Chapter 10
Mobile Commerce and Pervasive Computing

Learning Objectives

Upon completion of this chapter, you will be able to:

1. Discuss the characteristics and attributes of m-commerce.
2. Describe the drivers of m-commerce.
3. Understand the technologies that support m-commerce.
4. Describe wireless standards and transmission networks.
5. Discuss m-commerce applications in finance, advertising, and providing of content.
6. Describe the applications of m-commerce within organizations.
7. Understand B2B and supply chain applications of m-commerce.
8. Describe consumer and personal applications of m-commerce.
9. Describe some non-Internet m-commerce applications.
10. Describe location-based commerce.
11. Discuss the key characteristics and current uses of pervasive computing.
12. Describe the major inhibitors and barriers of m-commerce.

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Answers to Pause/Break Section Review Questions

Section 10.1 Review Questions

1. Define m-commerce.

Mobile commerce is any electronic commerce done in a wireless environment, especially via the Internet.

2. Define the following terms: 3G, PDA, WAP, SMS, GPS, and smartphone.

3G - the third generation of digital wireless technology: supports rich media such as video clips
PDA - personal digital assistants: a handheld wireless computer
WAP - wireless application protocol: and technology that offers Internet browsing from wireless devices
SMS - short message service: a technology that allows for the sending of short text messages on certain cell phones
GPS - global positioning system: a satellite based tracking system that enables the determination of a devices location
Smartphone - Internet-enabled cell phone with attached applications

3. List the value-added attributes of m-commerce.

The value-added attributes of m-commerce include ubiquity, convenience, instant connectivity, personalization, and localization of products and services.

4. List at least five major drivers of m-commerce.

Drivers of mobile commerce include widespread availability of devices, no need for PC, the handset culture, vendors' push, declining prices, improvement of bandwidth, and the explosion of EC in general.

5. Briefly describe the key elements of the m-commerce value chain.

See Exhibit 10.4.

Section 10.2 Review Questions

1. Describe the major hardware devices used for mobile computing.

Some of the major hardware devices include cellular telephones, PDAs, interactive pagers, screen phones, e-mail handhelds, and other devices.

2. List the major software items used for mobile computing.

Some of the major software applications include microbrowsers, mobile client operating systems, Bluetooth, mobile application user interfaces, back-end legacy applications software, application middleware, and wireless middleware.

3. Describe the major components of a mobile network.

The major components of a mobile network are the mobile station, the base station

controller, the mobile switching station and the fixed telephone infrastructure.

4. Define the terms FDMA, TDMA, and CDMA.

FDMA – **Frequency Division Multiple Access -** Used by 1G systems, this protocol gives each user a different frequency to communication on.
TDMA – **Time Division Multiple Access -** Used with some of the more popular 2G systems, this protocol assigns different users different time slots on a given communications channel (e.g., every 1/8 time slot).
CDMA - **Code Division Multiple Access** - Used with most 3G systems, this protocol separates different users by assigning different codes to the segments of each user's communications.

5. List the major standards used by mobile phone systems (e.g., GSM).

These are seen in Exhibit 10.6 and include GSM, GPRS, EDGE, PDC, W-CDMA, 3GSM, Camano, CDMA2000 1X, and CDMA2000 1XEV.

6. Describe the major components of a WLAN.

The major components are the device with wireless communications and the WAP.

7. List some of the key security issues in an m-commerce transaction.
Viruses are an issue for mobile commerce just as they are for traditional electronic commerce.

8. Describe the security issues and key solutions in m-commerce.

Solutions used in traditional IP networks can be applied to mobile commerce with effectiveness.

9. Describe IVR.

Interactive voice response is a computer voice system that enables users to request and receive information and enter and change data through regular telephone lines or through 1G cell phones.

10. List some of the uses of voice portals.

A voice portal is a Web site with audio interfaces, accessed by making a phone call. These can be used to automate navigation within IT and Web systems.

