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Content Prototyping – An Approach for Engaging Non-Technical Users in Participatory Design

Maletsabisa Molapo¹, Gary Marsden¹

¹ ICT4D Research Centre, University of Cape Town, Rondebosch 7707, Cape Town, South Africa

{mmolapo, gaz}@cs.uct.ac.za

Abstract. Many in the developing world have little to no experience with computers - they have never used software as part of their daily lives and jobs, so there is always a challenge for how this class of users can be engaged in Participatory Design in a manner that the value of their participation is not limited by their computing experience. This paper looks at previous work that addressed this challenge, and introduces an approach called content prototyping, which is an adaptation of existing practices to fit the needs of non-technical users. We also discuss the lessons learned from using this approach, and give recommendations for related projects in the developing world.

Keywords: HCI4D, Prototyping, Low-Literacy

1 Introduction

One of the goals in designing new technology for use in developing countries is to design such that the technology integrates into existing cultural structures and community ecosystems, and this can be achieved by seeking guidance from people belonging to the particular cultural groups [8], and involving them in the design process through participatory design [15]. However, for people to be in a position to make such a contribution, they need to fully understand what the new technology is capable of, and be able to visualize how it may integrate into their daily lives.

These questions arise, therefore: how can we co-design new technologies with users who have little to no technology experience? What methods can be used to conduct participatory design in such a manner that users' limited technology exposure does not become a hindrance to their ability to contribute to the design process?

This paper explores answers to these questions through lessons drawn from previous work in the field of HCI for Development (HCI4D), and introduces an approach termed 'Content Prototyping', wherein we recommend that designers seek to develop prototypes that fit their users' current realm of understanding and experience, instead of typical software-based prototypes which inexperienced users may have difficulty conceptualizing. The core of our proposed method of increasing user participation is asking the question: *what representation of the design concept can inexperienced*

users relate to the best? In our case, the best representation of the design concept was the output (content) that software would produce, so we prototyped the output for our users, not the software, and designed back from output to output-producing software.

2 User Centered Design

User Centred Design (UCD) is a broad methodology based on focusing on the user from the beginning to the end of the design process, ensuring that the needs, wants, and limitations of users are given extensive attention throughout the design process [1]. One form of UCD that has gained acceptance over the years is Participatory Design (PD) [1,12], which permits joint design between the designer and the user.

The success of PD is based upon the assumption that users have experience with digital technology [9], and can appreciate what the technology can do for them. This is hardly the case for most developing world users [3,5]. Because of their limited exposure to technology, such users would not be able to contribute to the design process as they would have limited understanding of how the technology can integrate into their daily lives and jobs, much as they would not have enough computing experience against which to judge what is good or bad technology [10].

In classical PD, prototyping is used to elicit user input on design ideas, where users are presented with prototypes of differing fidelity, and their feedback is used to inform design and motivate refinement of design ideas [6]. Normally, users would be started off with low-fidelity prototypes such as paper prototypes (typically paper-based simulation of user interface elements [8]). However, previous research in the developing world has revealed that users with low computer proficiency levels have difficulty interacting with low-fidelity prototypes because: it's difficult for them to conceptualize prototypes and abstract design concepts, e.g., associating paper sketches with software [9], so they mostly misinterpret and misunderstand design abstractions [11]. This means that PD techniques must be refined to be appropriate to the (computer) literacy and experience of prospective users, so as to encourage their interest in the process and increase the value of their participation.

3 Related Work

Different approaches that have been used to encourage participation of non-experienced users in design are discussed below, which are the works based on whose guidance we developed the idea of content prototyping.

3.1 Simple Technology Artifacts with Instant Utility

According to Ramachandran et al. [14], one way of getting users with little exposure to technology involved in the design process is by introducing simple technology artifacts whose capability is immediately obvious, and presenting these to the users at an early stage in the design process. This approach helps stimulate dialog between the users and the designers within the users' context, and gives a platform for users to

easily contribute their local knowledge and expertise to the design process in a manner that they wouldn't if a typical low or high fidelity prototype were used [10]. So the introduction of simple technology artifacts with immediately obvious capability in early stages of design works better than the introduction of low fidelity prototypes at the same stage.

3.2 Scenarios of Use

When users are presented with usage scenarios of the future system within the context of their current work or daily life, it becomes possible for them to envisage the use of the technology in their existing structures, and hence they are able to participate in the design process [13].

3.3 Progressive Design: Increasing Participation Through Experience

Maunder et al. [10] and Kam et al. [7] recommend progressively improving the user's technology experience to get them ready to participate in the design process. The designers would engage with the users in their natural work environment, developing the users to a point where they are comfortable with basic technology, while also building supportive structures within their environment. The authors indicate that this approach (termed Progressive Design [4]) "would ensure the progression and development of the users' knowledge base and skill set, thereby enabling the user to better understand the technology, the benefits it offers and how to utilize it effectively....the result is an empowered, confident, motivated user that is able to actively participate in every phase of the design process," [10].

