Process Tools for Interaction Design

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Abstract. In this work we describe tools that can be used to extend the *User-Centered Design* (UCD) process in its individual phases, such as user research and analysis, ideation, prototyping and usability testing. Doing so can potentially result in the three key advantages of a) involving a broader audience in the design process, b) simplifying multidisciplinary team communication, and c) providing tools that ease and speed up the development process. In this paper we are providing suggestions how such extensions, in the form of toolkits, might look.

Introduction

User-centered design and/or interaction design techniques are considered as an essential task when designing electronic products or interactive systems a stated by Buchenau et al. (2000), Lidwell (2003), Maguire (2001) and Saffer (2006). Interdisciplinary work-process models, as presented by Borchers (2001), that are not entirely engineering driven, have become more relevant in order meet users' expectations and needs. To accomplish this task and achieve a good outcome, expertise knowledge about the individual phases of UCD (see Figure 1) and techniques needs to be incorporated. However, not everyone possesses the appropriate skill-set applying UCD in their work-processes. In order to lower the participation barrier for a wider audience, we propose an approach where different process tools and methods are applied, offering possible extensions in UCD that make participation and execution easier for developers of interactive systems, unfamiliar with interaction design practices and principles. We introduce possible extensions in forms of toolkits to be applied within the user centered

design process. These toolkits are indented to possess an easy and cheap reproducibility. Doing so we propose an improved UCD model that itself potentially provides a high applicability (see Figure 3).

Plan — Understand — Specify — Produce — Carry out testings

Key Data Collection → User Research → Analysis → Concepts/Scenarios → Experience Prototype
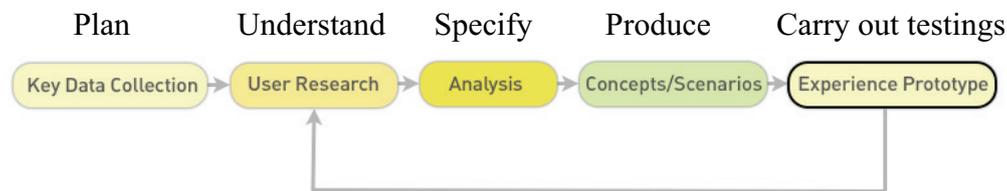
Figure 1. The UCD Process with its individual phases.

Related work

Low fidelity prototyping tools as described by Burns et al. (1994) or Hartman et al. (2008) are an integral element within interaction design practice. Buxton et al. (2007) and Tohidi et al. (2006) constantly proposed a *culture of sketching* thus, getting the design right. Svanæs et al. (2004) described a good example in their work of how end users can enrich and participate in the design process. In their workshop series, they provided different tools that empowered participants designing a mobile interactive system. Their, and other approaches, as exemplified by Snyder (2003) or Rudd et al. (1996), helped users to join the user centered design process by providing them with methods that incorporated familiar low-fidelity tools such as scissors, pen, paper, and glue. However developers are sometimes facing problems applying these methods to improve the design of a system as concluded by Greenberg et al. (2008). In contradiction to them our approach is oriented towards toolkits that provide possible starting points via pre-made elements and instructions. IDEOs (2003) method cards have been used in workshop sessions to develop complex scenarios for international clients, many designers and researchers have investigated how these tools can be developed further: Halskov et al. (2006) presented an extension of a scenario based process tool by providing inspiration cards that were related to a place or a new technology, helping designers to rapidly generate their own ideas. Wahid et al. (2009) exemplified a method that is intended to speed up the process of creating a design scenario using both high and low fidelities; their system exists as physical paper artifacts, whereas a complete digital version is online and open for extension by users. While both previously mentioned tools are intended to help designers communicating within the team, we are focusing on frameworks that would enhance communication between developers and end-users.

For a more physical fidelity experience, prototyping platforms such as Arduino (2007) or visual programming environments as presented by Koenig et al. (2010)

enable members of a wider user group to create their own experience prototypes, as stated in the work of Klemmer (2006) while the framework simplifies communication between sensors and multimedia computers, lowering the level of expertise knowledge previously required. In addition to them we want to establish tools that are also expandable by end-users, empowering them to grasp a complex, technological relationship more easily.

Tools for interaction design

In our research project, we are currently investigating exemplary tools that complement and extend each individual phase of the UCD process on both high and low fidelities (see Figure 2). In the following section, we will provide an overview from three of these tools, still in an explorative state.

