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User Experience Qualities and the Use-Quality Prism

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Abstract
Deciding the desirable user experience qualities, i.e. UX goals, for a future product or service is important but difficult. This case study explores how a set of qualities is articulated in the concept design process. The case is a project aimed at exploring the use of smartphones to augment the childhood home of Astrid Lindgren—the children's book author—with stories about her life and authorship. The results showed that articulated UX qualities focused the design work. It was also observed that one set of desirable qualities does not fit all phases in a project, and design consequences propagate between aspects of UX quality.

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Quality in use, user experience, use qualities, experiential qualities, interaction design qualities, quality-centered design.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction
Early in an experience design project it is important to set up desirable qualities defining the user experience (UX). We aim to find viable approaches to setting desirable qualities, i.e. UX goals. Articulating design

Practical Aspects

Usefulness: Do the users have use for the product or the service, its functions and content (relevance or usability in the broad sense)?

Usability: To which degree is it comprehensible, clear, maneuverable, and easy to navigate?

Communicational Aspects

Symbolism & Identity: Does the product or the service presents the actors in a desirable way, and is appropriate symbolism used?

Cooperation & Coordination: Does the product or the service support cooperation and coordination between actors?

Organizational Aspects

Operations & Admin: Is the division of labor for administrating the product or service thought through?

Business: Is it adapted to the business? Does it contribute to the business value?

objectives regarding UX facilitates the development of a sense of direction in the fuzzy front end of design and innovation [11]. The research question for this case study is how a set of desirable qualities was articulated in the concept design of a platform for mobile augmented reality (AR) applications, and an example application based on that platform. The platform was named Minnesmark, and the example application was called Astrid's Footsteps (Swe. 'Astrids spår'). The overarching purpose of the project was to explore how mobile augmented reality (mobile AR) could be used to communicate the life and authorship of the children's book author Astrid Lindgren in the landscape around Vimmerby, Sweden, where she grew up. The project also aimed at building on principles behind outdoors education such as physical outdoors group interaction. The idea behind AR is to enhance the physical world in real-time with computer-based graphics and sound. However, this paper does not focus on our specific application of augmented reality, which is a topic covered in an earlier paper [10]. This paper aims instead to describe how the desirable experiential qualities were articulated in the concept design process leading up to that end result.

Aspects of UX Quality

We share the aim of Lim, Lee and Kim [8] to develop a quality-centered design approach, not primarily based on rationalistic methods, but rather based on a sense of quality from a designer's perspective. There are however different perspectives that designers may impose on the design situation, and those perspectives will affect what aspects they will pay attention to [7]. Being able to change perspective on what design quality is, can give a richer picture of a product or service under design. Changing perspective will reveal new aspects and dimensions of the design. The following set of aspects of design qualities in interaction design have been described before in slightly different terms [4, 5, 6, 9]. They are described here using a terminology from activity theory, and the model has been referred to as the Use-Quality Prism [2, 3].

The practical aspects of UX quality are what we normally think about when we consider a subject doing something by means of an artifact directed towards some kind of object [4, 5, 6, 9]. It is the hammer made for driving down a nail, or the image editor made for editing images. The artifact is in this perspective seen as a tool for mediating instrumental action and attention directed at a material object. The tool itself remains in the background of attention. The practical aspects can be divided into the issues described in the sidebar.

The communicational aspects of UX quality involve the role of the product or service in relation to its use towards other people [4, 6]. These aspects appear when the artifact is seen as a sign or a medium, mediating social or communicative action and attention directed at other people. This includes both direct mediation of a message, and the more indirect symbolism of what the artifact means to us and signals to others. The artifact itself remains in the background of attention, while the message or symbolism is in focus. An example could be how a subject in relation to his or her family and friends uses an image editor. The communicational aspects can be divided into the following issues described in the sidebar.

The organizational aspects of UX quality concern the division of labour and rules in a community—issues

Aesthetic Aspects

Form & Material: Is the visual and physical design, behavior, material and media format appropriately selected?

Character & Innovation: Does the product or the service has a unique and novel character and feel?

Experience of activity: Is the experience of the interaction and activity appropriate, enchanting and natural?

Ethical Aspects

Habits: What habits and patterns of behavior does the product or service contribute to, and what are the long-term consequences?

Power: What power structures does it support or overthrow—between individuals, between individuals and organizations, or between individuals and society?

