A Study on Co-design Tool Efficiency of the Aged and the Underage

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Abstract: Objective: The co-design workshop that the aged and the underage participants. Based on a co-design workshop, efficiency of co-design tools was evaluated by researchers and participants; and, the workshop has been designed targeted at the smartphone APPs used by the aged and the underage populations. **Method:** In this paper, 6 co-design tools were selected and 1 group of the elder people aged between 68 and 91 and the other group of young people who are 6-10 years old were selected as research objects. Besides, another group of participants between 20 and 22 years old was also recruited as a contrast group. A workshop system process that has been designed was adopted to perform 3 workshop practices. **Result:** After efficiency of co-design tools has been evaluated dependent on the workshop, it has been found that it is extremely difficult for both the aged and the young to use some of these tools. **Conclusion:** Although co-design has the capacity to assist researchers in sharing creativity with aged and young populations and solving design issues, relevant tools should be utilized according to characteristics of participants; besides, they may even need to be upgraded.

1. Introduction

In the past, researchers and designers took advantage of user interview and focus group, etc. to translate users' demand for service, products and experience, based on which, optimal design direction was obtained. [1] Nevertheless, co-design tools have been adopted by them in recent ten years to directly stimulate creativity of users and guide them to create new service, product and experience solutions. [2]

In the entire creative and tentative process of co-design, three elements of participants, researchers and tools affect mutually and determine the final design result jointly. To be specific, while co-design participants are people employing tools to take part in co-design and provide creativity under the guidance of researchers according to cognitions and life experience of them as users, co-design researchers have the responsibility to manufacture and improve tools in addition to leading participants described above into completing co-design and collecting information. Sometimes, responsibilities of the researcher and the designer are assumed by the same person or individuals in an identical group. Professional skills in the design field can assist researchers to invent and use tools in a more accurate manner. As a link between tool researchers and participants, co-design stimulates creativity of participants and then conveys information containing creativity to researchers. A good tool is not only recognized to user friendly by participants, but researchers can utilize it to acquire proper information.

For the past few years, co-design tools have been extensively investigated, covering the invention of new tools and improvements of old tools. By contrast, no literature can be found in terms of evaluations on tool efficiency. As for this paper, it aimed at obtaining the efficiency of co-design

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tools used by populations of different ages in conditions of stable environment, fixed design aids and the same researcher.

2. Frame of Workshop

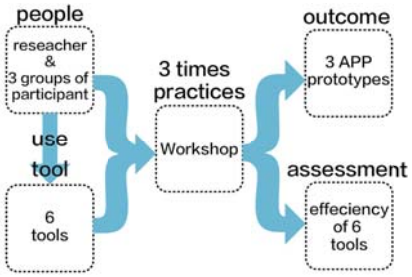

Fig. 1 The Co-design workshop process

As shown in Fig. 1, frame of the workshop is as follows. Through collaboration between the researcher and 3 groups of co-design participants utilizing 6 categories of co-design tools selected, 3 workshops of different themes were performed to gain 3 diverse APP prototype design schemes and simultaneously measure efficiency of these tools. Such a frame design has been implemented in 3 different groups of co-design workshops according to such a process to ensure uniformity of the environment and relevant conditions during the study. Among 3 groups of system design participants, 2 of them were those of the aged population and the underage people respectively. As for the last control group, it was composed of the young between 20 and 22 years old. Although 3 APP prototypes have been produced by workshops, the most important thing was evaluation on the efficiency of 6 tools.

3. Participants

3.1 Aged and Underage Participants

Tab.1 Workshop information of aged and underage participants & normal group participants

Workshop	Topic	Participant amount	Details
01 Aged	Design for aged	21	Old man live in YANJI nursing home and NANHUI nursing home（68-91 years old）
02 Child	Design for child	9	YANJI Community summer schools students （6-10 years old）
03 Normal	Design for girl	36	Volunteer from college（17-20 years old）

According to Tab. 1, workshops 01 and 02 are experimental groups in which the aged and the underage populations take part in. In this study, the aged was defined as people who have been or are being subjected to the influence of aging, such as biological aging (i.e., visual deterioration, hearing loss, muscle atrophy, cutis laxa, fat tissue deposit & cardiovascular dysfunction, etc.), psychological aging (i.e., learning, memory and recognition ability decline, & senile dementia) and social ability aging (i.e., loss of the ability to pay attention to and learn about new things; even considered being

incapacitated and losing part living competency). The age of participants selected ranges from 68 to 91.

Children are defined to be people who have lived through infancy but cannot be deemed as adolescence. In this phase, learning, memory and recognition abilities of most children are still under the mean level of adults. [3] Participants selected are 6 to 10 years old.

3.2 Participants of Control Group

Workshop 03 was a control group for which young volunteers were recruited from schools as its participants. After a lecture less than 30 minutes, almost all these young people can access such 6 tools without any obstacle.

