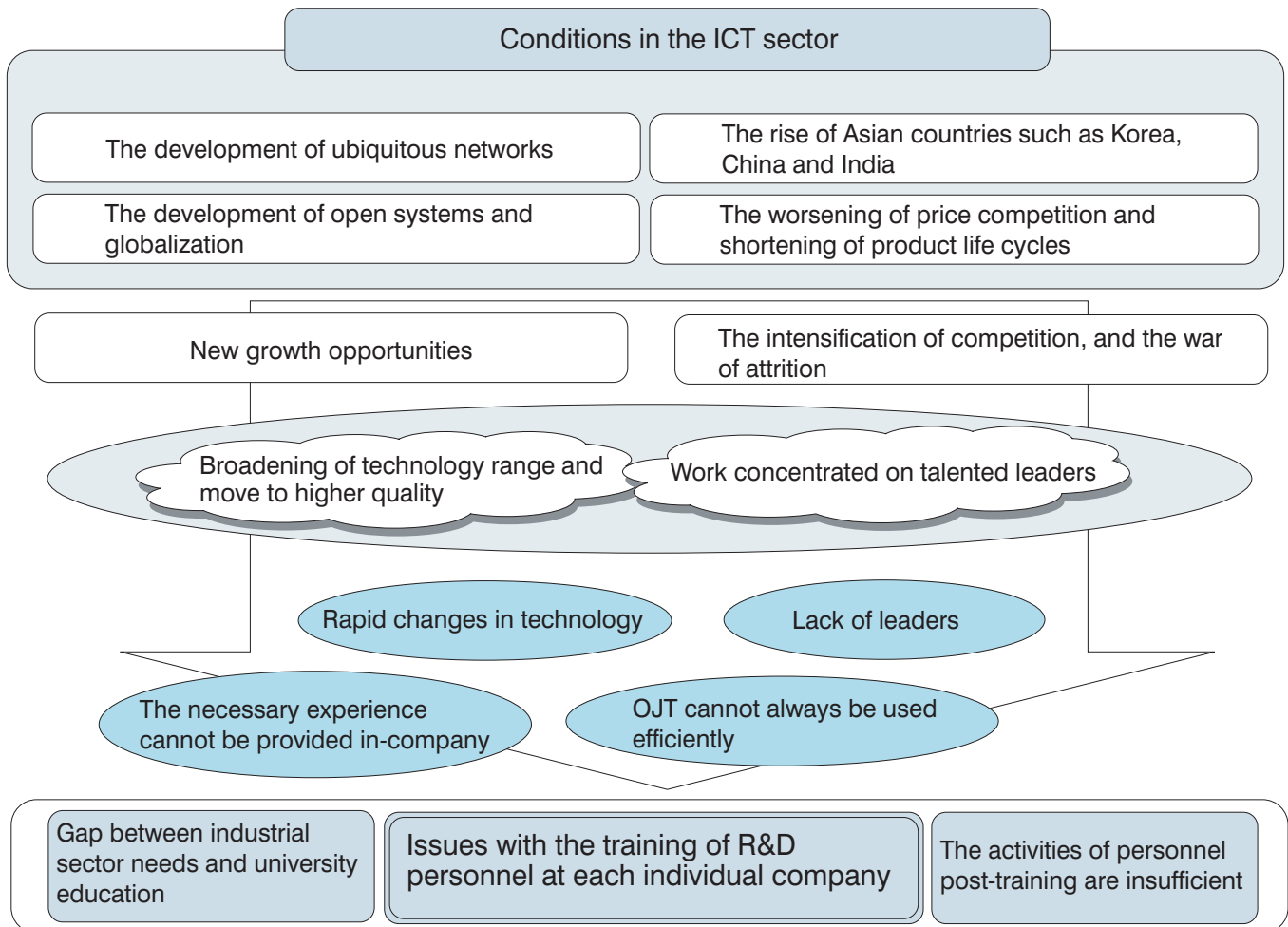
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Figure 1 Issues to do with the development of R&D personnel



Corporations have been reducing time devoted to OJT (on-the-job training) by leaders due to the severe business environment brought about by greater competition. In particular, as business has been concentrating around the more capable leaders, OJT has not necessarily been put to the best use. Also, as the time is approaching when a large number of people will be retiring, the total number of experienced leaders will no longer meet needs, plus systems are not being put in place for training due to the speed at which technologies are progressing. In addition, in order to conduct a project that brings together a large number of people, varying types of career are sought and it is becoming difficult to find the necessary experiences within companies.

