XHTML in Mobile Application Development

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Abstract. Nokia Research Center conducted a usability test for two XHTML Mobile Profile (MP) applications: a news application and an auction application. The goal of the test was to find out how XHTML MP components should and should not be used in order to build a usable mobile application. To compare different user interface solutions, both applications were designed in three different user interface styles. The findings on user performance, perception, and preference were used to make Mobile Application Development Guidelines.

1. Introduction

The language of WAP 2.0 will be XHTML Mobile Profile [1]. This is a big step towards one Internet for both fixed and wireless worlds, since the same site can be browsed both from a PC and a mobile phone. For an ordinary end user, the change from WML to XHTML MP is not that dramatic, but, depending on the browser, the "mobile Internet" may look more like the Internet that people know from the fixed world. A familiar look and feel is likely to increase user satisfaction when using WAP services for the first time.

At the time of writing this paper, there are few WAP 2.0 devices and services on the market. Also, there are no guidelines for developing usable mobile services with XHTML MP. It would be beneficial, however, if there were usability guidelines for WAP 2.0 already at this early phase. Usability guidelines or recommendations for WAP 1.x have been presented in several publications [2,3,4,5,6].

Nokia Research Center conducted a usability test of 20 test sessions for XHTML MP applications. The goal was to find the user interface solutions that users prefer and find easy to use as well as the solutions that users find difficult to use and thus should be avoided. We also wanted to find out whether there are cultural differences between the preferences of different nationalities on the user interface solutions. Based on the results, as well as the results of hundreds of earlier WAP 1.x usability test sessions, we compiled a list of usability guidelines for WAP 2.0 service development [7, 8].

In this paper, we concentrate on the differences found between WML and XTHML MP usage, and between different user types. At the end, we list some differences between designing applications for fixed and mobile devices.

2. Procedure

The tests were carried out with Nokia 65xx mobile phones, running a prototype version of the Nokia XHTML browser. The applications were used via a GPRS connection as WAP services, and the implementation was pure XHTML Mobile Profile.

The number of subjects was 20: 12 in Helsinki, Finland and 8 in Boston, USA. The subjects in Finland were from various European countries or from Japan. The subjects varied from active users of the current mobile Internet to ones that had never used it. Each user knew, however, at least the principle of either WAP in Europe/USA or Japanese mobile Internet (i-mode, J-sky or EZ-web). All subjects had a mobile phone in daily use and they knew how to type with a mobile phone keypad; they had either been writing SMS messages or inserted names to the phonebook of the phone.

The user interfaces used in the test were specified and developed just for this test. There were two services in the test: a news service for information retrieval and an auction service with interactive forms. Because we wanted to make general guidelines, we needed to compare the usability of different kinds of user interface solutions. We selected basic user interface solutions used in WAP, the web, or Windows today and built the services in three different ways. The three user interfaces contained the same data, but the way the data was presented, navigation, and the usage of the elements varied in each user interface style.

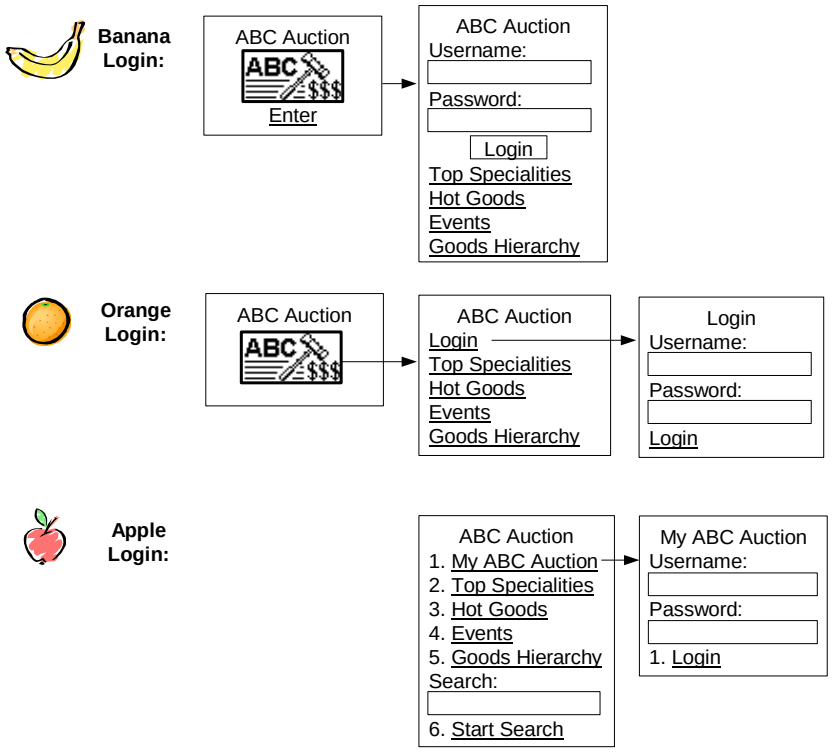
Different users tested the applications and user interface styles in different orders. To avoid associations that would make one style better than other, we named the styles according to fruits:

