Low-Fidelity Prototyping for Collaborative User Interface Specifications

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Abstract. The paper describes a procedure for requirements engineering workshops where attendees of different expertise are guided to identify and to describe user interface requirements. Based on a workshop structure with user-centered design constraints, participants are assisted in scoping and ideation processes using low-fidelity techniques and the World Café conversation method to determine user and system requirements.

Keywords: Low-fidelity prototyping · World café · Workshop · Requirements engineering · Interface specification

1 Introduction

The specification of user interfaces (UI) is the fundamental prerequisite for the whole UI development process and highly influences all subsequent steps. To identify user demands and system requirements the perspective of both the customer and the developer is needed. Thus, user representatives as well as application domain experts, designers, and developers have to discuss jointly and reach decisions in consensus.

However, all involved parties typically have their own individual terms, use diverse representations, and pursue different objectives. UI specifications tend to be merely textual and lack a common understanding. Thus, it results often in considerable changes in subsequent development steps.

We present a novel method for UI-related requirements engineering that can be used for a wide range of applications. Therefore, we combine principle ideas of low-fidelity (low-fi) prototyping [1, 2] which is a common technique for requirements engineering [3] with the World Café method [4] that is primary used for dialogues in large groups. Our approach results in a more structured and conversational interaction, enables open discussion, links ideas between heterogeneous participants, and benefits from the collective wisdom. Our practical experiences prove the strengths of the proposed method.

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2 Related Work

Low-Fidelity prototypes, on the one hand, are an important tool for designers as well as developers to create and test designs and solutions during early design phases [5]. In doing so, low-fidelity prototypes need to be "quick to build and easy to use" [6]. The concept of low-fi prototyping is applied in software and hardware design. In [7, 8], it is shown that low-fi prototyping can be used to enable end users to design mobile systems, whereas in [9], a low-fi rapid prototyping approach is applied to build a tactile vision sensory substitution system. The World Café, on the other hand, is a creative development technique in which medium size groups generate ideas to solve a problem; usually around social issues within a particular community, such as area development policies [10]. In [11], the World Café approach is applied to the conceptual phase of design processes, during which designers try to integrate concepts based on stakeholder information. The Application of the World Café concept can also be utilized to create interactive learning environments [12]. Studies using the World Café method for requirements engineering (e.g. for game design with children [13] or for geographic visualization with a high fidelity prototype [14]) indicate an efficient and successful approach for user interface specifications.

3 Approach

Based on a series of workshops, we developed a workshop structure that can fit many different objectives, purposes, user groups, and technologies in the context of UI requirements engineering. In our approach, we use an advanced toolset based on elements of a facilitator's toolbox to enhance scoping and ideation processes. These processes are guided by the World Café method. Within four incremental sessions of structured debates, the participants are encouraged to write and draw key ideas on paper and handicraft elements, following the basics of Low-Fi prototyping. Every session provides a different perspective on UI aspects, thus allowing the actors to analyze requirements and identify specifications. Therefore, a smooth progression from an abstract point of view to concrete requirements is realized within the workshop. In the following, we present the resulting structure that describes the creative processes involved and the whole workshop as a user-centered design procedure.

3.1 Preliminary Considerations

In preparation for the workshop, the questions "What should be achieved?" and "Who can help with that?" should be answered. Therefore the overall topic needs to be outlined– i.e., the main purpose of the interface to be built. One or more goals for the workshop have to be determined and their extents clarified. The participants should be chosen according to their fields of expertise, preferably including members from different thematic areas such as designers and developers and end users. Additionally, a workshop leader, who moderates each part of the event, has to be chosen. In a preceding step, the workshop room has to be prepared by arranging the World Café tables

and laying out the tools (i.e. pens and paper). The workshop itself is designed for 6 up to 12 participants and takes from 3.5 up to 5 h.

3.2 Kick Off

The workshop leader launches the workshop with a short introduction, giving a summary of the purpose and explaining basic rules for debates. Each participant introduces themselves and their field of work shortly. Afterwards, they will be assigned to one of three groups for the following implementation of the World Café method. In our case, this means that the participants move between three tables. At each table, they continue the debates so far and in response to a set of content issues. These questions are predetermined and focus on three specific aspects of requirements engineering, with each table representing one of the main topics: (1) Data and information, (2) Users and (3) Aims of the interface. For every main topic, the ideation and scoping processes are divided into four phases. In the course of the workshop, one participant of each group acts as a designated expert for one of the topics. This person will stay at the initially assigned table throughout the whole workshop. All other participants are carrying out all phases for each main topic.

3.3 Workshop Phases

The workshop begins with the participants joining their group around one of the three tables. Within the first iteration, they are instructed by the moderator to identify relevant influencing factors for the respective main topic (1), (2) or (3). Each identified factor is written on a Post-it note and collected on the table randomly, before being sorted into groups according to their coherences (Fig. 1).

