

Multiscale Service Design Method and Its Application to Sustainable Service for Prevention and Recovery from Dementia

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Abstract. This paper proposes multiscale service design method through the development of support service for prevention and recovery from dementia. Proposed multiscale service model consists of tool, event, human, network, style and rule. Service elements at different scales are developed according to the model. Firstly, the author proposes and practices coimagination method, which is expected to prevent the progress of cognitive impairment. Coimagination support system and program were developed as “tool” and “event”. Then, Fonobono Research Institute was established as a “network” for “human” who studies coimagination, which is a multisector research organization including older adults living around university campus, companies providing welfare and medical services, local government, medical institution, researchers of the University of Tokyo and Keio University. The institute proposes and realizes lifelong research as a novel life “style” for older adults, and discusses second social system for older adults as an innovative “rule” for social system of aged society.

Keywords: multiscale service design, prevention and recovery from dementia, aged society, coimagination method, fonobono research institute.

1 Introduction

There is a hypothesis that activation of three cognitive functions which decline at mild cognitive impairment (MCI) is effective for prevention of dementia[1, 2]. The cognitive functions include episode memory, division of attention, and planning function. Interactive communication activates above three functions as well as intellectual activities and basis of social network. Novel method named coimagination has been proposed by the authors supporting interactive communication for activating three cognitive functions[3–5]. Methods are effective when they are practiced in the real world. In order to develop services based on arbitrary methods, we propose multiscale service design method. Then we show how to implement the service for prevention and recovery from dementia from scratch via multiscale service design method.

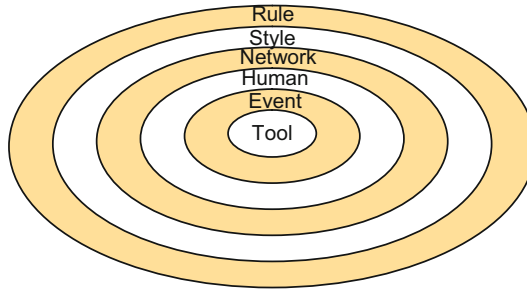


Fig. 1. Mutiscale Service Model

2 Multiscale Service Model

If we compare methods to seeds, services are seedlings. In order to grow such technical seeds to social seedlings, we propose multiscale service design method. It is known that amplifier of service consists of tool, circumstance, and social system[6]. For implementation, we devise circumstance for event and human. We also classify social system as network, style, and rule. In summary, we model that services consist of tool, event, human, network, style and rule (Fig. 1). Then, each element is implemented concurrently. Tool is designed which supports embodiment of method. Event is conducted utilizing the tool. Human resource development program is provided so as to grow human who can conduct events with the supporting tool. Network of humans and organizations is emerged through the series of event and training program. Lifestyle or philosophy is required for organization of network. Rule is also required for effective embodiment of lifestyle. We propose multiscale service design method which enumerate six elements of services, namely, tool, event, human, network, style and rule, and implement concurrently. In this paper, we show how to utilize this multiscale service design method with the case study of service for prevention and recovery from dementia.

3 Coimagination Method for Prevention and Recovery from Dementia

The aim of the coimagination method is to support interactive conversation for activation of episodic memory, division of attention, and planning function, which decline for early stage of mild cognitive impairment. Following is the description of coimagination method with cognitive functions which are expected to be activated for each step. The coimagination method is a method that supports interactive communication through the expression of feelings about images according to a theme. Allocated time periods and turns for each participant are predetermined so that all participants play the roles of both the speaker and listener. The aim of the coimagination method is to activate three cognitive

Table 1. A typical script of conversation supported by Coimagination Method

Speaker	Content
A	This picture shows the Fuse Sarasvati Temple. It was my first visit. This is one of the famous three sarasvati temples in Kanto region. The building was newly built very well.
B	It's in my neighborhood.
A	People place a lot of eggs because the god enshrined there prefer them.
D	Have you ever visited the temple?
C	Yes, once or twice on New Year's Day. It was quiet, not so many visitors.



