M-COMMERCE
Overview

• What is M-Commerce?
• M-commerce vs. E-commerce
• Classes of M-Commerce Applications
• Benefits of M-commerce
• Advantages of M-Commerce
• Disadvantages of M-Commerce
• Mobile Computing: Content, Infrastructure, and Services
• Wireless Telecommunications Networks
What is M–Commerce?

- M-commerce is the buying and selling of goods and services through wireless handheld devices.
- M-Commerce is the process of paying for services using a mobile phone or personal organizer.
- M-Commerce is the use of mobile devices to communicate, inform, transact, and entertain using text and data via a connection to public and private networks.
What is M–Commerce?

• Different than E-Commerce?
  – No, but additional challenges:
    • Security
    • Usability
    • Heterogeneous Technologies
    • Business Model Issues
Security Challenges

• Less processing power on devices
  – Slow Modular exponentiation and Primality Checking (i.e., RSA)
  – Crypto operations drain batteries (CPU intensive!)
• Less memory
• Few devices have crypto accelerators, or support for biometric authentication
• No tamper resistance (memory can be tampered with, no secure storage)
  – Primitive operating systems w/ no support for access control (Palm OS)
Usability Challenges

• Hard Data Entry
  – Poor Handwriting Recognition
  – Numeric Keypads for text entry is error-prone
  – Poor Voice Recognition
  – Further complicates security (entering passwords / speaking pass-phrases is hard!)

• Small Screens
  – i.e., can’t show users everything in “shopping cart” at once!

• Voice Output time consuming
Heterogeneity Challenges

• Many link layer protocols (different security available in each)
• Many application layer standards
• Businesses need to write to one or more standards or hire a company to help them!
• Many device types:
  – Many operating systems (Palm OS, Win CE, Symbian, Epoch, …)
  – Wide variation in capabilities
Business Models Issues

• Possible Models:
  – Wireless advertising (text)
  – Pay per application downloaded
  – Pay per page downloaded
  – Flat-fees for service & applications
  – Revenue share on transactions

• Trust issues between banks, carriers, and portals

• Lack of content / services
M-commerce vs. E-commerce

(Elliott, Phillips, 2004)

• E-Commerce is concerned with data and information transfer, and with Internet access, via wired technology

• M-Commerce is concerned with data and information transmission, and Internet access, via wireless technologies and various portable devices
Comparison between E-commerce and M-commerce

(Elliott, Phillips, 2004)

<table>
<thead>
<tr>
<th>Factor</th>
<th>E-Commerce</th>
<th>M-Commerce</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product or service <strong>focus</strong></td>
<td><strong>Product</strong> focus</td>
<td><strong>Service</strong> focus</td>
</tr>
<tr>
<td>Product or service <strong>provision</strong></td>
<td><strong>Wired</strong> Global access</td>
<td><strong>Wireless</strong> Global access</td>
</tr>
<tr>
<td>Product or service <strong>assets</strong></td>
<td><strong>Static</strong> information and data</td>
<td><strong>Dynamic</strong> location-based data</td>
</tr>
<tr>
<td>Product or service <strong>attraction</strong></td>
<td>Fixed <strong>non-time-constrained</strong> access</td>
<td><strong>Mobility and Portability</strong> of access</td>
</tr>
</tbody>
</table>
# Comparison between E-commerce and M-commerce

Barnes And Huff, 2003; Elliott, Phillips, 2004

<table>
<thead>
<tr>
<th><strong>Factor</strong></th>
<th><strong>E-Commerce</strong></th>
<th><strong>M-Commerce</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Devices</td>
<td>PC: <strong>Medium</strong></td>
<td>Mobile phone: <strong>High</strong></td>
</tr>
<tr>
<td>Network Operators can determine the services</td>
<td><strong>No</strong></td>
<td><strong>Yes</strong>, like a gatekeeper</td>
</tr>
<tr>
<td>Usage and Applications will charge</td>
<td>No standard way to charge; PC is essentially free</td>
<td>Users seem prepared to pay a ‘mobility premium’</td>
</tr>
<tr>
<td>User’s Location</td>
<td><strong>Hard to find</strong></td>
<td>Network Operator know who you are, where you are, can direct you to the portal of choice, and can charge you money</td>
</tr>
<tr>
<td>Reverse Billing</td>
<td><strong>No</strong></td>
<td>Yes, in which services are charged directly to the user’s phone bill</td>
</tr>
<tr>
<td>Display Screen Size and Memory</td>
<td><strong>Medium</strong></td>
<td><strong>Small</strong></td>
</tr>
<tr>
<td>Click through rates for banner AD and e-Mail (<strong>i-mode</strong>)</td>
<td>PC Less than 0.5%</td>
<td>3.6%; 24%</td>
</tr>
</tbody>
</table>
### Classes of M-Commerce Applications

