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The PEW Framework for Worth Mapping

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Abstract. In Human Computer Interaction, it is more and more clear that usability is not enough. In order to take into account the other criteria that may be relevant for design, G. Cockton introduced the notion of "worth" and the Worth Centered Design (WCD) framework for its operationalization. The WCD framework structures the development process and provides designers with a set of tools, including Worth Maps (WMs).
Worth maps connect systems attributes to human ones, and as such represent a promising tool. However, they remain understudied and under-experimented.
This paper presents the results of our experience with WMs. More precisely, it proposes the PEW (Perceived and Expected Worth) framework for worth mapping, reports findings from a study conducted with 5 experts regarding many aspects of WMs, and discusses future directions for research.
Keywords: Interactive systems design, worth, Worth Maps (WMs).

1 Introduction

The need to go beyond traditional criteria (e.g., usefulness, usability, learnability) in interactive systems design has been identified since years. For instance, the notion of emotional usability was formulated by Logan already in 1994 [3].

With the advent of ambient computing, this concern is becoming more and more important. Indeed, nowadays, the user is provided with the opportunity to interact with a large number of systems serving different purposes, using different kinds of devices, in different settings. This diversity of types of systems and of contexts of use has then given good opportunities to point other criteria relevant to consider in interactive systems design. For instance, from interviews that followed the field trial of the "Whereabouts clock" (a physical device that displays family members current location) elements such as reassurance, connectedness, expression of identity, and social touch emerged [9].

More recently, many works have investigated additional criteria for interactive systems design through new notions such as the new usability [4], the User eXperience (UX), or worth. The work presented here is related to the last aforementioned

notion, worth, initially introduced as 'value' by G. Cockton in 2004 [6], as well as the WCD framework for worth operationalization. The WCD framework structures the development process around 4 phases [8]: (1) study of needs, wants, and unfelt needs (for worth elicitation), (2) design (for the system design and implementation), and (3) evaluation (for worth accomplishment) that my lead to iteration. G. Cockton also proposes a set of tools, including Worth Maps, for supporting the WCD.

From a theoretical point of view, the WCD appeared to be well suited for the design of next generations of interactive systems. For instance, in [5], the authors argue that "the framework is particularly relevant for designing pleasurable, enjoyable and entertaining interaction." However, despite having this potential, the WCD has not received much attention from community. Indeed, the relevant literature regarding worth and the WCD framework has been essentially produced by Cockton (and colleagues). This notice motivated our work.

Our final goal is to promote the WCD through lessons of experience from a complete operationalization of the framework and the development/improvement of tools for supporting the method. In an earlier work, we have investigated the worth of a system named Cocoon (study of needs, wants, and unfelt needs). -This work allows us a better understanding of the notion of worth. In a further step, we have engaged in worth mapping sessions (prior to design and implementation) for the so-called system in collaboration with five experts involved in interactive systems design. This paper reports our experience with worth maps. Outcomes from this experience are twofold: (1) we propose a framework for worth mapping, so called the PEW (Perceived and Expected Worth) framework; (2) we provide insights regarding WMs representation, construction, and interest.

2 Background literature

2.1 Worth

Worth is anything that motivates the user to buy, learn, use, or recommend an interactive product, and ideally most or all of these [8].

The WCD begins by the identification of worthies and supports several starting points (e.g. field study [11], sentence completion [12]). In order to study the worth of Cocoon, a mobile and context-aware system that automatically pushes personal information (e.g. related to a maternity where a relative was born) and impersonal information (e.g. an historical building) to the user, we conducted 19 semi-directed individual interviews using storyboards. In order to surface elements beyond traditional criteria considered in Human-Computer Interaction (HCI) design, interviews focus not only on the "what" (features) and slightly the "how" (interface and interaction) but also on the "why" (motivations). Outcomes allowed a further understanding of worth.

