

NEC's Technological and Design Capabilities that Make the Ubiquitous Society a Reality

— Advancement of technological capabilities and development of cool products through the innovative spirit of NEC engineers —

By *Kazuhiko KOBAYASHI*

Executive Vice President and Member of the Board, NEC Corporation

1. Japan's international competitiveness ranking and Japan's science technology

An international competitiveness ranking which evaluates a number of nations including Japan has been published by the IMD (International Institute for Management Development). The IMD World Competitiveness Yearbook, published annually by the IMD, is a document that evaluates and ranks the national strength of various countries according to over 300 indicators in the four areas of "Economic performance," "Governmental efficiency," "Corporate efficiency" and "Infrastructure status" (**Fig. 1**).

According to this document, Japan, which was ranked No.1 over a decade ago, has since dropped to 30th in 2002 due to the bursting of the bubble economy and subsequent economic stagnation. Since then the economic climate has gradually recovered to bring Japan back up to 23rd, but has failed to regain a position in the high end of the international competitiveness ranking.

However, it is not like Japan has declined entirely across the board. There are indeed areas where Japanese competitiveness is ranked 1st or 2nd.

- Areas where Japan is strong compared to other countries are in patent acquisition rate, infrastructure development, R&D investment, and high-tech exports, ranking either 1st or 2nd to put Japan in the top class among the 60 countries being ranked.

*This article is based on the content of a panel discussion between Ms. Atsuko Fukushima (Caster, Essayist) and Mr. Kazuhiko Kobayashi (NEC Executive VP and Member of the Board) as part of the C&C User Forum 2004 on December 3, 2004, and has been edited by the secretariat in the form of an essay by Mr. Kobayashi.

†Some of the products mentioned in this article are for the Japanese domestic market.



Photo 1 Kazuhiko Kobayashi during speech.

- By contrast, areas which are dragging down Japan's international competitiveness are entrepreneurship, corporate tax rate, laws regulating foreign workers, and insufficient international experience by corporate top managers, where Japan ranks at or near the bottom of the 60 nation list.

In short, Japan possesses the world's top level technology, and is making way based on that technological capability (**Fig. 2**).

What I would like to emphasize here is that Japan must bolster its strong points even further. Japan's investment in research and development is 2nd after the U.S., maintaining a high level at 3.3% of GDP. However, since Japan is spending so much on R&D, it becomes even more essential to raise the efficiency of R&D and boost Japan's international competitiveness level.

Japan imports a large amount of energy, food and other commodities, creating high-quality products based on high-level technologies and exporting them to the world. According to foreign trade statistics for

2003, approximately 10% (¥56 trillion) of Japan's ¥500 trillion GDP came from total exports.

NEC is contributing to Japanese exports, as the electronics and IT fields that NEC is focusing on comprise roughly 25% of Japan's total exports.

2. Necessity of IT field to address social issues

Although the electronics and IT sectors provide society with useful products, the IT sector where NEC does business should be useful in addressing social issues (Fig. 3).

The first social issue is Japan's aging population and falling birthrate. This is a major problem also for NEC which employs engineers. The advent of an aging population with the lowest percentage of children in the world has arrived in Japan. As this trend continues, so will the number of engineers decrease, and it will become more and more difficult to pass on technology to the next generation. NEC believes that it is necessary to further improve office efficiency through IT as a countermeasure to make up for this trend.

The second issue is achieving a safe and secure lifestyle. As Japanese society continues to grow older, people may increasingly feel unease about life in the future, including healthcare and social services, disaster prevention, crime prevention, law and order. To be able to live with peace of mind, enterprises involved chiefly in IT like ours will need to boost the security of information networks.

We believe that R&D investment in the IT sector needs to be concentrated in fields that can address social issues, like improving office efficiency through IT and strengthening security.

3. NEC's technology strategy

Now I would like to offer a general overview of NEC's technology strategy.

