1 Human-Care Communication Project in Keihanna Human Info-Communications Research Center

—A new turn of Human Interface and Contents Processing Technologies Research in CRL—

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In July 2000, Communications Research Laboratory founded Keihanna Human Info-Communications Research Center for the promotion of its research activity in the domain of human-network interface and digital data processing technology. Keihanna Research center was intentionally located in Kansai Science City at Keihanna to promote the real cooperation with other Universities and research organizations in private sector, and resultantly enhance the research activity of CRL in this research domain. The research center also aims to produce the technical basis for the human friendly communication technology in response to the expected drastic change in the people's life caused by the common use of computer network. The research center promotes a five-years research project which aims to realize the application systems in the domain of human care service like as welfare service or cultural service, through development of communication and information processing technology and through demonstration on real computer network system.

1 Background of Establishing a New Research Center

Information communications technology consists of two core categories of technology: (1) Network construction and operation technology that includes the physical layer; and (2) Content/interface technology that links users (people) and information available on networks. The Communications Research Laboratory (CRL) is strengthening both core technologies by integrating the expertise accumulated by CRL research groups to stay abreast of the recent growth and rapid changes in information communications technology. There have been two main strands of CRL research activity regarding the information communications technology for human/information system interfaces. One is represented by research focusing on basic human characteristics (conducted at the Kansai Advanced Research Center). The other is represented by research on content/human interfaces, which was recently launched as part of a comprehensive R&D project on basic information communications technology. To enhance our research capabilities by integrating both research strands, we consider it necessary to work with in-house research groups and maintain close relationships with external sectors. In this way we can take advantage of our recent organizational transformation into an independent administrative institute, and thrive in a situation where the research institutes involved in the same fields work together to disseminate cutting-edge information. With

this goal in mind, we have decided to establish a new research center in Keihanna, a city with a reputation as a cultural, as well as a science and technology center, located near Kyoto, Nara, and Osaka.

The Keihanna Human Info-Communications Research Center is expected to play dual roles as an in-house organization of CRL and as a bridge to the outside world. This research center is the core CRL facility focusing on the development of content/human interface technology. Unless we conduct R&D activities that are deeply correlated with network technology, without paying much attention to the network and traffic/operation, an adequate level of creativity or availability cannot be obtained. For this reason, the Keihanna Research Center will maintain strong ties with the Koganei Research Center, which has focused its efforts on network technology. The Keihanna Research Center should conduct research in parallel with the leading research organizations in different sectors. These include private research organizations such as the Advanced Telecommunications Research Institute International (ATR International), NTT Communication Science Labs, and information communications departments at universities such as Kyoto University, Osaka University, and the Nara Institute of Science and Technology. The Keihanna Research Center should also formulate a comprehensive research scheme to provide a research test bed serving as a public organization and for ongoing projects. The Keihanna Research Center will conduct its own research, while creating a comprehensive, open research scheme by incorporating research activities in different sectors (organizations), fields, and cultures.

The Communications Research Laboratory (CRL) became an independent administrative institute in April 2001. This transition gives CRL greater discretionary power, greater flexibility, and significant flexibility, and without the hindrance of government supervision. This is an unparalleled opportunity for CRL to establish an institutional basis that is suitable, and even essential for implementing a comprehensive research scheme.

Against this background, the Keihanna Human Info-Communications Research Center was created and established as an organization of the Ministry of Posts and Telecommunications in July 2000. We have already completed our relocation from the Koganei Research Center and Kansai Advanced Research Center, and are now constructing a variety of systems that will serve as the basis for cooperative work with external institutes. Consequently, we are pursuing joint projects and technological exchanges with nearby universities and corporate research organizations. The Advanced Telecommunications Research Institute International (ATR International) in particular has been a crucial research partner since the establishment of the Keihanna Research Center, and is expected to function as a major player in CRL's cooperative scheme. Several ATR projects are introduced in this special issue as examples of cooperative efforts at various levels. Indeed, some of these projects have been outsourced by CRL.