This is why a number of

issues have arisen with individual companies working alone to develop human resources in R&D.

One can also point to the gap between the type of people needed by the industrial sector and university education, and to the fact that it cannot be said that people who have been trained are being put to adequate use by corporations.

The image of R&D human resources in the ICT sector

Within the ICT sector, there is a strong need for R&D leaders as well as high-level researchers and engineers capable of dealing with new technologies.

R&D leaders can broadly be divided into ICT innovation leaders who are R&D leaders specializing in the creation of new business areas, and R&D leaders specializing in solutions, who deal

with expansion in existing business areas.

In order for corporation to survive, ICT innovation leaders who can guide the creation of innovations are necessary, but since a wide range of experience is necessary, it has become extremely difficult to train such people within a single company.

A framework for the development of ICT innovation leaders

Since it is very difficult indeed for a single company to develop ICT innovation leaders on its own, it will be necessary in the future to address the development of ICT innovation leaders in a way that covers the limitations of training capabilities of individual companies.

Basic approaches on the development of ICT innovation leaders

(1) Actual experiences are necessary in order to tackle R&D and it is vital to construct an environment that will bring this about.

(2) The individual resources that are suited to ICT innovation leaders include having multi-faceted interests along with a huge spirit of challenge, and being passionate about R&D.

(3) Leaders and evaluators are necessary for putting in place an environment to develop ICT innovation leaders.

(4) It is necessary to bring together a large number of R&D personnel at the same time, and to implement R&D with the same goals.

(5) Education is also necessary to acquire technological management skills as knowledge of intellectual property rights and knowledge of management skills. Efforts need to be made to improve language ability, centering on English language, as well as efforts to acquire an international perspective.

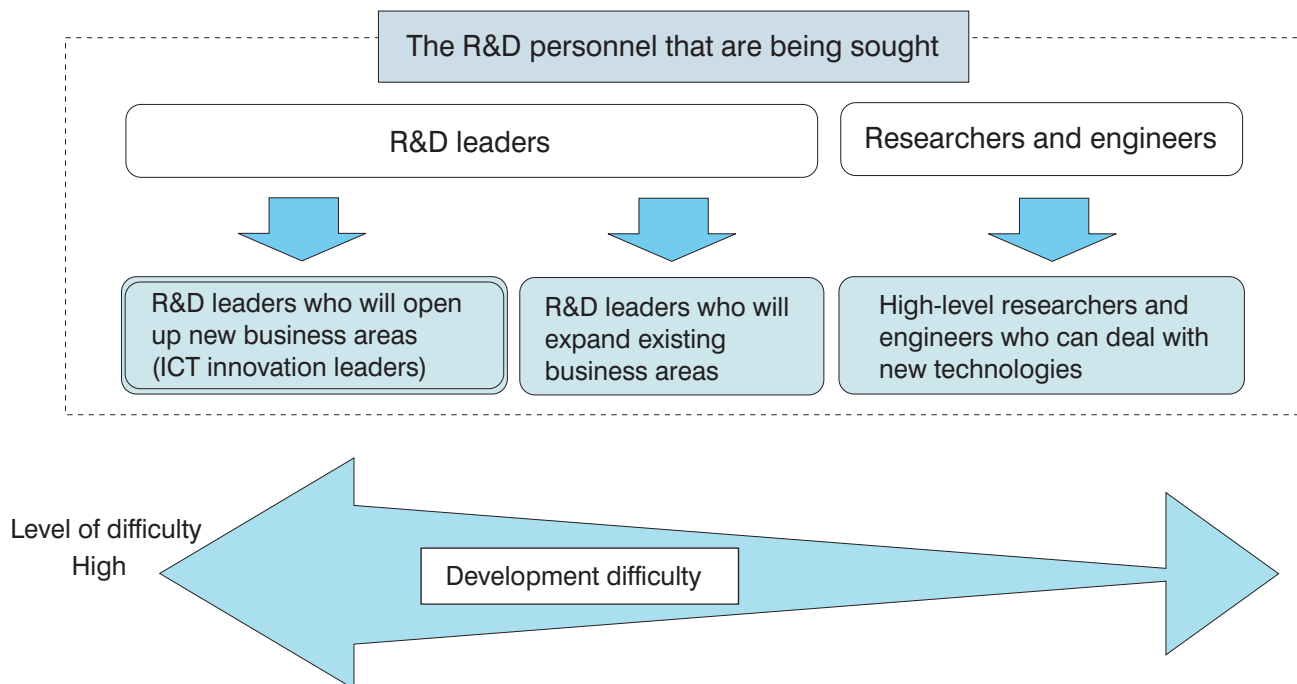
(6) It is necessary to take a long-term view with regard to the development of ICT innovation leaders.

