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UNDERSTANDING USABILITY *in Mobile Commerce*

RAMIFICATIONS FOR WIRELESS DESIGN: 'E' ≠ 'M'.

"The great advantage [the telephone] possesses over every other form of electrical apparatus consists in the fact that it requires no skill to operate the instrument."

—ALEXANDER GRAHAM BELL, 1878

"My department is in possession of knowledge of the details of the telephone, and the possible use of the telephone is limited."

—ENGINEER-IN-CHIEF, BRITISH POST OFFICE, 1887

"There's an old story about the person who wished his computer were as easy to use as his telephone. That wish has come true, since I no longer know how to use my telephone."

—ATTRIBUTED TO B. STROUSTRUP, INVENTOR OF C++

Over the past 200 years, technological breakthroughs and new economies have emerged with remarkable regularity. In 1800, no information, goods, or services moved faster than they had for thousands of years. Two centuries of rapid technological advances and innovation have evolved communications and commerce from being tied to networks of waterways and (literally) horsepower to being tied to digital telecommunications networks. In the last half-decade, we have witnessed the emergence and power of the Internet as a means for electronic, "e," -commerce. In the emerging period of e-commerce, many questions were raised: Would consumers adopt it? How would they behave? What did they want? How

could companies capture or create value? What capabilities were required to make e-commerce viable?

Today, the mobile Internet is emerging even faster, in part because providers, content partners, customers, and investors are leveraging lessons from e-commerce. Cellular carriers, both nationally and globally, have made significant advances to enable next generation data or "wireless Web" services and mobile, "m," -commerce. Broadly defined, m-commerce involves an emerging set of applications and services people can access from their Web-enabled mobile devices [10]. Yet, m-commerce is facing many obstacles as an emerging market, particularly in the U.S. For example, in addition to

lack of standards, cost and speed issues, a Yankee Group [12] survey suggests that U.S. consumers are not convinced they want or need mobile services and many think it is simply too complicated. This is in contrast to other global markets in Asia and Europe where “going online” means reaching for a mobile handset, not turning on a PC. In Korea, for example, reports suggest that one-third of all mobile phone subscribers use their handsets for m-commerce activities [6].

In the U.S., despite the touted benefits of m-commerce, several large companies are abandoning (Wells Fargo) or scaling back U.S.-based wireless efforts to focus on global markets (Amazon.com). Yet, carriers and content partners are still investing and bright spots exist. EBay recently launched a new service that lets customers bid more easily from mobile devices. According to a Yankee Group report [12], the new service has the correct success factors—priced right, speed, and ease of use.

Like e-commerce, m-commerce represents a huge opportunity for businesses to connect to consumers.

While a myriad of issues warrant attention, we focus on an area that has been largely neglected—usability and the user interface experience. We began this article with several quotations highlighting the fact that issues of usability have been of interest for over a century. While easy to use, the telephone was limited in use to voice communication. Today, the commercial benefit of understanding and improving the usability of wireless Web interfaces—delivered via mobile devices such as cell phones and PDAs—by consumers is enormous.

Usability and the User Interface

The user interface is the environment in which online users conduct communication, information search, and transactions [3]. Thus, an important prerequisite for the success of e-commerce and m-commerce sites is ensuring that customers’ experience, via the interface, satisfies both their sensory and functional needs. Studies have shown, for example, that user interface features, such as page and content design, are key determinants of sales in online stores [2]. Yet, m-com-

ASSESSING USABILITY

We used a holistic measure of usability to compare perceptions of wired and wireless Web sites. The measure and instrument (see [1] for details regarding the metric and the instrument) are based on the Microsoft Usability Guidelines (MUG; see [7]).

Briefly, MUG comprises five main categories: content (informational and transactional capabilities of a site), ease of use (cognitive effort required in using a site), made-for-the-medium (tailoring a site to fit a particular user’s needs), promotion (advertising of a site), and emotion (affective reactions invoked by a site). Each main category, except for promotion, has associated subcategories. Category/subcategory examples include: content/relevance (pertinence of the content to audience); ease of use/structure (organization of the site); made-for-the-medium/personalization (technology-oriented customization of the site); emotion/plot (how the site piques a user’s interest). Application of the MUG involves the computation of usability by taking into account an individual’s weighting of each category/multiple subcategories and his or her rating (evaluation) of a site on the particular category/subcategories.

