

Adaptive Collaboration: The Road Map Leading Telework to a More Advanced and Professional Working Format

Mayumi Hori and Masakazu Ohashi

Abstract - In this chapter, we would like to discuss the Adaptive Collaborative TeleWork as medium which connects individual to individuals, individual to organization, individual to community, individual to society, and individual to the world as large without the restriction of time or location. Information and Communication Technology (ICT) offers new ways to provide more flexibility to the working format. Especially the new method that integrates a number of different systems and applications into one system to enable the Adaptive Collaborative Telework has been generating much attention as it may meet the diverse and growing demands in the future of the Ubiquitous Society. In other words, in our Ubiquitous Society with advanced ICT infrastructure, tacit knowledge, the most difficult yet valuable type of knowledge to be transmitted which is gained through personal experiences and stored within individuals, has better chances to be transferred and stored on the network. Therefore, it is required to build a platform to make tacit knowledge more accessible and sharable in the society. The Next Generation Collaborative Studies Platform in Tokyo have been built since April 2003 Not only the experiment enabled people to share data through telecommunication, it also

demonstrated that utilizing the knowledge management systems in conjunction with the WDM facilitates an enhanced communication structure. In essence, the union of the two systems creates a real-time collaborative research environment by allowing users to share the processes and results of researches between the institutions regardless of their location. The purpose of this paper is to illustrate the road map to lead telework to a more advanced and professional working format by applying the Adaptive Collaboration. Also we would like to examine telework's effectiveness for human resources and how it would efficiently facilitate the Adaptive Collaboration environment, which may characteristically represent the working format for the 21st century.

Index Terms—collaborative system, telework, working environment.

Introduction

The progress and popularization of Information and Communication Technology (ICT) has placed a major impact on working environment. In addition to the development of ICT in Japan, other conspicuous factors contributing to the shifts in working environment are the aging of society, the falling birthrate, globalization of economy, and increasing concern over the global corporate competitiveness. All of these mega-trends are forcing corporations to review and revise their traditional

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Mayumi Hori is a professor at Graduate School & Faculty of Business Management, Hakuoh University, Tochigi, Japan Email:m.hori@hakuoh.ac.jp

Masakazu Ohashi is the Dean of Faculty of Policy Studies and a professor at Graduate School & Faculty of Policy Studies Chuo University, Japan. Email:ohashi@fps.chuo-u.ac.jp

employment practices and personnel management systems that had been considered as the strengths of Japanese corporations since the period of high economic growth during 1960's to 1970's.

Combined with an increased presence of women in the workforce, all of these trends such as the emergence of ICT and shifts in social and business environment are forcing corporations to alter their traditional practice that requires women to play only a supporting role. Many corporations are now seriously considering and viewing women workers as integral members of their team. ICT did not merely increase the number of jobs; it has been creating entirely new types of jobs. As an alternative working format, telework brings enormous potentials for revolutionizing traditional work and employment formats.

In recent years, telework, which has not yet commonly practiced in Japan, has attracted a great deal of attention from Japanese, especially from women workers. Looking at the types of telework in Japan, most of them are for outsourcing and are not for unskilled, low-paid work.

We would like to emphasize that the Adaptive Collaborative Telework, which transcends the boundaries of traditional telework, may play a significant role in realizing a true collaborative society. The philosophy of the Adaptive Collaboration is not simply to computerize all of the operations in corporations and administrative agencies, but more so to build a society where diversity is embraced and creativity appreciated, thereby allowing workers to pursue their mission in a coordinated manner.

1. A Proposal for the Adaptive Collaborative Telework and Experimental Pilot Study

1-1. The Concept of AC

Expansion of the versatility of ICT has facilitated many corporations and administrative agencies to merge and collaborate with each other and enabled them to enter into new business schemes. On the other hand, it has become extremely difficult to maintain the competitive advantage in the present market as the

culture of sharing and collaboration prevailed. Furthermore, many corporations and administrative agencies have been urged to meet the diverse needs of the people while improving economic efficiency. In accordance with these situations, we would like to propose the Adaptive Collaboration (AC) as an essential concept for the new paradigm of knowledge integration and collaboration in the Ubiquitous Society.

The Adaptive Collaborative (AC) is defined as a system that efficiently relates, shares, and utilizes data, information, and knowledge in the Ubiquitous Society where the amount of information created grows at an accelerated pace. This AC system would also allow entities of different ontological level to be linked laterally therefore making it easier for people in the organization to appreciate each other's expertise and the know-how, which essentially encourages further development and innovation. Likewise, the system breaks the conventional relationships within and between organizations.

