InteracDiff

Visualizing and Interacting with UX-Data

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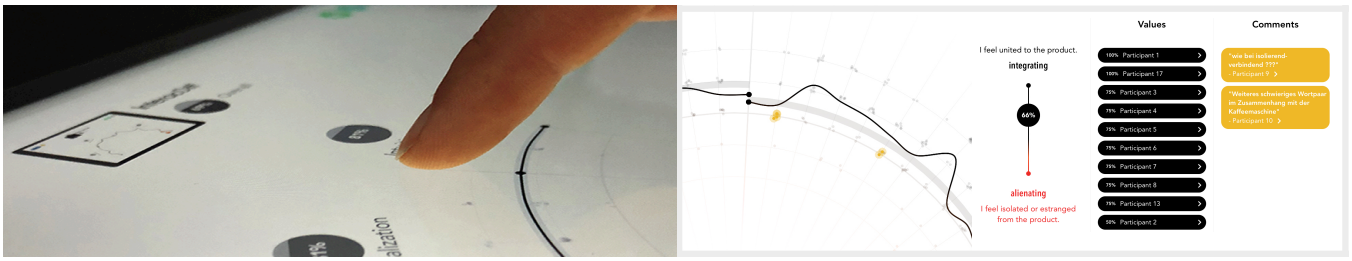

Figure 1: This figure shows the main User Interface (UI) of InteracDiff, where the Bezier path representing the main values and user comments is marked yellow. An evaluation with individual values and comments provides a quick overview.

ABSTRACT

We present InteracDiff, a prototype of a UX visualization tool that helps address the challenge of interpreting and understanding UX data after testing and evaluation sessions. We describe the development and implementation of our tool and follow with the summary findings of a study. This study was conducted with twelve novice users to examine the added value of our solution, compared to (standard) representations of user experience data. The preliminary results indicate, that participants outside the scientific community could take advantage of a more playful way to digest collected UX data.

CCS CONCEPTS

• **Human-centered computing** → *Usability testing*.

KEYWORDS

Information Visualization, UX Data, User Experience

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1 INTRODUCTION

User experience (UX) can be considered as the holistic experience of a person before, during, and after using a digital service or product [4]. To steadily improve these experiences, UX research, testings and design iterations are compulsory. Those testings can, for example, include questionnaires that provide UX data to measure a product's hedonic and pragmatic qualities [5]. The gathered UX data is often presented in a scientific format (e.g. mean value diagrams), which makes it sometimes difficult for people outside the scientific community to understand, as we have learned in our projects. However, understanding the benefits, limitations and challenges of product related UX data is an important basis for improving new services or products, that are currently under development. Drawn upon our long term work experiences in the industry, we reflected the feedback gained in eight long-term projects (12m+) in conjunction with our clients conducted in the past four years. We learned that understanding and interpreting UX data that was gathered from questionnaires can be very challenging to people with no scientific background. With that issue in mind, we developed a prototype of an interactive visualization tool that we will present in this work. InteracDiff seeks to help people in

the industry (e.g. product managers, marketing managers, CEOs) by translating collected UX data into a more playful and exciting format. In our organization, UX evaluations are usually structured following a defined work flow of three phases (task, questionnaire and interview). The aforementioned structure helps us to carry out UX evaluations in chronological orders. In the second (questionnaire) phase, we usually collect the main UX data. This data mostly relies on semantic differentials with numerical scales, which are a suitable foundation for visualizations. Our common method to evaluate the gathered data is to use an Excel spreadsheet and transfer the data to a graphical representation by hand. Based on our work experiences, this technique is not very efficient, as it incorporates one hundred participants or more and becomes almost impossible to connect individual statements and comments to individual participants in a fast and easy way. From our perspective, a shortcoming in current UX practice as the combination of semantic self-assessments and personal anecdotes. Why a participant rates a particular user experience negative or positive can help to gain deeper insights and subsequently lead to direct product improvement. Our scientific contribution in this paper is twofold: We present an interactive visualization tool that is aimed to let users view and understand collected UX data in an alternative format. In addition, based on our conducted study setup, we describe how InteracDiff helped identify individual cases (e.g. outliers), discover problems using an alternative visualizations, and draw a digital connection between semantic rating scales and individual comments. This could be beneficial when analyzing a large number of participants and performing geographic product comparisons.