4 Context and Stakeholders

In developing countries, the shortage of health facilities and qualified health professionals is supplemented by employing Community Health Workers (CHWs). CHWs (who are textually illiterate) are trained by public health professionals who are based in rural health centers. Our goal was to assist this training process by designing a content creation model wherein the trainers would create non-textual digital content for the CHWs. We worked together with health centers in Lesotho and Sierra Leone. To understand the CHWs' training context we conducted interviews, user observation, and contextual inquiry. These were followed by persona definition (of trainers and CHWs), task analysis and the design of the local content creation model. In the content creation model, there would be a computer application developed, which would be used by trainers to create non-textual content for CHWs (using images and recorded voice), and the content would be shared to CHWs via Bluetooth when they visited the health center for their monthly training sessions. Our study of the user space revealed that most trainers have low computer proficiency skills, mostly acquainted with basic office applications and web browsers, and all the CHWs had never used a computer before, but all of them owned mobile phones.

5 Methodology

The understanding of our users' skill set led us to rethink the classical prototyping approach we had initially planned to use, which would involve designing a technology (software) that implements the content creation model, starting with low fidelity prototypes, and then going back to the trainers and CHWs with the low fidelity prototypes for them to give us feedback on the design. However, at this stage, we were unsure whether the trainers understood what the introduction of a new technology would mean for them, and how they could integrate it into their daily work. We needed to communicate the possibility of integrating a technology into the training process in a manner that they would understand and relate to [10]. Additionally, we had already established that CHWs are major role players in the flow of health information from the health trainers, via themselves, and on to the communities they serve. Therefore, we also decided that it would be important to involve them in the design process, to give them a say on the content that they would not only consume, but also distribute. Input from the CHWs would be especially valuable from a local cultural perspective. A low fidelity prototype of a computer application (even a fully developed software prototype) would not make sense to a village woman (a CHW) who had never used a computer before, and was never going to interact with the software, only the content produced.

5.1 The 'Content Prototype' Approach

We decided to postpone designing an application and introduced what we term a "content prototype" to mimic the concept of "a simple technology artifact with instant utility" [14], to develop the trainers' and CHWs' mentality to the possibility of using technology in training [4,7,10], as well as to present them with usage scenarios for digital content in their existing training process [13].

To achieve this, we would present sample content to the users, the kind that would be produced in the content creation model we had designed, and use this content as a platform to start the conversation around the idea of digital training content and the process of creating it. We envisaged that both health trainers and CHWs would relate better to digital version of the content they already knew, than a paper prototype of an application whose use they may not clearly understand.

With sample content presented first, we believed that introducing software later on would make sense to them (the trainers especially) as "a tool that creates the useful content we saw earlier". Moreover, based on the work of Ramachandran et al. [14], the expectation from this early stage prototyping using the "simple technology artifact with instant utility," the content prototype in our case, is that we would be able to attract the users' interests in the technology (in this case being the digital content produced for consumption on mobile phones), expose local attitudes towards the technology, elicit design ideas for subsequent stages in the design process, stimulate dialog between the users and the designers within the users' context, and to give a platform for users to easily contribute their local knowledge and expertise to the design process.

5.2 How Does Content Prototyping Compare to Other PD Approaches?

Content Prototyping is based on recommendations from other designers who have used PD in developing world projects, but centers on the question: *what representation of the design concept can users relate to the best?* In this case digital samples of existing content would be the best representation of the idea of digitizing available content into multimedia formats.

5.3 Creating The Content Prototype

We revisited the content used in training (image books, flash cards, posters) and translated some of it into sample digital content (mock-up multimedia content), resembling the kind that the trainers would produce according to the content creation model we were proposing. We extracted some of the images on the posters and image books and used them to create sample content in the form of “mobile videos”. Most posters and image books are made of images accompanied by a line of text that describes the concept represented, as in Figure 1(left). Per concept, we placed an image on a separate PowerPoint slide, then recorded the descriptive line in voice-over in the local language; then saved the overall presentation as a PowerPoint show. This meant that when the trainer opened the PowerPoint show, they would see, in full screen per slide, an image showing with voice-over playing. On the slides, we framed the images with a mobile phone in a person’s hand to demonstrate that the videos (series of images with voice over) would play on mobile phones.



