

The Emergence of M-Commerce

James A. Senn
Georgia State University

Driven by a widespread understanding of the Internet's capabilities, the power of electronic commerce, and advances in wireless technologies and devices, mobile commerce (m-commerce) is rapidly approaching the business forefront. According to independent research findings, m-commerce—the conduct of business and services over portable, wireless devices—will soon be a dominant force in business and society. For example:

- IDC, an information technology research firm, reports that 70 percent of all wireless subscribers worldwide will access data applications via their phones by 2002.
- The investment firm Robinson Humphrey predicts that, in the US, 50 percent of Internet hits will originate from wireless devices by 2004.
- The Yankee Group, a telecommunications research firm, projects that by 2004 more than 40 percent of wireless users in the US will access Internet content directly from their mobile devices.

The viability of these projections depends on the power of the underlying technology drivers and the attractiveness of m-commerce applications. To compete in a marketplace dominated by wireless devices, businesses must devise effective m-commerce strategies. Building successful strategies begins by recognizing the forces driving m-commerce's emergence.

FORCES DRIVING M-COMMERCE

The US Federal Communication Commission's auctioning of personal-communication-service spectrum space in the mid-1990s triggered the current rush to wireless communication methods. Wireless communication now encompasses not only telephones but appliances, including personal digital assistants (PDAs).



The technology is nearly perfected. The time is right for companies to begin formulating application strategies for mobile commerce.

Wireless-installed base

Internet use has grown on the strength of PC networks. According to Yankee Group projections, the installed base of PCs will reach 500 million by 2003, as Figure 1 shows. This huge base is essential to continued growth in electronic commerce and other communications applications. Moreover, because these systems will have greater power and storage capability, as well as the best ever price-performance ratios, more powerful and sophisticated applications will likely emerge for desktop computing and the Internet.

Although these expectations are impressive, PCs still have two limiting characteristics. First, users must sit in front of them. Second, even portable-notebook PCs have to load software, dial into and

connect with a network service provider, and await completion of the handshaking process before they can launch an Internet application. This sequence is understandable, but at best it seems a tolerable nuisance. Hence, the dominant applications are still those that are worth the trouble it takes for a user to follow this access sequence or, at least, to keep the computer and applications running.

The aggregate PC installation is substantial, but even more mobile communication devices are in use. The Gartner Group and other research firms project that by 2004, the installed base of mobile phones worldwide will exceed 1 billion—more than twice the number of PCs. In addition, the number of other wireless mobile devices will also increase dramatically. Wireless PDA use will more than triple in the next three years. Unlike PCs, these wireless devices require no boot sequence, so people can use them as soon as they turn them on—making them attractive for quick-hit applications.

Wireless protocol standards

Just as the transmission control protocol/Internet protocol and the general-purpose browser were principal drivers of Internet growth, letting disparate devices interconnect and communicate, similar factors will simplify the interconnectivity and communication of heterogeneous wireless devices. As Figure 2 shows, mobile network carriers have relied on a variety of incompatible wireless access standards. Recently, however, a common communications technology and uniform interface standard for presenting and delivering wireless services on mobile devices—wireless application protocol (WAP)—have emerged.

WAP specifications include a micro-browser; scripting similar to JavaScript; access functions; and layered communica-

tion specifications for sessions, transport, and security. These specifications enable interface-independent and interoperable applications. Most wireless handset and device manufacturers, as well as several service and infrastructure providers, have adopted the WAP standard.

Ample bandwidth

Current access technologies, including TDMA (time division multiple access), CDMA (code division multiple access), and GSM (Global System for Mobile Communication), transmit at 9.6 to 19.2 Kbps. These speeds are dramatically slower than the dial-up rates of desktop PCs connecting to the Internet. Although m-commerce is possible at these bandwidth rates, the slow speeds are not conducive to creating widespread business or consumer participation.

By 2002, 3G (third-generation) wireless technology will be available. In addition to having greater bandwidth rates, with speeds up to 2 Mbps, 3G will support multimedia transmission. Integrating voice, data, and one- or two-way video will let m-commerce run over any wireless device. Moreover, active support from the International Telecommunication Union is likely to make 3G practical.

M-COMMERCE APPLICATIONS

M-commerce applications fall into three main categories: transaction management, digital content delivery, and telemetry services.

