The Outlook for Innovative Office Environments and Work Styles Targeting Thirty Years Ahead

The C&C Innovation Research Laboratories opened in July, 2007. It is to be found on the 2nd floor of the NEC Kansai Research Laboratories building located in the Keihanna Gakken-toshi (Keihanna Science City) of Ikoma city, Nara prefecture. The aims of the laboratory are to predict future trends and to contribute to creating new business opportunities over the coming 30 years or so. The unique activities of the laboratory include the creation of innovative office and work styles aimed at realizing a "Heart-to-heart Communication" environment in which staff are able to cooperate in an open manner. While optimally using state-of-the-art facilities and technologies, remarkable demonstration experiments are being carried out in order to pick up the pace of staff creativity and to create a better communication environment in which they may work more effectively.

Leading New Businesses in the Market under the Theme of "C&C in the Future"

The C&C Innovation Laboratories (**Photo 1**) opened in 2007 and set its mission as "contributing to creating new businesses that will preempt societal issues of the coming thirty years." In 1977, Koji Kobayashi, then-Chairman of NEC, attended the INTELCOM77 which was held at Atlanta, Georgia U.S.A., and made proposals aimed at the future of telecommunication technology. He stated that the advent of the age of "the fusion of computers and communication" or "the C&C society" was imminent. Coincidentally, the year 2007 is three decades on since that occasion. Chairman Kobayashi then made a speech and mentioned that "In the early 21st century, technology will be advanced and will enable us to communicate with each other from anywhere and at any time while being able to see each other on screen." "When such a day comes" he said "all technologies including telecommunications, computers and televisions will be integrated as one. I expect the technology of the future to be so." Thirty years have now passed since his prediction and the technologies of today have evolved as he predicted. Meanwhile NEC has been accumulating expertise while developing the innovative technologies that have supported these changes.

C&C Innovation Laboratories has set our target to be "C&C in the Future" and focusing thirty years ahead. In order to achieve this aim, we will promote R&D based on our accumulated innovative technologies and also with the motivation that supported the projected vision of our predecessors. There are three significant differences between our new laboratory and conventional laboratories. Firstly, it is a "Vision Driven" business. This means that we search for and find market movements hidden in everyday events and based on our involvement in these movements we create new businesses that enable significant changes in society. The second difference is "Open Innovation." This means that we will communicate and exchange technologies and knowledge with other companies, even with competitors or companies from different industries. The third difference is the innovation of office environments and work styles. This means that we will promote communications between researchers to stimulate their ideas for creating beneficial facilities and technologies via their experimental researches. Three years have now passed since the C&C Innovation Laboratories opened and we can confidently say that our challenge is achieving its target, step by step.

Photo 1 C&C Innovation Laboratories in Nara prefecture. R&D is conducted by focusing on the 30 years ahead.

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Significant Social Movements and Business Opportunities Hidden in Every Day Life

How will the society of the future change in the context of the "Vision Driven" business? - Kazuo Kunieda, Manager of the laboratory explains:

"First, I want to find out what sort of societal changes might occur over the next thirty years. Then, I will select those businesses that are most likely to be of interest to NEC in providing our services to create new values for society. The keyword is "communications between people," e.g., for the elderly, as we head inexorably toward an aging society. The creation of social infrastructures that feature efficient energy consumption and eco-oriented awareness will be accelerated. Social movements in various aspects are likely to occur. When society is viewed from such a perspective, elderly people do not function as supportive members of society. However, as they are the principle players, society will need to change its mechanisms in order to help them to adopt a more active role. Also in order to establish a "smart city" or to operate supportive "car sharing" systems, it is important that we should not rely too much on hardware. It is important to build a system in which gentleness or caring minds will contribute to environmental activities. For controlling a harmonized society such as "communication between people," I think that an infrastructure such as the so called "urban OS (operating system)" will be required."

Signs of change within society are already discernible. Society has already started to move. People have begun to discover more productive life styles by finding places where they can use their specializations more effectively than by spending their entire professional careers in the employ of the big named companies. Such movements will mix different corporate cultures, and will also demand common business infrastructures. Consequently, technologies including cloud services and other service platforms will be required as measures to help people to work more efficiently without imposing limits of time and place and to thereby add more value to their contributions. What we are trying to accomplish in this laboratory is not to predict such changes but to find issues and solutions by being involved in these changes and by carrying out demonstration experiments in cooperation with our neighbors and organizations in the neighboring districts. As a result of such imminent changes in the society as we know it, I am expecting that a new market that relates to C&C (Computers & Communications) will arise and that it will be a market of several trillion yen."

The Shift from "Competition" to "Heart-to-heart Communication," which is Basic to the Open Innovation Concept

The concept of "Open Innovation" to which the laboratory aspires excites and stimulates.

Manager Kunieda continues "You will reach a limit in your R&Ds potentialities if it is promoted exclusively within the confines of your company. If you want to improve the pace of development and to increase the investment effects, you must learn more from other companies about the knowledge and technologies that your company does not yet possess. For such an aim to succeed you must open your knowledge to them and collaborate with them, it is thus that innovation will be achieved. This laboratory is open to researchers and companies from inside and outside Japan, and it also accepts many international internship students. Since we opened our laboratory, we have found many issues that require a solution. We have also found that each researcher shows different attitudes and has different levels of motivation and we have learned that it is important for us to share such differences. Moreover, we have discovered that we need new technologies in order to support the finding and sharing of such differences.