2 Overview of the Keihanna Human Info-Communications Research Center

This research center boasts 25 regular staff members and has hosted some 20 visiting scholars as of August 2001. The center operates on an annual budget of 1.8 billion yen and is located on the first floor (1500 m^2) of the ATR Building in Keihanna Science City (Seika-cho, Kyoto). This research center belongs to the Communication Systems Division of CRL and supports five research groups supervised by the center's director. The number of regular staff involved in a given project is limited in an effort to extend manpower through a reliance on external human resources. The research groups have hosted visitors from external organizations such as ATR, Kyoto University, the Nara Institute of Science and Technology, and other nearby research institutes.

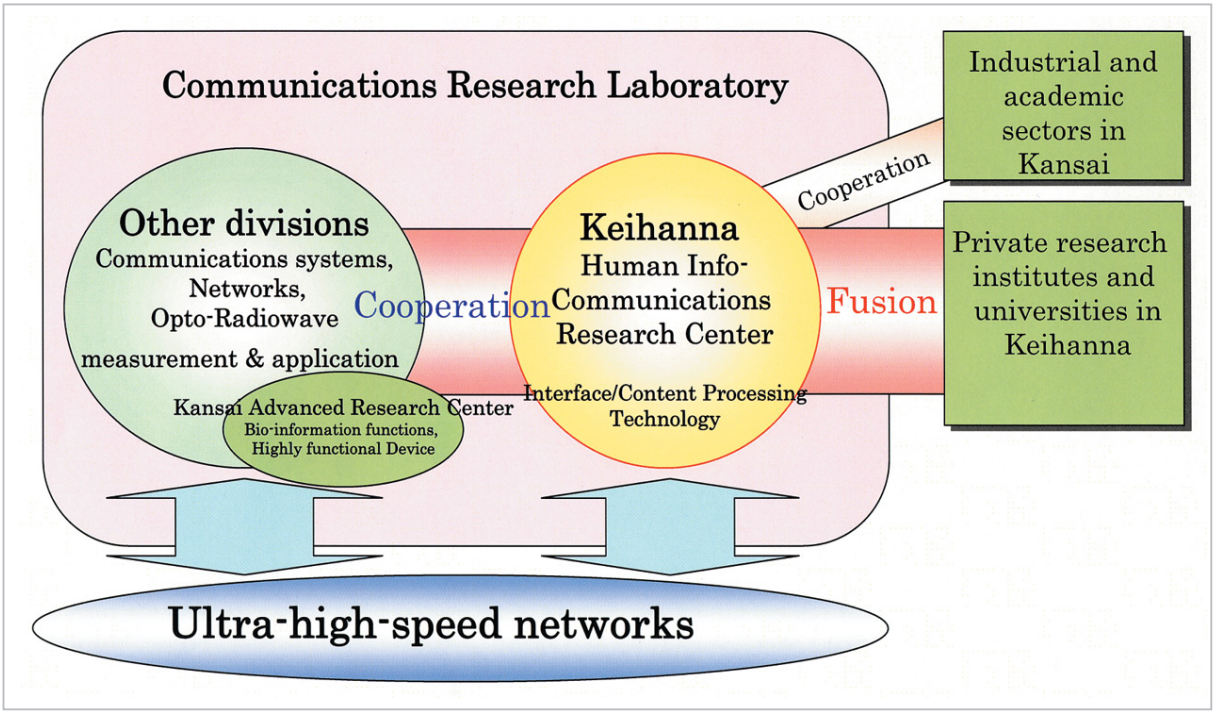

Fig. 1 *Role of Keihanna Human Info-Communications Research Center*

3 Philosophy of the Keihanna Human Info-Communications Research Center

Our principal goal is to develop human-centered communications technologies that will promote the development of human relations and allow people to apply communications technology on a human scale. This research center will develop technologies for use in tools used by people in information-communication networks. Thanks to advances made in communications technology resulting from the incorporation of diverse physical phenomena, transmission capacity has increased significantly. Massive amounts of information can now travel farther and faster. Recent years have seen the advent of even ordinary users handling huge amounts of video data, text, and voice data. The relevant technologies have been rapidly commercialized and applied to products used in daily life. Nevertheless, there are few technologies available that allow us to fully use such conveniences to enrich our lives. Such enrichment is not achieved simply by products and social infrastructures, but through a better appreciation of culture and the arts. To fully utilize today's high communications capabilities to enhance our quality of life, we must humanize information communications technology, based on content/human interfaces that link people to electronic content on networks.