- Worth is multidimensional

Outcomes from interviews revealed that worth is related to several aspects. Most of classes of elements identified from the analysis of existing WMs (see section 2.2) emerged from interviews: features (e.g. contextual information push), qualities (e.g. easy to use), consequences from usage (e.g. discovery of new places and new stories), and worthwhile outcomes (e.g. social impacts: maintain of ties). Interviews also revealed that associations of the aforementioned elements may activate the user' personal values such as family, friendship, freedom, and so on.

- Worth is twofold

During interviews, participants mentioned:

- The positive side of Cocoon (i.e. what would motivate them to buy, learn, use, or recommend the system). We called this positive side: the "*perceived worth*".
- The negative side of Cocoon (i.e. what would not make them buy, learn, use, or recommend the system): aversions, missing or poorly addressed features. We called **elements that compensate** this negative side: the "*expected worth*". For example, the two following verbatim are examples of aversions that the possibility of controlling the number of notifications from Cocoon compensates: "*I don't want to receive information everywhere otherwise I would have too much information*"; "*Can you imagine? I would be notified every time I pass near a building in order to inform me that a relative worked here*."

Intuitively, there is no expected worth in a perfect system and the goal of design should be to transform the expected worth to perceived worth.

- Worth is related to the system

As we mentioned above, worth is also related to personal values. However, interestingly, interviews revealed that it is tied to the system from a user's point of view. Consequently, "worth" is "worth of the system."

2.2 Worth Maps

WMs are inspired from Hierarchical Value Maps (HVMs) [2] used in Marketing to study customer motivations for purchase. An HVM is a diagrammatic integration of separately elicited Means-End-Chains (MEC) [1]. A MEC links a product attributes (concrete/abstract) to its desirable and undesirable consumption consequences (functional/psychosocial) that are in turn linked to values (instrumental/terminal).

WMs revisit HVMs in several points which are detailed in [11]. In HCI, WMs connect system-oriented attributes to user-oriented ones, thus shifting from "*designing as crafting to designing as connecting*" [12]. From an analysis of existing WMs, we have identified the following classes of system-oriented attributes: materials, features, qualities (of features); and the following classes of user-oriented attributes: usage consequences (i.e. actions, feelings, UX), worthwhile outcomes, aversions, and adverse outcomes.

WMs follow a vertical representation. The system-oriented attributes connected to user-oriented ones are placed above aversions and adverse outcomes. However, it is important to note the negative side (aversions and adverse outcomes) are not generally shown on WMs because they are supposed to be overcome by the upper side elements: "*the benefits are worth the costs*". Thus, a WM models an ideal system.

WMs support design in different ways. First, they represent a means to ensure that the system satisfies users' expectations (*credibility* [13]). Second, WMs maintain the design team focused on the design goals (*commitment* [13]) relevant evaluation criteria can be instantiated according to associations highlighted in WM [10]. As such, WMs represent a support for evaluation.

3 Worth Mapping for Cocoon

3.1 Individual interviews with experts

An initial version of the framework was produced on the basis of results from the study of worth of Cocoon and an analysis of existing literature regarding HVMs and WMs. This framework and an instantiated WM for Cocoon were then submitted to five people involved in interactive systems design as support for discussions during semi-structured individual interviews.

Interviews were conducted with: a project manager (7 years of experience), a User Interface (UI) and interaction designer (9 years of experience), a psychologist (12 years of experience), a graphic designer (15 years of experience), and a software engineer (11 years of experience). Participants worked for the research and development department of a telecommunication company and are used to work together within agile development teams.

Each interview lasted approximately 45 minutes. Interviews followed two goals: (1) assessing the understandability and the interest of WMs, (2) assessing the understandability and applicability of our framework. In order to reach these goals, interviews were structured around the following themes:

- role(s) of the participant in the design process;
- communication means and supports used in the participant's design team;
- systems evaluations goals;
- understandability and interests of WM (using Cocoon WM as example for illustration purpose);
- understandability and applicability of the worth mapping framework (using the initial framework).

3.2 Results

Interviews were recorded using a Dictaphone and analyzed using a speech analysis. Results are summarized below.