2 RELATED WORK

Usability and UX Evaluation

Terms, that are used to describe usability goals are comprised to a small set. According to DIN EN ISO 9241-11,[4] and Schneiderman[12], usability focuses on effective and efficient designs. Additionally the differentiation of UX is described here as the entire experience of users, which includes the holistic experiences of users before, during, and after using a product or service. These are summarized by Diefenbach and Hassenzahl, as hedonic attributes[3]. How stimulation or identifying a products usability is perceived, has been examined by Hassenzahl et. al [6]. Their scientific tool, AttrakDiff, lets experimenters evaluate a product's entire experience based on subsets of opposite word-pairs. While their output format usually results in standard diagrammatic representations we focused on transferring this data into a more usable and enjoyable representation, derived from the domain of information visualization [14]. To visualize the collected data, we considered a differentiation between: purely scientific visualizations, which concentrate on phenomena from the real world, as well as information visualization (InfoViz), that is described as the discipline of developing efficient metaphors for the visual mapping of abstract data [10]. Relying on Kosaras' criteria for visualizations [9] we focused on the main purpose of translating the data into a format which is understandable to the non scientific community. To address this goal we designed InteracDiff by granting more exploratory (digital) freedom. Important findings/issues are therefore highlighted and help is provided to understand which information is important and in which context [1], [2].

3 DEVELOPMENT

We developed InteracDiff following a typical user-centered design process that we describe from a technical point of view in the following section [8], [11]: Our prototype was implemented as a native iOS app, using Swift. Therefore developer documentations [7] were used for standard app development guidelines and the storage and retrieval of data from a local database. To evaluate a product, users are guided through three simple steps (Figure 2): (1) Information is entered into the *ProductInformation* category (basic information about the client and the product can be stored). This feature allows users to define titles and upload pictures to link the product to a brand. InteracDiff gives the user the ability to evaluate a product multiple times, which makes it useful, if users want to compare product increments after design revisions. Next, InteracDiff (2) creates a survey definition, using elements from the *SurveyKit*, to symbolize an ongoing or new evaluation. The survey itself is composed of items (word pairs) (3). Any used items are predefined in the *SurveyKit* and displayed in InteracDiff, specified in a specified display type. This *Survey Display-Type* allows users to visualize the data differently than it is collected. Hence, it can still be customized to the users individual needs *SurveyKit*. (4) Every survey, that is completed by a user will generate a *Survey-Instance*.

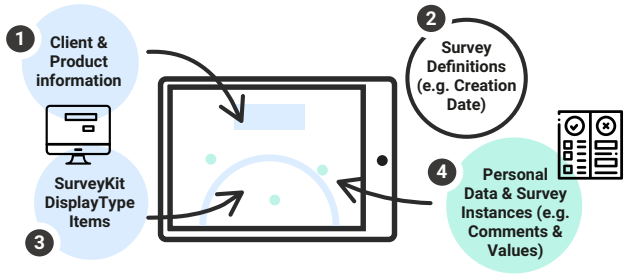

Figure 2: Surveys are based on general information and created, using a set of items, that are visualized in display types. Personal data and survey instances are based on user input.

This instance includes the user's input values and comments, in addition to *Personal Data* for each of the study's participants.

4 FUNCTIONALITY

Initially InteracDiff loads an empty graph with the information included in *SurveyDefinition*. Then the actual data is filled in, by loading all associated *SurveyInstances*. Every item (word pair) rating of each participant is drawn as a circle on a predefined grid and rendered in the 2D canvas inside the view. The graph can be explored by zooming or panning around in real time. If an item received comments by a participant, it is highlighted in yellow vs. the translucent black in the graph. Figure 3 depicts the basic functionality of the data set, which is stored on the server.