(7) Increasing the flow of personnel will play an important part in improving Japan's R&D power.

(8) Participation in the ICT innovation leader scheme will be freely open to all corporations.

(9) R&D personnel from overseas, starting with those from Asia, should be welcome.

Figure 2 The R&D personnel that are being sought



Requirements for development of ICT innovation leaders

In order to train ICT innovation leaders, an exchange among people is important in "practice areas" where competition and encouragement between people can be brought about by putting in practice friendly competition between a multitude of R&D personnel both from Japan and overseas.

It seems that actual experiences in the shape of in overcoming different kinds of obstacles, and the experience of multiple repetitions of difficulties can create outstanding ICT innovation leaders.

Constructing a system for developing ICT innovation leaders

(1) Theme selection

It is necessary for the state to select those fields that should be strengthened from a national point of view, from among the fields that are likely to become major industries for Japan or fields that are of particular interest to industry. Also, from the perspective of developing ICT innovation leaders, it is necessary to determine the areas where a single company would not have the resources to handle alone. Furthermore, from the perspective of having multiple companies participating, it is necessary that they should be themes that have not yet caught the competitive eye.

(2) Project leaders

These should be researchers who

have both good knowledge and experience in the subjects that will be implemented as projects, and that they should have the authority that comes with wide recognition. Another important element is that they should have experience in promoting new business areas or product development within the corporation.

In addition, on top of specialized knowledge, they should have a clear vision of the future, a wide-ranging awareness of other fields, a good network, passion for what they do, the ability to communicate smoothly with participants, as well as an outstanding ability to explain things to the outside world, starting with assessments.

(3) Project participants

With regard to those who would be in line for training as ICT innovation leaders, these should be selected out of a variety of corporations and given authority for the development of a particular R&D topic from among the project subjects, and given responsibility for its compilation.

By having outstanding young people and post-doctorial researchers as well as researchers from overseas participating in these projects, a more competitive and encouraging environment will be put in place.

(4) Project operation

A shared road map created by industry, academia and the government needs to be promoted in terms of operating the R&D

projects, simultaneously positioning as project results both the results of research and success in human resources development.

The people who will be trained as ICT innovation leaders will receive ongoing guidance from project leaders as they attain the targeted capabilities. On the other hand, by offering guidance to the young personnel and post-doctorial researchers who are participating in the projects, they will gain experience as ICT innovation leaders.