First, Japan has the fastest broadband network in the world while its fees are the lowest in the world. And use of this broadband network by individuals, households and enterprises, is growing dramatically

Drop in entire nation's competitiveness

Ranked based on 4 areas: Economic performance, Governmental efficiency, Corporate efficiency, Infrastructure status (graded by over 300 indicators)

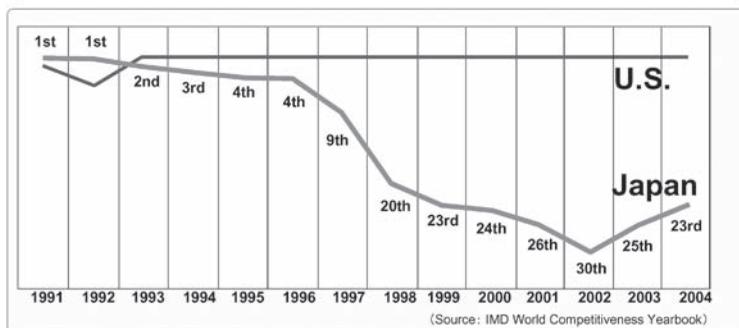


Fig. 1 Japan's international competitiveness ranking.

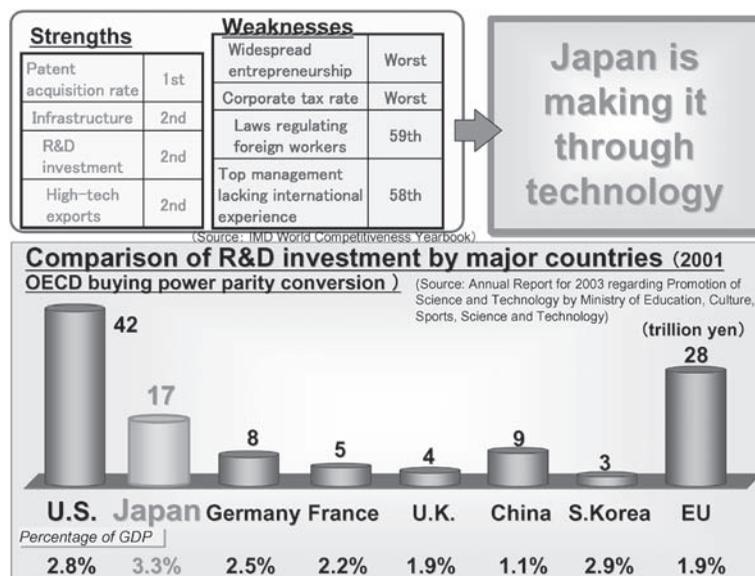


Fig. 2 Japan's strengths and weaknesses.

(Fig. 4).

Broadband network usage within NEC is also on the rise. Compared to 18 million messages two years ago, the e-mails received monthly by our employees from outside parties has grown to 30 million messages, to about 1.7 times what it was before. What's more, the daily amount of accesses from within the company to the Web outside grew from 46 million accesses two years ago to 62 million accesses, a 1.3x increase.

In this environment of increasing e-mail volume and Web access, there is one point of concern, which whether or not the network laid-in throughout Japan

will be overloaded as a result. We predict that at this rate, without a doubt, it will overload. So at NEC we are working on ways to revamp the system and avoid an overload.

3.1 Promoting the establishment of a nationwide network infrastructure in Japan

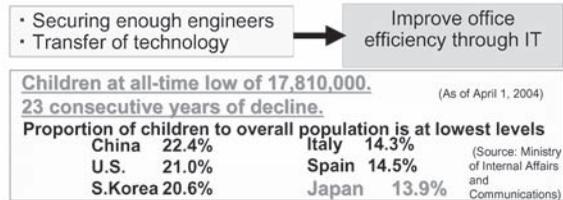
Here I will discuss NEC's idea of a future network infrastructure framework.

The corporations, households and individuals who comprise the end users receive services through line connections such as ADSL and fiberoptics (FTTH), and the subscriber reception stations are the buildings equipped with NTT parabolic antennas, a familiar sight. Various types of equipment are installed at these subscriber reception stations, and the ADSL and fiberoptic lines of customers are received there. Information such as phone communication, Internet data and moving images are transmitted through these lines, but it is access equipment that controls the flow of that information. This access equipment is bundled and relayed to the metro equipment. Then the metro equipment is connected to each other by optical fiber, creating an "optical highway," akin to a highway or bullet train. This optical highway spread to all corners of Japan, so the phone calls you make

are instantly connected through the network, and Web access is instantaneous wherever you are.

