MOBILE COMPUTING

EMERGING TECHNOLOGY THRU MOBILE...

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ABSTRACT

Our society is going Mobile. Datacom and telecom are integrating. Electronic Commerce is changing the market. In the last couple of years, the interest of Mobile IT has arisen tremendously and future directions point towards an explosive and expansive area. Mobile datacom and the concept of E-Commerce are heading towards integration. The objective was to make a map on present doings in the two areas of Mobile Computing and Electronic Commerce, and examine how these two could be integrated into the concept of Mobile E-Commerce. To explore how mobile commerce services map customer’s requirements in geographical bound retailing. This is done through a geographically bound recommendation service adapted to mobile phones. The service addresses well known problems within the area of shopping by:

1. Offering expert recommendations
2. Notifying the user where products are available.
3. Distributing information in appropriate situations
4. Letting the user search for products.

The findings of the study indicate that the full potential of Mobile E-commerce services can only be established through a complete E-Commerce transaction implementation. The concept of Mobile E-Commerce would prove much more complex and overarching, the future is mobile, and mobile is the future. Mobile E-Commerce is tomorrow’s market economy that will affect and incite changes in organizations, society and people’s everyday lives. The mobile phone is not a wearable desktop. The mobile phone is a wireless wallet, a remote control, and a pathfinder that will make the global marketplace of customer interaction, fit in your hand. The mobile phone gets the role of a remote controller, where products are ordered, paid for and home delivered through a few pressings on the buttons.
INTRODUCTION:

- **Mobile Computing**
  
  Mobile computing has been touted as the next Internet. In reality mobile computing will not replace traditional web surfing but augment it. Mobile devices including cell phones, pagers, PDA's, GPS systems, music players, and game players are converging into one multi-purpose device. The benefit of mobile computing is that a small hand held device is a convenient way for people on the go to send and receive just-in-time information.

- **E-Commerce**
  
  Electronic commerce is the electronic exchange (delivery or transaction) of information, goods, services, and payments over telecommunications networks. E-Commerce activities include establishing and maintaining online relationships between an organization and its suppliers, dealers, customers, strategic partners, regulators, and other agents related to traditional delivery channels.

  We make a map on present doings in the two areas of Mobile Computing and Electronic Commerce, and examine how these two could be integrated into the concept of Mobile E-Commerce.

- **Mobile E-Commerce (MEC)**
  
  Mobile E-Commerce (MEC) is defined as any type of transaction of an economic value conducted through a mobile terminal that uses telecommunications network for communication with the e-commerce infrastructure.

  Toward’s the end of the last century, the integration of the wireless communication and e-commerce started to emerge. As e-commerce technologies advance into the 21st century and more technical hurdles are eliminated in mobile computing, there is no doubt that the popularity of mobile e-commerce will further increase. Small sized, hand-held mobile devices, such as smart phones with embedded SIM card to enhance processing power and storage capabilities, carry out many mobile e-commerce transactions. The main driving force for the rapid acceptance rate of mobile e-commerce is its increased convenience and efficiency in performing simple transactions compared with the stationary machines. For example, some transactions involve only a single request and reply between a customer and a merchant, and possible another round trip message exchange between the customer and the bank. Using a mobile device, people can perform these kinds of transactions anytime and anywhere, and use very simple interface that fits only the small sized screen provided by the mobile device. It is secure provided the mobile device has the capability of performing cryptographic algorithms and access these algorithms is further authenticated by the secrete personal identification number (PIN) of the user. A PIN is a short sequence of digits or mix of digits and letters.
At the end of 2002, there were 454 GSM operators worldwide in 182 countries, and they served over 730 million users. In 2002, 75 percent of the new mobile customers started to use GSM terminals and services offered by the GSM networks.

❖ **We need Mobile E-Commerce**

Mobile E-Commerce is needed for effective delivery of commerce applications into the consumer's hand, anywhere, using wireless technology. This advance has the power to transform the mobile phone into a 'mobile wallet'. Already, major companies have begun to establish partnerships with banks, ticket agencies and top brands to take advantage of the retail outlet in the consumer's hand.