- The framework for mapping Perceived and Expected Worth

The resulting framework, so called the PEW framework, (see Fig.1) is only slightly different from the initial one. Indeed, regarding this aspect, participants' suggestions were mostly related to the form rather than to the content.

The major contribution of our framework is in reflecting the actual system (instead of an ideal one), at a given time (from a user's point of view) by making explicit both positive (perceived worth) and negative (expected worth) associations. This introduces implicitly another use of WMs as support to evaluation based on comparison of WMs representing the system at different design stages.

Our framework also suggests a vertical representation for WMs. Following existing representation patterns, the framework suggests representing positive associations (perceived worth) up and negative ones (expected worth) down. The Native Software and Hardware Components (NSHC) of the device hosting interaction may support features: they represent a key class of elements for WMs. As they are shared by both perceived and expected worth, they naturally come in the middle. It is important to note the linkage among the user-oriented attributes is simplified on the proposed framework: a hierarchy may exist (see Fig.2).

Participants of interviews investigating WMs use and interest for interactive systems design suggest that boxes borders and links width corresponds to their importance. Thus, relevant elements can be visually identified at first glance.

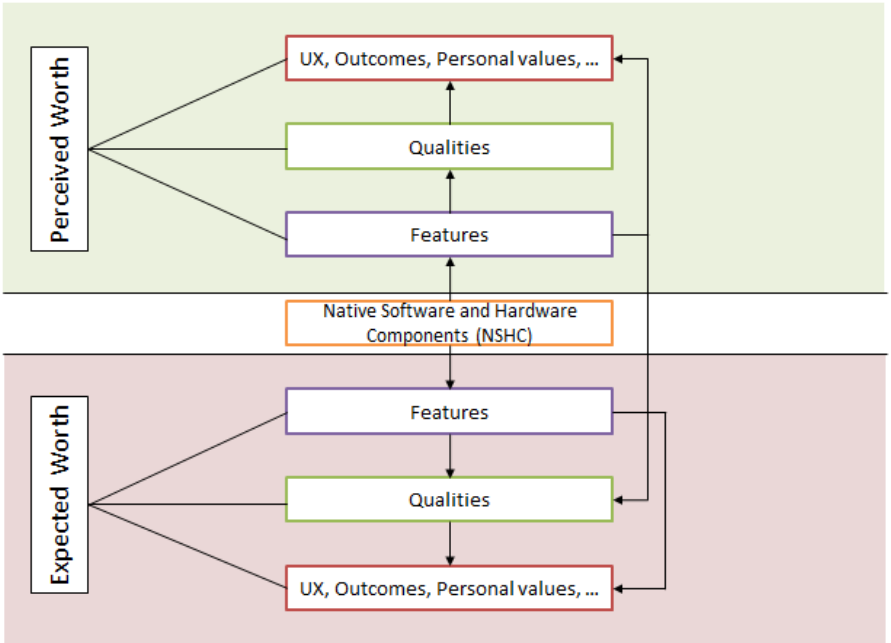

Fig. 1. The PEW framework

- WMs construction

Regarding construction of WMs two points appeared to be critical: worth elicitation and the base support for worth mapping. For instance, the psychologist asked whether WMs should be constructed manually from scratch (on the basis of worth elements). According to her, the worth mapping process may require too much time to be applicable in realistic design processes. Indeed, the study of users' deep motivations requires a careful analysis. Moreover, our experience shows that the construction of WMs from scratch is a fastidious task.

Participants then proposed the ontology for worth associating already elicited worth elements to different types of system, device, user, or features as well as tools that support construction of WMs. They also suggested that WMs are interactive and the developer suggested involving users in the construction of WMs.

