Mobile Commerce Technologies

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Contents

- Mobile commerce
- Device and communication platforms
- Mobile commerce applications
- Issues in mobile commerce
Commerce

- Trading of something of economic value such as goods, services, information or money between two or more entities

- Four types of exchange
  - Bargaining
  - Bidding
  - Auctioning
  - Clearing
Electronic Commerce

• Buying and selling of products or services over electronic systems such as the Internet and other computer networks

• B2B / B2C

• Prior to 1995: infancy

• 1995-1999: “golden age”

• 2000-2001: dot-com bubble

• 2002-present: resurgence
Mobile Commerce

• Buying and selling of products or services using a mobile device

• Mobile.smart phones
• PDAs
• Emerging mobile equipment
  ▪ Dashtop mobile devices
Ubiquitous Access Paradigm

- Commerce: be able to buy/sell...
- eCommerce: ...using a computer network...
- mCommerce: ...anytime & anywhere
Where Are We?

- Mobile commerce
- Device and communication platforms
  - Hardware platforms
  - Wireless access technologies
  - Content delivery protocols
- Issues in mobile commerce
Device Platforms for m-Commerce

- **Requirements**
  - Mobility
  - Graphical user interface
  - Network connectivity
  - Good input capability

- **Constraints**
  - Low bandwidth
  - Limited resources: CPU, RAM, battery, screen, small/inconvenient keyboard
Mobile Phones

- Primary feature: voice communication
- SMS (text messages)
  - MMS (photo and video)
  - Microbrowsers
  - Java support
- Top 5 manufacturers: Nokia, Samsung, Motorola, SonyEricsson, LG
Smart Phones

- Symbian
- Linux
- Windows Mobile
- RIM Blackberry
- Palm OS
- Apple OS X
Smart Phones: iPhone

- TIME Magazine’s 2007 invention of the year
  - The iPhone is pretty
  - It's touchy-feely
  - It will make other phones better
  - It's not a phone, it's a platform
  - It is but the ghost of iPhones yet to come
Smart Phones: Android

• Linux-based open source mobile phone platform
• Developed by the Open Handset Alliance
• Features
  ▪ Handset layouts
  ▪ Connectivity
  ▪ Messaging
  ▪ Web browser
  ▪ Java virtual machine
  ▪ Media support
  ▪ Additional hardware support

▪ Video: [http://www.youtube.com/watch?v=1FJHYqE0RDg](http://www.youtube.com/watch?v=1FJHYqE0RDg)
Dashtop Devices

- Satellite radios
- GPS navigation systems
- OnStar

- General Motors vehicles
- Other manufacturers
  - Acura
  - Audi
  - Subaru
  - Volkswagen
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Wireless Access Technologies

Wireless Communication Technologies

Long Range
- Personal Communication
  - 1G
  - 2G: GSM
  - 2.5G: GPRS, EDGE
  - 3G: UMTS
  - 4G

- LAN/MAN
  - 802.11 WiFi
  - 802.16 WiMAX

Short Range
- Bluetooth
- UWB
- RFID
2G: GSM – Global System for Mobile Communications

- Open, digital cellular technology for transmitting voice and data
  - Digital TDMA
  - Europe: 900MHz and 1.8GHz bands
  - US: 850MHz and 1.9GHz bands
  - Used by 82% of the global market
  - Data transfer speeds up to 9.6 kbit/s
    - Basic data services: SMS
    - SIM card: Subscriber Identity Module
2.5G: GPRS, EDGE

- GPRS: General Packet Radio Service
  - Used for WAP, SMS, MMS, Internet
  - Max speed up to 40 kbit/s
  - Very high latency: RT ping up to 1 sec

- EDGE: Enhanced Data Rates for GSM Evolution
  - Used for any packet switched application, e.g. Internet connection
  - Max speed up to 230 kbit/s
  - Typical speed: 70-135 kbit/s
3G Family

- Wide area cell phone networks
  - High-speed internet access
  - Video telephony
  - Max speed: 2-10 Mbit/s
  - Supports greater numbers of voice and data customers

- UMTS: Universal Mobile Telecommunications System
  - One of popular 3G technologies
  - Typical speed: 384 kbit/s, up to 3.6 Mbit/s for HSDPA handsets downlink
4G Objectives

- High network capacity
  - More simultaneous users per cell
- High speed
  - 100 Mbit/s for moving clients
  - 1 Gbit/s for stationary clients
- Smooth handoff (heterogeneous nets)
- Global roaming
- High QoS for multimedia:
  - HDTV video, mobile TV
- Interoperability with existing standards
- All IP, packet switched network
IEEE 802.11 – WiFi

• Family of IEEE 802.11 standards
  ▪ Short range IP networking (WLAN)
  ▪ Speed up to 54 Mbit/s (802.11g)
  ▪ Available on many smart phones
  ▪ WiFi hot spots
IEEE 802.16 – WiMAX

- **Worldwide Interoperability for Microwave Access**
- Max speed: 70 Mbit/s
- Practical speed: 10 Mbit/s at 10 km
Bluetooth