❖ **Driving Factors For Mobile E-Commerce:**

- It is 100% Personal use, Small mono-color screen, and fashion item.
- SMS is always on, Goes wherever I go.
- Browsing of spatial information, e.g. in the form of a city map.
- Navigation: the user must be able to acquire directions and guidance for reaching a specific point of interest.
- Access to catalogue data, e.g. names of restaurants and their description like menu, range of prices, opening hours, etc. Catalogue data must be spatially referenced, so the facilities in the catalogue can be represented on the map and directions for reaching them can be acquired.
- **Location-based access:** The user must be able to access map and catalogue data based on his/her present location. If locating the user cannot be resolved automatically by the system, the user must be provided with the option of manually entering his/her location. The system should be able to handle such requests through geocoding procedures.
- **Fast access:** The user must be able to run various queries, e.g. for nearby restaurants or even for the nearby vegetarian restaurants that are opened after 9pm. Because of these factors mobile had become essential commodity in everyone’s part of the life and the increase the technology and the competition lead to the availability of E-Commerce applications on the mobile making user more friendly and satisfied.

**SERVICES OFFERED THROUGH MOBILE E-COMMERCE:**

Internet e-commerce services using a mobile terminal. They utilize WAP or I-Mode…

Examples:
- Information
- Banking
- Travel
- **Payment**
  Mobile e-commerce services without the need of an IP network. They utilize location-based service technology, Blue tooth,
  - **Ticketing**
  - **Payment**

On line electronic money
Transferable electronic values
Location-Based Services

Mobile E-Commerce Network Model: -

**TECHNOLOGICAL FACTORS: -**

The SIM, of course, is a tried and tested platform and is now regarded as a fundamental security component of m-commerce. The wireless device with its integral SIM is perfectly positioned to become a payment device in its own right, or by supporting payment mechanisms via a second Smart Card access point i.e. 'dual-slot'. This effectively puts the wireless device in the position of becoming a Point-of-Sale terminal in the near future.

**Technological Infrastructure: -**

In this section we will briefly describe the technology leading to 3rd generation (3G) mobile networks, the technology used in Mobile E-Commerce and the technology for mobile terminals.
Mobile Networks and their Development:

Our current mobile services infrastructure is mostly based on 2nd generation (2G) digital public mobile networks. The families of standards created to specify these systems include e.g. Global System for Mobile communications (GSM), CDMA standard (Qualcomm, USA) and PDC (Personal Digital Cellular).

From M-Commerce point of view, Circuit Switched Data (CSD), High Speed Circuit Switched Data (HSCSD), Global Packet Radio Service (GPRS), and Short Message Service (SMS) are important in the GSM standards. They make the wireless data transfer services and applications possible in a wireless telecom network.

The standardization for the third generation of mobile telecom systems (3G) was started at the beginning 1990’s. The International Telecommunication Union (ITU) specified a framework standard for the global 3G system, called International Mobile Telecommunications 2000 (IMT-2000). The central idea of IMT-2000 standard is to enable advanced multimedia services on wireless telecom networks (video streams, animations, pictures, etc.), offer a truly global roaming, and the global coverage of the services. Universal. The work towards 4G networks has also already begun. They should be in operation around 2012. It is no yet clear what 4G systems should and could offer to the users. The hopes for the offerings are: seamless roaming and handoff between various types of technologies such as UMTS/W-CDMA, Blue tooth and Wireless LANs; truly seamless wireless Internet access and; and more bandwidth for wireless data transmission. The main objective as concerns roaming and handovers is to materialize the Always Best Connected (ABC) idea.

Wireless Telecommunications Issues:

Issues related to telecommunications are important in m-commerce because of the widespread use of mobile phones (the “bandwidth cram” problem). Many of the issues with wireless telecommunications technologies are similar to those found with wireless LANs. Older generation technologies result in distinct bandwidth limitations that make it difficult to develop efficient applications for all technologies. Standards vary from country to country. It is difficult for devices to interface with networks in different locations. (There are no phones that handle all systems.) Frequencies are becoming crowded quickly. Currently, the three basic second-generation (2G) digital wireless telephone technologies are:

- Time Division Multiple Access (TDMA),
- Global System for Mobile (GSM), and
- Code Division Multiple Access (CDMA)
All these technologies are circuit-switched services. A user must dial in and maintain a connection to obtain data communications. GSM is the most widely used of the three technologies, but the current speed of GSM is only 9.6 kilobits per second (Kbps). In the future, this issue will become even more complex. Wireless telecommunications continued to evolve into the current state of so-called two-and-a-half generation (2.5G) technologies, some of which are being implemented. High-Speed Circuit-Switched Data (HSCSD) is a circuit-switched wireless data transmission for mobile users at data rates up to 38.4 Kbps. Enhanced Data GSM Environment (EDGE), a faster version of GSM, is designed for data rates up to 384 Kbps to enable the delivery of multimedia and other broadband applications. General Packet Radio Service (GPRS), which promises data rates from 56 to 114 Kbps, is a continuous packet data service that is “always-on,” thus allowing mobile users to access the Internet without dialing in. Redesigning applications for this generation of technology will create additional problems.