There are roughly 2,000 of these subscriber reception stations in Japan. By bringing in more and more fiberoptic equipment here, it will be possible to avoid a network overload. NEC, together with carriers, is working to improve the network.

(1) Aging population and low birthrate



(2) Safe and secure lifestyle

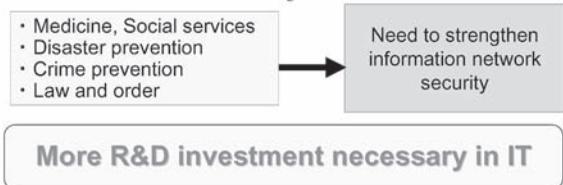


Fig. 3 Approach towards social issues in the IT field.

• Research areas NEC should focus on

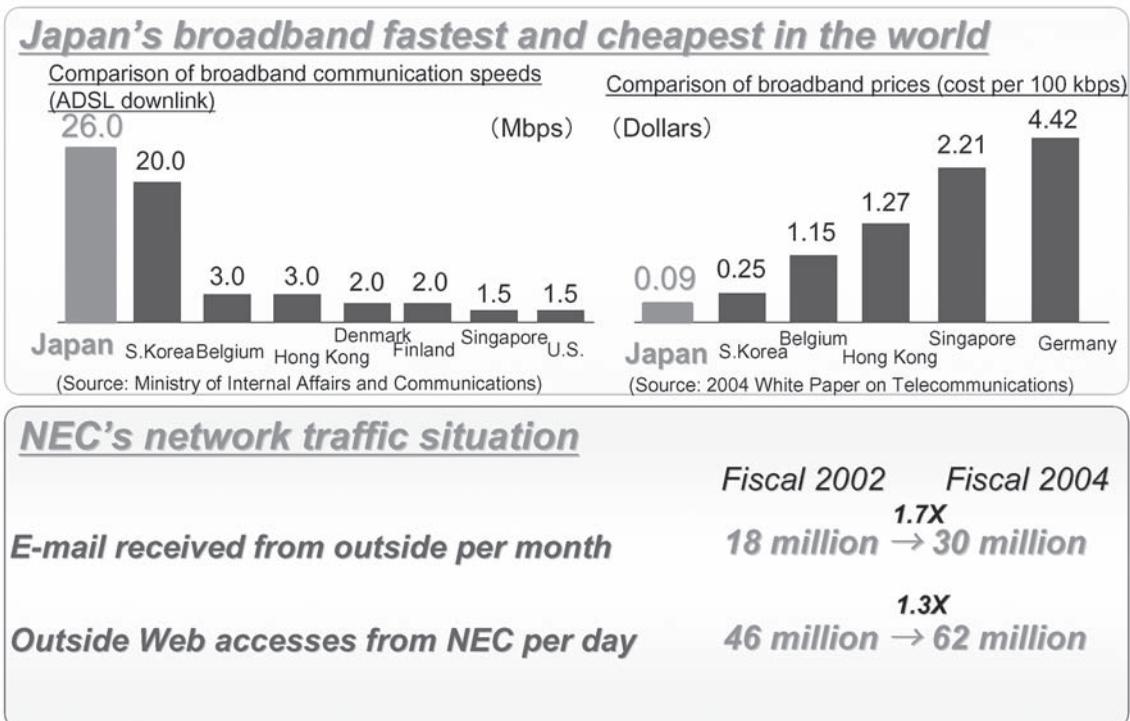


Fig. 4 Spread of broadband.

Recently NTT President Mr. Wada announced the NTT group's mid-term management strategy. It stated that capital investment in fixed-line communication facilities from 2005 to 2010 will total 5 trillion yen, and 30 million households will be connected by optical fiber by 2010. We at NEC hope to contribute toward this.

3.2 Improving productivity of office work through UNIVERGE business products

NEC offers a business-use lineup of products called "UNIVERGE". This lineup fuses together conventional IT and NW technologies, and uses UNIVERGE, a combination of "Universal" and "Convergence," as its title.