To serve as a new national research institute, the Keihanna Human Info-Communications Research Center, with its accumulated expertise in this research field, must define a clear mission. The Center is expected to contribute to overall national research activities by working with private research institutes and universities, playing a complementary role, and facilitating practical technologies developed by private research organizations and basic, original research conducted at universities. Thus, the research conducted at the Keihanna Human Info-Communications Research Center is to be characterized by:

-Information environment protection: Creating technologies to provide a richer, safer, more comfortable, and more reliable information environment for people, including barrier-free (including barriers represented by language, culture, physical handicaps, and information illiteracy) and human-friendly tech-

nologies that allow everyone to benefit from information technologies.

-Basic research: Conducting innovation-oriented basic research that the private sector is unable to address consistently, due to market constraints.

-Universality: Creating cultural human interfaces that fill the cultural gaps between nations, and accelerating the fusion of different cultures in the networked world. The technologies for standardization, which are closely related to middleware technology, are to be designed to comply with international standards.

To further contribute to the promotion of national research activities, we will actively pursue greater cooperation between industry, government, and academia based on joint research work, serving as the core of a cooperative research scheme in which various research elements are integrated.

4 Fields of Research

With future social development in mind, research work should focus on wider-ranging activities that will have greater impact on helping us lead more enlightened lives. In addition to the development of basic, innovation-oriented technologies, we will construct a major new system that incorporates basic technological elements and raises the level of element technologies, based on feedback provided by the field testing of such a system.

There are three major fields of research currently assigned top priority. First among these is the field of human communications, in which human information input/output characteristics are transformed into a specific technology and reflected in interface technology. When information goes out to networks, the communication media negotiates the interaction between humans and cyberspace. The media consist of two main categories: language media that support human intellectual activities, and video media that serves as the core of a true multi-modal/virtual information world. We plan to develop interface technology drawing on both categories.

5 Research Projects

By shifting from a technology-centric to a human-centric emphasis, we will develop basic technologies in these fields of research, then construct and implement projects that provide need-driven systems that utilize these basic technologies. One example of such a system would be the construction of a comprehensive interface/virtual information world that would enable barrier-free communications for welfare and artistic content in public services.

To promote the development of such systems, we must develop and create sustainable basic technologies, construct verification systems using those technologies, and upgrade systems via feedback from the results obtained.

We call this “Human-care Communications” project, which connotes that we will help people contact others and access the world of information via networks.

The Human-care Communications project is based on two technological concepts, and consists of four individual research themes for realizing such systems. The two core technologies are:

(1) An interface technology system that serves as a comprehensive interface between users and the digital world and helps users share a given situation with others via networks. This system includes technologies for expressing and understanding body language and spoken language, as well as understanding and acquiring knowledge, as typified by humanoid robots. These technologies will be incorporated into a number of specific systems, for example, that can be used for welfare, lifelong study, and care of the elderly.

(2) Interface technology that allows users to directly access the network world without mediation and provides a world of content where users may enjoy convenience and intellectual engagement. Such technology