(5) Technology courses

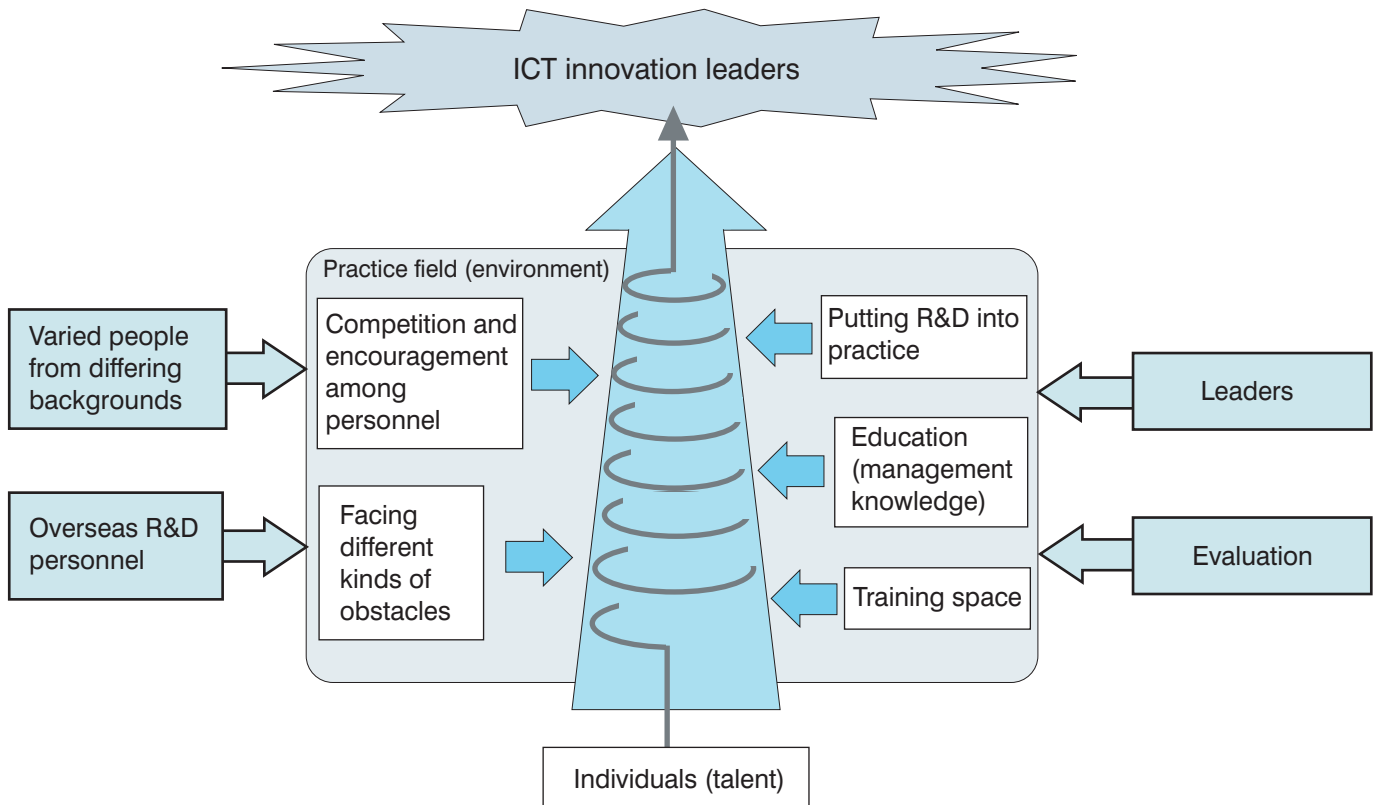
It is necessary to make it possible to obtain the latest information on the newest technology trends and technology management, technology marketing and intellectual property strategy.

(6) Evaluation

(Evaluation of R&D projects)

As well as implementing direct evaluation of research results, it is necessary, from the perspective of human resources development, to put in place subjective evaluations such as announcements at international conferences and a process for problem solving. It is desirable to evaluate the development of human resources from a number of different perspectives.

Figure 3 Outline of elements for shaping the training of ICT innovation leaders

**(Personal evaluations)**

With regard to companies that provide personnel, it is necessary to give them a report of the evaluation results and to enable the company's human resources division to grasp the results of the training so that they can build an approach that will be reflected in that person's treatment.

(Evaluation of human resources development scheme)

It is also necessary to have an overall evaluation of human resources development schemes that includes research and development projects and technology courses.

(7) Other

With regard to intellectual property related to the results of research and development, it is necessary to administer these in a way that rights do not remain vague.