Norms and ideals: Does it reinforce or tear down norms and ideals in society?

touched upon in earlier models [5, 6, 9]. It could, for instance, be if a person has been given the role of photographer at a wedding, and the image editor is then used as part of the organizational workflow aiming at creating and documenting this event. In this perspective, the artifact is like a business component mediating social or societal action directed at a community of people and its division of labor and its rules. The community of people that action is directed at can be either internal or external to the organization. This aspect of UX quality includes issues like organizational change and business models. The organizational aspects can be divided into the issues in the sidebar.

The aesthetic aspects appears when a product or service is used with the user's own experiences in focus [4, 5, 6, 9]. A person could for example have an aesthetic use of an image editor when just sitting around playing with images. The activity has then no practical purpose. In some sense the use of the application is directed towards the image, but even though the focus is on the image as an object, the end object is the user himself or herself, since it is his or her experience of the activity that is the important thing. This becomes even clearer in such cases where it does not matter which image the user is playing around with. In this perspective the artifact is hence seen as an objectified form, mediating action and attention directed at the user's own experience of the artifact. The aesthetic aspects can be divided into the aspects in the sidebar.

The ethical aspects of UX quality are about considerations in design and use concerning rules, norms and ideals [4, 5, 6, 9]. What kind of world is it that a designer wants to create? What kind of world do users and designers want to contribute to? What is OK to do, and what is not OK to do? What behaviors do we want to encourage and what behaviors do we want to avoid? For example, do we want to encourage a healthy way of life where you eat a varied diet, or do we want to encourage eating junk food? Do we want people to get up and move around more, or do we want to encourage a life as a couch potato? What kind of ideals lie behind the desirable use? In this perspective the artifact is seen as an objectified concept, mediating action and attention directed at ethical concerns. The ethical aspects can be divided into the issues presented in the sidebar.

The technical aspects of UX quality appear as a subject aims the attention towards the interactive product or service and sees it as a structure or material [5, 6, 9]. Let us say that a person edits an image and changes the saturation in the image editor, which suddenly does something unexpected. In such a situation the application becomes objectified as the person tries to understand its construction. This technical aspect is crucial during the development process, but not desirable during operational use, except in some learning situations were a user needs to learn how to use a product or service. In this perspective the artifact is accordingly seen as an objectified structure, mediating action and attention directed at the construction or material of the artifact. The technical aspects can be divided into the issues in the sidebar.

Working with the Multiple Aspects of UX Quality

It is important to put the question why for each and every issue described above. The why-questions force a designer to provide motivations for the design. The

Technical Aspects

Construction: Is the product or service technically thought through in terms of robustness, performance, skilled craftsmanship and engineering?

Technical constraints: Can the product or service be realized with reasonable cost, time and performance?

Technical opportunities: Does it take advantage of the possibilities of technology?

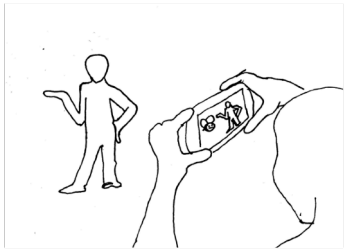

Figure 1. From the concept "Guide with virtual sidekick".

aspects are a basis for discussing thinking things through.

Design decisions based in one aspect of UX quality can propagate consequences for other aspects of the design. For example, if a designer of an image editor makes a decision, for practical reasons, to include a function for retouching a human body, it may have the consequence that all models in advertisements are made based on a skinny ideal (ethical aspects). It may also have the consequence that the function is difficult to program (technical aspects).

The idea of thinking in terms of different quality aspects has been tested in an action research project [2]. It was then used to used to analyze what has been overlooked in the design process, and it was observed that the different quality dimensions, as well as specific design qualities (i.e. correctness, simplicity, and sociability) needs to be defined in close cooperation with users and other stakeholders. It is in their situation the qualities get their meaning. Regular thematic qualitative analysis of users' and stakeholders' accounts and field notes from ethnographic work can be used to obtain a set of desirable qualities in a design project. This set can then be hierarchically ordered in a means-ends hierarchy to get a clearer picture of the objectives for the design project [1, 3].

The Case of Astrid Lindgren's Näs

The case presented here studies the concept iteration of the design of an augmented reality application with the aim at communicating the life and authorship of the children's book author Astrid Lindgren in the landscape where she grew up. The design team particularly focused on the area around her childhood home: Astrid Lindgren's Näs in Vimmerby, Sweden. The prototype developed for Astrid Lindgren's Näs became in the end a mobile AR treasure hunt.