Figure 2. (From left) Interaction design tools which are currently explored: (a) Sketching with Objects (artifact from a brainstorming session) (b) Paperbox 3D (ideation prototyping for a TUI) (c) Building in a Box (screenshot from the capture tool).

User research phase: sketching with objects

Sketching with Objects is a low-fidelity toolkit consisting of two-dimensional (2D) interface elements, for example symbols for screens, icons for various forms of interactions such as *Radio Frequency Identification Devices* (RFID), smart-cards, or Bluetooth. Furthermore, the kit contains various graphical elements for buttons and textures. In the initial project brainstorming, the toolkit offers a range of elements that participants can cut out and glue onto Styrofoam elements, creating early mockups of prototypes from initial ideas. These artifacts can be used during user research sessions, simplifying communication during interviews, as explaining technologically complex concepts to end users can be a time-consuming task. Furthermore, the generated artifacts can serve to focus attention on possible opportunity/solution spaces, together with questionnaires in the first informal interviews with end users regarding their needs and desires. *Playful mobile interactions in an art history context* is an exemplary project where this

tool is currently explored further, developing a new guide for an art museum, thus providing one possible process extension (see Figure 3).
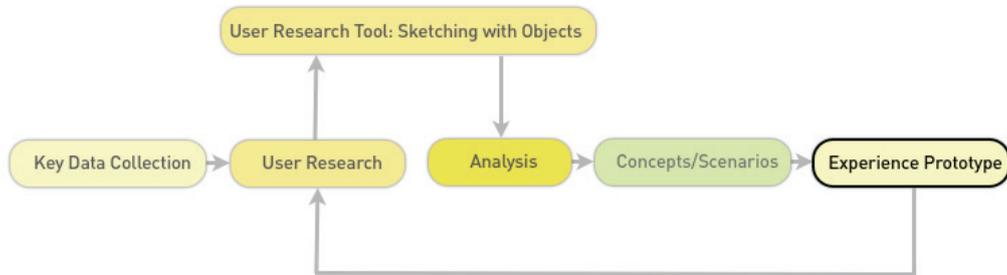
Figure 3. An UCD process model including the tool Sketching with Objects.

Concept phase: paperbox

Paperbox is a tool that is intended to be used when designing tangible user interfaces (TUIs) on interactive surfaces. Providing three-dimensional (3D) primitive models based on the theory of object recognition, a variety of geometrical icons (Geons) made out of white cardboard in different sizes serve as mediators between developers and end-users, intended simplifying communication (see Figure 2, middle). These shapes provide alternative stimuli when pre-testing different applications in this domain as well as the affordances implied by a TUI. The toolkit can be used in initial usability tests on pure low-fidelity using paper or hybrid interaction forms. End users are invited to suggest their own ideas and to express physical needs by defining appropriate affordances for mixed digital/physical interaction forms.

Experience prototyping phase: building in a box

Building in a Box is one example of how end users can easily bring in their own preferences in terms of digital content. This experience prototype consists of a mobile LED panel that can potentially be used for early content explorations intended to be later implementation on a multimedia facade. By equipping the panel with hardware and software components, for example an application that allows end users or potential clients to capture a region on their computer screen such as YouTube videos (see Figure 2, right), it is possible to translate the content to a mockup of a multimedia facade. By doing this, experience prototyping is more accessible to end-users, resulting in own ideas for content being brought into the project.

Discussion

Regarding the applicability of these tools there is the need to consider the development of a classification system. We are only providing some examples for very specialized use-cases, hence we will be only able to deliver evidence on the beneficial aspects of UCD extensions in these cases. However if development teams are working in different HCI domains, a structured framework and guidelines can possibly help re-use elements of our implementations.

Conclusion and future work

We have described three possible extensions for UCD in the form of toolkits. Considering the fact that the described work-process tools have not been fully explored and evaluated yet and are still in different stages of development our assumptions might not be verified. In the next month, we will develop the mentioned tools further and conduct user studies to elicit more insights into whether this path is feasible. Another aspect of the project that remains undefined is the question of which measurement techniques should be applied for analysis. Criteria can be based on cognitive psychology, educational psychology that focuses on the creative outcome of the process, aesthetically appealing design, or usability aspects.

Further, a standardized, digital version of these tools, incorporating a high reproducibility, can be a door-opener to communities, as extensions of these tools through a growing user group can be beneficial for the success of such systems.

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