Once the training is completed, it is necessary follow those who have participated in the projects long-term.

The role of related organizations in the training of ICT innovation leaders through research and development projects
(1) The role of the government (MIC)

1) To ensure the necessary funding for the implementation of the research and development projects

2) Support in determining project themes and selecting project leaders

3) Evaluation from the perspective of human resources development

4) Support with regard to determining themes for the technology courses that are held

5) To revise mid-term goals is necessary in order to clarify human resources development as a role of NICT (National Institute of Information and Communications Technology), an incorporated administrative agency

(2) The role of NICT

A research and development site will be set up within NICT, and the training of ICT innovation leaders

will take place through research and development projects.

(3) The role of the industrial sector

1) There will also be a contribution from the industrial sector to the funds that are needed for the implementation of the research and development projects.

2) It will provide the leaders most appropriate for the role of promoting the research and development projects.

3) In order for the ICT innovation leaders who have been trained to be active most effectively within their corporations, it will be necessary to have an activity plan with clearly defined training objectives when participating in the projects.

(4) The roles of research organization such as ATR (Advanced Telecommunications Research Institute International) and YRP (Yokosuka Telecom Research Park, Inc.)

1) Possibilities include the implementation of the research

and development projects and the training of ICT innovation leaders.
 2) With regard to the technology courses, investigation of determination of themes and curriculum building. They can either implement the courses or offer support in implementation.
 3) They can be of support in inviting outstanding researchers from universities, corporations and

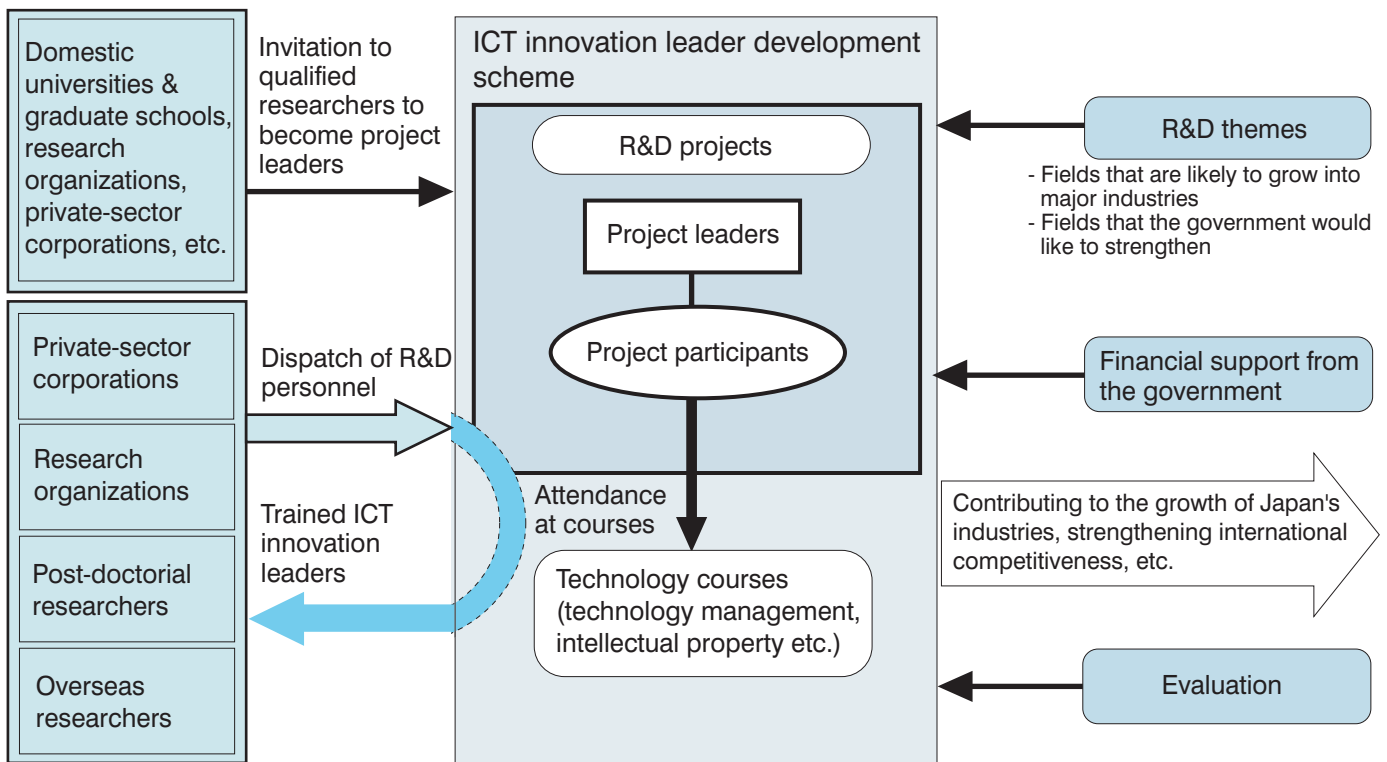
research organizations, both in Japan and overseas.