Banana: Long pages, flat hierarchy; Tables; Selection lists; Images

Orange: Short pages, deep hierarchy; Wizards; Choice for text input or list selection; Images

Apple: Accesskey shortcuts; Keyword search prioritized; Textual input; No images

When designing the user interface styles, we targeted the Banana style for novice users, Orange for intermediates, and Apple for experts. In Banana and Apple, we placed one or two logical entities of data on one page, whereas in Orange we even split one logical entity onto several pages to minimize scrolling. Examples of these different user interface styles follow:



3. Main Results

It seems that the differences in the users' preferences on different user interface solutions were not between the subjects from different countries, but between the experienced mobile application users and novice users. There were differences between countries in the experience level, however: all Japanese subjects were very experienced, whereas in Boston, the subjects were not that familiar with the mobile Internet.

The experienced users emphasized finding information and making selections quickly. They liked to use a search when performing the tasks, and asked for direct links to the main pages of the service. Text input was less painful for experienced users, and they could better keep in mind the selections they had made in forms. Experienced users also more easily understood the structure of the application, which made it easier for them to know where they were. They were also more patient in waiting for the page to download. Because these services were being used for the first time, many expert users liked the simple user interface styles and felt the Apple style, designed for them, was too complicated. A longer study period would be needed to find out whether frequent use would increase the success of the Apple style.

Novice mobile Internet users had to learn to browse and use the pages without a mouse. They did not always scroll down enough to see the whole page. Novice users preferred a tree hierarchy to a search functionality in navigation, because seeing the list of sections helped them to understand the structure of the application and to increase the feel of control. The users that were not familiar with text input with the phone keypad did not like to input text, but preferred selection lists. They were uncertain whether they used the system as they were expected to, and when a page was downloading too slowly, they wanted to cancel the download. These users preferred the Banana and Orange styles, but the ones who used the search function in the Apple style liked it.

3.1 Some Differences between XHTML Mobile Profile and WML

The new user interface elements provided by XHTML MP include push buttons, check boxes, radio buttons, multi-line text fields, animated image format, and tools for sophisticated page layout. XHTML MP does not provide decks of cards, timers or other events, softkey assignments, input filtering, or multi-page forms [1,9]. What does this mean for the user interface design?

Page Length

In WAP 2.0, data is downloaded as single pages, not as decks. This has an effect on the optimal page length: in many cases, it is better to have a few long pages rather than the same information split on several short pages. In our tests, subjects felt that the download time of a short page was longer than that of a long page (time perception related to amount of information expected). The appropriate page length depends on the information on it: target pages containing the data that the user was searching for may be even 20 screenfuls long, whereas the navigation pages normally should not contain more than 10 one-line links.

Forms

It seemed that users started to lose control if the form was longer than two screenfuls or if the form was split onto several pages. A multi-page form could work, if the form was short, familiar, and there was no need in any situation to go back and change the values. Users did benefit from viewing all the selections on one page. If the users did not remember the selections they made in a peaceful lab environment, they are even less likely to do so in a disturbance-prone mobile environment.

Users also seemed to think that the input they give is immediately saved, without a need to send the data to server. If there are several ways to proceed from the form page, the input may not get saved even if the user meant to do so.

Push Buttons

Users seemed to understand well the command buttons to execute the final actions for the tasks. It was better if the labels in buttons were not technical terms; terms like Update or Submit are harder to understand than Save Changes or OK. Push buttons

should not be used for cases where more information is needed before the operation can be executed. In those cases, use hyperlinks instead of push buttons.

Text and Number Input

The standard XHTML MP does not provide a way to define whether an input field is numeric or textual. This makes it hard for the end users to enter values, since they have to do the mode change from text to numbers, or vice versa. We recommend avoid requiring a mix of numbers and letters in one field, but putting the device in the correct input mode would need a change in the XHTML MP language. Nokia devices will understand a cascading style sheet (CSS) property "`-wap-input-format`", which defines the input mode and prevents input errors already on the terminal side.

4. Conclusion

Although the move from WML to XHTML Mobile Profile helps the application developers in multi-platform development, there still remains a possibility to make the application usage difficult for the end user. Lack of decks means the site structure must be different than in WML, and the developers must use extensions in order to have smart input fields. The developers must learn to use push buttons and hyperlinks in a consistent way.

WAP 2.0 is not the only change that the mobile Internet will face in the near future. At the same time, quicker networks (like GPRS), more WAP capable devices, and better displays and input devices are coming into use. These are likely to make WAP more usable also for the end users.

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