Section 10.3 Review Questions

1. Describe some of the services provided by mobile banking.

Several mobile and financial applications exist and work in similar ways to online financial applications.

2. Discuss mobile micropayments.

Micropayments can be made through cell phone calls that debit money from accounts or through smartcard-like features involving proximity or short range transmissions.

3. Describe the m-wallet and wireless bill payments.

The mobile wallet is a wireless wallet that enables cardholders to make purchases with a single click from their wireless devices. Wireless bill payments use mobile commerce interfaces to pay bills through mobile networks.

Section 10.4 Review Questions

1. Describe how mobile devices can be used to shop.

Mobile devices can be used to make payments through calls to specific accounts or through proximity or short-range transmissions.

2. Explain targeted advertising in the wireless environment.

Based on GPS information, merchants could advertise to specific mobile users based on their physical locations (i.e. close to a store).

3. Describe mobile portals and what kind of information they provide.

A mobile portal is a customer interaction channel that aggregates content and services for mobile users.

Section 10.5 Review Questions

1. Describe wireless job dispatch.

A mobile employee can be given information about their next activity without returning to the home office. This information can be transmitted through a wireless device.

2. Discuss how wireless applications can be used to provide customer support.

Wireless applications can provide support by supporting personnel in the field who are working with the customer, as well as providing the customers access to systems such as a CRM system.

3. List some of the major intrabusiness wireless applications.

Examples are listed on pages 402-404.

Section 10.6 Review Questions

1. Describe wireless support along the supply chain.

Wireless devices can provide a variety of information to users at different points in the supply chain, providing them with better, more up-to-date information to make the supply chain function more efficiently.

2. How can telemetry improve supply chain operations?

Telemetry can help businesses indemnify the location of goods and employees to make more efficient decisions by adding products/employees location to the decision process.

Section 10.7 Review Questions

1. Describe the application of wireless and mobile technologies to games and entertainment.

Wireless can be used extensively in games an entertainment to make them move mobile and interactive.

2. Discuss some of the potential applications of Wi-Fi and Bluetooth technologies in hotels.

The ability to access hotel services and the Internet using wireless devices are potential applications.

3. Describe some potential uses of mobile and wireless technologies in providing medical care.

Wireless telemedicine is the use of mobile telecommunications infrastructures and multimedia technologies to provide medical information and deliver health-care services remotely.

Section 10.8 Review Questions

1. Describe some of the potential uses of l-commerce.

Location-based commerce is electronic commerce applications provided to customers based on a user's specific location. It can be used to target advertising or services to a user based on location.

2. Discuss the technologies used in providing l-commerce services.

L-commerce uses m-commerce tools in addition to GPS/GIS.

3. Describe GPS and GIS.

A global positioning system is a wireless system that uses satellites to enable users to determine their position anywhere on the earth. GPS is integrated with GIS to provide users with information about their locations relative to maps and other directional information.

4. Discuss telematics.

The telematics is the integration of computers and wireless communication to improve information flow using the principles of telemetry.

5. List some of the barriers to l-commerce.

Barriers to l-commerce include technical and nontechnical limitations. The technical limitations include lack of the standardized security protocol, insufficient bandwidth, 3G licenses, transmission and power consumption limitations, and WAP limitations. The nontechnical limitations center around public adoption and acceptance.

Section 10.9 Review Questions

1. Define pervasive computing.

Pervasive computing is invisible, everywhere computing that is embedded in the objects around us.

2. List some of the major properties of pervasive computing.

These properties include: invisible devices; embedded microchips; always on; ubiquitous networks; life-enhancing applications; consumer-centric solutions; increased productivity; and long-term vision.

3. Discuss some of the ways that pervasive computing can be used in the home.

It can be used with lighting, energy management, water control, home security and communications, and home theater.

4. Describe the OnStar system.

This is a cellular and location system that connects to a 24-hour help center.