(5) The role of universities and graduate schools
 Providing suitable leaders who can play the role of promoting the research and development projects, offer support for joint research, and provide lecturers for the technology courses.

Conclusion

The development of science and technology cannot happen without the people who want to make it so, and their development is of the utmost importance. MIC will base itself on the reports that have been compiled and will participate in the development of ICT innovation leaders.

Figure 4 Image of the ICT innovation leader development scheme centering around R&D projects



TOPICS

Looking Ahead to Building Ubiquitous Communities - From the Investigation of the Panel on Revitalization of Local Community and Ubiquitous Network Society -

Japan is currently facing a large number of issues including a lower birthrate and an increase in the aging population, difficulties in both national and regional financing and a decline in regional industries and economies. In order to find solution to these issues, it is vital to build strong regions which are appealing due to their independence and vitality in society, economy and industry.

To achieve this, the most efficient method would seem to be for the relevant people to band together and strongly promote and support the building of regional ubiquitous communities (a society in which ICT can be used to develop autonomous solutions to various problems) which would offer equal access to opportunities via ICT.

Based on this background, MIC set up the Panel on Revitalization of Local Community and Ubiquitous Network Society in November 2006 from the perspective of working towards the revitalization of regional social economies through the building of regional ubiquitous communities, to investigate concrete issues and measures. The panel met 8 times through June 2007.

This article outlines the proposals that were made by the panel.

Announcement from panel members: examples of regional revitalization through ICT

The panel saw introductions from various panel members coming from private sector industry, academia and the government,

from the perspective of the areas that they were involved in. Once these were compiled, they yielded the following information.

- A community that makes full use of ICT has been built through SOHO support and joint support from the private and public sectors.
- In terms of welfare, crime prevention and disaster prevention, regional communities have been revitalized through community association activities.
- Through the activities of resident directors and resident cram schools, information has been coming out from exchanges with "outsiders, young people and different people" and the region has been revitalized.
- Discovery of regional resources, needs matching etc. through the efforts of the private sector
- Development along railway lines and regional revival due to results of ICT research
- Support for employment, industry creation and regional communities through promotion of telework
- Building networks for the elderly through support for computer literacy by senior personal computer volunteers
- Solving regional issues integrated with the information and communications infrastructure
- Sharing inter-community information such as cable television programming in cooperation with locals
- Disseminating regional resources as contents
- Urban revitalization in England making use of regional information and private sector financing
- Independence and coexistence

between regional people centering around local small and medium size companies

Topics for regional revitalization through ICT

In order to further promote regional revitalization through ICT, based on earlier examples as shown above, the existence of the issues shown below has become clear.

Firstly, the ICT infrastructure installation, including broadband and mobile telephones is insufficient. In the more advanced ICT regions, an approach to strategic installation of an ICT infrastructure is being seen in the shape of the installation of a concrete information infrastructure using optical fiber and aimed at the entire population of the mountainous municipality. However, in areas such as remote islands where conditions are unfavorable, low financing power means that infrastructure installation is often difficult, even in combination with existing subsidies, and even if an infrastructure is put in place, there are cases where bearing the burden of its maintenance would be difficult. Also, the cost effectiveness of putting in place an ICT infrastructure is not clear, and investigations for the installation of such an infrastructure advance slowly.