The UNIVERGE products lineup is composed of the SV7000 telephony server which controls phone calls, the WL Series wireless LAN servers which enable wireless LAN phone service, and the MB Series mobile IP systems which enable access to your office's internal network from outside via the Internet, while we also offer other hardware such as routers, switches and terminals (Fig. 5).

Meanwhile, in terms of software, we offer e-mail and Web access, Website transmission, and portals that display numerous service screens, communication doors that provide digital phonebooks, conference calls and video teleconferencing using a PC, as well as security software, and operations management software that combines all of these capabilities.

3.3 Moving ahead with ubiquitous computing

I often receive comments that "ubiquitous" is hard to understand and its concept is difficult to grasp. So here I would like to talk about ubiquitous, including some examples.

(1) Communication anytime, anywhere, with anyone

Let's say that one of my staff, Mr. Iketani, tries to call me at my desk's extension number using his softphone, but I'm not at my desk but instead am at a location far away from the office. At this time, of course Mr. Iketani doesn't even

know where I am. He assumes that I'm at my desk and dials my extension number from his desk phone. However, we realized a system where that call will be sent to the PC softphone at the location where I currently am. Unlike calling me up on my cell phone, he is simply dialing my extension number, and that call can be answered by me via my PC's softphone at a venue that's so far away from the office. Furthermore, it will be possible to have our phone conversation while using our personal computers to view the



Fig. 5 UNIVERGE product lineup.

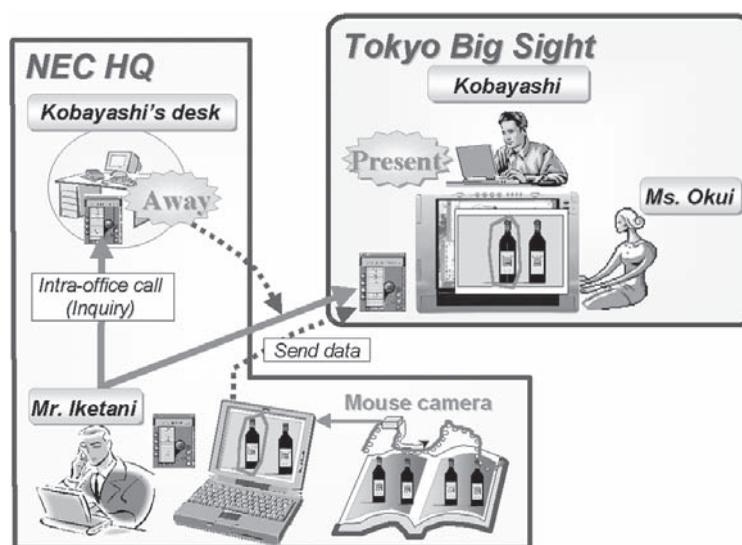


Fig. 6 Communication anytime, anywhere, with anyone.

same on-screen content (data), to get jobs done immediately. (Fig. 6).

System contents will be set as follows:

- ① Mobility of phone number
Calls made to your extension number will reach you wherever you are (whether in or out of the office).
- ② Sharing information on PC while conversing via softphone
 - Instantly capture the content of a book using the mouse camera.
 - Send captured data instantly to the other party and share the information.
 - Possible to pen-in comments to the shared information to better communicate with the other party.

The system for phone number mobility is comprised of the previously mentioned SV7000, WL equipment and wireless LAN terminal which are interlinked, and these three instruments work together as a team to continuously monitor the whereabouts of the wireless LAN terminal I've carried to this location. Switching to transfer the extension call is done using the SV7000's switchboard function.

Also, in order to readily share information using a PC, we test-produced a mouse with built-in scanner. Using this, you can scan documents and then will be instantly displayed on the PC screen, but as time elapses, the PC processes the image data so it will be displayed as a beautiful, high-resolution image. This is what's called mosaicing technology, and is something NEC is very proud of.

In the future, more than two persons at a time will be able to use their terminals to perform N-to-N communication (conferences).