Fig. 2. Image Displayed during Coimagination Session

functions for prevention of dementia. Following is the description of coimagination method with cognitive functions which are expected to be activated: Preparing speech in an allotted time activates planning function; Preparing images for speech activates episodic memory; Interactive communication activates division of attention.

Table 1 shows the interactive conversation of older adults using day care service supported by coimagination method. Fig. 2 is one of the images displayed during coimagination session, brought by one of the participants, participant A. Participant A is healthy older adults, and participants B and C are dementia patients. Host is referred to as D. It is difficult for participants B and C to communicate in daily life. In contrast, they gave comments during coimagination session, since images and statements of other participants might have helped participants to remember the episodic memories of the temple, and to participate in the conversation.



Fig. 3. Fonobono Panel: Coimagination Support System(Tool)

4 Multiscale Service Design Based on Coimagination Method

First of all, we summarize the definition of coimagination method. Coimagination method supports interactive communication through bringing feelings with images according to the theme. Allocated time for each subject is predetermined. Subjects take turns so as to play both roles of speakers and listeners. The themes of communication are examined considering the effects for social networking. Cognitive activities which require episodic memory, division of attention, and planning are measured by memory task. We describe developing service for prevention and recovery from dementia based on coimagination method, so that how to apply multiscale service design method to real-world problem.

4.1 Coimagination Support System (Tool)

There are four requirements for coimagination support system.

1. The system dynamically displays the images corresponding to the stories of subjects.
2. Users of the system easily register the images. The registered images are accumulated for each subject.
3. Operations of the system are logged so as to be analyzed afterwards. Questions for the memory task are generated from the registered data for display.
4. The system is accessible from all over the world, so that the results of coimagination program are accumulated.

We developed coimagination support system named “Fonobono Panel” which meets the above requirements. The system consists of a laptop computer which can communicate the remote web database for the chair of the session, a projector for displaying the images, and a screen.



Fig. 4. Coimagination Program for Older Adults Interested in Prevention of Dementia

Before starting the session, the chair of the session scans pictures into the computer and registers them for each subject. Once the session starts, the chair selects the images of the speaker. The initial window is shown in Fig. 3. On the right, icons of the participants are arranged according to the seating order. On the left, images of each speaker is displayed. In this case, three images of flowers, a bird, and a building are shown.

4.2 Coimagination Program (Event)

We designed coimagination program based on coimagination method. Typical coimagination program includes five series of sessions (Fig. 4). First four sessions are coimagination sessions. Last session is for memory task. Each session is held for an hour per week. Theme of each session is different. Average number of participants is six. There are two rounds for each coimagination session. The first round is for brief speech, and the second round is for questions and answers. Average allocated time is five minutes for each subject and round during first four weeks. On the fifth week, the session for memory task is held. Images of the series of four sessions are displayed one after the other. Subjects guess the owner and the theme of the collected images.

4.3 Human Resource Development Program of, by, to the Older Adults (Human)

We propose human resource development program for coimagination program. Instructors of the program were older adults in Kashiwa city, Japan, who have been working with the inventor of the method. The curriculum of the program was designed so as to bring out social intelligence of the students. The program was divided into two parts. In the first half of the program, students participated in the coimagination program, and practiced interactive conversations. In the latter half of the program, students conducted coimagination sessions as moderators, score keepers, or reporters (Fig. 5). We found that social intelligence of the students improved through attending and conducting coimagination sessions during the program.