- Wireless personal area networks
- Low power consumption
- Short range, power-class-dependent
  - 1 meter, 10 meters, 100 meters
- Max speed:
  - V.1.2: 1 Mbit/s
  - V.2.0: 3 Mbit/s
RFID

- Radio-frequency identification
  - Integrated circuit for storing and processing information, modulating and demodulating a RF signal and other specialized functions
  - Antenna for receiving and transmitting the signal
- Usage in m-commerce
  - Identification in physical payment systems
Wireless Access Technologies

Adapted from Schiller, Mobile Communications
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Content Delivery Protocols

- **Short Messaging Service (SMS)**
  - Text messages up to 160 characters

- **Wireless Application Protocol (WAP)**
  - WAP browser
  - Wireless Markup Language (WML)

- **i-Mode**
  - Specialized light-weight HTML and other proprietary protocols
  - Very popular in Japan
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Mobile Commerce Applications

• Mobile applications
  ▪ Browsing/search
  ▪ Personalization services (ringtones, ringback, logos, etc)
  ▪ Full-track music downloads
  ▪ Imaging (streamed, broadcast, downloaded/uploaded and interactive)
  ▪ Information services (paid-for and free)
  ▪ Mobile payments and banking
  ▪ Entertainment (e.g. games, gambling)

• Crosscutting applications
  ▪ Mobile social networking
  ▪ Adult content
  ▪ Advertising
Where Are We?

- Mobile commerce
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- Mobile commerce applications
  - Mobile advertisement
    - Mobile payments
    - Mobile ticketing
    - Mobile banking
    - Mobile entertainment
- Issues in mobile commerce
A New Frontier for Mobile Ads

- Reuters, June 18, 2007
- Media, technology and online companies are scrambling for the biggest slice of a booming mobile advertising market. The advertising market for mobile devices is expected to balloon in the next few years.
- Video:
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Mobile Payments

- Remote mobile payments
  - Paying for digital goods or physical goods via a mobile web enabled retailer

- Physical mobile payments
  - Payment is made in a physical storefront in the same way we would use cash or a plastic debit/credit card
Remote Mobile Payments

- Premium Rate SMS
- Mobile phone bill – “direct to bill” (D2B) payment
- Online – Payment for the Mobile Web (WAP billing)
- SMS payment – mobile wallet & account based payment
- Person-2-Person
Payments for the Mobile Web

- Enables retailers to bill goods or services from a mobile web site
- Very similar to payment on e-Commerce sites
Mobile payment is initiated using SMS and the funds are transferred from a registered account or a mobile wallet.
Mobile Payments: Crandy

- Mobile payment system
  - M-parking
  - Vending machines
  - E-ticketing
- Available in
  - Belgium
  - Egypt
  - France
  - Germany
  - United Kingdom
  - USA

Video:
http://www.dailymotion.com/video/x2ecwc_crandy_business
Person-to-Person Payments

- Funds are transferred between mobile phone users and then the funds are redeemed for either goods or cash at selected merchants.

www.paypal.com
Physical Mobile Payments

- “Text & PIN”
- “Wave & Pay” - Contactless
Mobile Payments: FeliCa

Transit ticket
Boarding pass
ID card
e-ticket
e-Money
Internet credit service
Access control
Multifunction IC card
Consumer electronics

Video: http://www.sony.net/Products/felica/mpv/index.html
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Mobile Ticketing

- Customers can order, pay for, obtain and validate tickets using mobile phones

Advantages
- Reduce costs
  - Printing
  - Distribution
  - Infrastructure
- Improved consumer convenience
- Increased revenue by increasing ticket accessibility

Applications
- Mass transit
- Airline check-in
- Cinema ticketing
- Concert/event ticketing
- Trade shows
Mobile Ticketing Technologies

- SMS
- Barcode
- RFID

RFID ticket to 2005 Japan EXPO

RFID ticket for the 2006 FIFA World Cup Finals in Germany
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Mobile Banking

- Mobile online access to a bank account
  - SMS
  - Mobile Internet
  - Special software
Mobile Banking: Services

- Account Information
- Payments & Transfers
- Investments
- Support
- Content Services
Mobile Banking: Challenges

- Interoperability
- Security
- Scalability & Reliability
- Application distribution
- Personalization
- Customer adoption
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Mobile Entertainment

- **Worldwide market**
  - 2006: US$18.84 billion
  - 2011: US$38-47 billion

- **Types of mobile media and services**
  - Mobile music (including ringtones)
    - 2006: 40%, 2011: 36%
  - Infotainment
    - Sport, leisure and information products
    - Now dominated by wallpapers
  - Games
  - Gambling
  - Video and TV
  - User-generated content
    - 2011: US$13 billion
Mobile Music: Ringtones

**Drivers**
- User personalization
- Fun
- Product innovation
- Growing disposable incomes
- Increasing mobile penetration
- Competition