On reaching the end of the first and every following phase, the workshop leader documents each table in its current state (i.e. with pictures) and explains the next round. Participants of one group, except the designated expert, start to move to the next table. The expert shares ideas and results of the previous round with the new members.

The second iteration comprises a translation of the influencing factors into a visual grammar[1]. The members start by picking one up to three factors (Post-it), sticking it onto an element of the visual grammar and therefore creating entities. As a next crucial step, they determine the User Experience (UX) factor (e.g. simplicity or cognitive load) that plays a role concerning this entity. It is combined with the circle holding the Post-it note. Other Post-it notes are added to this entity if they belong to the same UX factor. In the end, each Post-it should be placed on one entity with a UX factor.

Within the third phase, relations between the entities of one main topic have to be identified and drawn on the table as lines between the circles (Fig. 1).

[1] In its simplest form, the visual grammar consists of nothing more than a few circular elements which the Post-it notes are placed on following the grammar rules. These grammar rules are predefined by the workshop leader. Depending on the complexity of the workshop topic, the set of plain circles can be extended by differently colored circles or other geometric items, varying in size and texture.

Fig. 1. Cooperative work within different sessions of the requirement engineering process

Once all relevant relations are marked, the groups of all three tables are reunited to start the last phase. There all participants collaborate to define entities across all three main topics and complete the requirements analysis.

3.4 Outcome and Next Steps

Once the main topics are combined in one big picture and connected to each other by the modelled relations, the actual steps of the workshop are finalized. Subsequent to the phases, participants should reflect upon what they have created in the workshop: the completeness of the requirements, the insights they have gained and if this form of collaboration is adequate for their own understanding of the tasks at hand. At the end, the workshop leader gives a summary of the results including a full list of requirements and interface specifications and closes up with a preview of the next necessary steps.

4 Benefits

Three critical factors of UI requirement engineering are addressed by the described approach: (i) Collection of design-critical information, (ii) Kick-start with Ideation and (iii) Participant's buy-in. In the following, the benefits are presented in greater detail.

4.1 Collection of Design-Critical Information

The low-fidelity prototyping methodology puts the objective at the center of all design efforts. Tasks and objectives, the specific users and user groups who have to fulfill them, and the underlying data and necessary information are connected to each other. Establishing these connections is the key to design the aimed UI experience.

With the connections between the three main topics being visible to the participants, it is easy to discover commonalities between them, e.g. all user groups have to fulfill Task A. However, specific requirements of only one user or user group are identified as well. This enables a scrum-based approach in later implementation stages. In addition, user stories can be generated quite effortlessly. The beauty of this method is that the participants gain deep insights about critical design paths to follow-up. By illustrating users in conjunction with objectives as well as information they need, an effective and successful UI design process can be achieved. The described method is distinct in the sense that participants bring-in their knowledge, needs, and experiences and basically do the 'requirements elicitation process' without really knowing it, and all by using their own language.

4.2 Kick-Start with Ideation

Often discussions in the context of requirements engineering emerge around single terms or the meaning of them. Low-fi prototyping substitutes this stage with a motivating, challenging and inspiring ideation stage. At the same time, the utilization of the World Café method creates an open atmosphere where all participants are encouraged to speak up freely and share their thoughts with the group. The massive ideation at the very beginning of the first phase necessitates full concentration and creativity of all participants.

The benefit of this ideation stage on the professional side is that key ideas and requirements are identified quickly and immediately taken further by the next group. Even more importantly, on the motivational side, clear results are produced in the first meeting and lie on the tables in a physically graspable form.

4.3 Participant's Buy-In

Communication during a software development process and interest in its progress can be key factor to failure or success. Developers, designers and end users need to be equally invested in the latter. This can only be the case when everyone has a common interest in reaching this goal, as well as a shared perception of the software's main purpose.

Bringing-in all involved parties in the first stage of the UI design step and letting them work on the requirements jointly puts them on the same page with the project. This creates a closer working atmosphere and enhances the chances of a lively exchange throughout the following processes. This situation is very effective as the personal investment in a successful implementation grows. The participants become promotors, engage in continuously improving the design and will defend the final product.

5 Conclusion

Low-fi prototyping embedded into a workshop structure based on the World Café method improves the requirements engineering process and builds an environment in which users' needs can be identified interdisciplinary. The presented approach was found to be very productive in UI requirements engineering. Especially, guiding non-UI-designers

through the process of requirements elicitation in a way that feels natural and motivational to them is a key argument. During the process, an individual common language is formed that is comprehensible to all and encourages collaboration. Using visual abstractions as prototyping elements supports early informal sketching compared to medium or high fidelity prototypes [15]. Furthermore, the World Café method as a guided procedure facilitates the concretion of interface requirements, unleashes broad support for the UI design and an adequate description of UI requirements.

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