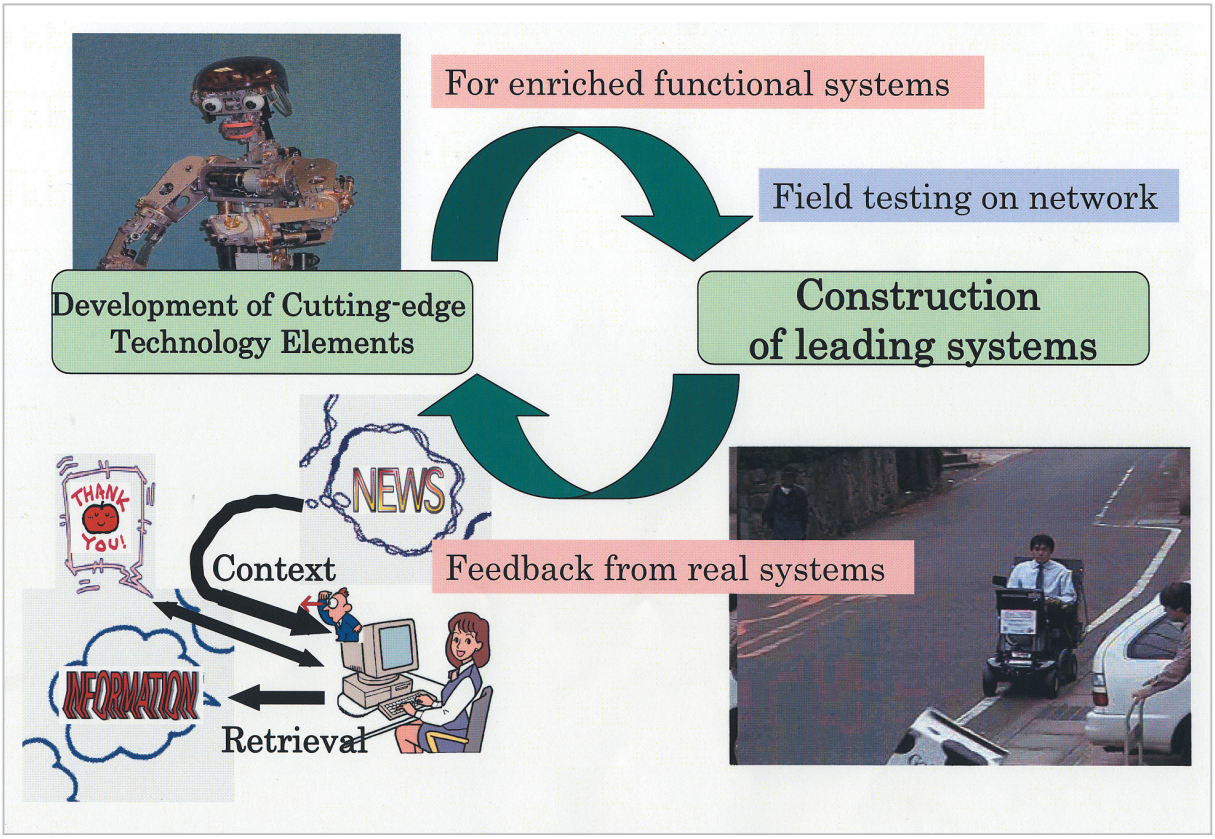

Fig.2 *Common concept of research style*

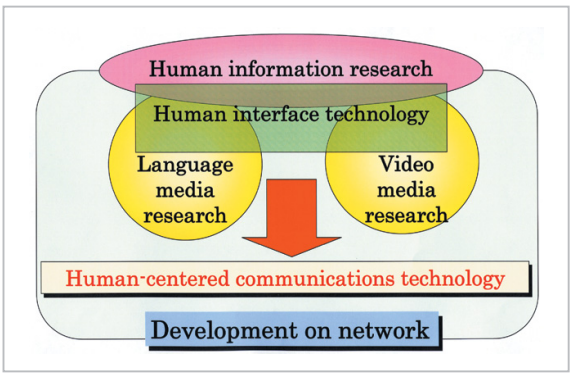

Fig.3 *Fields of Research at Keihanna Human Info-Communications Research Center*

will incorporate other technologies to build a three-dimensional world consistent with both real and virtual worlds, which offers users easy content and remote operation. The major targets of the application would include intellectual and cultural assets and medical content.

We have selected individual projects based on specific content utilities, taking into account the degree of contribution to the public. A priority has been placed on the welfare of the elderly and needy, assisted lifelong study, access to rich cultural resources, and involvement in medical care, with the ultimate goal of contributing to richer lives.