Farther in the future, Universal Mobile Telecommunications System (UMTS) is projected to be the third-generation (3G) mobile phone technology. It offers broadband, packet-based transmission of text, voice, video, and multimedia at data rates that will reach 2 Mbps and greater. Based on GSM, UMTS is the planned global standard for mobile users. Once UMTS is fully implemented, computer and phone users can be attached continuously to the Internet and have access to a consistent set of services worldwide. Europe and Asia, however, will probably benefit from 3G wireless before the United States does [Redman, 2000].

**Mobile E-Commerce Considerations:**

The following are the three areas of consideration for Mobile E-Commerce, they are:-

- ACCESS
- SECURITY
- PAYMENTS

- **ACCESS:**

  The access channels for Mobile E-Commerce are as follows:-
  - SMS (mobile devices)
  - WAP (mobile devices)
  - Internet (merchants, Financial Inst….)
  - Common Merchant AP

**Access through WAP channel:**

WAP is a Wireless Application Protocol developed by WAP Forum, based on already existing Internet protocols optimized for mobile users with Wireless devices.
**WAP Architecture:** Traditionally web servers (such as Apache, IIS) can host pages for WAP. Wireless Markup Language (WML) is functionally equivalent to HTML and is used to design pages for WAP (either static or dynamic). WAP Gateway is an intermediary between the Internet and mobile network.

- It translates the mobile device requests (WAP requests) into HTTP requests.
- Redirects the web-server’s HTTP responses to the mobile device.

**Limitations of WAP:**
- Designed with constraints like
  - Small display.
  - Limited input facilities.
  - Narrow bandwidth of network connection.
  - Limited memory.
  - Insufficient computational resources.

**Common Merchant API:**
Common Merchant API minimizes the application development efforts needed by the application developers (order of weeks) and makes the mobile e-commerce solutions faster to launch in the market.

**New technologies to make it happen:**
Several recent technologies, industry and standards developments are enabling the mobile e-commerce market. Ericsson had initiated several cross-industry alliances, including the WAP Forum, Bluetooth, Symbian, Radicchio and the GPRS Applications Alliance. Some of them are…
General Packet Radio Service (GPRS): -

General Packet Radio Service (GPRS) provides mobile users with data rates of up to 115kbit/s (twice as fast as the typical fixed line modem). Because GPRS is packet-based, users can be always connected and always on-line.

Bluetooth: -Bluetooth is a low -cost, low-power radio technology that allows mobile phones, PCs, PDAs, laptops, printers and other devices up to 10 meters apart to communicate without wires. For example, it allows payments to be made from a mobile phone to a vending machine, and is a key enabler for the wireless wallet.

Third-generation (3G) evolution: -

There are developers of third-generation (3G) systems among all mobile manufacturers. With the wideband, multimedia connections that 3G will provide, a whole range of mobile e-commerce services will be enabled, including real-time video playing.

1. SECURITY:-

   The following are the security issues considered in mobile e-commerce:-

   1. “Ordinary” CDMA, TDMA, GSM terminals
   2. GMS phase 2+ terminals, SIM Application Toolkit
   3. WAP 1.1/SMS based solutions.
   4. WPKI certificate management and validation

1. WAP 1.1/SMS Based Solutions:-

   All communication over the Wireless Network uses the Wireless access Protocol (WAP). WAP allows information to be sent from one mobile device to another or from a mobile device to the computer to another through a variety of intermediate and separate networks before it reaches its destination. At the same time, the fact that WAP allows information to pass through intermediate devices makes it possible for a third party to interfere with communications in the following ways: -

   1. Eavesdropping: - Information remains intact, but its privacy is compromised. For example, someone could learn your credit card number, record a sensitive conversation, or intercept classified information.

