The Future of M-Interaction

Joanna Lumsden
National Research Council of Canada IIT e-Business, Canada

INTRODUCTION

Many experts predicted that this, the first decade of the 21st century, will be the decade of mobile computing; although in recent years mobile technology has been one of the major growth areas in computing, the hype has thus far exceeded the reality (Urbaczewski, Valacich, & Jessup, 2003). Why is this? A recent international study of users of handheld devices suggests that there is a predominant perception that quality of service is low and that mobile applications are difficult to use; additionally, although users recognise the potential of emerging mobile technology, the study highlighted a general feeling that the technology is currently dominating rather than supporting users (Jarvenpaa, Lang, Takeda, & Tuunainen, 2003). Users are generally forgiving of physical limitations of mobile devices imposed by technological constraints; they are not, however, so forgiving of the interface to these devices (Sarker & Wells, 2003). Users can excuse restrictions on their use of mobile technology on the basis of level of technological advancement, but find it hard to accept impractical, illogical, or inconvenient interaction design.

Mobile devices are becoming increasingly diverse and are continuing to shrink in size and weight. Although this increases the portability of such devices, their usability tends to suffer. Screen sizes are becoming smaller making them hard to read. If interaction design for mobile technologies does not receive sufficient research attention, the levels of frustration—noted to be high for mobile technology and fuelled almost entirely by lack of usability (Venkatesh, Ramesh, & Massey, 2003)—currently experienced by m-commerce users will only worsen. Widespread acceptance of mobile devices amongst individual consumers is essential for the promise and commercial benefit of mobility and m-commerce to be realised. This level of acceptance will not be achieved if users' interaction experience with mobile technology is negative. We have to design the right types of m-interaction if we are to make m-commerce a desirable facility in the future; an important prerequisite for this is ensuring that users' experience meets both their sensory and functional needs (Venkatesh et al., 2003).

Given the resource disparity between mobile and desktop technologies, successful e-commerce interface design does not necessarily equate to successful m-commerce design. It is therefore imperative that the specific needs of m-commerce are addressed in order to heighten the potential for acceptance of m-commerce as a domain in its own right. This chapter begins by exploring the complexities of designing interaction for mobile technology, highlighting the effect of context on the use of such technology. It then goes on to discuss how interaction design for mobile devices might evolve, introducing alternative interaction modalities that are likely to affect that future evolution. By highlighting some of the possibilities for novel interaction with mobile technology it is hoped that future designers will be encouraged to "think out of the box" in terms of their designs and, by doing so, achieve greater levels of acceptance of m-commerce.

THE COMPLEXITY OF DESIGNING INTERACTION FOR MOBILITY

Despite the obvious disparity between desktop systems and mobile devices in terms of "traditional" input and output capabilities, the user interface designs of most mobile devices are based heavily on the tried-and-tested desktop design paradigm. Desktop user interface design originates from the fact that users are stationary—that is, seated at a desk—and can devote all or most of their attentional resources to the application with which they are interacting. Hence, the interfaces to desktop-based applications are typically very graphical (often very detailed) and use the standard keyboard and mouse to facilitate interaction. This has proven to be a very

successful paradigm which has been enhanced by the availability of ever more sophisticated and increasingly larger displays.

Contrast this with mobile devices—for example, cell phones, personal digital assistants (PDAs), and wearable computers. Users of these devices are typically in motion when using their device. This means that they cannot devote all of their attentional resources—especially visual resources—to the application with which they are interacting; such resources must remain with their primary task, often for safety reasons (Brewster, 2002). Additionally, mobile devices have limited screen real estate and standard input and output capabilities are generally restricted. This makes designing mobile interaction (m-interaction) difficult and ineffective if we insist on adhering to the tried-and-tested desktop paradigm. Poor m-interaction design has thus far led to disenchantment with m-commerce applications: m-interaction that is found to be difficult results in wasted time, errors, and frustration that ultimately end in abandonment.

Unlike the design of interaction techniques for desktop applications, the design of m-interaction techniques has to address complex contextual concerns. Sarker and Wells (2003) identify three different modes of mobility—travelling, wandering, and visiting—which they suggest each motivate use patterns differently. Changing modality of mobility is actually more complex than simply the reason for being mobile: with mobility comes changes in several different contexts of use.

Most obviously, the physical context in which the user and technology is operating constantly changes as the user moves. This includes, for example, changes in ambient temperatures, lighting levels, noise levels, and privacy implications. Connected to changing physical context is the need to ensure that a user is able to safely navigate through his/her physical environment while interacting with the mobile technology. This may necessitate m-interaction techniques that are eyes-free and even hands-free. This is not a simple undertaking given that such techniques must be sufficiently robust to accommodate the imprecision inherent in performing a task while walking, for example.

Users' m-interaction requirements also differ based on task context. Mobile users inherently exhibit multitasking behaviour which places two fundamental demands on m-interaction design: firstly, interaction techniques employed for one task must be sympathetic to the requirements of other tasks with which the user is actively involved— for instance, if an application is designed to be used in a motor vehicle, for obvious safety reasons, the m-interaction techniques used cannot divert attention from the user's primary task of driving; secondly, the m-interaction technique that is appropriate for one task may be inappropriate for another task—so, unlike the desktop paradigm, we cannot adopt a one-technique-fits-all approach to m-interaction.

Finally, we must take the social context of use into account when designing m-interaction techniques; if we are to expect users to wear interaction components or use physical body motion to interact with mobile devices, at the very least we have to account for social acceptance of behaviour. In actual fact, the social considerations relating to use of mobile technology extend beyond behavioural issues; however, given the complexity of this aspect of technology adoption (it is a research area in its own right) it is beyond the immediate scope of this discussion. That said, it is important to note that technology that is not, at its inception, considered socially acceptable, can gain acceptability with usage thresholds and technological evolution—consider, for example, acceptance of cell phones.

EVOLVING INTERACTION DESIGN FOR MOBILITY

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

The above observation from Alexander Graham Bell, the founder of telecommunications, epitomises what we must hold as our primary goal when designing future m-interaction; that is, since the nature of mobile devices is such that we cannot assume users are skilled, m-interaction should seem natural and intuitive and should fit so well with mobile contexts of use that users feel no skill is required to use the associated mobile device. Part of achieving this is acquiring a better understanding of the way in which mobility affects the use of mobile devices and thereafter designing m-interaction to accommodate these