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# Development of Evaluation Heuristics for Web Service User Experience

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## Abstract

Positive user experience (UX), including its pragmatic and hedonic aspects, is a central design target for interactive products and services. Increasingly, Web services are developed for both PCs and mobile terminals to support user needs for media content management and social interaction. Even though many UX models have been developed over the last decade, the specific characteristics affecting UX of Web services have not been studied systematically. In this paper we present the first phase of our service UX study in which three Web services were evaluated by three UX experts each, using an initial set of service UX evaluation heuristics. We discuss how well these heuristics covered the positive and negative service UX evaluation findings, and how the heuristics and the expert evaluation approach of UX should be developed further.

## Keywords

User experience (UX), Web services, evaluation heuristics, expert evaluation

## ACM Classification Keywords

H.3.5 Online Information Services, H.5.2 User Interfaces.

## Introduction

Over the past decade, user experience (UX) has become a central design target for interactive products and services. UX viewpoint extends the user-centered design approach to cover issues beyond *pragmatic* functionality and usability with *hedonic* user motivations [2] such as stimulation, identification and self-expression. Several UX theories and models have been developed (e.g. [1], [2], [6]) but so far, practical tools for designing and evaluating the specific experiential and dynamic aspects of UX are scarce.

Web services are developed increasingly to cover a wide variety of users' online activities. Features that the new types of services – often referred to as Web2.0 services [8]– include are for example user-generated content and its sharing, social interaction, and user participation in the service development. Many of these services can be used both via PCs and mobile terminals. One of the most well known Web2.0 type service is Facebook ([www.facebook.com](http://www.facebook.com)), and many others are entering people's everyday lives.

Design principles and evaluation heuristics have been developed specifically for Web sites [7], but they focus on usability rather than on new, experiential aspects of Web services. Usability heuristics have been extended in many studies [5] to better suit new domains, for example playability or gaming experience [4] and for social interaction [9], but these do not cover the broad UX aspects of Web2.0 types of services.

Expert evaluation plays an important role in usability engineering. To our knowledge, no expert evaluation methods exist that focus on both pragmatic and hedonic aspects of UX. Jordan [3] has proposed expert

evaluation as a method for pleasurable aspects of products, but the focus is on usability rather than on UX. Furthermore, no UX evaluation heuristics have been developed for Web services.

The goal of our research is to understand the characteristics of Web service UX and to develop tools for HCI practitioners for UX design and evaluation. We have explored the characteristics of Web service UX [10] and established an initial set of service UX heuristics. In this research, three Web services were evaluated by three UX experts each, using the UX evaluation heuristics. This paper presents the results on the applicability of the heuristics and on the suitability of the expert evaluation approach to service UX.

The initial set of Web service UX heuristics The initial set of service UX evaluation heuristics is presented briefly in the following. (See [10] for more details on background and motivation.)

H1: *Usage and creation of composite services*. Users can add new service components offered to them through the service. In some cases, users can even create their own service components or applications.

H2: *Cross-platform service access*. Users can access the relevant service elements they need on their PCs and mobile terminals.

H3: *Social interaction and navigation*. Users can interact with their relevant user communities, and utilize other users' navigation histories in their interaction with the service.

H4: *Dynamic service features*. Users can perceive the changes in the service contents or user interface (UI).

H5: *Context-aware services and contextually enriched content.* The service adapts to the user's context of use and offers meaningful contextual information associated with the media contents.

H6: *General UX-related issues.* The service user interface should be usable and aesthetically pleasing, support users' trust and privacy, and other experiential aspects.

H7: *Findings outside heuristics 1-6.*

For each heuristic, there was a longer description of its purpose and applicability, as well as examples of its pragmatic and hedonic aspects. For example, H4 (Dynamic service features) listed the following aspects.