1-2. Experimental Pilot Study on the AC

As we believe the AC is an essential component for the new working style of the 21st century, the Next Generation Collaboration Studies Platform in Tokyo have been built since last April (2003) supported by the Ministry of Post and Telecommunications. In order to examine the effectiveness of collaborative work through telecommunication, an experiment utilizing the knowledge management systems and the Wavelength Division Multiplexing (WDM) was conducted in cooperation with several universities and research institute in Japan(The Report of Society for the Advance Study on e-Society).

The purpose of this pilot study is to examine the effectiveness of applying the XML Web Services into the ACW essentially from the perspective of users. The XML Web Services automatically sorts and relates different application systems and computing resources required to process the queries

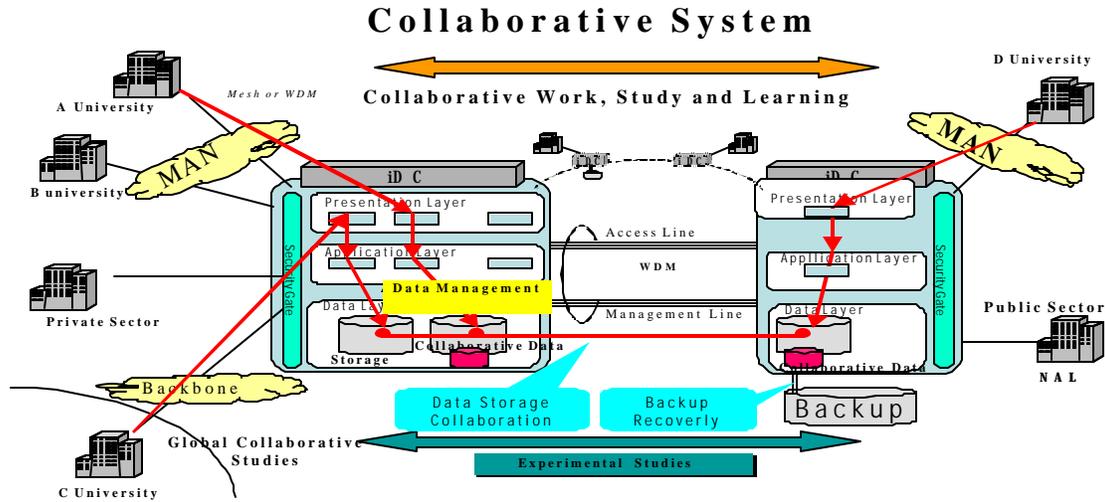


Figure1: Collaborative Work System

on the Internet regardless of the program format. Therefore, we believe that utilizing this technology, users may be able to execute their process without having to worry about unfamiliar technologies and complicated procedures.

As the ACW environment involves complex and entangled elements, it is hard to put a simple desk plan into practice. Therefore, for our pilot study we created a test-bed system simulating the real collaborative work and research environment where several corporations, universities, research institutes conducted experiments on their basic technologies and performance, and studied the efficiency of the system. Our aim was to develop a system, based on the empirical evidences, that organically manages data and storage. The system searches, retrieves, extracts, provides, and utilizes data and data structure that are independent of the application types, and allows users from different location and organization to share the storage which is suited for managing large amount of data.

The experiment proved the Adaptive Collaborative Telework to be very effective. Beyond merely sharing data through telecommunication, the experiment demonstrated that utilizing the knowledge management systems in conjunction with the WDM facilitates an enhanced communication structure. In essence, the union of the two systems creates a real-time collaborative research environment by

allowing users to share the processes and results of researches between the institutions regardless of their location.

This demonstration experiment was conducted in the following settings: 1) a collaborative research and experiment system in an integrated distributed environment, and 2) Adaptive Collaboration for visual media contents production. These trials were performed using the database and applications in the collaborative workspace located in the external storage within the iDC (Internet Data Center). The knowledge management systems enabled users to control the access to files and data stored in the iDC. Not only allowing authorized individuals to customize the settings to obtain access to specific organizations, workgroups, and workplaces, the experiment also performed detailed control over the visibility and invisibility of the intelligent folders, bulletin boards, and emails. An application that intelligently relates the databases

in the external storage to each organization was also introduced, allowing users to voluntarily create and/or alter the settings of the collaborative workspace. The AC is also autonomous-distributed collaborative work system with an iDC centralized, layered datatype sharing model, which enables the clients distributed on the network to autonomously provide services to their consumers (figure1).

2. Results of the Experiment.

2-1. Performance Tests

The series of performance tests clarified the effectiveness of the MAN environment composed of the multiple iDCs connected with WDM. The following are the details of what we found in the performance tests: 1) there was a performance degradation of network access among [FC-SW]-[WDM]-[FC-SW] due to the interconnection problem between WDM and FC-SW as well as the lack of tuning of FC-SW configuration. Improving the tuning of FC-SW configuration is the future assignment. 2) The IP connections such as NFS going through WDM were successfully established within the multiple iDCs without any stress, which correctly enabled data sharing via multiple file servers located in remote areas. 3) Acceleration of the data transfer rate was found to be possible by reducing the server load with the dispersed file servers within the remote iDCs. 4) It is required to improve the MAN environment which ensures the redundancy by doubling the lines running within the multiple iDCs.

