

Digital Co-Design: A Future Method?

Lei Shi
International Digital Laboratory
WMG, University of Warwick
Coventry, United Kingdom
lei.shi@warwick.ac.uk

Carolyn Dawson
International Digital Laboratory
WMG, University of Warwick
Coventry, United Kingdom
c.h.dawson@warwick.ac.uk

James Mackrill
International Digital Laboratory
WMG, University of Warwick
Coventry, United Kingdom
j.b.mackrill@warwick.ac.uk

Elisavet Dimitrokali
International Digital Laboratory
WMG, University of Warwick
Coventry, United Kingdom
e.dimitrokali@warwick.ac.uk

Rebecca Cain
International Digital Laboratory
WMG, University of Warwick
Coventry, United Kingdom
r.cain.1@warwick.ac.uk

ABSTRACT

This paper reports on a study assessing the use of a digital co-design method for use in hospital design. Here we present findings on users' perceptions towards ease of use and behavioural intention of using a digital co-design method in comparison with using a paper-based co-design method. The study was conducted in a simulated hospital ward. The results showed that participants found limitations with the current iteration of digital method negatively affected their perceptions regarding ease of use compared to the paper-based method. However, behavioural intention showed a positive trend towards future selection of digital-based methods over paper-based methods. Future work will look in depth at what features of the digital method require improvement to enhance perceptions of ease of use in order to respond to end-user behavioural intentions.

Categories and Subject Descriptors

H.5.1 [Information Interfaces and Presentation]: Multimedia Information Systems – *Evaluation/methodology*.

Keywords

Healthcare environment; co-design

1. INTRODUCTION

The user-centred design methodology of co-design [1] has become increasingly used within a variety of sectors including healthcare. Co-design involves stakeholders in solution development, often through the use of paper-based methods, which can be widely used to collect user opinions on a given topic. It does have, however, some drawbacks. One concern is that participants may be put off from engaging with traditional paper-based methods as digital devices are perhaps more appealing as they are more embedded in daily life. Thus, the use of traditional

paper-based methods might negatively affect participants' behavioural intention towards participating in a co-design process and impinge on project objectives.

This study used a controlled environment to test a current bespoke digital co-design technology in comparison to a paper-based approach. The aim was to understand where differences between the two approaches lie in an effort to optimise co-design methods in the future. This paper focuses on 1) participants perceptions on ease-of-use of digital and paper methods, and 2) participants' behavioural intention of using the digital method, in comparison with using a paper-based method.

2. METHOD AND PROCEDURE

This study was carried out in the 3D Sound Room laboratory at the University of Warwick. The Sound Room was used to provide an aural and visual simulation of a cardiothoracic (CT) hospital environment thus allowing increased control for the study. Twenty-six computer science, math and engineering staff and students (17 males, 9 females; mean age 30, s.d. 4) participated in the study.

A repeated measures study design was used. Participants were asked to sit in the Sound Room (Figure 1, left) and use the co-design method (paper or digital on alternate weeks) (Figure 1, middle and right) to submit their opinions of improving four CT ward areas including the patient bay, the ward corridor, the entrance to the ward, and the view outside the ward. Both methods were designed in the same format as much as possible i.e. using the same CT ward area images, asking the same questions, and using the same colour and layout. Additionally, the participants were experiencing the same aural and visual CT ward simulation when performing each task. This was to control independent variables.

Sixteen participants completed the co-design task using the paper-based method first, and then, one week later, they completed the same task using the digital method. The other ten participants used the digital method first followed by the paper-based method after a one-week gap. Counterbalancing in this way controlled for order effects. The one-week gap was used to control demand effects.

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Figure 1. The 3D sound room (left), the paper-based method (middle) and the digital method (right)

After the participants completed the co-design task, they were asked to specify their level of agreement or disagreement on a five-point agree-disagree Likert scale for 17 questionnaire items in 4 categories:

Perceived Usefulness:

- PU1.** The method helped me to understand how to design the healthcare centre.
- PU2.** The method engaged me to participate in the healthcare centre design.
- PU3.** The method inspired me to design the healthcare centre.
- PU4.** The method assisted me to express and record my ideas.

Perceived Ease of Use:

- PE1.** The method was user-friendly.
- PE2.** The method required the fewest steps possible to accomplish what I wanted to do.
- PE3.** It was easy to learn how to use the method.
- PE4.** It was easy to remember how to use the method.

Satisfaction of Use:

- SU1.** The method was attractive to use.
- SU2.** The method was fun to use.
- SU3.** The method was pleasant to use.

Confidence of Use:

- CU1.** I felt confident to interact with the method.
- CU2.** I felt confident to contribute to the healthcare centre design.
- CU3.** I felt confident that the method recorded my contributions.

Behavioural Intension:

- BI1.** I would use the method again for the healthcare centre design.
- BI2.** I would use the method frequently for the healthcare centre design.
- BI3.** I would tell other people about the method.

This questionnaire was designed based on previous work [2]. Free-text comments were also collected, with participants asked about how they would improve each method.

3. RESULTS AND DISCUSSION

After normality of the data was established results were analysed using paired samples t-test using IBM SPSS 22. Perceived ease-of-use recorded a significant difference; (**PE1.** ($M=0.77$, $SE=0.35$), $t(26)=2.21$, $P<.05$, $r=.32$); **PE2.** ($M=0.58$, $SE=0.24$), $t(26)=2.36$, $P<.05$, $r=.80$; **PE3.** ($M=0.54$, $SE=0.17$), $t(26)=3.04$, $P<.05$, $r=.54$).

Thus, participants perceived the paper-based method easier to use than the digital-based method. However, qualitative data from free-text comments suggest that participants may have been influenced by usability limitations of the version of digital method. Participants suggested a need for greater processing speed, more functions, and better graphics. Such limitations may have hampered the perceived ease of use of the digital tool. Interestingly, behavioural intention to use the digital tool did not seem affected. Findings from BI questions found a non-significant, yet positive trend in mean values ($M=0.65-0.77$) suggesting a preference (albeit small) towards the digital tool. This suggests that digital methods can more positively affect a co-design process than the paper-based method. The positive trend was supported by free-text comments from participants, who noted that the digital-method would be preferred, especially if usability aspects were to be improved.

Limitations of this study are noted and include participant's demographics of university staff and students – rather than hospital stakeholders, and although allowing increased control, the laboratory setting rather than use in a busy a hospital ward.

4. CONCLUSIONS AND FUTURE WORK

This paper has reported on a study assessing the use of a digital co-design method compared with a paper-based method. Results indicate that the digital method holds potential and requires optimisation for usability to be fully effective. Future work will address the limitations discussed in section 3. We have already initiated a pilot study on investigating the method use by extended demographical participants [3]. Future work will also define key requirements for the digital method in order to shape co-design in the future. This will focus on how we use notions of technology acceptance to optimise interface design and how behavioural intention is linked to this and enhanced. Optimising these two factors may promote co-design in healthcare to overcome existing and future issues in environment design.

5. ACKNOWLEDGMENTS

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