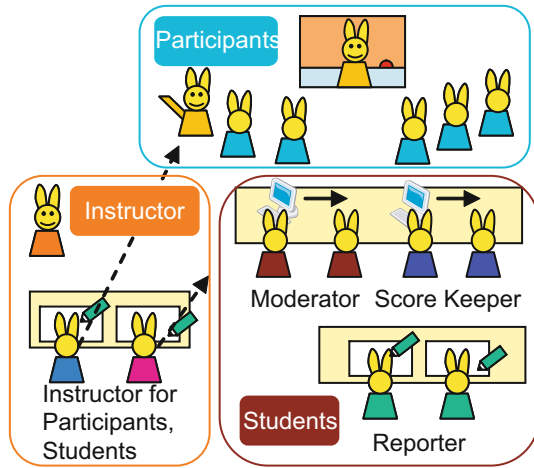


Fig. 5. Role of Instructors, Students, Participants of Human Resource Development Program



Fig. 6. Instructors and Students of Human Resource Development Program

Our first human resource development program aimed to train potential instructors with “social intelligence” started from fall 2008. It consists of 15 classes, each class for 2 hours with lectures and practices, and took about six months (Fig. 6). It was found that it was too long for two parties, both students and instructors. In order to solve the program, we designed a new short-term introductory course of coimagination, which is expected to bridge its graduated students with strong interests to a typical coimagination program.

Our first short-term introductory course of coimagination opened in fall 2009. It consists of 3 classes, each class for 1 hour and a half. Two of the classes are lectures, one of the class is a practice in order to learn through doing. In order to find and recruit motivated people among the students, we found our new method to be effective. In our newly designed course, a circulation of service receivers

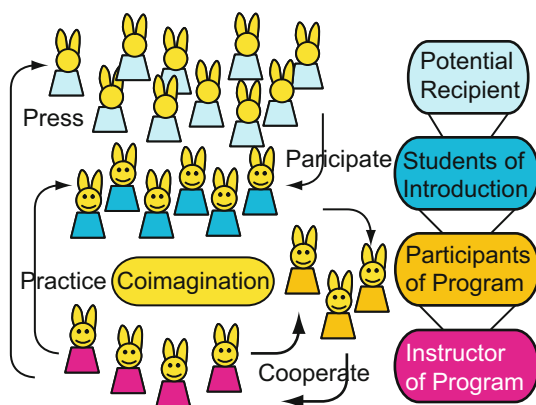


Fig. 7. Sustainable Delivery Method for Support Service for Prevention and Recovery from Dementia Organized

into service providers is expected, which ensures the sustainable human resource development (Fig. 7). Currently in fall 2010, 5 among 36 graduates became citizen researchers or in training.

4.4 Fonobono Research Institute (Network)

In order to organize instructors of programs and to coordinate multiple sectors for implementation of services, we established “Fonobono Research Institute”, a multisector nonprofit research organization including older adults living around university campus, companies providing welfare and medical services, local government, medical institution, researchers of the University of Tokyo and Keio University (Fig. 8). Research project of Fonobono Research Institute was established in July 2007. We established an incorporated nonprofit organization of Fonobono Research Institute in July 2008 for running research project. Government and News Media involve in research project and not involve in an incorporated nonprofit organization for fairness. Older adults who are interested in prevention and recovery from dementia and social action program can participate an incorporated nonprofit organization rather than research project by membership system for supporters and instructors.

4.5 Lifestyle of Lifelong Research (Style)

Lifelong study is popular among retired people. However, learning is a consumption of knowledge whereas research is a production of knowledge. Older adults may contribute to society effectively if they are engaged in knowledge creation activities. Therefore, we propose the novel lifestyle of “lifelong research” rather than “lifelong study”. Core members of the Fonobono Research Institute are named “citizen researchers” (Fig. 9). They embody the lifestyle of lifelong research through daily research and development activities of service creation.