Currently, we are monitoring the movements of human beings by locating various sensors to analyze their movements from the monitored data. We also collect various thematic opinions from people from both inside and outside the laboratory. I confidently expect that something significant will arise from the accumulation of such data and of people's opinions."

Office Environment and Work Styles Supported by State-of-the-art C&C Technologies

Setting a vision is not a goal. The vision has to be brought to fruition in order to indicate the clear direction for future businesses. This is our mission and in order to achieve it, activities to support such a vision are important while also examining their social acceptability by using the latest tools and technologies.

Tools and technologies that are suitable for realizing this vision have already been prepared and located in the laboratory. For example, they include ultra high-speed large capacity network systems, thin client terminals, allay-type microphones, infrared sensors, RFID devices, floor sensors, ultra-large touch panel screens and state-of-the-art GUI devices, etc. Most of these devices are installed behind walls or above ceilings (**Photo 2**), so that you are not aware of them. What you see in

Photo 2 State-of-the-art facilities are installed above ceilings and behind walls.

Photo 3 A working room employing the free address system.

our laboratory is an office with a futuristic and lively atmosphere attended by NEC's mascot communications robot, PaPeRo.

To improve the balance between creativity and efficiency, what sort of environment and facilities are required? Also how should we work or communicate with each other? Various measures developed under these themes are located everywhere in the laboratory. For example, the working space adopts a "free address system" and a flexible layout so that researchers can use any desk in the room. Moreover, researchers can relax in a lounge where sofas are located (**Photo 3**). ID tags are applied to books that researchers have brought into the laboratory so that anyone may freely read them. Screens are used to partition the office areas and these are also used as screens to display images inside other laboratories and sometimes those of overseas researchers. These arrangements have made it possible to hold video conferences at any time. Most of the walls have slide-type info-boards installed (white boards), and many notices are displayed (**Photo 4**). Small staircase seats are located in a presentation room so that anyone can hold a presentation at any time, a facility that encourages discussion in an open and relaxed atmosphere.

Moreover, an 8 m wide big screen is located on the wall of a corridor and it is called the "Future Creation Canvas" (**Photo 5**). This innovation has been developed in cooperation with the G-SEC (Global Security Research Institute of Keio University). Various opinions and solutions for the future society are displayed on the screen via homepages and twitters. Various themes including war, religion, etc. are displayed in three dimensions; with time on the horizontal axis, possibility on the

Photo 4 On the info board, there are many messages and information to encourage ideas.

Photo 5 "Future Creation Canvas" being developed in cooperation with Keio University.

vertical axis. Many subjects and opinions classified in their different categories by different colors are displayed in perspective. Moreover, any one of them may be picked out by touching the screen in order to view more relevant details thanks to the adopted state-of-the-art GUI technology.

Creating New Business Strategies for C&C Technologies and Promoting Social Change

In order to establish an office environment and work styles in which creativity, efficiency and communication are optimally harmonized; Manager Kunieda states "We are the testing bench for promoting demonstration experiments." Various censors and devices are installed above ceilings and behind walls for carrying out our experiments. A sensor detects the ID tag carried by a researcher and records his/her movements in real time in order to collect and analyze data (**Photo 6**). Which researcher is meeting another at which place and how long he/she stays there? All data regarding the researchers is collected together with a recorded trace of his/her movements in the office, which is then displayed on a screen located in the corner of the room. Moreover, data quantifying how much he/she talks is recorded, and any memorandums written on the white board to support discussions are also automatically recorded. A further mechanism is provided to record even the timing when an idea germinates in a researcher's mind and in which situation this occurs.

However, do such technologies disturb the privacy of researchers? Manager Kunieda explains "We measure the amount of their conversation but we do not record the details of what is said. Researchers are getting used to the system. They get to understand its significance and become aware of how much such unconscious behavior and informal communication can stimulate the "Heart-to-heart Communication" system. Although the efficiency of environmental activities can be effectively quantified, the amount of creativity cannot be measured in terms of a scale of efficiency. The important thing is how to maintain a satisfactory balance between such activities. How to measure such a balance is one of our key research aims."

Photo 6 Researchers' movements in the laboratory can be monitored.

A vision-driven research environment aimed at predicting future trends is provided at the C&C Innovation Laboratories. Significant social change will surely come about. We are trying to discover signs of its arrival by making our observations from the perspective of the global scale with the aim of making such changes fit our business strategies. Moreover, we are examining our hypotheses in cooperatively organized research facilities and workshops together with other top-class research laboratories worldwide and also with participating local interests. We intend to maintain our policy to freely exchange newly acquired knowledge and technologies with them. Creating an innovative office environment and work styles is being experimented by optimally using our latest facilities and technologies. Feedback of the results acquired from our experiments is relayed to other departments of NEC and supports them in using the benefits of the results for improving their products and services.

As explained above, our daily challenges as well as our significant arsenal of inherited technologies and expertise are about to become essential components in creating the "Heart-to-heart Communications" office. By establishing standards for the work styles of the future, C&C Innovation Laboratories will contribute to achieving a society that enjoys creativity and affluence.

Collaborator

KUNIEDA Kazuo
Senior Manager
C&C Innovation Research Laboratories