2-2. The Potentials of Applying the Experimental Results and Effectiveness of Collaborative Work

The experiment proved the effectiveness of the MAN environment composed of multiple iDCs connected with WDM. Furthermore, there is a good chance of building the enhanced MAN environment which enables the sharing of sever storages and applications resources on the iDCs seamlessly while ensuring the security and reliability. Moreover, although the test bed environment was built on the two iDCs for the experiment, it is highly possible to expand the network operating area. Hence, we can formulate a vision for the future utilization of the system as a collaborative work environment for interregional businesses. Further, as for telework, the main subject of this paper, the experiment proved the Adaptive Collaborative Telework to be very effective.

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Utilizing the knowledge management system allowed people with different expertise or in different fields –those who do not share the same terminology or methodology-to work collaboratively on the same project. Thus, this experiment proved the effectiveness of collaborative work through telecommunications by not only highlighting the inherent nature of telework as an alternative working style, but also by suggesting its clear potency for efficiently yielding significant results through real-time collaboration.

During the collaboration process on a research project, a variety of information including documents and numeric data was collected in the storage. Information submitted by geographically

-dispersed researchers provided a diverse data structure associated with their writing style, wording, and specific terms they used. The knowledge management system analyzed and clarified the relationships among terms, sentence structure, numeric data, and semantic data. As a result, the system clarified the relationships and commonalities even when the relationships or structures of the data submitted by researchers were different from each other.

3. How Does the AC Promote Business Benefits?

3-1. Effective Use of Human Resources with the AC

This all contributed to making it easier for the researchers to effectively work together, and to compare each other's findings. Consequently, employing this system not only enables collaboration among researchers in the same field, but also promotes a group effort among those in different fields, and allows greater opportunities for obtaining references from a third party. Accordingly, analysis on data structure that informs the relationships between data and words only served to enrich and deepen the collaboration process.

The Adaptive Collaboration generates innovative ways to make effective use of human resources of both in-house and outside staffing with ICT. For in-house teleworkers, a collaborative, group-work environment may help them maintain favorable working conditions as well as achieve good results in their work.

The AC requires one to work toward common goals with other members of the group who have perspectives other than one's own. It can also assist group members in creating a shared new value and understanding. Although collaboration requires harmony, it does not suppress or discard different perspectives and values. Sharing of common goals encourages each member to assume a responsibility and commitment for creating new knowledge that in turn benefits the group as a whole. Therefore, instilling this culture of "sharing" is critical for the successful AC.

3-2. New Services linking Knowledge and Expertise between Public and Private sectors

Another main purpose of introducing the AC is to make a difference in the nature of the work of public officials as it would change the way they carry out their job at home by aggrandizing the definition of telework. In other words, unlike the conventional unilateral services offered by the government, the AC promotes new lateral services that link knowledge and expertise between public and private sectors of different ontological levels. It is also different from the Telework Centers which only change the location of work while the quality of work remains the same. Alternatively, the AC divides and distributes work by its nature and quality such as research and writing papers that can be conducted outside of the conventional office. For example, many software engineers value the working style of the Adaptive Collaborative Telework because the nature of their work allows them to work independently while applying ICT to permit high-quality collaboration so that they can remotely and continuously check their system's integrity with other engineers.

Although telework has been considered merely as a means of outsourcing in Japan, ICT has increased the potential for its expansion, resulting in the conception of the Adaptive Collaborative Telework. Consequently, as the global economy continues to move further from a manufacturing base more towards a service base, the demand for the Adaptive Collaborative Telework will grow. Thus, the critical factor becomes a process of determining how to divide and distribute the work by both its nature and quality.

4 . Changes in Employment Practice in Japan and the AC as a Personnel Strategy

4-1. The Increased Presence of Women in the Workplace

With the fundamental structural change in the Japanese economy and society, a broader diversification of the employment structure has emerged. The most common pattern is the increase of part-time workers and dispatched workers (workers supplied by temporary help agencies). The rapid entry of women into the workforce is ample evidence of a change in occupational attitude among workers. Overall in the 25 years since 1975, women workers have increased by almost 36%, compared to about 18% for men: 18.78 million(1965), 19.53 million(1975), 23.04 million(1985), 24.74 million(1989), 26.56 million(1998). More women in the workplace will inevitably lead to the collapse of the rigid role consciousness—the idea of "woman's place is at home, man's is at work." This attitude has long been a central value in male-female relations in Japan. Today, with advanced levels of education, more women are seeking positions to exercise their special abilities, which would also entail them the independence and allow them to continue working without dropping-out.