Figure 1 - Left: A page from an image book. Right: Three PowerPoint slides, showing a mock-up video made from the image book. Descriptive voice was recorded over each slide

5.4 Introducing The Content Prototype

When the content prototypes had been created, we introduced them to the trainers and CHWs. We first held a meeting with the health trainers, where we made an introduction and then started playing the samples that were created. The day after meeting the trainers, we held a focus group meeting with 20 CHWs. We did not make the

introduction of the content in this meeting, but the chief nurse at the health center did, explaining to them what the content meant (which showed that she had understood it clearly from the meeting we held the previous day). She explained the concept in the simplest terms, and got the CHWs excited even before seeing the content. After the briefing and the playback of the content, we got into a discussion facilitated by one of the junior nurses at the health centre.

5.5 Feedback from The Content Prototype

The results of our ‘early-stage prototyping’ by the use of our content prototypes are compliant with those reported by Ramachandran et al. [14]. The sample content helped to ground our interactions with the users (both trainers and CHWs), and started a conversation about the possible use of mobile digital content, how it would be used, CHWs’ familiarity with mobile technology, etc. Seeing the mock-up multimedia version of their already existing content gave the health trainers an idea of what digital content could do for them. The mock-up content enabled them to ask more questions and express their concerns. Beyond this, we, the researchers, gained more clarity and insight from their comments for the next stages in the design process.

Feedback from The Trainers: The first opportunity spotted by the chief trainer from Lesotho was that through mobile digital content, CHWs would be able to retain information more. She recalled that on several occasions, they would give instructions to the CHWs on what to do for patients in the villages, and the CHWs would get the procedures wrong due to forgetfulness. Beyond training, she also saw the potential of the mobile digital content helping them give elaborate instructions to CHWs. While on the subject of getting procedures right, she suggested that it would be useful if the content produced would include moving pictures, i.e. videos clips. She indicated that sometimes they would wish to demonstrate a procedure to the CHWs, e.g., how to inject a patient. Apart from seeing the potential borne in the use of multimedia content, she also expressed an interest in being able to create or modify the digital content. She emphasized that for their CHWs, it would be best if the voice recordings were in the local language spoken by the CHWs. We informed her that we would provide software that allows them (the trainers) to create such digital content on their own, at which her primary concern was how easy the software would be to use.

Feedback from Community Health Workers: When asked for their opinions on the introduction of digital content, the CHWs’ main comment was that the content would be useful only when the voice is recorded in the local language (Sesotho in Lesotho). They indicated that if the content is in Sesotho, they could use it to counsel their patients. CHWs also saw the opportunity to have medical information with them at all times, seeing that the content “in their pocket”(meaning their phones), could make it easy to refer to the content in cases of emergency.

Evidence of A Two Layered User Base: The trainers saw the potential to disseminate information and instructions to the CHWs more effectively, while the CHWs saw the potential to do their jobs in the community more effectively, and the platform to share content in their communities. This revealed to us that our two sets of

users have, to a certain extent, different goals and perceptions, and that our design should embrace these differences. The content prototype enabled this revelation.

6 Discussion

The centre of content prototyping as a method is identifying an understandable artifact, which users can relate to, and use it to guide participatory design exercises. In our case this was sample digital content. The trainers of CHWs do understand the content communicated to their trainees more than they do software, so we chose to use samples of digital content to elicit their needs, interests and concerns. Seeing the content prototypes, the trainers were able to visualize how digital content could assist their existing processes, and even expressed interest in creating such content themselves, also expressing needs that we had not initially designed into the content creation model (e.g., the need to include moving video clips in the content).

This manner of content prototyping also helped engage the CHWs in the early stages of the design process; an opportunity they would not have had if our first prototype were a software prototype, or a low- or high-fidelity prototype of a computer application. The CHWs were able to contribute to early discussions and played a role in influencing the decisions made in the design. Later on in the project, the CHWs' feeling of involvement in the project also encouraged their adoption, appropriation, and ownership of the digital content, as also observed by other researchers, e.g., [2].

7 Conclusion

Maunder et al. [10] discussed the challenges of using techniques like paper prototyping with people who have limited technology experience, and along with Ramachandran et al. [14], recommend the use of simple technology artifacts with instant utility, introduced early in the design process to expose users to the technology and to elicit requirements and contextual issues from the users' interaction with the technology artifact. Other researchers recommend depicting technology usage scenarios to develop ideas around the use of the technology in everyday life, while other recommendations involve progressively preparing the user for participation in the design process by exposing them to technology bit by bit.

We adopted all these recommendations in our design, but instead of introducing a technology, we introduced "content prototypes," which were a representation of the output that a computer application would produce. This was identified as a representation of the design idea that our users would relate to the best. We learned from this that our two layers of users (content creators - the trainers, and CHWs - content consumers/distributors) were able to participate in the design process as they could relate to the content prototype.

We make a further recommendation therefore, alongside those made by other researchers whose work guided this approach, that where a technology being designed will produce a certain product, it is beneficial to deploy content (or output) prototypes and design the way back from output to output-producing software.

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