Item Categories

To convey the data as easy and efficient as possible to the user, we implemented a few extra features and concepts. For the evaluation of AttrakDiff [6], a display method was added, that aims to simplify the terms, by using them as section titles. In our previous experience we have observed that the standard categories practicability, stimulation, identity and attractiveness are hard to understand as product attributes for people outside the scientific community. To address this issue, we proposed slightly different naming for our prototype: Instead of four equally large categories, three new ones were formed, that differ in size. Two categories, *Practicability* and *Attractiveness* remained, while the other two (forming the hedonic qualities) were combined into the funnel category *Quality and Feelings* that spanns all 14 items of *Stimulation* and *Identity*. The original word-pairs of the AttrakDiff questionnaire were not modified. Through this step, our aim was to create a more holistic understanding and a digestible approach in our intended target user group.

5 EVALUATION AND STUDY-SETUP

To identify problems, limitations and opportunities for InteracDiff, twelve participants were invited to test the tool, through a combination of several standard methods for product inspection: Users had to carry out different tasks with the application using the think-aloud protocol.

Next we conducted semi structured interviews combined with UX/Usability questionnaires. To capture the users actions and emotions during the tasks we used the eye tracking recording equipment Tobii Glasses 2. None of the twelve participants had no prior experiences with UX evaluation or similar methods, nor were they familiar with any UX data evaluation tool. However, they were highly experienced in the development of touchscreen operated devices, which intended target group. Two were female and ten male. The

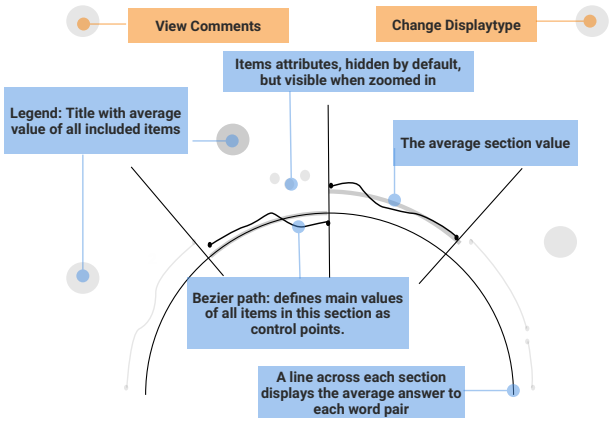

Figure 3: The app provides an UI for manipulating the visualization of the data in real time.

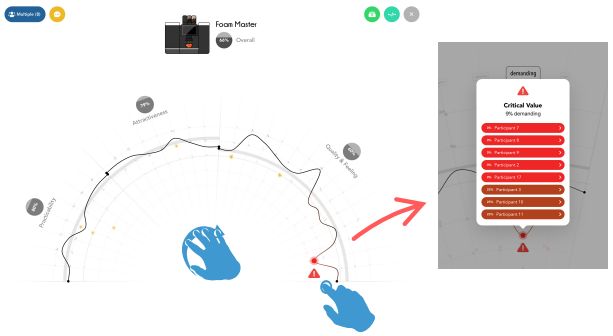

Figure 4: Pop-ups provide further information on rating, comments, peaks or other irregularities in the data set.

users were between 27 and 54 years old and all had a professional engineering background (e.g. project managers). As a task the users needed to find uncertainties in the presented UX data and compare the different visualization methods, the printed version [6] and the InteracDiff application, directly against each other. Therefore the types displayed the same word pairs but using different terminology and categorization. Usability and intuitiveness were assessed using the INTUI questionnaire [13].