How the Field Study Was Conducted

Our field study was designed to explore consumers’ perceptions of the usability of Web and wireless sites (for full details of the study design see [11]). The study allowed us to compare and contrast the weights

(relative importance) of the MUG categories/subcategories across industries and access devices (PC vs. mobile handset).

Two sites each were chosen from each of four industries: banking, news, shopping, and tourism, representing both informational and transactional oriented sites. The sites chosen had a Web site accessible via a browser and a wireless site accessible via a WAP-enabled device. Since we were interested in seeking participation from users who had experience with the Internet as well as data-oriented features on wireless devices, the study was conducted in a downtown movie theatre complex in Helsinki, Finland. Briefly, participants (812 in total) browsed sites using a kiosk and responded to a questionnaire. Specifically, the participants were first prompted to provide their perceptions of the weights of the different categories/subcategories for Web and wireless sites in a particular industry. An aggregation across participants provided the mean weights for all sites in that industry. Then, the participants visited both the Web (using a PC browser) and wireless (using a cell phone emulator) sites and rated them on each of the different MUG categories/subcategories on a 10-point scale. The usability rating for each Web site (for a user) was determined by computing the sum of the weighted ratings. An aggregation of the ratings across users provided the mean ratings for a particular site within each industry. **C**

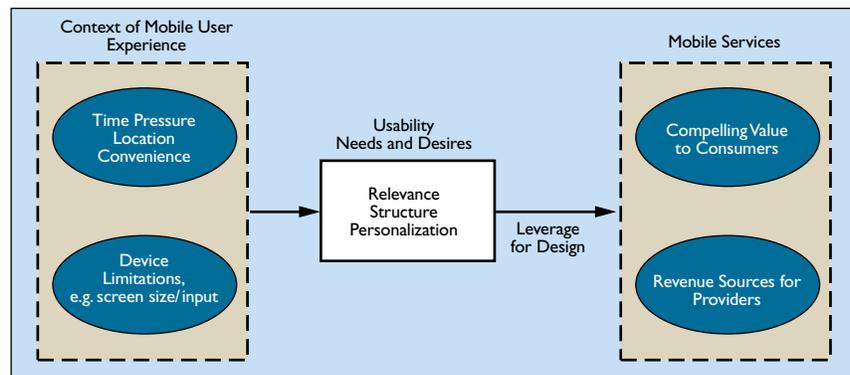
merce poses new challenges and questions. While mobile phones and PDAs can provide access to an array of new applications, they impose limitations such as small screen size, limited screen resolution, and cumbersome input mechanisms. Surveys of mobile Internet users indicate usability is the biggest source of frustration [5, 9]. Before wireless site designers can address the usability challenge, and before organizations can leverage the commercial benefits of m-commerce, a deeper understanding of what aspects of usability are important to users and how they may differ in a wireless context is required.

Web site usability has received a lot of attention in both academic literature as well as trade press [8, 9]. What have primarily emerged are sets of guidelines that provide pointers for improving various components of a Web page, such as the layout of a single Web page or the design of the structure for the entire Web site. However, these guidelines do not prescribe which specific aspects of usability are more critical or whether criticality may differ for different users in different contexts. Furthermore, there is limited guidance about which guidelines to implement in specific situations (for example, a primarily informational news site vs. a more transactional shopping site) or relative to different mobile business models, such as mobile advertising or marketing. Thus, understanding what is important to users is central to creating a more compelling m-commerce experience and driving revenue sources. We pose the following questions: Are certain aspects of usability more (or less) important to users of wireless Web sites than to users of traditional Web sites? Does importance differ by type of industry? Finally, how can organizations leverage this understanding in order to provide compelling value for consumers and drive revenues? Answers to these questions should provide insights to firms (re)designing wireless Web sites.

Results

Here, we summarize the results of our assessments (see the sidebar for background information on our study; for full details of the analyses and results see [11]). With regard to the usability weights, the overall pattern of results suggested content was important regardless of whether a site was Web-based or wireless. However, when we delved into the subcategory weights for content we found that for all four industries relevance was significantly more important in the wireless context than in the Web context. Unlike content, in most of the other categories there was a shift in the weights between

the Web and wireless sites. Ease of use was significantly more important in wireless contexts, largely due to the subcategory structure. Similar to ease of use, and except for the news industry, made-for-the-medium was significantly more important in the wireless context. Its importance was due to the personalization subcategory. Even in the news industry significantly greater weights were assigned to personalization in the wireless context. Overall, the greater weights assigned to content, ease of use, and made-for-the-medium resulted in lower weights being assigned to promotion and emotion for



Linking context, usability, and value.

both Web and wireless Web sites. Both these categories were significantly less important in the wireless context.