4. Tools

4.1 6 Tools

Fig.2 6 Tools and its function of the workshop

As presented in Fig. 2, 6 tools are applied into workshops in conformity with certain procedures and orders. The reason why they were selected was that such tools represent different functions at different stages and cannot be replaced mutually. While, storytelling and group sketching can be used to explore demands, affinity diagram and mind map to settle the logic, rough prototyping to express concepts and role play to reproduce scenes. [4] To fit with the design theme of each workshop on the whole, certain sub-subjects were put forward by the researcher when these tools have been put into use.

Fig.3 Group Sketch of workshop 02: I use phone like this when summer holidays

A. Group sketching. Dependent on Fig. 3, group sketching is applicable to sketch participants' visions of products and relevant experience. Moreover, nearly boundless discussions and imagination within the scope limitation over products are realized. In this case, group sketching simplification not only further lowers participation difficulties of participants, but is tremendously beneficial for those who are shy. [5]

Fig.4 Story telling of workshop 01: I use mobile phone this way

B. Story telling. In Fig. 4, storytelling serves as an approach to gain insights on one hand; on the other hand, it is also incorporated into user experience and becomes a part of the brand, in line with the user experience story telling theory system proposed by Quesenbery W. [6] Most information conveyed by storytelling are users' understanding of their life experience and links between such experience and products. In this paper, users of storytelling addressed important ways to satisfy their own demands.

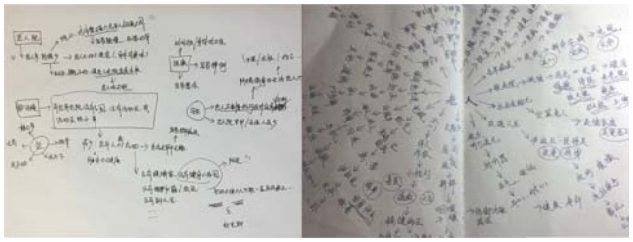

Fig.5 Mind map of workshop 01: I am an old man like this

C. Mind map. As shown in Fig. 5, mind map is applied into this study to search solutions to corresponding demands. Firstly, all problems and difficulties were listed, which was followed by looking for appropriate solutions to these problems and difficulties. Eventually, a logically related cluster was formed by them that is a unique thinking system. [7]

D. Affinity diagram. In this paper, affinity diagram played a major role in classifying and combining demands, which could be carried out based on information gathered during applications of storytelling and group sketching.

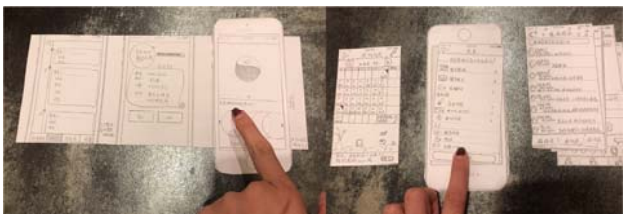

Fig.6 Rough prototype of workshop 03: wo-men APP / Mimi APP

E. Rough prototype. In Fig. 6, a simple hand-painted protograph was utilized as the rough prototype in this paper. It was delivered to participants who simulate the usage of this APP. During the simulation, researcher should obverse this course and then communicate with participants after completion summarizing defects and strengths of such an APP rough prototype.

Fig.7 Role play of workshop 03: A day of new fresh office lady

F. Role play. Service experience was simulated by participants, designer or researcher, as shown in Fig. 7. By changing some potential conditions of partial functions, specific scenarios of service were maneuvered for multiple times; or, they could be practiced by switching roles. In this way, the way for diverse behavioral approaches and scenarios to affect behaviors was discovered.

4.2 Tool Efficiency Evaluation Strategy

Tool efficiency evaluation was conducted after all participants have adopted these tools in line with two evaluation data of adaptation and feedback. The following two rating scales were designed according to the Likert scale and full mark of each was 5. The score of tool adaptation was graded by participants with an aim to acquire their comfort levels and learning difficulties at the time of using these tools. [8]

Tab.2 Tool adaptation rating by participant

1 score	The tool is too bad. I don't know the meaning it conveys.
2 scores	The tool is bad. I am not sure about the meaning it conveys.
3 scores	The tool is just so-so. It can conveys my meaning sometimes.
4 scores	The tool is ordinary and has the ability to convey my meaning.
5 scores	The tool is easy of use and can accurately convey my meaning.

Tool feedback was rated by the researcher for the purpose of gaining both quantity and quality of valid information collected by the researcher who has adopted such tools.

Tab.3 Information feedback rating by researcher

1 score	The tool is not applicable at all, because participants cannot understand or coordinate with it.
2 scores	The tool is not applicable, because it is rather difficult for participants to understand or coordinate with it and only a few data and a little information are obtained.
3 scores	The tool is just so-so, because only limited data and information can be obtained although some participants can coordinate.
4 scores	The tool is applicable, because not only can a majority of participants coordinate, but data and information obtained are of great use.
5 scores	The tool is easy to use, because almost all participants can coordinate and massive high-quality data and information can be obtained.

Ultimate tool evaluations were respectively conducted according to such two evaluation standards, accompanied with relevant cause analysis.