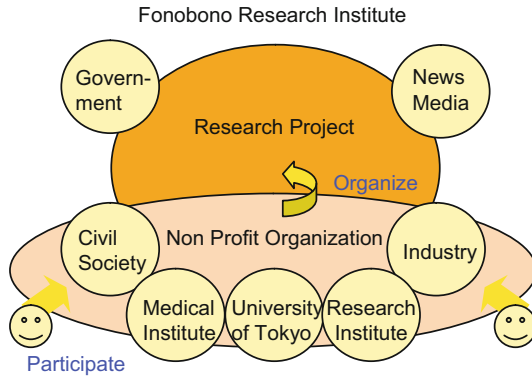


Fig. 8. Fonobono Research Institute: Multisector Organization of Civil Society, Industry, and Academia collaborating with Government and News Media



Fig. 9. Citizen Researchers and Director of Fonobono Research Institute

They develop and provide coimagination program, human resource development program, and organize Fonobono Research Institute. The citizen researchers presented their studies at the Annual Conferences of the Japanese Society for Artificial Intelligence every year in 2008, 2009 and 2010. Above all, the citizen researcher at the age of 84 presented in the first year of 2008, and encouraged other researchers through his spirit of challenge (Fig. 10).

4.6 Second Social System for Older Adults (Rule)

Older adults after retirement used to enjoy rest of their life with amusement and entertainment. It has been possible when the ratio of retired people in the society is vanishingly small. Recently, the percentage of people over 65 years old exceeded 20 %, and may become around 40 % in the year 2050 in Japan. Collapse

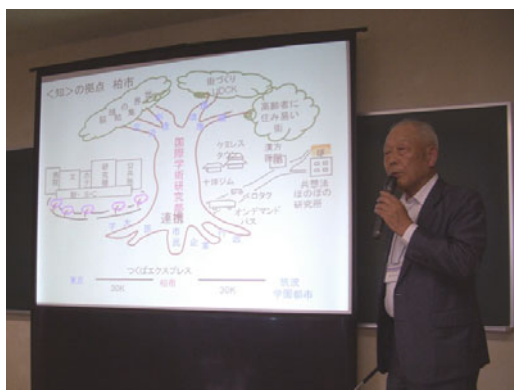


Fig. 10. Citizen Researcher who presented the Studies at the Annual Conferences of the Japanese Society for Artificial Intelligence in 2008

of social security system has become a real issue. The same situation may occur in developing countries as well as developed countries in the near future. However, retainment of older adults in the existing labor market narrows the opportunity of younger adults to enter into it. We propose that we develop the second social system and hopefully in the future, novel labor market consisting of older adults over 65 years old. With this innovative system, older adults and younger adults can coexist and co-prosper. Service for prevention and recovery from dementia is one of the prospective candidate for the second social system.

5 Discussion

The service which we are developing is bidirectional and co-creative. It amplifies through the interaction between service receivers and service providers, as well as service receivers and service providers. In our service, service receivers attain service by actively participating communication, and influence other service receivers. Therefore, one service receiver plays a role of service provider for surrounding service receivers at the same time. If the design of the service system is successful and all service receivers are motivated, service receivers can receive service more than service providers prepared beforehand. Other service elements, tool, event, network, style and rule may help service receivers. We need to investigate the conditions so that all service receivers play roles of service providers as well to guarantee effectiveness.

It is reported that participatory approaches to research and evaluation is growing, particularly in public and social policy areas, and especially in relation to health and social care[7], and older adults are included in the whole processes of research[8]. In this study, older people play more innovative roles to both research and provide services concurrently.

6 Conclusion

In this paper, we proposed multiscale service design method which enumerate six elements of services, namely, tool, event, human, network, style and rule, and implement concurrently. We showed how to utilize this multiscale service design method with the case study of service for prevention and recovery from dementia based on coimagination method. Coimagination support system and program were developed as “tool” and “event”. Then, Fonobono Research Institute was established as a “network” for “human” who studies coimagination, which is a multisector research organization. The institute proposes and realizes lifelong research as a novel life “style” for older adults, and discusses second social system for older adults as an innovative “rule” for social system of aged society. We successfully developed innovative service system from scratch utilizing the multiscale service design method. Future work includes service operating method for sustainable and evolving services which can meet future needs with uncertainty.

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