5. Describe some of the ways that microprocessors are being used to enhance the intelligence of appliances.

They can be used to monitor and control the device, diagnose problems, improve performance, coordinate devices, and profile use.

6. Discuss the key elements of Auto-ID.

A system that hopes to create an "Internet of Things" so that individual items could be tracked.

Section 10.11 Review Questions

1. Discuss the role that usability plays in the adoption of m-commerce.

Because of their mobile nature, current mobile devices generally have small screen sizes and may be difficult to use because of this. Since ease-of-use is driving many IT advancements, mobile commerce must be similarly easy to use.

2. List the technical limitations of m-commerce.

The technical limitations include lack of the standardized security protocol, insufficient bandwidth, 3G licenses, transmission and power consumption limitations, and WAP limitations.

3. Describe the potential health hazards of mobile devices.

Some believe that exposure to electronic emissions from wireless devices may have health ramifications including cancer.

Answers to EC Application Case Questions

EC Application Case 10.1: U.S. Fleet Services and Wireless Networking

1. What systems did U.S. Fleet have to put in place before implementing its wireless solution?

The firm had to deploy a full ERP system.

2. Why did U.S. Fleet select the Intermec 710 handheld device? How does the device communicate with the company's intranet?

The device had a bar code scanner, runs Microsoft's Pocket PC OS, runs VB applications, uses CompactFlash cards, can do short range Wi-Fi communications and is rugged. It connects to the intranet through Wi-Fi.

3. What are the major benefits that U.S. Fleet has realized by combining handheld devices with Wi-Fi?

It allows them to more easily communicate with people in the field, saving time and reducing errors.

EC Application Case 10.2: Empowering Assisted-Living Patients

1. What are some of the pervasive devices used in the Elite Care facility? What types of data do these devices provide?

Some examples include: weight monitors, location monitors, panic buttons, Internet access, and climate controls.

2. In what ways do these devices encroach upon the privacy of the residents?

These systems provide a large amount of data to the administrators about a resident's routine and location.

Answers to Discussion Questions

1. *Discuss how m-commerce can solve some of the problems of the digital divide (the gap within a country or between countries with respect to people's ability to access the Internet). (See the 1999 report "Challenges to the Network" at* ***itu.int****.)*

Mobile commerce can potentially provide Internet access to those in the "digital divide" by providing access through more common and less expensive devices such as cell phones and personal digital assistants. Additionally, mobile networks do not rely on the same infrastructure required for wired networks.

2. *Discuss how m-commerce can expand the reach of EC.*

Student answers will vary. Mobile commerce eliminates the barrier of physical location in electronic commerce by allowing individuals to conduct commerce from any location at any time.

3. *Explain the role of protocols in m-commerce.*

Protocols are used to ensure that various devices from different manufacturers can all

speak a common language and use common networks. Standard protocols are beneficial to mobile commerce because they provide a single communication language that allows the system to reach critical mass quicker.

4. *Discuss the impact of m-commerce on emergency medical services.*

The mobile 911 system has allowed individuals to use their cell phones to call for emergency response services, and emergency services are able to target the location of each call.

5. *How do smartphones and screenphones differ? What characteristics do they share?*

Both types of phones support more information than a typical telephone. But screenphones are designed to present not only audio but also video transmissions. Smartphones are designed to support Internet-enabled communications with attached applications.

6. *How are GIS and GPS related?*

GIS displays maps and directions, and GPS displays physical locations. When GPS and GIS are integrated, users can find where they are and receive directions from a map.

7. *List three to four major advantages of wireless commerce to consumers presented in this chapter and explain what benefits they provide to consumers.*

New services - mobile commerce can provide customers with a variety of new services such as location-based services that would not be available through traditional electronic commerce.
Mobility - at its core, mobile commerce provides the ability for people to access services in locations and at times that they would not ordinarily able to access the services
Ubiquity - mobile commerce can potentially be implemented in a wide range of devices, making access to applications easier and more common

8. *Location-based tools can help a driver find their car or the closest gas station. However, some people see location-based tools as an invasion of privacy. Discuss the pros and cons of location-based tools.*

Advantages would include the applications stated in the question, disadvantages will center around privacy issues. Advantages of this type of system would include the ability of systems and companies to assist customers with helpful information based on their specific location and needs. Disadvantages might include an invasion of privacy and the ability of companies to “spy" on its customers and their actions.