Pragmatic aspects of the heuristic:

- When users enter the service, it is possible to gain an overview of the recent changes in the service
- While using the service users can easily find the new content that is interesting to them

Hedonic aspects of the heuristic:

- The service feels like a lively place where it is enjoyable to spend time
- The service satisfies users' curiosity/seeking of knowledge by frequently offering interesting content

#### Research method and process

This paper reports the first phase of our research on service user experience, i.e. the development of service UX heuristics based on expert evaluation of three Web services.

#### *The evaluated services*

We chose three services for the evaluation based on how well they supported a wide variety of Web service characteristics, including both PC and mobile usage.

Facebook ([www.facebook.com](http://www.facebook.com)) is a free-access Web service for social networking. Users can for example join networks, add friends, post status comments, and send messages. The mobile UI includes the central functionality of the service.

Nokia Sports Tracker ([sportstracker.nokia.com](http://sportstracker.nokia.com)) is a GPS-based activity tracker. A mobile device is used to automatically store workout information such as speed, distance and time in user's training diary. PC UI includes functionality for editing, viewing, sharing and commenting information based on map views. Users can also join groups.

TripAdvisor ([www.tripadvisor.com](http://www.tripadvisor.com)) is a travel guide website. Users can for example provide and find travel destination reviews, network with other people and send messages. The service does not offer a distinct mobile UI but it can be accessed via a standard mobile Web browser.

#### *The process of service UX expert evaluation*

Each service was evaluated by three UX experts. Before the evaluations, evaluators had varying amounts of usage experience of the services. Facebook had been used most by the experts, 1-12 months (its mobile UI 0-6 months), Nokia Sports Tracker 0-2 months (mobile UI 0-2 months) and TripAdvisor had not been previously used by the evaluators.

Evaluators were instructed to use the services as comprehensively as possible on both devices, PC and mobile phone with S60 UI. Evaluators were asked to write down all positive and negative findings they thought were affecting the user experience of the service. Neutral observations were not written down. Also, evaluators marked whether the finding was pragmatic or hedonic by its primary nature. They were also asked to enter the number of the applicable heuristic (H1-H7) related to the finding.

The time span of service evaluation was between 2 and 11 days. During the evaluations, the service evaluators actively used the services from 2 to 11 hours, depending on the diversity of the service and the amount of previous usage experience. All evaluators had much more experience of service usage on PC than on the mobile terminal.

In the end of evaluations, we asked experts to comment the heuristics and the evaluation process.

### Results on the applicability of service UX heuristics

Table 1 shows the overall number of findings in the UX evaluation of the three Web services, and how the seven heuristics were applied to the findings by the expert evaluators.

The evaluators were asked to list both positive (+) and negative (-) findings, as well as consider if they were primarily pragmatic (P) or hedonic (H). Table 2 presents examples of each type of finding. (The detailed service evaluation findings are outside the scope of this paper.)

Heuristic	# of UX findings in the evaluation of three services			
H1	10 (4%)	+	3	H -
				P 3
		-	7	H 1
				P 6
H2	31 (12%)	+	9	H 1
				P 8
		-	22	H 2
				P 20
H3	59 (23%)	+	37	H 24
				P 13
		-	22	H 11
				P 11
H4	13 (5%)	+	5	H 4
				P 1
		-	8	H 1
				P 7
H5	14 (5%)	+	4	H 2
				P 2
		-	10	H 1
				P 9
H6	97 (38%)	+	24	H 5
				P 19
		-	73	H 1
				P 72
H7	31 (12%)	+	11	H 6
				P 5
		-	20	H 5
				P 15
Total	255	+	93 (36%)	H 42
				P 51
		-	162 (65%)	H 22
				P 140

Table 1: Amounts and types of findings associated with the service UX heuristics (H1-H7) in the evaluation of the three services. "+" refers to a positive finding, "-" to a negative finding. "P" refers to primarily pragmatic finding, "H" to a hedonic finding, as described in each of the heuristics.