Moreover, traditionally Japanese women staying at home engaging only in household chores and childrearing had a limited social circle. That is, they interacted mostly with family members and people in the same community. People traditionally grow personal relationship and strong bounds of trust through face-to-face communication. Likewise in business field, most valuable knowledge transmitted and shared among

group is called “water-fountain knowledge.” Japanese business people very much value this type of knowledge and often grow personal level relationship outside of office through dinner and drinks. Therefore, for teleworkers to instill the culture of sharing, innovative and ingenious contrivances utilizing ICT are necessary.

4-2.The Possibilities of Telework for Women

Telework brings women not only the opportunity to exercise their expertise as a professional, but also the interactions with others that were once impossible or at least very difficult. This social interactions itself encourage women at home to maintain better mental health. As a result, telework has a potential to entail Japanese women an independency as a professional which leads a better self-confidence, better mental health through more active social interactions, and finding a better balance between traditional chores and work therefore improving the quality of their lives.

There are many women, including the elderly and physically-challenged, whose abilities are not fully exercised in our society. The AC would apparently promote employment opportunities for them so that they can make the most of their abilities.

Furthermore, till today after the high economic growth period from 1960's to 1970's, Japanese corporations and administrative agencies had built their organizational foundation based on the entrenched practices of the personnel and wage system such as permanent employment, seniority-based pay and promotion, and uniform wage system.

However, today's economic environment has shown us that these entrenched practices in personnel and wage systems are no longer effective but hinder the sustainable and continual development of organizations, and even endanger their survival. Along with a number of profound transformations in the society such as globalization, these Japanese traditional practices that only seek for stability but do not require competition among employees need drastic changes. That is, organizations are required to instill more competitive strategies which enable individual employees to maximize their

potential, share and utilize knowledge and competence that organization possesses, collaborate with other organizations and research institutes to share the know-how and expertise.

Organizations are also required to operate the “core-competence management” to concentrate their management resources on their strengths and efficiently utilize outsourcing. The AC facilitates the effective utilization of human resources by enabling the distributed operation and encouraging women workers to exercise their full potential. Therefore, the AC is one of the essential personnel strategies that powerfully assist organizations.

Conclusion

By experimenting with the test, we could perform technical examinations for storage operation, the switching technology for network failure, and knowledge management for collaborative work environment. Additionally, we could also examine the network and the collaboration process of visual image contents creation from the perspectives of both users and providers in the collaborative work environment.

With a conventional business model, individual organization builds an information system that only fits the organization. However, in the era that requires innovative management, organizations are strongly urged to collaborate and cooperate with a variety of organizations to create more value and competitiveness as seen in the XML Web Services, rather than trying to compete against each other. That is, organizations will no longer need to stick to specific data or applications but to be flexible enough to adopt appropriate objects according to each business model and project. Consequently, the AC, we believe, can bridge between the traditional top-down, hierarchical organization and the horizontal business models.

The AC also acts as a contact point between analogue organization and digitalized system through innovative Internet businesses based on the network such as those operated by the iDC. This digitalized system enabling the AC is the XMLWeb

Services. Therefore, the AC is composed of the two main components: iDC and the XML Web services.

The AC is a promising business model and is effective for collaboration for utilizing knowledge and expertise of autonomously distributed clients. It is especially useful when launching projects that transcend the boundaries of organizations. Hence, we believe that the AC is essential for the advanced and sophisticated application of distributed work such as telework we discussed in this paper.

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Dr. Mayumi Hori

Mayumi Hori received the B.E. and M.E. degrees in economics from Rikkyo University, Japan in 1976,1993, respectively and Dr. Policy Studies degree from Chuo University, Japan, in 2003.Now she is a professor at Graduate School & Faculty of Business Management, Hakuoh University,Tochigi,Japan. She is a director of the Web Services Initiatives in Japan, which synthesize and integrate the needs of the users, aiming to build the systems from the perspectives of users. And she is the vice-chairperson of The Institute for the Studies of an Information Society,a member of The Society of the basis for e-Community,and The Society of the Basis for the Information Community in Japan.
Email:m.hori@hakuoh.ac.jp

Dr.Masakazu Ohashi

Masakazu Ohashi received the B.E.,B.S.,M.E. and Dr.Eng.degrees from Chuo University,Japan, in 1976,1978,1980,1983, respectively. Now he is the Dean of Faculty of Policy Studies and a professor at Graduate School & Faculty of Policy Studies Chuo University, Japan. Dr.Ohashi is the chairperson of Time Business Forum, iDC Initiatives,The Institute for the Studies of an Information Society, The Society of the basis for e-Community,The Society of the Basis for the Information Community in Japan and a member of UN/CEFACT TBG6.
Email:ohashi@fps.chuo-u.ac.jp