**Exhibit 8.2 Classes of M-Commerce Applications**

<table>
<thead>
<tr>
<th>Class of Applications</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile financial applications (B2C, B2B)</td>
<td>Banking, brokerage, and payments for mobile users</td>
</tr>
<tr>
<td>Mobile advertising (B2C)</td>
<td>Sending user-specific and location-sensitive advertisements to users</td>
</tr>
<tr>
<td>Mobile inventory management (B2C, B2B)</td>
<td>Location tracking of goods, boxes, troops, and people</td>
</tr>
<tr>
<td>Proactive service management (B2C, B2B)</td>
<td>Transmission of information related to distributing components to vendors</td>
</tr>
<tr>
<td>Product locating and shopping (B2C, B2B)</td>
<td>Locating/ordering certain items from a mobile device</td>
</tr>
<tr>
<td>Wireless reengineering (B2C, B2B)</td>
<td>Improvement of business services</td>
</tr>
<tr>
<td>Mobile auction or reverse auction (B2C)</td>
<td>Services for customers to buy or sell certain items</td>
</tr>
<tr>
<td>Mobile entertainment services (B2C)</td>
<td>Video-on-demand and other services to a mobile user</td>
</tr>
<tr>
<td>Mobile office (B2C)</td>
<td>Working from traffic jams, airport, and conferences</td>
</tr>
<tr>
<td>Mobile distance education (B2C)</td>
<td>Taking a class using streaming audio and video</td>
</tr>
<tr>
<td>Wireless data center (B2C, B2B)</td>
<td>Information can be downloaded by mobile users/vendors</td>
</tr>
<tr>
<td>Mobile music/music-on-demand (B2C)</td>
<td>Downloading and playing music using a mobile device</td>
</tr>
</tbody>
</table>

Benefits of M-commerce

- Your Internet offerings are easier and more convenient to access.
- You get considerable flexibility while conducting business.
- Transaction and personnel costs are reduced due to widespread automation of back-office operations.
- Field staff is more effective as they have flexible access to back-office data.
Advantages of M-Commerce

- Offers many payment options
- Push advertising, direct marketing.
- More efficient and extensive service offered.
- The Internet is going mobile
Disadvantages of M-Commerce

- Expensive cost
- Larger screens won’t be displayed is clear
- Slow speed
- Limited for longer message
- It hard way to fill the data.
- Security is not protected
Mobile Computing: Content, Infrastructure, and Services

- **Hardware**
  - Network access points
  - Mobile communications server switches
  - Cellular transmitters and receivers

- **Software**
  - Mobile operating system
  - Mobile application user interface
  - Microbrowser
  - Wireless Application Protocol (WAP)
Mobile Computing: Content, Infrastructure, and Services

• Infrastructure:
  – Requirements: small screen, reduced memory, limited bandwidth, restricted input
  – Wireless connection: Network access points, mobile communications server switches, cellular transmitters and receivers
  – Delivery of services: WAP gateways, GPS locators, GPS satellites
Mobile Computing: Content, Infrastructure, and Services

• Mobile Computing Software
  – Mobile OS: Palm OS, Windows CE (PocketPC), EPOC (Symbian)
  – Mobile Application UI: touch screen, mini-joystick, jog dial, thumb wheel
  – Microbrowsers
Mobile Computing: Content, Infrastructure, and Services

• Wireless Application Protocol (WAP)
  – It is designed to enable different kinds of wireless devices to access WAP-readable files on an Internet-connected Web server
  – WAP Forum was established by Nokia, Phone.com (currently OpenView), Ericson and Motorola in June 97
  – WAP standards are open and independent of devices, operating system and air interfaces.
  – WAP 2.0: multimedia
Mobile Computing: Content, Infrastructure, and Services

• Wireless Application Protocol (WAP)
  – Uses WML (Wireless Markup Language) that has been derived from XML. This language is designed to satisfy the demands of small screen users.
  – xHTML: subset of XML, compatible with HTML, potential to replace WML
  – Voice XML: VXML
  – WAP devices communicate through WAP Gateways which then communicates with web server to access internet
  – Suite of protocols that adheres to OSI seven layer model
### Mobile Computing: Content, Infrastructure, and Services