Secondly, the theories and tools concerning the effective regional use of ICT are not yet established. So, even if infrastructure installation moves ahead, investigations and evaluation of its effective use may be lacking, and the know-how for

effective use insufficient or again, models for solving regional issues through the effective use of ICT may be inadequate. Also, it may be the case that systems that are open, highly-reliable, and low cost and meet the region's individual approaches will be lacking, and as there may be no indices to measure results through the effective use of ICT, this may not tie in with approaches to the full use of ICT. There are also actual examples of building business models that yield greater profits through the full use of ICT, and it is necessary to study the results of these models properly and plan for their development.

Thirdly, one can also mention a human resources mismatch in leading the full use of regional ICT. There is a concentration of personnel in urban areas and not only is there a gap appearing between regions, it has also become clear that the skill set which is necessary for the people who will promote the full use of regional ICT is lacking, and measures for the people with those skills to feel comfortable in using them and feel trusted and recognized, are insufficient.

Fourthly, it is necessary for the relevant people to coordinate their efforts. There needs to be a strengthening of coordination between regions that share common topics, between people who are active in the regions, or the relevant organizations that have support tools.

Measures for resolving issues

Based on all of the above, the propositions in the report are looking for a general and planned promotion of a 3-level ICT policy comprising (1) regional ICT infrastructure should be put in place, (2) the effective use of regional ICT should be promoted, (3) the development of human resources for regional ICT, and (4) the establishment of a system to

promote these (Figure 1). In concrete terms, these are as follows.

(1) With regard to the installation of a regional ICT infrastructure, there should be an increase in support measures for areas with particularly difficult access such as remote islands and the like, and investigation should be put under way regarding support measures relating to running costs for the infrastructure.

(2) With regard to the promotion of the effective use of regional ICT, along with working towards the construction and dissemination of a platform that would enable systems coordination between the private sector, academia, government and the regions, there should be the formulation of models of measures for the effective use of ICT that would resolve regional issues, and their dissemination. Also, other proposals include an investigation into standard specifications for function requirements for public applications, the gathering and storing of actual examples of leading edge effective use of regional ICT, and its dissemination, and the setting up of methods for the evaluation of results related to the effective use of regional ICT.

(3) With regard to human resources development for regional ICT, proposals include the formulation of skill standards for regional ICT human resources, the formulation of training programs based on those standards, the investigation of a certification standard for regional ICT human resources, and the establishment of "Regional ICT Human Resources Centers" (tentative name) that would have the authority to train and match regional ICT personnel.

(4) And from the perspective of promoting these activities in an integrated and general manner, it is recommended to set up a

promotion committee made up of experts and people from the relevant ministries and government organizations.

Through these actions, this report proposes the construction of ubiquitous communities that would in fact be a society in which the full use of ICT would autonomously resolve the various regional issues.

The society we should be aiming for: Ubiquitous communities

Ubiquitous communities make up a society in which the private sector, academia and the public sector cooperate, with the full participation of the people, and which maintains its openness while respecting individuality and variety (Figure 2).

By building this type of society, the following can be expected: (1) It will not only work towards the rapid realization of a ubiquitous network society in which the wisdom of ICT is available at any time, anywhere, to anyone and in any way, (2) but it will also create regional business models of cooperation between the private sector, academia and the public sector, strengthen the competitiveness of regional industries, leading to a contribution to increasing Japan's international competitiveness overall, (3) it will work towards improving the efficiency and the quality of regional public services such as the administration, medical care, education and disaster prevention, (4) and it can be expected to contribute to the revitalization of communities through seamless coordination through ICT between public organizations, local corporations, town committees, NPOs and the like.

MIC plans to investigate concrete measures in working toward the realization of the "ubiquitous communities" proposed in this report.

