



Mobile Commerce for the Masses

Stuart Feldman • IBM • sif@us.ibm.com

Rarely has a new area of business been heralded with such enthusiasm as “mobile commerce.” Articles in the press paint pictures of people ordering clothes over the Net while waiting for a bus, downloading merchant coupons on their PDAs as they enter a store, or bidding for the last table at a hot restaurant by digital phone in a spur-of-the-moment auction. But such lighthearted uses represent just the tip of a very big iceberg.

The advent of “m-commerce” has far-reaching implications. Once they become widely available, portable devices won’t be restricted to simple purchases but will handle expanded forms of business and innovative transactions as yet scarcely envisioned. Over the next few years, telecommunications firms will install new types of cellular networks that can deliver voice and data as packets and provide much greater bandwidth than current analog and early digital networks.

Carriers will need a great deal of high-value business activity to pay for huge infrastructure investments; better voice telephony alone won’t suffice. Implementing the next standards for digital wireless communication General Packet Radio Service (informally called 2.5G) and third-generation (3G) services will also require massive expenditures. Telecommunications companies have already spent over

\$100 billion on licenses, and additional portions of the broadcast spectrum remain to be auctioned around the world. At least as much will be spent to build the networks before they generate revenue. Many companies are clearly betting on a flourishing world of mobile commerce.

If We Build It, Will They Come?

Meanwhile, m-commerce has fallen victim to one of the fastest “hype curves” ever. Newspapers and magazines are already lamenting the failure of mobile business before most people have even seen an application. Users haven’t been pleased with early trials of cell phones enabled for the wireless application protocol (WAP) because of deficiencies in early versions of WAP and because they use narrow-band communications.

There are indications, however, that people will take advantage of digitally networked portable devices. In Japan and Scandinavia, for example, people are using them to find restaurants, check their bank balances, and perform other useful tasks. Only four months after it started offering service from cell phones, one Japanese bank (Sakura) found that customers were using phones more than ATMs to manage their accounts.

The sale of mobile devices and ser-

vices has been driven by social and fashion trends as much as by technical progress or commercial need. Not many techies predicted, for instance, that flashy colored faceplates would be among the fastest-selling and most profitable items in the mobile-device world, or that data transfer would be dominated by short messages between teenagers. While consumer whimsy often determines the success or failure of individual products, the optimism of those betting on the advance of m-commerce in general seems well founded.

M-commerce’s main promise is based on four factors: the anticipated ubiquity of devices, online access for a large portion of the world’s population, location sensitivity of the devices, and authentication and authorization capabilities. Starting next year, carriers in the U.S. will be required to enable new cell phones to identify their locations, so eventually, through attrition, all cell phones will have location sensitivity. There are many potential social and business (and government) uses for such information. In a few years, designers will be able to implement wireless access, global positioning, and information management on a single chip. Data-enabled cell phone costs will plummet as manufacturers climb the learning curve. Network capabilities will be supported by installed equipment with low incremental operating costs. Several analysts predict that data-enabled cell phones will outnumber PC-style laptops and desktops by around 2003 and that the number of users will grow by hundreds of millions each year thereafter. For the first time, “third world” citizens will be able to communicate easily anywhere and engage in business without geographical limitations.

Technical challenges abound, including establishing standards for transmitting signals and conveying information and commands, determining appropriate styles of interaction for the masses, and supporting reliable business communication in a world of intermittent connections (devices will frequently be turned off or inaccessible). But opportunities are also great, and we can look forward to new forms of business interaction and uses of loca-

tion information that are culturally appropriate and commercially valuable.

M-commerce raises many concerns that apply to other areas of mobility as well. As business goes mobile, the demand for reliable connections and secure financial transactions will increase so that successful interactions can be ensured. Furthermore, applications that communicate with mobile devices and perform important business functions will need to be aware of the environment so they can tailor style and content accordingly.