The four individual research themes are: research on barrier-free communications (focusing on welfare); research on a symbiotic learning assistance system (focusing on intellectual and social improvements in a wide range of daily life); research on a museum sphere (focusing on providing and demonstrating diverse cultural resources to users and offering retrieval services to meet the needs of each user); and research on a 3D-image cooperative use medical system (focusing on remote surgical treatment and neural surgery).

The following outlines these four research themes:

■Research on barrier-free communications (Section 5)

We offer information barrier-free tools to bring information to the elderly and handicapped. Sign language and voice translation technology to assist in communicating with

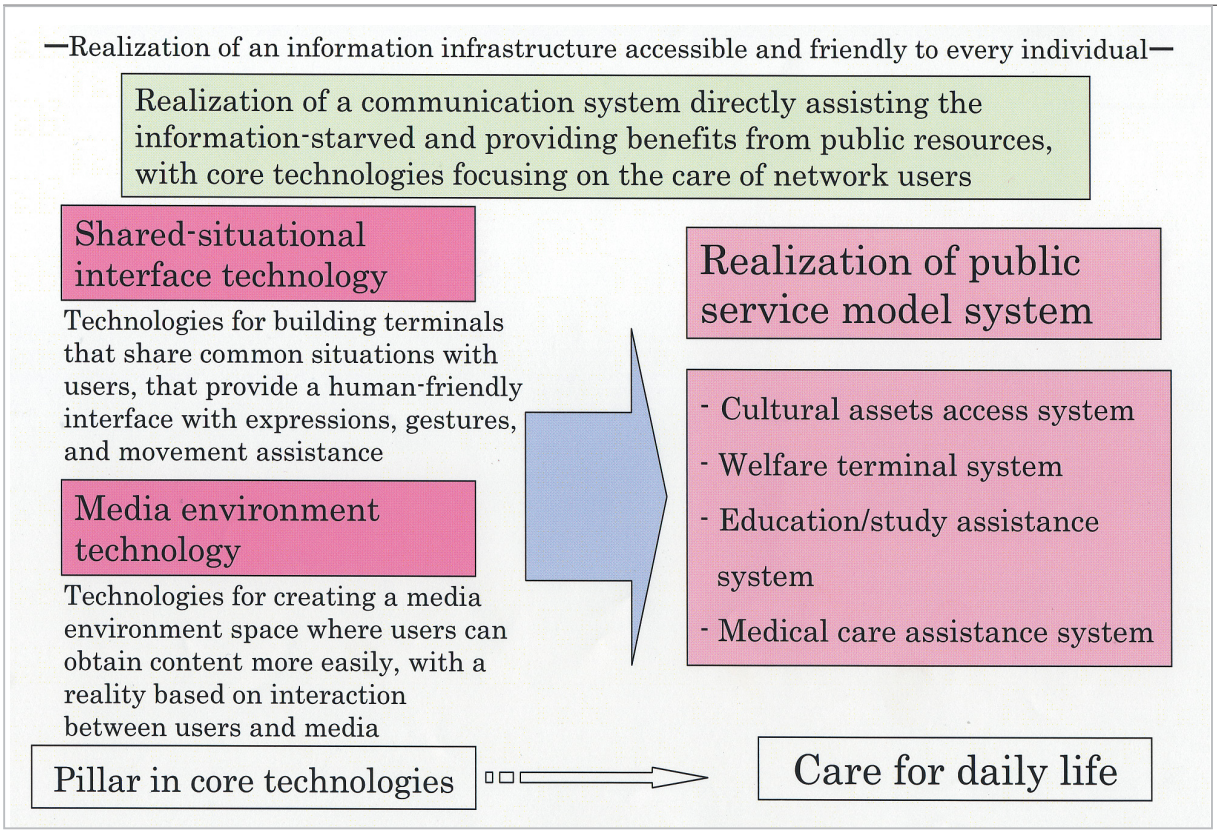

Fig.4 *Human-care Communication project*

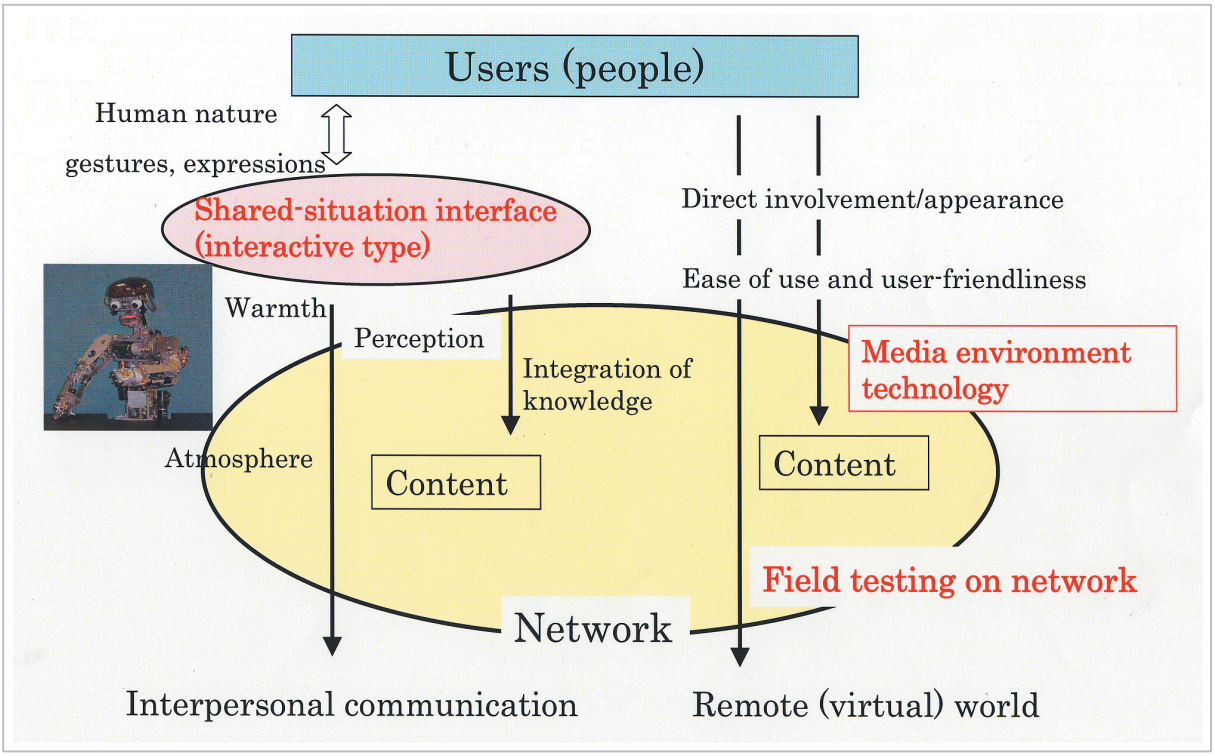

Fig.5 *A Technology strategy for Human-care Communications*

deaf people will be investigated. A robotic communication terminal that will help the elderly and handicapped move and even take casual walks will also be investigated. Such technology will also be applied to non-verbal communication, while the terminal will be

adopted to handle the diverse daily needs of the elderly and handicapped.

■Research on a symbiotic learning assistance system (Section 2)

The basic system is a humanoid robotic terminal developed based on body language (e.g., eye contact, gestures) communication technology. By integrating interactive processing technology and knowledge processing technology based on natural language processing to facilitate conversation via this terminal, we can build a universal and human-friendly study assistance system for the elderly and information-starved who are unfamiliar with electronic hardware. This robotic terminal model will be able to recognize human speech, and be equipped with the functions of eye contact and basic facial expressions.