9. *Discuss how wireless devices can help people with disabilities.*

Wireless devices provide a wide variety of advantages for individuals with disabilities.

Specifically, their ability to work from any location, where a computer may not be practical or possible. Specific examples would include GPS/GIS integration, and mobile 911 services.

10. *Discuss the benefits of IVR.*

An interactive voice response system has several advantages including the possibility to eliminate the usability problem with small screens on wireless devices in addition to the ability to use wireless applications with older technology.

11. *Discuss the benefits of telemetry-based systems.*

Telemetry-based systems can be useful because of their ability to determine the specific location of the user and then provide them with information or directions based on that location. The applications include directions and automated job dispatch.

12. *Discuss the ways in which Wi-Fi is being used to support m-commerce. Describe the ways in which Wi-Fi is affecting the use of cellular phones for m-commerce.*

Student responses will vary.

13. *Which of the applications of pervasive computing–smart cars, homes, appliances, and things–are likely to gain the greatest market acceptance of the next few years?*

Student responses will vary.

14. *Which of the current m-commerce limitations do you think will be minimized within 5 years? Which ones will not?*

Student responses will vary.

15. *Describe some m-commerce B2B applications along the supply chain.*

Some examples include one-entry applications, user information applications, and reporting solutions.

Internet Exercises

(Note: URLs may change over time; please check the Internet Exercises on the Turban Web site for possible updates: www.prenhall.com/turban.)

1. *Learn about PDAs by visiting vendors' sites such as Palm, Handspring, Hewlett-Packard, IBM, Phillips, NEC, Hitachi, Compaq, Casio, Brother, Texas Instruments, and others. List the m-commerce devices manufactured by these companies.*

Student responses will vary.

2. *Access **progressive.com**, an insurance company, from your cell phone (use the "Go to..." feature). If you have a Sprint PCS wireless phone, do it via the Finance menu. If you have a Palm i705, you can download the Web-clipping application from Progressive. Report on these capabilities.*

Student responses will vary.

3. *Research the status of 3G and the future of 4G by visiting **itu.int, 4g.newstrove.com**, and **3gnewsroom.com**. Prepare a report on the status of 3G and 4G based on your findings.*

Student answers will vary based on when the report is made.

4. *Explore **nokia.com**. Prepare a summary of the types of mobile services and applications Nokia currently supports and plans to support in the future.*

Student answers will vary based on when the report is made.

5. *Enter **kyocera-wireless.com**. Take the smart tour and view the demos. What is a smartphone? What are its capabilities? How does it differ from a regular cell phone?*

A smartphone is an Internet-enabled cell phone with onboard applications for surfing the Internet, sending e-mail and connecting to other services.
See: **http://www.kyocera-wireless.com/kysmart/kysmart_series.htm**

6. *Enter **www.i3mobile.com**. Run the Pronto demo. What types of services are provided by Pronto? What types of users would be more likely to use Pronto rather than a smart phone?*

This site is currently unavailable.

7. *Enter **ibm.com**. Search for wireless e-business. Research the resulting stories to determine the types of wireless capabilities and applications supported by IBM software and hardware. Describe some of the ways these applications have helped specific businesses and industries.*

Student answers will vary.

8. *Using a search engine, try to determine whether there are any Wi-Fi hotspots in your area. Enter **wardriving.com**. Based on information provided at this site, what sorts of equipment and procedures could you use to locate hotspots in your area?*

Student responses will vary.

*9. Enter **mapinfo.com** and look for the location-based services demos. Try all the demos. Find all of the wireless services. Summarize your findings.*

Student answers will vary.