(2) My office, anytime, anywhere

Moreover, NEC is developing a system for "My office, anytime, anywhere," which makes it possible to do office work during business trips, out of the office or at your desk, in the same identical environment. For example, it lets take the very same data that's on your office desk's PC and display it on the notebook PC you've brought along on your business trip to a hotel room in the U.S., so you can continue working on a job while in the U.S. that you started back when you were still in Japan (Fig. 7).

What's more, NEC developed a new product last month (Nov. 2004), the N900iL, which can be used

outside of the office as a FOMA cell phone (IP phone), and in the office it switches to an extension phone handset. With this handset too, it is possible to use the data on your desk PC just as the example mentioned previously.

Also, as part of the cell phone technology, we developed new technology that allows Web pages that are viewed at your desk PC to also be viewed on a cell phone handset. It is what's called semantic zooming technology that analyzes HTML content, automatically extracts layout information, and displays it as a table of contents on the cell phone screen (Fig. 8).

(3) Advanced security technology

NEC's security technology is highly advanced and provides a safe and secure environment. First, when net connection is attempted, there's hardware recognition technology to decide whether it is okay for that

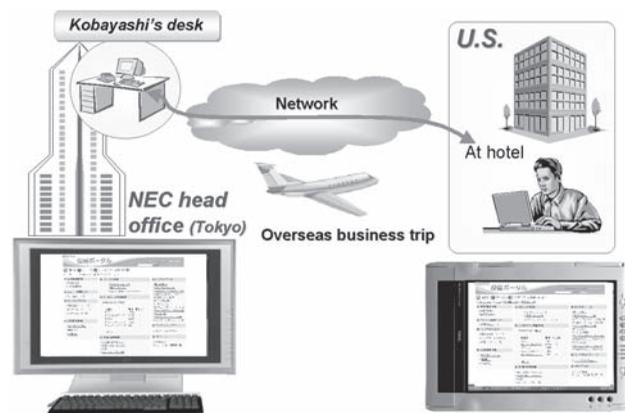


Fig. 7 Jobs started in Japan can be continued in the U.S.

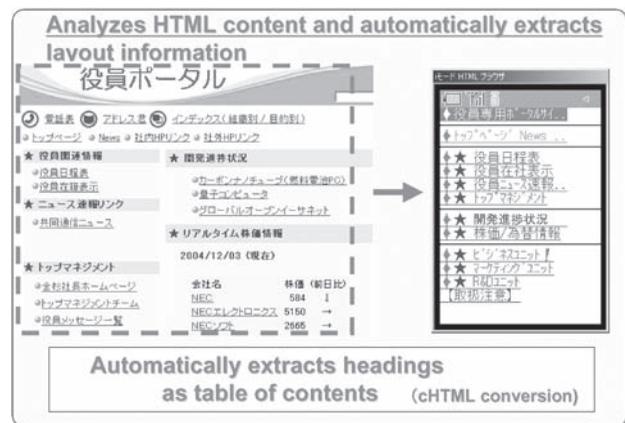


Fig. 8 Portable office using cell phone — semantic zooming.

apparatus to link to the network; then there's user verification technology to recognize if the user is the correct person or not; and there's encryption technology to protect against spying and virus attacks. The Internet is full of potential security risks, but we must use these technologies to develop networks that offer full security protection.

Although we will continue to develop security enhancing technologies, as an example of recently developed NEC products we would like to highlight the integrated security gateway product SLIMIT, which searches for and deletes viruses and ever-increasing junk mails at 1,000 times conventional speed. This is a breakthrough product which screens data whenever e-mail is exchanged or when connecting to the Internet (just like immigration processing at a nation's borders), and does it at the accelerated speed of 1,000 times normal.

Another product we developed is the hardware called HSE which incorporates a new LSI that was made to screen all data at once, ultra-high speed, as an improvement over previous types which screened data one at a time and thus were very slow.

(4) NEC group security management

At the NEC group we have installed a management center that uses NEC-developed security products to continuously monitor all of our approximately 163 thousand PCs, 23 thousand servers, and 42 thousand IP phones, to see whether they are cleared for network access, whether they have the most up-to-date software versions, and whether their anti-virus vaccines are the newest available. We have a system in place that will immediately repel any viruses or spam mails that are sent our way. And in addition to performing these security measures, this center is also always informed of the latest virus information, and releases information and instructions so that the latest vaccines can be applied to the 163 thousand PCs in our company.