   2. Impersonation: - Information passes to a person who poses as the intended recipient. Impersonation can take two forms:

      a. Spoofing: A person can pretend to be someone else. For example, a person can pretend to have the email address jdoe@mozilla.com, or a computer can identify itself as a site called www.mozilla.com when it is not. This type of impersonation is known as spoofing.
b. **Misrepresentation:** A person or organization can misrepresent itself. For example, suppose the site www.mozilla.com pretends to be a furniture store when it is really just a site that takes credit-card payments but never sends any goods. Many sensitive personal and business communications over the Internet require precautions that address the threats listed above.

2. **Wireless Public Key Infrastructure (WPKI):**

   This is the Public key infrastructure for the wireless world this infrastructure facilitates several security services
   a. Digital signatures (non-repudiation)
   b. Authentication
   c. Content encryption
   d. Push based signatures.

3. **PAYMENTS:**

   Electronic payment is an integral part of Mobile E-Commerce. Broadly defined, electronic payment is a financial exchange that takes place online between buyers and sellers. The content of this exchange is usually some form of digital financial instrument (such as encrypted credit card number, electronic checks or digital cash) that is back by a bank or an intermediary or by legal tenders. Three factors are stimulating interest among financial institutes in electronic payments: decreasing technology cost reduced operational and processing cost, and increasing online commerce. The desire to reduce cost is one major reason for the increase in electronic payments. Cash and cheques are very expensive to process and banks are seeking less costly alternatives.

   Electronic Currencies are designed as electronic analogs of various forms of payment backed by a bank or financial institutions. Simply stated, electronic currencies are equivalent to cash that is backed by a bank.

   Electronic currencies are of three types:

   1. **Cash or real-time:** Transactions are settled with the exchange of electronic Currency. An example of this online currency exchange is electronic cash (Ecash).
   2. **Debit or Prepaid:** Users pay in advance to the banks or financial institution.
      Example of prepaid payment mechanisms are stored Smart Cards and electronic purses that store electronic money.
   3. **Credit or Postpaid:** The server authenticates the customers and verifies with the Bank that funds are adequate before purchase. Examples of postpaid mechanisms are credit/debit cards and electronic cheques.
WHERE IS MOBILE E-COMMERCE TODAY AND FUTURE?

Mobile based services are demonstrated in many locations but are not commercially offered yet. For example, the public transport system in Berlin (Berliner Verkehrsbetriebe) is introducing a ticket via mobile phone on a trial basis since October 2002. An Austrian weather service company that provides weather forecasts in the German speaking countries is starting LBS for 3G phones – Austria is the first country in Europe to introduce 3G services commercially. The German Ministry of Transportation just signed a contract ultimately worth $7 billion for the development, installation and operation of a toll system for trucks that will use GPS and mobile networks. The UK operator Hutchinson 3G who has announced the start of its 3G service later in 2004 has just signed agreements with five companies to provide to its customers digital maps and directions to services such as hotels, restaurants, shops and businesses. California just enacted a law preventing unsolicited text messages being sent to mobile users. This is killing the dream of every marketer: to send advertisements to all mobile users within a certain radius from a store. It looks though that m-commerce solutions will still leave room for billboards and other traditional marketing methods.

Predicted reach for fixed and mobile e-commerce (source: ARC Group, Intelligence)

CONCLUSION: -

In this paper, we briefly reviewed some of the most important technologies for Mobile E-Commerce. E-Commerce development is now shifting from wired computers to wireless mobile devices. WAP will take a major role in future E-Commerce applications. we should explore an alternative method in supporting interface of both Web and WAP (XML and XSL are one such). We presented a few future implementations of mobile e-commerce that re expected in near future. Mobile E-Commerce is surely an area of modern mobile services where considerable growth is observed. The developments in the Internet domain, wireless/mobile networking as well as the proliferation of positioning technologies expedited such evolution.
Requirements need to be reviewed and studied very carefully by all the involved actors. Our analysis, as presented in this paper, shows that the technologies and issues involved in mobile e-commerce deployment and provision cover a very wide spectrum including operating system capabilities, user interface design, positioning techniques, terminal technologies, network capabilities, etc. The meticulous mapping of these technical aspects to the identified requirements is a critical success factor for Mobile E-Commerce.

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