Transaction management

Users will increasingly initiate a wide range of business transactions from mobile devices. Online shopping sites tailored to mobile phones and PDAs—including browsing, selection, purchase, payment, and delivery—have already emerged. These sites include all the necessary shopping features, such as online catalogs, shopping carts, and back office functions. Online booksellers are among the firms that have already implemented wireless shopping transactions.

Another class of m-commerce transactions involves using wireless devices to initiate and pay for purchases and services in real time. These kinds of trans-

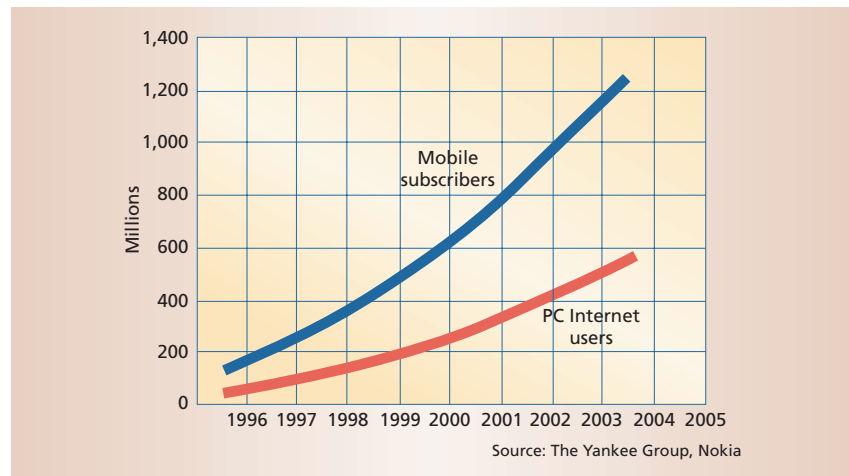


Figure 1. Projected worldwide installed base of PCs and mobile telephones.

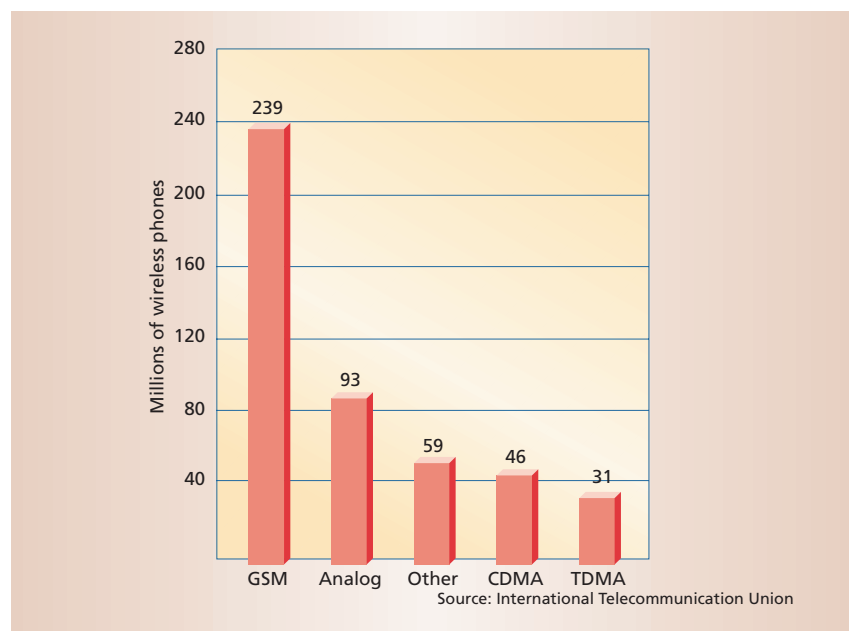


Figure 2. Phones equipped with alternative wireless access standards, worldwide, as of 1999.

actions will likely increase as users gain the capability—and become comfortable enough—to manage them.

The highest m-commerce transaction volume will probably occur in *micro-transactions*. When individuals reach for their e-cash-equipped mobile phones or PDAs—rather than coins—to settle transactions such as subway fees, widespread use of digital cash will be a reality.