(5) Implementation of voice recognition technology in VoIP

As for the ways in which voice recognition technology can be used, the following main types can be cited.

1) Example of usage at customer call center

As inquiries from customers are accepted at the call center, we developed a technology that would enable a PC to recognize (voice recognition) the operator's conversation. Since issues are resolved with the assistance of a PC, it makes extremely efficient and speedy service possible, contributing to cus-

tomers satisfaction.

Specifically, the phone conversation is converted to text on the PC, and keywords are automatically extracted and displayed. When the operator clicks on those keywords, answers and methods of resolving issues can easily be found. This easy search requires no keyboard input, making it possible to promptly address the needs of customers (**Fig. 9**).

2) AV indexing technology

AV indexing technology automatically recognizes the audio within various video files such as lectures, discussions and other meetings and such, and extracts keywords to represent the content, as well as indexing the table of contents and substance of the contents. So all the user does is click on the index or search for a keyword to instantly access the exact scene he or she wishes to view (**Fig. 10**).

(6) Japanese Cool

Last year I talked about Japanese Cool (see Vol. 1, No. 2, p.96). And by cool, I don't mean cold or chilly, but rather snazzy or great. This was because I wanted to emphasize NEC's policy of infusing Japanese Cool into ubiquitous technology and products.

The point of my contention is that by harnessing Japanese sensibilities we can appeal cool-ness to the world, making that a cultural industry that will expand and grow. I believe it is very important to create ubiquitous products with Japanese sensibility. The value of Japanese cultural exports pertaining to Japanese Cool has tripled over the past 10 years (according to study by Marubeni Research Institute).

1) MOT (Management Of Technology)

Last year I raised the education of engineers and an important issue for the future. Since then, NEC developed a training course called MOT (Management Of Technology), and are intensively educating our engineers based on it. As shown in **Fig. 11**, engineers need to master the basics of "gauging and understanding trends in technology and trends in the market," "quickly understanding the true essence of problems," and "concentrating business in fields of competence," to effectively partake in R&D activities.

2) Product design

NEC is also focused on product design, with a design center established including 100 design engineers.

These design engineers are almost in daily contact with excellent works of art, such as sculptures, ancient architecture, paintings, and the latest car