5. Workshop Results

5.1 APP Prototype

Fig.8 Part of prototype of 'come back'

Workshop 01 finally manufactured 3 APP prototypes, namely, *Phone Call from the Elder*, *Parents Tracking* and *Return*. POP prototype of *Return* was one that could be tested in the mobile phone by its touch screen, which was very close to the final form of such products. After the end of workshop 01, 20 volunteers aged between 19 and 41 were invited by the researcher to try out and subsequently join satisfaction evaluation constituted by 10 questions. Under the circumstance that full mark of such an evaluation was 5, the APP obtained an average score of 4.1. [8]

Instead of providing specific service items for the elder or their families, *Return* aimed at reminding users of the finitude of life by virtue of the voice, images and notification bars of this APP. Regardless of the aged, pets or children in a family, spatial-temporal separation comes definitely. Maybe, taking every day and every moment spent with our families seriously is the best method of relieving anxiety and preventing regret. As regards workshops 02, 03 and 04, while the former produced 1 APP prototype, 2 APP prototypes were separately manufactured by the latter two. [9]

5.2 Tool Efficiency Evaluation

Tab. 4 Efficiency rating scale of Co-design tools

rating/tools	Story telling	Group sketching	Mind map	Affinity map	Rough model	Role play
			Group of the aged			
Adaptation	3.7	0	3.3	2.9	2.0	0
Feedback	2.8	0	2.1	3.2	1.9	0
			Group of children			
Adaptation	2.9	3.1	2.7	0	3.8	0
Feedback	2.8	2.6	2.9	0	2.9	0
			Control group			
Adaptation	3.7	3.1	3.9	4.1	3.8	3.6
Feedback	3.5	2.8	4.0	3.9	3.5	3.8

Based on Tab. 3, data given in this tool efficiency rating scale were analyzed as follows.

Child participants (hereinafter referred to as children) were most adaptive to the rough model. The reason is that its use procedure is similar to utilizing toys to play "playing house". Unfortunately, as expression abilities of children were still below those of adults, feedback of this model was limited. What takes the second place is group sketching. However, some children portrayed contents out of the range of relevant subjects, which results in a feedback score graded at 2.6. Subsequently, tools

generating an extremely low adaptation to children were story telling and mind map, because stories told by children were inclined to be logically leaping or logically mistaken leading to the failure in forming information with logic chains. Conversely, feedback rating of mind map featured with simple sentences was higher than adaptation through researcher's interpretation and supplement. Tools with children's adaptation rating of 0 were role play and affinity map as more than half of these children were incapable of understanding their usage modes. Generally, strong representational understanding but weak logical thinking abilities have been reflected by children. Therefore, tools that are presented in a representational form are suitable for children.

Story telling is the tool most adaptive to the aged participants (hereinafter referred to as the aged). Nonetheless, the relevant feedback rating was low due to too much useless information conveyed, so that a high deviation value of 1.1 has been incurred. Concerning them, the tool of rather high adaptation rating was mind map, despite that relevant contents should be written by the researcher on behalf of the aged, which was caused by a high illiteracy rate and writing ability degradation. In addition to mind map, the aged was also favorably adaptive to affinity map. Through interpretation and supplement from the researcher, feedback rating of the latter was otherwise above adaptation. That producing extremely low adaptation rating was rough model and some of them even refused to use "toys made of paper". Tools with the adaptation rating at 0 were role play and group sketching. Almost all of the aged rejected to take part in physical performances required by the group sketching. In general, the aged showed a strong verbal description competency, but a weak logical thinking ability. Thus, it can be summarized that tools employing language as their carrier or presenting something in a paper form by translation based on language are appropriate to the aged populations.

No matter children or the aged, their tool usage efficiency was lower than that of the control group. This is incurred by differences in cognitive competence of them.

6. Conclusions

Firstly, workshop practices prove that APP prototypes of favorable evaluations effects can be achieved by solutions of the design targeted at the aged and the underage users dependent on co-design that those populations take part in.

Secondly, it has been found through workshop practices that exertion of tool efficiency relies on cognitive models of participants themselves, especially the aged and the underage populations. In this case, tools should be customized according to actual situations of participants. By virtue of such a pattern, tools can be constantly used and iterated to improve their efficiency in a spiraled manner. [10]

Thirdly, understanding of service design and experience design was inclined to products in the past, that is the function these products give play to in particular scenes and time. Nevertheless, more emphasis should be laid upon experience itself today when it is much likely for processes of enjoying service and gaining experience may to become precious emotional experience of a single individual or a social group. In the future, emotion guided by experience may be one of those more important missions assumed by user experience design. [11]

Looking back to researches performed by predecessors, it can be found in the process from product innovation to experience innovation and further to service innovation that researchers and designers keep updating their definitions of design while pursue creativity and solutions constantly together with repeated improvement of relevant tools and methodologies. Additionally, they also continuously explore various approaches that can be adopted to stimulate creativity. In other words,

these researchers and designers attempt to solve each practical problem in our daily life in diverse ways.

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