Content delivery services

Digital content delivery uses the wire-

less channel's distribution characteristics. These m-commerce activities include information browsing—instant retrieval of status information (weather, transit schedules, sports scores, ticket availability, and market prices)—and directory services. The CNN Wireless news subscription service and the UPS PDA-linked package tracking and locator service are representative of emerging content delivery services.

Digital products easily transport to and from wireless devices. Hence, down-

Table 1. M-commerce application framework.

Category	Applications	
	Passive (self-activated)	Active (user-activated)
Transaction management	Tolls, payments, automatic updates	Shopping
Digital content delivery	E-mail, short messages	Information browsing, directory services, video
Telemetry services	Status monitoring, interactive marketing, smart messaging	Stock quotations, appliance management

loading entertainment products—for example, MP3 music—is likely to become even more commonplace when 3G arrives. Transferring software, high-resolution images, and full-motion advertising messages will also become common activities. The emergence of high-quality display screens and greater bandwidth will undoubtedly trigger the development of innovative video applications. Individuals will use wireless devices to access, retrieve, store, and display high-resolution video content for entertainment, product demonstration, and distance learning.

Telemetry services

The transmission and receipt of status, sensing, and measurement information—telemetry services—form the basis for a wide range of new applications involving mobile devices. Innovations in this area let people use wireless phones and appliances to communicate with various devices from their homes, offices, or in the field. For instance, delivery drivers will “ping” intelligent dispensing machines or store computers to determine where their rolling inventory is needed most or which locations need immediate service. Similarly, users will transmit messages to activate remote recording devices or service systems.

PASSIVE APPLICATIONS

Active m-commerce applications function only when someone directly initiates them by transmitting payment details, requesting information, receiving specific content, or retrieving status information. In contrast, passive applications occur without the user taking any action—for example, the automatic collection of toll charges with dedicated cash cards. Integrating digital cash into mobile devices would make these cash cards

unnecessary. These wireless devices would facilitate and record payment of toll, mass-transit, fast-food, and other transactions without the user authorizing or entering identification information for each individual transaction. Users could arrange to have their cash chips update automatically by directing the wireless device to contact their money source and download additional digital cash whenever necessary. Table 1 gives examples of active and passive m-commerce applications.

Popular in Europe, short messages—text messages, up to 160 characters in length, that show up on the recipient’s display as they arrive—are examples of passive content delivery. As digital convergence becomes more commonplace, all forms of mail will passively go to wireless devices, including digitized voice mail, fax documents, and e-mail. The necessary technology is nearly perfected, and greater awareness and universal access to these services will soon make its use commonplace. These fee-for-service m-commerce activities will increase and will likely trigger innovative payment systems—for example, free services in return for viewing audio or video advertising delivered to the wireless device.

Passive security, intrusion, and emergency telemetry services will refine the monitoring of facilities and individuals. Any unusual event or unacceptable condition will trigger user notification, regardless of location.

Airlines are testing technology that will let them alert passengers, especially frequent fliers, to seat upgrades, schedule changes, and so on, through wireless devices. Some airlines already have prototype telemetry systems that transmit this kind of information to passengers as soon as they enter the airport or pass near a kiosk-like device.

Passive m-commerce telemetry is the foundation of still another form of interactive marketing. Stores will be able to market their products and services by transmitting promotional coupons and messages to passers by: “Come in and enjoy a complimentary cup of our new coffee blend,” or “Get half off, if you make your purchase within the next 30 minutes.” This type of marketing may give rise to a new challenge: managing m-junk messages without turning off your wireless device.

The technology to facilitate m-commerce is within reach, even as barriers to its development fall away. Applications and wireless devices promise to evolve together, each driving the introduction of innovative and powerful features in the other. The opportunity and challenge is for business to develop strategies that capitalize on the strengths of mobile commerce, thereby helping it to compete in an increasingly digital marketplace. The greatest challenge to structuring such a strategy may be creating the innovations that will meet the needs and expectations of consumers and commercial participants. ✨

James A. Senn is professor and past chair of the Department of Computer Information Systems at Georgia State University, Atlanta. Contact him at jsenn@gsu.edu.

Editor: Upkar Varshney, Department of CIS, Georgia State University, Atlanta, GA 30002-4015; voice +1 404 463 9139; fax +1 404 651 3842; uvarshney@gsu.edu