• Keyboard-less customer service for improved operating efficiency

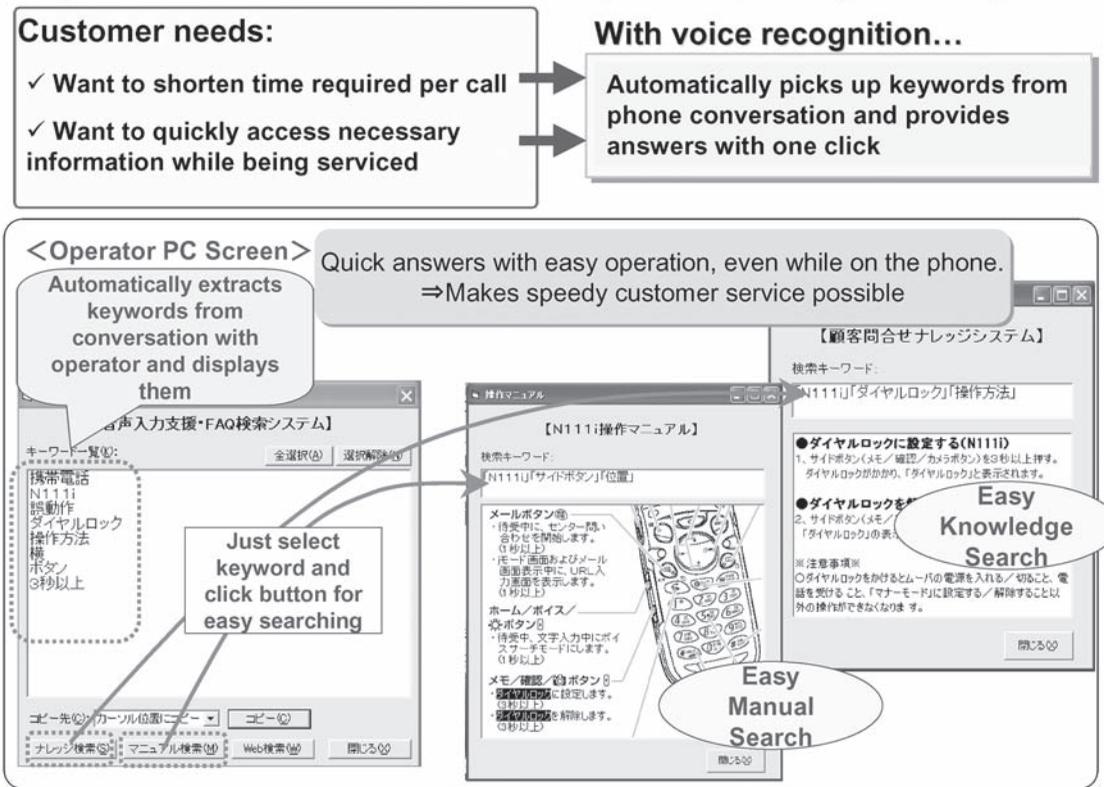


Fig. 9 Operations efficiency at call center.

Makes keyword search and topic selection possible by using voice recognition and video analysis technologies

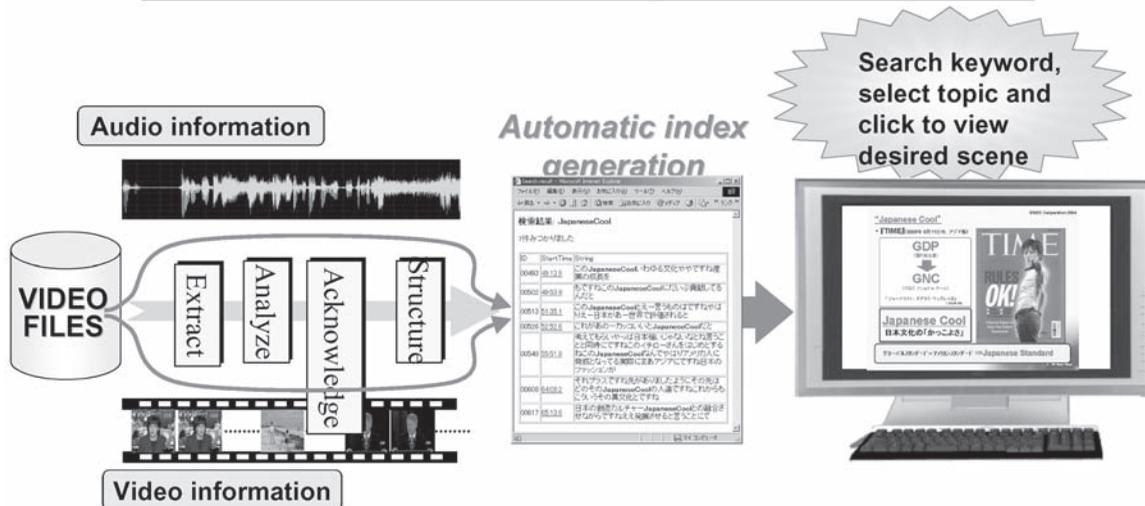


Fig. 10 AV indexing technology.