Figure 1: Measures for resolving issues and their process

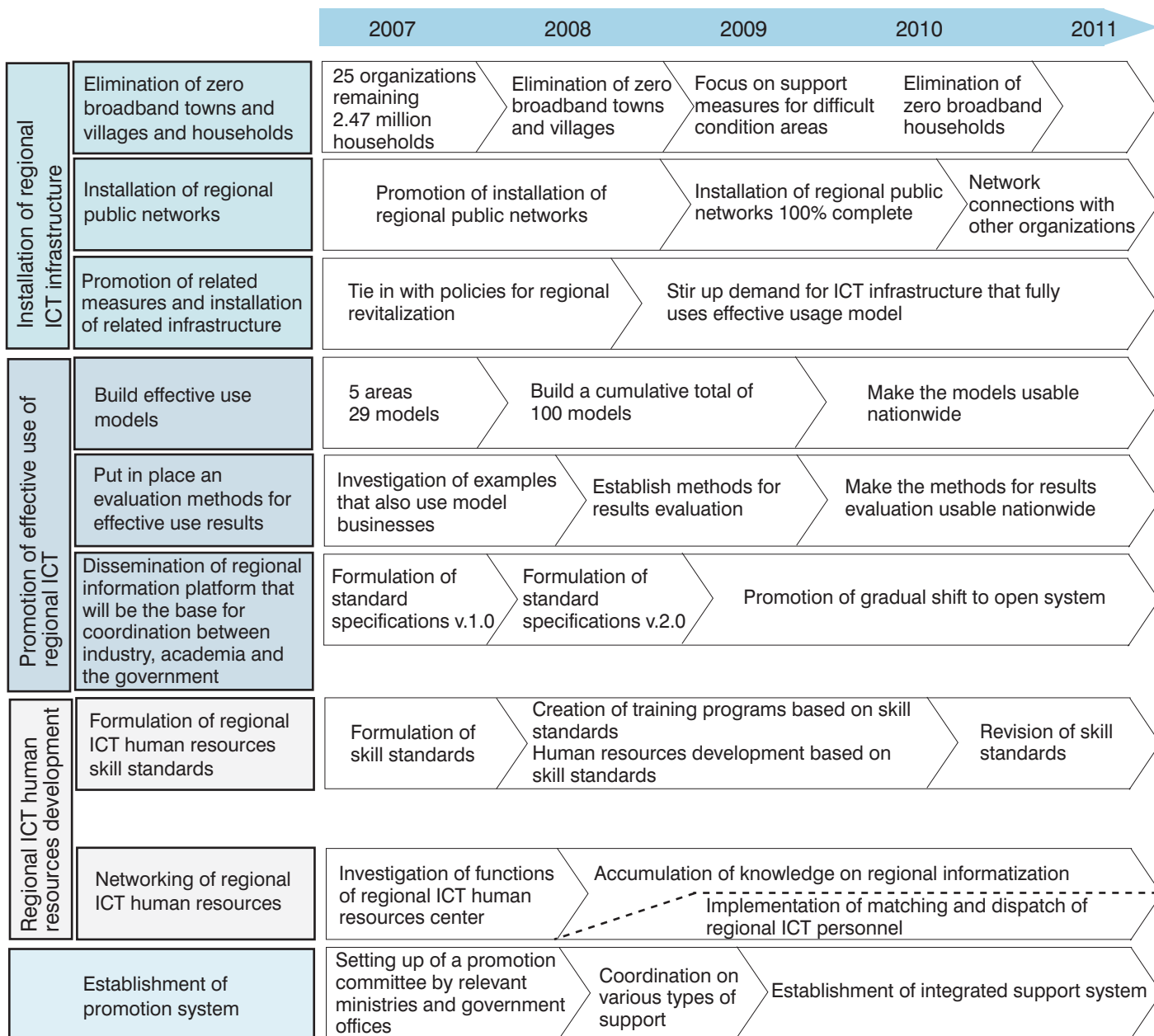


Figure 2: The building of ubiquitous communities and their results

Ubiquitous Communities:

A society in which autonomous solutions can be achieved to regional issues through the use of ICT (information and communications technology)