Long ago (in 1998) people lashed together e-mail filters so that their mobile devices could monitor bidding in online auctions. Such notification functions will become routine in commerce platforms, but the wide-scale success of m-commerce will depend on additional capabilities. Few would decide to bid on a painting judged solely by its appearance on a monochrome PDA, for example, so designers will have to address challenges involving presentation as well as application behavior. This means rethinking common applications and restructuring them to be effective across the full spectrum of devices, network capabilities, and interfaces.

Enhancing Presentation

One important concern is how business information will be presented. For the foreseeable future, mobile devices will provide a wide range of visual and audio inputs and outputs. Small portables will have telephone-grade audio and small screens supported by limited processing power, memory, and bandwidth, but an increasing number of users will have better screens, more computing power, and network bandwidth. New capabilities will change the approach for delivering advertisements, images, and designs, and for managing business discussions. Music delivery is already popular, and video might prove equally popular once it can be delivered reliably.

At this early stage of experience and with current tools, applications are written to function on a single style of device. To work well on another type of device—portable or desktop—applications must be rewritten, which is obviously an uneconomical process

with a proliferation of device types. Already, middleware exists for managing multiple forms of content and even transcoding it automatically (as IBM's Websphere Transcoding Publisher does). Such middleware makes it much easier to target different types of devices. But the solution is incomplete because most portable devices have extreme limitations (much like the first generation WAP phones) that require humans to tweak the content to produce acceptable results. As portable devices become more powerful, it will be possible to get acceptable results using general tools and techniques.

Over the next decade, billions of people will gain access to mobile devices. Many of them will be functionally illiterate, and only a small percentage will be comfortable with English. New, technologically unsophisticated users won't tolerate confusing modes of operation. A polyglot environment will place a large premium on language translation, clear interactions, and speech interfaces, but even after 30 years of research in these fields, sophisticated applications remain scarce. The best results come from carefully restricting the domain—that is, specializing the vocabulary and limiting the set of actions.

For devices and applications to behave naturally, we need mixed styles of input, seamless transitions between vocal and screen presentations, and operating modes that minimize human error and confusion. Researchers have demonstrated multimodal interactions, and standards activities have begun, but tools and models to routinely create such applications are lacking. Applications and underlying middleware configurations will have to allow for interactions to switch communication modes smoothly without loss of clarity and while maintaining the thread of conversation. Standards supporting multimodal communications are evolving, but so far we have little experience with using them for commerce or transactions.

Application Design and Execution

Information presentation is only part of the challenge facing m-commerce. Application structures and underlying

business processes might also need to change to accommodate user and device capabilities. Imagine, for example, a company selling 50 different styles of socks. Users with a large, high-resolution screen could view a small picture of each style and select a few for closer examination, but who would painstakingly scroll through a series of photos on a tiny cell phone screen? Instead, a smart program would narrow the choices through queries and profiles, then present at most two or three images.

This, of course, is a simple example. Devising ways to support long-running multiparty interactions and high-value results will be much more complicated. In the short run, different programs must be written for each major case, and the software will select the approach at the start of the user session. If the environment changes (say, the network bandwidth deteriorates or the user moves to a device with a larger screen), the software may not react optimally. Software will be needed to help create and manage multiple versions of applications and to change pieces as situations evolve.

A more sophisticated approach will require breaking applications into smaller steps that can be assembled on the basis of environmental conditions. Over time, designers will build a repertoire of techniques, tools, and libraries they can call on to help design more contextually aware applications. Tools will be needed for defining configurations dynamically and managing the resulting workflows.

Low-cost, truly pervasive devices that can present multimodal information naturally and perform transactions will enable many more people to engage in e-business, dramatically changing what they do and how they do it. We'll need entire generations of new technology to bring the fruits of current investments to the widest possible public. Meeting the promise of mobile commerce will be one of the biggest research challenges of the coming decade. ■

Stuart Feldman is director of the IBM Institute for Advanced Commerce and head of Computer Science in IBM Research. He is a member of *IC's* editorial board.