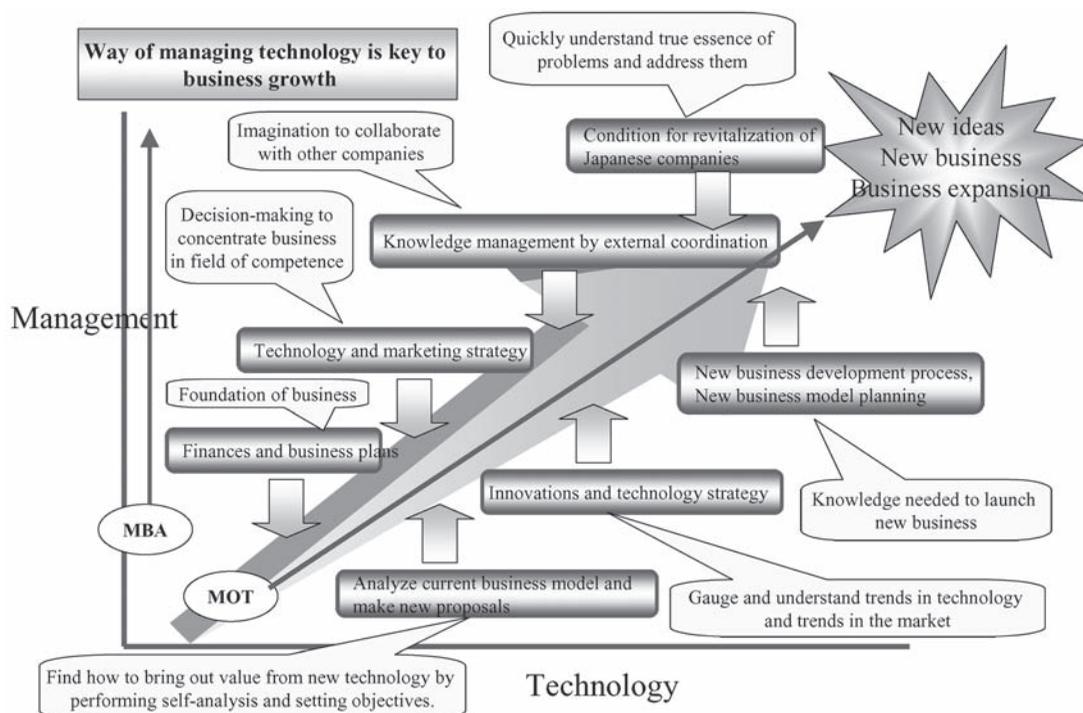


Fig. 11 Advantages of the MOT concept.

designs, to hone their own sensibilities. And by clearly analyzing their plans based on their target customers, in categories such as young adults or the elderly, they newly incorporate illumination and sounds into their ideas with careful consideration in creating their designs (Fig. 12).

We are beginning to see the fruits of these efforts. All of the six products listed below that received the Good Design Award* for this year were designed based on Japanese Cool.

- ① FOMA N900i Cellular Phone: Incorporates an arc line form to give it an edgy design.
- ② N900 Cellular Phone: World's thinnest and first card-type cell phone. Mega-hit in China.
- ③ VALUESTAR S Desktop PC: Keyboard stows underneath the TV monitor, making this desktop PC usable just like a home appliance.
- ④ VT70 Series LCD Projector: Compact with soft lines for a gentle design.
- ⑤ Express5800/100 Series Tower Server:

- Estimate future technological and popular trends to propose new lifestyles.
- Clearly analyze preferences of target users and pursue new values.
- Customer satisfaction incl. usability, ease of understanding, convenience, etc.
- Design that appeals to the senses, incl. new materials, colors, ornamental illumination and sounds.



Quest for Japanese Cool (subtleties of Japanese)

Fig. 12 What to do to bring out Japanese Cool.

*The Good Design Award is an authoritative award system that evaluates the design of various fields such as industrial products, buildings and environment in the Japanese domestic market each year and awards those that are deemed to have superior design.

Cool and active design featuring translucent blue material.

- ⑥ NEFAX IP4000 Facsimile Machine: Fax machine that incorporates universal design.

What's more, our design engineers are also thinking about what the PC of the future should be like. With the concept model PRISM, they are envisioning an LCD screen that is soft and flexible, expands and contracts, and can be taken out or put into the main unit, and are currently developing it. We believe it may be possible to market this product within the next 2 or 3 years.

4. Conclusion

I have thus talked about the social situation of Japan and the world as well as the rapidly materializ-

ing ubiquitous society from the viewpoint of Japan's technological progress, and also how NEC should take part in it, and have introduced a number of our products.

Now and in the future, NEC will move ahead and take the lead with world-class IT and network technology, to open up the way to a ubiquitous society. Also, we would like to contribute to the promotion of the coolness of Japanese culture through Japanese Cool design.

We intend to polish our technologies and products based on the motto that it is the innovative spirit that will bridge our way to the ubiquitous age.