*10. Visit **ordersup.com, astrology.com**, and similar sites that capitalize on l-commerce. What features do these sites share?*

Student answers will vary. All of these firms have a portion of their services available to mobile audiences.

*11. Enter **packetvideo.com** and **microsoft.com/mobile/pocketpc**. Examine their demos and products and list their capabilities.*

Student answers will vary.

*12. Enter **internethomealliance.com** and review their white papers. Based on these papers, what are the major appliances that are currently in most U.S. homes? Which of these appliances would most homeowners be likely to connect to a centrally controlled network?*

Student answers will vary. Many of these appliances can be networked to home computers providing information about the appliance and the ability to monitor and control its activities. Additionally many other functions are possible including home security, light and music control, as well as remote control.

*13. Enter **onstar.com**. What types of fleet services does OnStar provide? Are these any different from the services OnStar provides to individual car owners?*

It appears that the fleet services options offer all of the features available to individuals with management reports available to the firm.

*14. Enter **autoidcenter.org**. Read about the Internet of Things. What is it? What types of technologies are needed to support it? Why is it important?*

This is a concept detailed in the text about tracking all products to completely understand a distribution channel. It would allow complete transparency in distribution. It would require the use of smart technology (tracking) for all items. Student reports will vary.

15. *Enter **mdsi-advantex.com** and review the wireless products for the enterprise. Summarize the advantages of the different products.*

Student reports will vary.

Team Assignments and Role Playing

1. Each team should examine a major vendor of mobile devices (Nokia, Kyocera, Motorola, Palm, BlackBerry, etc.). Each team will research the capabilities and prices of the devices offered by each company and then make a class presentation, the objective of which is to convince the rest of the class why one should buy that company's products.

Student reports will vary.

*2. Each team should explore the commercial applications of m-commerce in one of the following areas: financial services, including banking, stocks, and insurance; marketing and advertising; manufacturing; travel and transportation; human resources management; public services; and health care. Each team will present a report to the class based on their findings. (Start at **mobiforum.org**.)*

Student reports will vary.

*3. Each team will investigate a global organization involved in m-commerce, such as **gmcforum.com** and **openmobilealliance.com**. The teams will investigate the membership and the current projects the organization is working on and then present a report to the class based on their findings.*

Student reports will vary.

*4. Each team will investigate a standards-setting organization and report on its procedures and progress in developing wireless standards. Start with the following: **atis.org, etsi.org**, and **tiaonline.org**.*

Student reports will vary.

5. Each team should take one of the following areas–homes, cars, appliances, or other consumer goods such as clothing–and investigate how embedded microprocessors are currently being used and will be used in the future to support consumer-centric services. Each team will present a report to the class based on their findings.

Student reports will vary.

Answers to End-of-Chapter Real-World Case Questions: Hertz Goes Wireless

1. Which these applications are intrabusiness in nature?

Both quick rental and instant return applications could be considered intrabusiness. Quick rentals provide a method for customers to rent quickly, with a reduction in paperwork and time–this can be seen as advantage to the company. The instant return

system uses technology to quickly return cars–this can be seen as a benefit to the company because of the reduction in time and costs.

2. Identify any finance- and marketing-oriented applications.

The instant return feature is a finance-oriented application because it allows for the quick figuring and billing of customers as they return cars. All other applications could be considered marketing applications because they provide benefits to the customer that can be used to differentiate this firm from other car rental agencies. All of these additional features provide benefits to the customer and a way for Hertz to attract and retain customers.

3. What are the benefits to Hertz of knowing exactly were each of its cars is? As a renter, how would you feel about this capability?

Hertz has better control over its assets, namely cars, when it is aware of where they are at all times. This can stop customers from stealing cars, or otherwise using them in a way that is against their rental agreement. It is also a benefit to the company because they can help customers who are lost or are in need of any other type of assistance. Student answers will vary based on their reaction to the use of this technology.