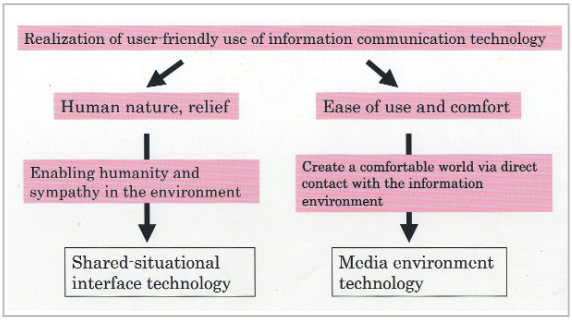

Fig.6 *Shared-situation interface and media environment technology*

■Research on museum sphere (Section 4)

We will build an electric museum that is dynamically formed in view of the needs of each user. At the same time, basic multimedia content technology will be developed to help users create, store, edit, search, distribute, and transform digital content for individual use in the next-generation, ultra-high- speed Internet environment. A system for field testing will also be developed.

■Research on 3D-image cooperative use medical system (Section 4)

We will create a "media-unified time and space" distributed system that offers a high degree of realism. In this space, users may exchange and share information, working together without regard for physical distance or time. We will develop and upgrade technologies for expressing medical content such as surgical treatment assistance technology and image diagnostic technology, which are expected to serve as the basis of remote medicine in the future. Information search technol-

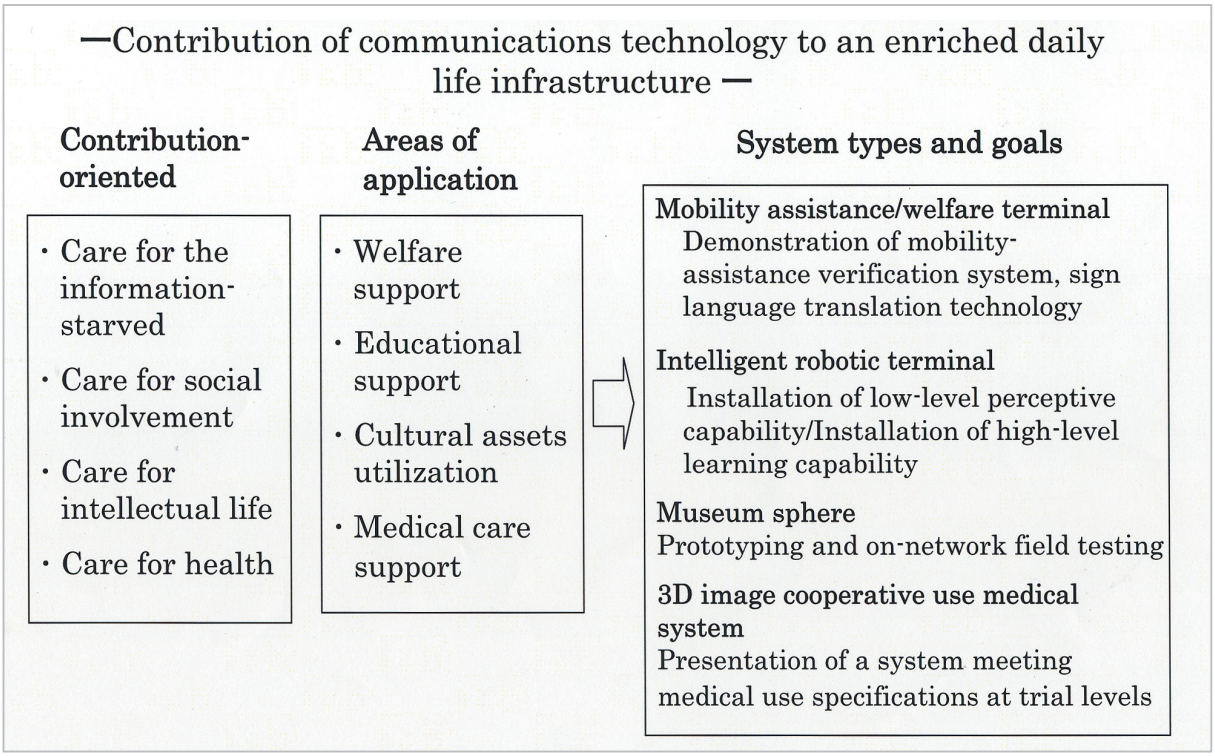

Fig.7 *Establishment of a real system providing on public services*

ogy will be developed as well. For our research and development, the media-unified time and space communications technology will be used as a basic common technology to reflect user needs in the systems after field testing on networks.