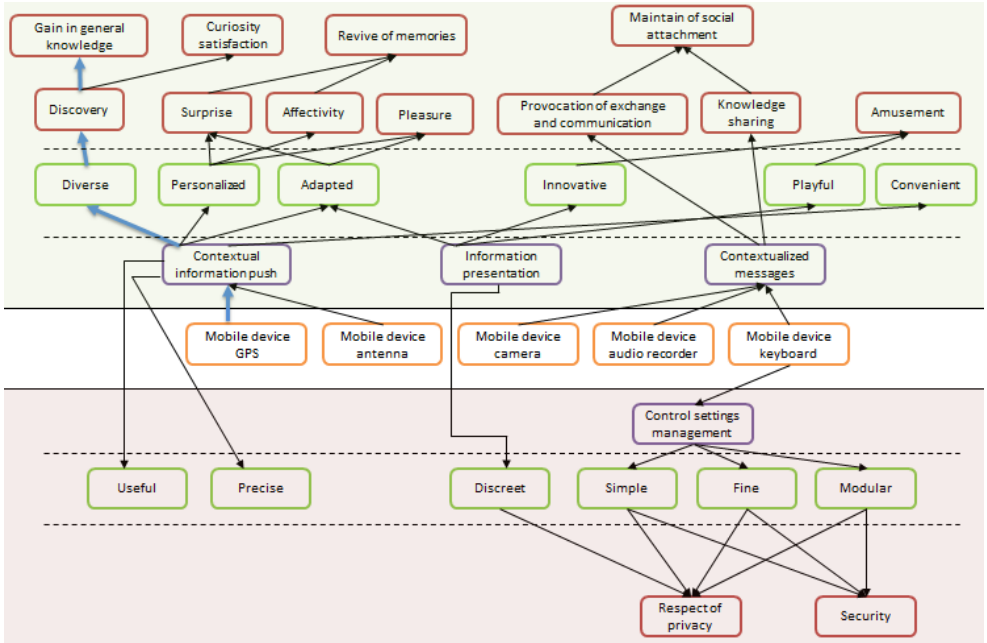

Fig. 2. The WM of Cocoon (partial) – The chain highlighted in blue can be read as follows: the contextual information push feature supported by the GPS of the mobile device presents the quality of being diverse (because serves the user with different types of information, personal and impersonal); this diversity enhances discovery of new things which results in a gain of general knowledge for the user.

- WMs interest

Outcomes from discussions with interactive systems design experts highlighted additional interests of WMs for designing.

— WMs as support to UI and interaction design

According to the interaction designer, WMs may support UI and interaction design through qualities. For instance, an expected quality of modularization (see Fig.2) suggests organizing the UI using different blocks.

— WMs as support to graphic design

According to the graphic designer, WMs may support his design activity through user-oriented attributes and, especially, through UX elements. More precisely, a WM would inspire him in the choice of the design "ambiance": color, graphical elements, etc. For instance, according to him, he will not hesitate to use joyful colors for Cocoon as the study of worth revealed amusement as an UX element (see Fig.2).

— WMs as support to system implementation

According to the software engineer, WMs may provide software developers with directions for coding through functional qualities (e.g. rapidity (response time)).

— WMs as support to communication

Interviews were conducted with experts addressing different aspects of design. Yet, WMs appeared to be useful for each of them. All the five participants and, particularly the project manager, agreed that WMs may represent a common support for multidisciplinary teams, giving them an overview of the system regarding different aspects.

WMs as support to implementation was less stressed out by the software engineer than WMs as support to interaction and graphic design. However, the software engineer appreciates that WMs convey "what is important to the user". According to him, as he is not heavily involved in user studies, that "gives meaning to his work".

4 Conclusion and Future Work

This paper presents results of a preliminary work on worth maps in interactive systems design. To our best knowledge, this work represents the first attempt of the WCD framework operationalization by a research team not including the method author.

This paper provides a better understanding of the notion of worth, proposes the PEW framework, and highlights additional interests of WMs for HCI design.

More interestingly, this work highlights numerous directions for future research. In the short term, we will validate the applicability of our framework from its use by other design teams. At the same time, we will conduct further investigations regarding WMs different uses, elicited from this work, for supporting design activities through the development of Colibri, an Advanced Planning System (APS).

In the long term, we will explore the ontology for worth and focus on the development of tools, such as LadderUX[i], for WMs construction.

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[i] http://www.ladderux.org/