P	+	"Adding new applications is really easy" (FB, H1) "It is easy for the user to see the current location in the service as the tabs and options below them are clear" (TA, H6)
P	-	"It is really confusing when the application UI changes" (FB, H4) "User cannot access the associated media items from the mobile UI" (ST, H2)
H	+	"Changing of profile pictures is fun, and allows the user to present various sides of their identity to friends" (FB, H3) "It is exciting to try to improve one's training when friends can see the workout live" (ST, H4)
H	-	"It is not clear who sees the comments I write to others" (FB, H3) "The user is reminded too often that his/her browser is unsupported" (TA, H6)

Table 2: Examples of UX findings from expert evaluations. FB = Facebook, TA = Trip Advisor, ST = Nokia Sports Tracker.

#### *Findings about the heuristics*

Based on how the heuristics were applied in the evaluations, and on the experts' comments about the heuristics, the following issues need to be taken into account when developing the heuristics further.

Heuristic H1 (Usage and creation of composite services, applied in 4% of the findings), H4 (Dynamic service features, 5%) and H5 (Context-awareness, 5%) were applied only to small number of findings. This may be partly due to the nature of the evaluated services. H1 is mainly applicable to services in which new service components are offered to the users (such as Facebook applications). H5 is applicable especially in services which utilize contextual information gathered by the mobile terminal. Of the three services, only Sports

Tracker is currently supporting this. Still, Web services are developing into such directions that these heuristics will still probably be needed. H4 could be applicable to all services with dynamically changing content or user interfaces, but it may require longer usage time to observe problems related to this heuristic.

Heuristics H3 (Social interaction and navigation, 23%) and H6 (Other UX issues, e.g. usability, aesthetics and trust, altogether 38%) were used most. The broad applicability of H3 stems from the fact that all the evaluated services support interaction between service users. In addition, H3 included a wealth of issues of social interaction and navigation. H6 included broad sets of aspects and thus was used extensively, especially to usability problems (of H6 findings, about ¾ were usability-related findings). To make the heuristics more specific, both H3 and H6 should be divided into two or more heuristics. H7 (12%) was applied mostly to report technical problems, and was seen useful as such.

Table 1 shows that of the total number of the evaluation findings, 36% were labeled positive and 64% negative, and 26% were seen hedonic and 74% pragmatic. Thus, evaluators were able to focus on the diverse aspects of UX of the services.

#### **Conclusions and discussion**

All the initial heuristics were used but some were applied much more frequently than others. Partly this is due to the nature of the evaluated services – not all heuristics were applicable to all of them. Still, we would not abandon any of the heuristics at this stage. However, specific, additional heuristics seem to be needed for the following areas of service UX:

- Usability: service navigation and presentation
- Safety, trust and privacy
- Content creation for user's own consumption
- Support for cost-awareness
- Unobtrusive presentation of advertisements

Regarding the new kind of UX evaluation approach in which the experts were asked to focus on both hedonic and pragmatic issues, as well as on both positive and negative experiential issues, experts felt that the evaluation was challenging but interesting. They stated that it was somewhat difficult to try to estimate UX from other users' perspective. Also the allocation of the findings to pragmatic and hedonic categories was challenging, as many findings were experienced to belong to both categories.

The experts also commented that a longer period of usage might affect the evaluation findings. Especially the social interaction aspects evolve during the usage, and thus the evaluation period of approximately 10 hours over few days may be too limited time for a thorough evaluation. Possibly the findings should be divided into phases of usage life cycle. This would take better into account the dynamic and temporal nature of UX. The longer evaluation period is naturally a trade-off with the idea of the expert evaluation being a fast and low-cost evaluation method.

#### Next steps: Field studies of service UX

Next, we will analyze and report the findings of the service evaluations. In spring 2009 we will conduct field studies with Web service users. This will enable us to refine and evaluate the service UX heuristics further. We will also develop the service UX design guidelines that can then be used by HCI practitioners in the early phases of service development.

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