**Advantages**
- User confidence
- Pricing
- Billing
- Speed of advanced network rollout and handset availability
- Market maturity
- Operator centricity
- Do it yourself ringtones
Mobile Music: Full Tracks

- Over-the-air full track mobile music downloads

Drivers
- Proven demand for personal mobile music enjoyment
- Single communications and entertainment device
- New delivery channel
- Increasing 3G availability and penetration
- Maturing delivery platforms
- Growing disposable incomes

Advantages
- User confidence
- Music industry acceptance
- Rights management
- Internet alternative
- Price levels
- Business models
- Operator centricity
- Music handset availability
- 3G network availability
Mobile TV and Video

- Mobile streamed TV
- Mobile broadcast TV

Problems
- Regulatory constraints and spectrum availability
- Network coverage and costs
- Handset and service pricing
- Content types, rights and security
Mobile Gambling

- Casino games
- Skill games with prizes
- Lotteries
- Sports betting
- Betting exchanges
Mobile Games

- Technology
  - Embedded games
  - SMS/MMS games
  - Web browser-based games
  - J2ME games
  - Native OS games

- Genre
  - Action
  - Logic/puzzle/skill
  - Sports and racing
  - Arcade
  - Role-playing games
  - Card and casino games
  - Movie games
  - Adult games
  - Lifestyle games

- Number of Players
  - Soloplay
  - Multiplay

- Next tutorial
Mobile Infotainment

Content/Service

- Financial news
- Yellow pages and directories
- Weather and travel information
- Traffic information
- Astrology and horoscopes
- Comics and cartoons
- Sports services
- Navigation services
- Tracking services
- Celebrity interest services
- TV and film interest services
- Community services

Deliverables

- Text messaging and alerts
- Picture messaging and alerts
- Streamed audio and audio clips
- Video clip downloads
- Streamed video
- Wallpapers and graphics
- Voting
- Chat
- Location
Mobile Infotainment Market

Drivers
- Anywhere, anytime accessibility
- Target market match
- Globalization of sport and celebrities
- Growth of 3G networks and technology
- Advance of Mobile TV
- Improvements in content accessibility
- Improved content protection
- D2C distribution

Constraints
- User experience
- Localization and optimization
- Digital rights constraints
- Mobile TV delays
- Network limitations
- Handset limitations
- High pricing
Mobile User Generated Content

- Personal content distribution
- Social networking
- Mobile dating and chatroom services
Where Are We?

• Mobile commerce
• Device and communication platforms
• Mobile commerce applications
• Issues in mobile commerce

• Adoption barriers
• Issues in security and privacy
Success of m-Commerce

- Synergy of
  - Technological innovation
  - Evolution of new value chains
  - Active customer demand

- Integrated mobile devices
- Ultramodern mobile applications
- Geographic-oriented applications
- Advanced security and privacy
Adoption Barriers

- Unawareness
- Device inefficiency
- Personalization/customization
- Nice-to-have vs. must-have
- Geographical roaming
- Perception
Where Are We?

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  - Adoption barriers
  - Issues in security and privacy
Security Issues

• m-Commerce layered architecture
  ▪ Wireless (network) infrastructure
  ▪ Mobile middleware
  ▪ Wireless user infrastructure
  ▪ Mobile commerce applications
Security and Privacy Risks

- Risks
  - Authorization
  - Authentication
  - Integrity
  - Confidentiality
  - Availability
  - Non-repudiation
  - Privacy

- Controls & countermeasures
  - Management countermeasures
  - Operational countermeasures
  - Technical countermeasures
Security Controls: Wireless Network Infrastructure

- **Management countermeasures**
  - Comprehensive security policy
  - Education, awareness and training
  - Legal agreements
  - Security audits

- **Operational countermeasures**
  - Physical access controls
  - Vulnerability assessment

- **Technical countermeasures**
  - Hardware configuration
  - Wireless access controls
Security Controls: Mobile Middleware (WAP)

- Management/operational countermeasures
  - Physical access to WAP gateway
  - Security policies and procedures
- Technical countermeasures
  - SSL
  - WTLS
Security Controls: Wireless User Infrastructure

- **Management countermeasures**
  - User knowledge and “mobile literacy”

- **Operational countermeasures**
  - Device theft prevention and recovery

- **Technical countermeasures**
  - Password protection
  - Biometric access control
  - Antivirus/malware protection
Security Controls: Mobile Applications

• Management countermeasures
  ▪ Posted privacy policies
  ▪ User education

• Operational/technical countermeasures
  ▪ SIM deactivation
m-Commerce Risks

- **Security**
  - Ad-hoc networks
  - Malicious domains
  - Roaming
  - Launching attacks from mobile devices
  - Loss or theft of device
  - Wireless protocols

- **Privacy**
  - Monitoring user’s private information
  - Offline telemarketing
  - Who is going to read the “legal jargon”?
  - Location-based services
Security and Privacy Challenges

- Over-the-air transmission
- No physical security safeguards
- Inadequate wireless cryptography
- Maturing technologies
- Increased complexities
- Limited awareness
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