These individual themes will be described in detail in the indicated section by the researchers in charge. Closely associated with our project is a group of research projects at the Advanced Telecommunications Research Institute International. Some ATR projects closely related to the R&D underway at the Keihanna Human Info-Communications Research Center will be introduced. Some of these projects are scheduled with CRL projects, while others are potential themes for cooperation with several projects at the Keihanna Human Info-Communications Research Center. In this way, cooperatives efforts between CRL and ATR have already been launched in various ways. The major role of the Keihanna Research Center is to construct a research network to further cooperative R & D. We find it exciting to seek new ways of undertaking cooperative work and research with other research institutes.

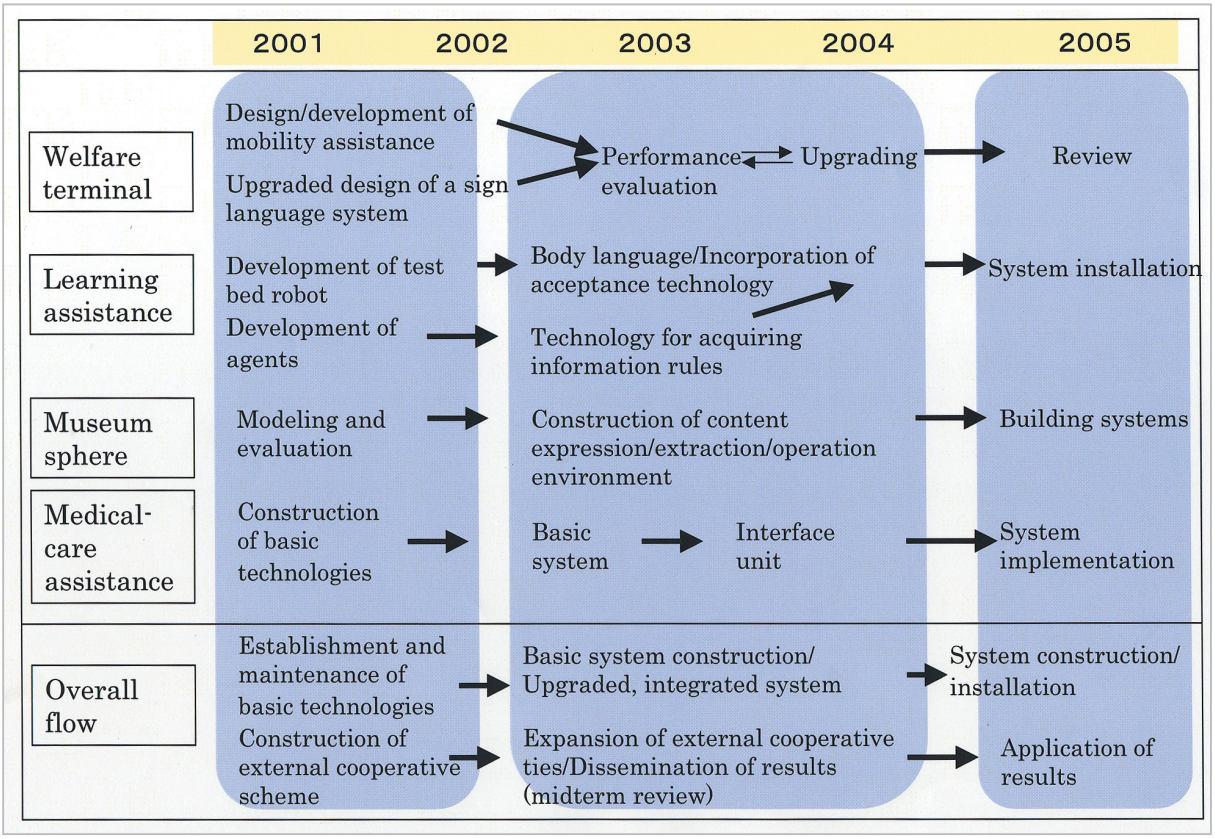

Fig.8 *Stream of projects over five years*

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