Collaboration Technology for Human Life Design

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Abstract : Three approaches for collaboration technology are introduced as Abduction, Ba, and Culture. We also describe two settings (design workshop and research laboratory) in which to develop the practical application of collaboration technology for human life design.

Keywords : Collaboration Technology, Groupware, KJ method, Abduction, Ba, Cultural knowledge

1. Introduction

Practical research of computer systems over a computer network such as the Internet has two representative research approaches: the first approach is Intelligence Amplification (IA), with the aim of augmenting human intelligence by computer systems as tools for human thought [1], and the second approach is Artificial Intelligence (AI), with the aim of realizing computational intelligence, which includes office automation and an interface agent instead of a human secretary.

Collaboration technology has the purpose of supporting human collaboration; therefore, it naturally takes the IA approach. Various academic communities have committed to supporting human collaboration via computer networks. Such communities who utilize collaboration technology have appeared since the 1980s and have represented the concepts with keywords such as CSCW (Computer Supported Cooperative Work), Groupware (Software for Group), Hypertext/Hypermedia (Non-linear Text or Multimedia), CHI (Computer Human Interaction); however, the keywords are changing to social computing and WWW according to the current diffusion of practices associated with the Internet.

On the other hand, idea generation support systems [2] have been researched in Japan since the 1990s. Especially, the KJ method [3],[4], a well-known technique in Japan, is taken into account when an idea generation support system is considered. Our previous work involved researching groupware for an idea generation support system, named GUNGEN [5] and KUSANAGI [6] and we have also applied these groupware systems to various types of laboratory experiments.

In this paper, we introduce three concepts in relation to conceiving and producing collaboration technology, and then we describe the practical direction of two settings for human life design.

2. Three approaches for collaboration technology

This section introduces three concepts for collaboration technology in the age of knowledge. They are Abduction, Ba, and Culture to support intelligent productive work within a collaboration environment, and they might be related to knowledge creation, knowledge sharing or diffusion, and different types of knowledge or localized knowledge, respectively.

Our research referred to many concepts of human practices such as groupwork, knowledge management, and pragmatics, because it is desirable to develop the IA approach to support human activity by considering either practical human experiences or an understanding of humans.

2.1 Abduction

Abduction is one type of human reasoning that can be used to conceive a new idea, a new concept, and a new hypothesis. Three types of human reasoning are expressed as symbolic manipulation below.

The three rules are deduction, induction, and abduction. A simple deduction rule is "if p and p->q then q." This rule always maintains validity of reasoning and becomes the foundation of a computational machine. A simple induction rule is "if p, q then p->q." This rule is compatible with statistics, and it becomes the mathematical foundation of data mining, including BigData technologies. A simple abduction rule is "if p->q and q then p," This rule violates the validity of logical reasoning. Whereas the former two forms of reasoning correspond to the AI approach, abduction is expected to be advantageous to the human creative role.

Groupware research for new idea generation support systems has focused on group creativity. We have evaluated the groupware GUNGEN, and KUSANAGI in the distributed work environment to support the distributed and cooperative KJ method depicted in Figure 1. The method is an arrangement of the original KJ method and consists of three steps. The screen shot of GUNGEN, where three participants carried out the distributed and cooperative KJ method with three personal computers via a computer network, is depicted in Figure 2. In Figure 3, three participants could concurrently handle about two hundred idea data with KUSANAGI, which realized a large screen interface by connecting ten personal computers.

The first step is brainstorming in which many ideas are suggested without hesitation and is related to divergent thinking.

The next step involves the grouping of ideas by using the similarity of idea data and is related to convergent thinking. This step is known as an affinity diagram in the seven new QC tools and in the contextual design technique for client-centered design [7]. Users are encouraged to find a new concept by avoiding classification based on foresights. The last step entails writing a conclusion sentence after the previous two steps and is related to evaluation thinking.



Figure 1. Process of the distributed and cooperative KJ method.



Figure 2. A screenshot of GUNGEN.



Figure 3. Collaboration with Large Screen Interface of KUSANAGI.

The laboratory experiments with groupware systems revealed that (a) the evaluation of the conclusion sentence with distributed work resembles work performed in a neighboring setting, (b) many ideas (a dataset containing more than a few hundred ideas) can produce a good conclusion sentence, (c) large screen interfaces combining several computer screens can improve the group activity and is a unique part of the KJ method in the problem solving process.

2.2 Ba

The concept of "Ba" was introduced as a concept of knowledge management [8]. Ba is a space in which to induce a dialog for knowledge sharing in the socialization step of the SECI process, which is acronym of four steps as Socialization, Externalization, Combination, and Internalization [9], and it might be supported by collaboration technology for a face-to-face or distributed environment. Moreover, informal communication is a successful factor of product development in manufacturing organizations to maintain the flow of technology where it is considered desirable to locate group members within 30 meters of each other to induce informal communication, which can occur under face-to-face communication conditions [10].

These practical concepts and facts can be applied to a collaboration environment to support "Ba" over the Internet. The technology of media space [11], in which remote places maintain a continuous connection via video communication channels to realize accidental or casual communication, has tried to encourage informal communication but has failed to become a major application. Furthermore, instant message services, such as those of Skype and LINE, support the communication, and have become major applications over the Internet.

We proposed and developed a prototype system to support a research laboratory including the concepts of media space and instant message services; however, this was a short-term practical implementation (lasting a few months), after which the system was considered not to work in the current conventional IT environment.

2.3 Culture

Culture is a concept that links human knowledge, values, and behavior to human living spaces. Therefore, two countries may have different cultures. Under certain circumstances, this concept of culture might be applicable to some differences between the scientific community and the community of humanity, as suggested by the Two Cultures by Snow.

Cross-cultural collaboration is considered to be important in the age of globalization. Cross-cultural collaboration requires the use of machine-translation technology to overcome the language barrier as well as technology that promotes an understanding of the cultural differences within a group work setting.

The role of cultural differences in group decision tasks is discussed by comparing western and eastern countries. Our

laboratory experiments included increasing the number of interrogation chat statements in the case of participants from different country pairs (Thai-Chinese or Japanese) compared to those of same country pairs (Thai pairs). In addition, cultural knowledge, which notes different aspects of objects or behaviors between two cultures, promotes a cultural learning attitude. Nevertheless, this is expected to require the development of a new concept of collaboration technology capable of bridging cultural differences based on an understanding of these differences.

3. Directions of Collaboration Technology for Human Life Design

Kapor, who was a software designer of an early spreadsheet application, Lotus 1-2-3, manifested that design is an important activity to produce good software and he required designers to try to bring together the world of technology and the world of people [12].

Generally, we evaluated our collaboration system by conducting laboratory experiments. The practical application of the system to human life design will be considered by installing our collaboration systems in the two settings described below.

The first setting is a design workshop that would require not only design but also prototype making. To date, laboratory experiments were generally carried out by using text language for meetings. Groupware systems could use image data; thus, we intend using image data to consider physical artifacts in the design, and expect to use some new function to support prototype making based on the design.

The second setting is the research laboratory to support various activities of the creative problem solving process for student research, in which knowledge creation and knowledge sharing are the basic activity; therefore, the concepts of Abduction and Ba of collaboration technology will be applicable to the practical implementation of the creative problem solving process.

In conclusion, the collaboration technology for these two settings will require usability and maintainability for group members. It might require re-building the groupware systems with WWW technology in order to satisfy the requirements.

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