When we turn our attention to the usability ratings of the Web and wireless Web sites in the four industries, our results indicated sharp differences when comparing an organization's Web presence to its wireless presence, with the wireless sites being rated significantly lower in all cases. The results clearly suggest that a successful Web presence does not automatically lead to a successful wireless Web presence. There was also considerable variability in ratings between the wireless sites within an industry, such as news, suggesting a lack of standard industry-specific design guidelines.

Ramifications for Wireless Design

At a higher level, it is important for wireless designers to realize the mobile experience is fundamentally a different use context. The experience is largely about saving time, varying locations, and convenience. Our results strongly suggest that relevance, structure, and personalization are essential to creating a positive wireless interface experience. At the same time, designers must understand the value consumers derive from saving time, location options, and convenience, and how aspects of relevance, structure, and personalization can be leveraged in designing wireless sites to provide that value. Given the small keypads and limited display interfaces of cell phones and PDAs, wireless site designers should offer a small number of relevant features

rather than numerous offerings. Just like in the early days of e-commerce, when site designers had to move beyond trying to lay out content like they had laid out print media, m-commerce site designers must move beyond trying to shrink Web pages to fit a cell phone or PDA. Similarly, design efforts should ensure site navigation is not cumbersome and users can find relevant content with minimal effort. Simple menus, forms, or icons will allow users to navigate with little or no typing. Furthermore, our results strongly suggest that a key to success in the wireless context (more so than in the Web context) is the ability to present content to users in a customized fashion.

Importantly, while mobile devices offer anywhere/anytime access to services, the goals consumers are trying to achieve via a cell phone or PDA are not the same goals usually desired or attainable in a Web (PC-based) context. As noted previously, in a wireless context, goals are often conducted relative to some time or location pressure [10]. For example, while consumers may do financial planning or organize a vacation via a Web site, they are unlikely to do so via a wireless site. However, wireless sites can provide services to support time-critical activities like selling declining stocks or obtaining driving directions while on vacation. Similarly, a wireless shopping site can be designed to present users with targeted content such as clothing items on sale, based on prior knowledge of their preferences and/or knowledge of their current location, such as proximity to a shopping mall. The figure on the previous page illustrates that by understanding the context of the mobile experience, designers can leverage the desire and need for specific usability aspects in order to offer mobile services that create value and generate revenues.

Conclusion

Our study suggests organizations will be well served to not be complacent with their wireless site design efforts. A dominating Web presence does not necessarily translate into a dominant wireless Web presence: 'e' ≠ 'm'. For the industries we studied, the significant differences in usability ratings for wireless sites compared to their Web counterparts suggests much work must be done in the wireless contexts. Furthermore, the strong contrast in weights between Web and wireless contexts has implications for site design (or redesign) efforts in the wireless context. Since the context of the mobile experience is different from a PC-based Web experience, what is important to consumers is also different.

We strongly favor conducting usability studies using systematic methods such as the MUG guidelines in order to understand the overall weighting scheme used by customers. By benchmarking its site against com-

petitor sites, an organization may be able to identify weak areas that can be a focus of site redesign efforts. In addition to the context of the mobile user experience, other factors influencing usability must be considered. For example, cultural differences have been found to influence online behavior [3] and thus, may influence the relative importance of the various categories and sub-categories. Further work is also needed to understand how prior experience or adoption life-cycle stages can influence perceptions of usability. Our study involved participants from Finland, a country with deep penetration and utilization of cell phones. Results may be different with participants from other countries, or geographic regions, where adoption is in an earlier life-cycle stage.

Today, m-commerce looks in many ways much like e-commerce did in 1995. At that time, the future of e-commerce was not clear. Yet, as of 2002, the business-to-consumer e-commerce market had grown to \$843 billion [5]. Like e-commerce, opportunities for success in m-commerce will go to those companies that focus on creating compelling value for customers, founded on a deep understanding of the mobile experience. ■

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