Results

Figure 5 shows the final aggregated results of our UX tool evaluation. Overall the participants gave positive feedback on the intuitiveness and appearance of the app, which is reflected in the bar graph under the category "Effortlessness (3.97)". Users were able to reach their goal easily and could orient themselves. However, the value (3.6) of "required

my close attention - ran smoothly" showed that the mental workload using the tool was still high. Half of the participants stated, that they found it easier to scan, discover and filter product relevant information using the our tool. However, five participants preferred using paper to get an initial overview of all word pairs. The eye gazing results showed, that the category legends above the graph were used as general anchor points, in particular during movements in the graph. Most of the participants looked at icons more frequently and therefore took less time reading text (e.g. the alert icon before reading the connected text below). During the follow up interviews, the participants provided valuable feedback regarding concepts, features and further improvements, such as "filtering functions" for participants and storage of personal information (e.g. age or product experience) to enable the evaluation of products using different user groups and comparisons.

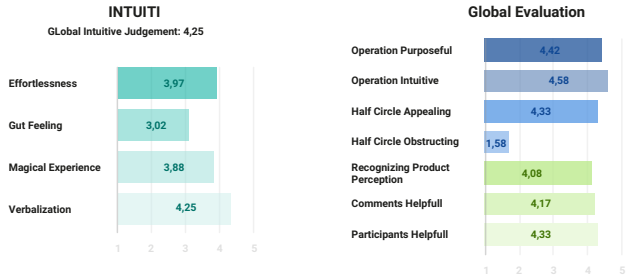

Figure 5: (left graphic) Evaluation of the INTUI categories based on [13]. (right graphic) Evaluation of given statements answered with gradiations between fully disagree (1) and fully agree(5).

6 DISCUSSION

Considering our conceptual approach and our prototype implementation, combined with a first round of user testing and feedback, we see the potential for InteracDiff to offer benefits to people (i.e. product managers) who prefer a more interactive and playful way to view UX data. The clean and reduced design might prove beneficial for users not being familiar with scientific representation formats. However, there is still room for improvement, as we are currently in a prototyping state, that needs to be enhanced with a clearer access in viewing the collected UX data. Our approach shows tendencies that it provides a high degree of flexibility, especially when investigating the qualitative feedback participants gave in connection to their semantic self assessments. We aim to evolve and substantiate our approach of visualizing UX data in alternative formats. However, these results have to be further validated with real users in an extended study with larger data sets to gather further insights into the suitability of our approach. In summary we consider the following benefits and limitations with regard to the current state of our prototype and conceptual work.

Benefits:

- Our work is based on a new, playful and flexible interaction concept.
- The tool offers an easy approach to visualize UX data in alternative formats.
- Our prototype enhances current methods by collecting UX data (qualitative and quantitative) in a single tool.

Limitations:

- The usability of our tool requires to be improved regarding clearer visual indications for a faster evaluation.
- Our prototype still requires a high cognitive load.
- UX summary categories must be evaluated with psychologists to strengthen the scientific approach.

We made efforts to propose a prototype version of a novel UX tool, that potentially improves the accessibility of UX data to other target groups. However, InteracDiff has been developed for our industrial purposes and clients and therefore needs to be improved further, both from a technical point of view with regards to features and options that support the ease of use, and also on a more user experience theory basis that includes the tested categories and their connections. Despite the given limitations we consider our state of development as a profound basis for future works and subsequent technical and conceptual implementations.

7 CONCLUSION AND NEXT STEPS

Our work presents a novel, interactive form of UX information visualization. We have developed an interactive prototype, targeting users of the non scientific community. The conducted rounds of UX/UI testing of our prototype application gave valuable insights into the current user experience and perceived usefulness of InteracDiff as an additional tool. Preliminary findings show, that our software can be considered a feasible solution to help novice users understand UX data in a more playful way so they can digitally connect quantitative ratings with qualitative statements. We consider our tool to be a basis for continuing with further implementations in the visualization of UX data. Since the application has only gone through one iteration of development and evaluation, it is mandatory to continue with further rounds of design revisions. As next steps we would like to use our insights to evolve InteracDiff in functionality and usability.

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