- **Wireless Application Protocol (WAP)**
  - **WAP Stack**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Protocol/Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application Layer</td>
<td>Wireless Application Environment (WAE)</td>
</tr>
<tr>
<td>Session Layer</td>
<td>Wireless Session Protocol (WSP)</td>
</tr>
<tr>
<td>Transaction Layer</td>
<td>Wireless Transaction Protocol (WTP)</td>
</tr>
<tr>
<td>Security Layer</td>
<td>Wireless Transport Layer Security (WTLS)</td>
</tr>
<tr>
<td>Transport Layer</td>
<td>Datagram (UDP/IP)</td>
</tr>
<tr>
<td>Network Layer</td>
<td>Datagrams (WDP)</td>
</tr>
<tr>
<td></td>
<td>Wireless Bearers</td>
</tr>
</tbody>
</table>
Mobile Computing: Content, Infrastructure, and Services

• A WAP gateway is a two-way device (as with any gateway)
• It compiles the WML into binary format so WAP enable devices can understand
• On the web server side it communicates using HTTP while it uses WTP to communicate with WAP devices
Mobile Computing: Content, Infrastructure, and Services
Mobile Computing: Content, Infrastructure, and Services
Mobile Computing: Content, Infrastructure, and Services
Mobile Computing: Content, Infrastructure, and Services
Mobile Computing: Content, Infrastructure, and Services

- Mobile Computing Services
  - SMS
  - EMS: tiny pictures, simple animations, sounds, and formatted text
  - Multimedia Messaging Service (MMS)
  - Micropayments: < $10
  - LBS
  - Voice-Support Systems
    - Interactive Voice Response (IVR)
    - Voice portal
    - tellme.com, bevocal.com
Mobile Computing: Content, Infrastructure, and Services

• Supporting Services
  – Synchronization
  – Docking Stations
  – Attachable keyboards
  – Batteries
Wireless Telecommunication Networks

• Personal Area Networks (PAN)
  – Device-to-device connections
  – Very short range: 30 feet

• Bluetooth:
  – IEEE802.15
  – short range: 60 feet (20m)
  – Low-power radio technology in the 2.4GHz
Wireless Telecommunication Networks

- Wireless Local Area Networks (WLAN) and WI-FI
  - IEEE 802.11 (a, b, g)
  - Medium range: 300 feet
  - Wireless access point: an antenna that connects a mobile device to a wired LAN
  - Hotspot: an area or point where a wireless device can make a connection to a WLAN
Wireless Telecommunication Networks
Wireless Telecommunication Networks

- Wireless Metropolitan Area Networks (WLAN) and WIMAX
  - IEEE 802.16
  - Medium range: 51km
- Wireless Wide Area Networks (WWAN)
  - Subscriber identification module (SIM) card
Wireless Telecommunication Networks

• WWAN Communication bandwidths
  – 1G: 1979-1992 wireless technology
  – 2G – current GSM with a speed of 9.6 kbps. Can not meet serious business demand
  – GPRS (General Packet Radio Service) – CDMA2000 (Code Division Multiple Access) also called 2.5G. Promises 150 Kbps and particularly suited for web browsing
  – 3G - 3G promises increased bandwidth, up to 384 Kbps when a device is stationary or moving at pedestrian speed, 128 Kbps in a car, and 2 Mbps in fixed applications (UMTS)
  – 4G mobile data transmission rates are planned to be up to 20 megabits per second
Wireless Telecommunication Networks

- WWAN Communication Protocols
  - Frequency Division Multiple Access (FDMA)
    - 1G
  - TDMA- Time Division Multiple Access
    - 2G, Second most used system in US and Japan
    - Both systems cover 90% of the world mobile systems
  - CDMA – Code Division Multiple Access
    - 3G, Used mostly in USA and now hopefully in China
    - Uses 800 MHz to 1.9 GHz and based on Spread Spectrum method
    - Various versions like CDMA2000 and WCDMA
Wireless Telecommunication Networks

- WWAN Network Systems
  - GSM – Global System for Mobile Communication
    - Digital mobile system operates over 170 countries including Europe and Middle East
    - 85%
    - Uses 900 MHz or 1800 MHz
  - Personal Digital Cellular (PDC): Japan
  - IS-95, IS-136: US