The concept iteration consisted of three phases: conceive, construct and consider. Initial concepts were conceived in participatory design workshops. Contextual inquiries were made at places that could have something to tell using AR. The technical work also started by investigating feasibility on different platforms. Concept sketches were made based on the documentation from the workshops. In total, forty concept sketches were made. High-level storyboards were in addition made for the most promising concepts. An early coded implementation prototype was also constructed. The concept design iteration was concluded by considering the concepts in a concept selection matrix (a.k.a. Pugh charts). The basic idea of such a matrix is to compare all concepts in relation to a set of criteria and then decide which concept or concepts to continue working on.

The work in the contextual inquiries and design workshops was, together with the original purpose of the project, translated into the thematic design objectives in the sidebar.

Most of the design objectives in the list above are connected to practical aspects. They have primarily to do with the usefulness and utility of the future outcome of the project. Some communicative and technical issues are also present.

The early work also conceived objectives for how the prototype should be experienced by the users. The following qualities were extracted from workshop

Thematic Design Objectives

Augmented Reality: The project aimed at exploring how augmented reality could be used in tourism and outdoors education.

Physical Interaction: A basic principle in outdoors education.

Group Activity: Another principal of outdoors education that the design team wanted to support.

Astrid's Life & Authorship: What the design team wanted to communicate.

Folklore & Cultural History: The design solutions should be able to be used to communicate the lore and history of a place.

Biology & Nature: The solutions should be able to be used to communicate knowledge about the biology and the nature of a place.

participants' experiences of Astrid Lindgren's authorship: *Respect for the child; Empathy; Equality; Questioning of authority; Respect for the culture; Respect for nature; Curiosity; Breaking the norms*.

These desirable UX qualities are primarily of an aesthetic nature, but also ethical in their critical stance. The qualities were subsequently used in brainstorming sessions. One of them was taken up in the session and ideas around that specific objective were generated. For example, the quality of 'breaking the norms' was taken up and ideas were developed about what could be built that broke the norms and at the same time fulfilled the thematic design objectives and the purpose of the project. In this way about 40 concepts were generated. The presentation of the concepts also included which interaction design qualities they did build on. Figure 1 shows an example of a concept sketch.

Every concept was then assessed using the thematic design objectives and the five most promising concepts were detailed further in the construction of high-level storyboards (Figure 2).

Figure 2. From the concept "Show and tell".

The concept design iteration ended with considerations and concept selection. The criteria for selecting concept were also based in the original thematic design objectives and desirable user experience qualities. They were however, at this stage revised and some new criteria were added since the design team had a better understanding of the design situation. The criteria at this stage are described in a sidebar. The role of these criteria was not to drive creativity and support a divergent process as the original objectives. They rather had the role of saying "no" to particular design solutions, and hence support a convergent process.

The desired focus on the natural and cultural landscape made the design team decide that navigation in the information space should be made by walking around (place-based navigation) and by pointing the phone in different directions (device-direction-based and movement-based navigation). The design team did accordingly not want to employ too much interaction with the touchscreen, simply to decrease the focus on the screen.

Apple iPhone 4 and iOS were chosen as platform since the project team already had knowledge of the platform (an organizational issue), and it provided all the sensors needed (a technical issue). ARToolKit was used for the augmentation because of availability and cost (technical and organizational issues).

Conclusions

The research question was how a set of qualities was articulated in the concept phase of this case. The results show that qualities in the form of design objectives and desirable user experiences were explicitly articulated and re-articulated. Re-articulation

Criteria for Concept Selection

Arouse Curiosity: A new aesthetic quality.

Focus on Natural & Cultural Landscape: A combination of several of original qualities, both practical and communicational.

Communicate Astrid's Life & Authorship: The same communicational quality as before.

Support Outdoors Education: A combination of several original practical and communicational qualities.

Good Long-term UX: A new aesthetic quality.

Cost: A new technical and organizational quality.

Feasibility: A new technical quality

Viability for Recreational Business: A new organizational quality.

of design qualities was crucial in order to find objectives on the level of abstraction appropriate for every phase of the design process. The early interaction design qualities had the role of supporting a divergent creative work in concept generation, and focusing on the experience of doing things. In concept selection their role was instead to support convergent evaluation work with the goal of limiting the number of alternatives and a step back towards the motives was taken.

The UX qualities in the Astrid Lindgren's Näs case were sometimes broad and connected to the motives that drove the activity, and at other times they were more narrowly tied to goals of the users involved. When they were at their most detailed level they almost directly pointed towards the properties of a specific design element and users' operations.

The conclusion of this case study is that the work with UX qualities is present through the entire design process. Design decisions made in based on for example aesthetic grounds propagate consequences for technical or practical aspects. Articulations of design qualities are used differently depending on where in the process the design team is. One set of desirable design qualities does not fit all design situations in a project.

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