Review on Mobile Commerce in Electronic Commerce

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Abstract: Electronic commerce which also known as e-Commerce is a type of business model or segment of a larger business model which it enables an individual or firm to conduct business over an electronic network, typically the internet. Electronic commerce operates in all four of the major market segments which are business to business, business to consumer, consumer to consumer and consumer to business. In this study, researchers present an overview of mobile commerce for electronic commerce. Researchers focus on the how to successfully define, architect and implement the necessary hardware/software infrastructure in support of mobile commerce. At the end of this study, researchers summarize technologies, issues and applications in mobile commerce.

Key words: Electronic Commerce, mobile commerce, network business, financial, internet

INTRODUCTION

Electronic commerce or also known as e-Commerce is a type of business model or segment of a larger business model which it enables an individual or firm to conduct business over an electronic network, typically the Internet. e-Commerce operates in all four of the major market segments which are Business to Business (B2B), Business to Consumer (B2C), Consumer to Consumer (C2C) and Consumer to Business (C2B). e-Commerce draws the technologies such as mobile commerce (m-Commerce), electronic funds transfer, supply chain management, internet marketing, online transaction processing, Electronic Data Interchange (EDI), inventory management systems and automated data collection systems (Behrouz and Firouz, 2012).

In this study, researchers present a survey on m-Commerce for the e-Commerce. Researchers outline the definition, architecture and implementation of the necessary hardware/software infrastructure in support of m-Commerce.

BACKGROUND

e-Commerce is burgeoning as a means of doing business and shows every sign of continuing to expand at a rapid rate. It typically can be divided into three stages: first, the pre-purchase stage including advertising and information seeking; second, the purchase stage including purchase and payment and third, the delivery stage.

In principle, all types of products can be advertised and purchased over electronic networks. e-Commerce requires that a final product can be presented as digitalized information and transmitted electronically, typically over the Internet. Many services can be supplied as digitalized information including financial transactions or legal advice. Besides, some information and entertainment products typically characterized as goods such as books, software, music and videos embody digitalized information that can also be supplied electronically over the internet.

For past 10 years, almost all e-Commerce applications envisioned and developed so far assume fixed users with wired infrastructure on a personal computer connected to the internet using phones lines or Local Area Network (LAN). Many new e-Commerce applications will be possible and significantly benefit from emerging wireless and mobile networks.

Wireless and mobile networks have experienced an exponential growth in terms of capabilities of mobile devices, user acceptance, standards and network implementation and middleware development. According The International Telecommunication Union (ITU) Estimation by February (2013) there were 6.8 billion mobile subscriptions at the end of 2012. This is equivalent to 96% of the world population (7.1 billion according to the ITU) and it was huge increase from 6.0 billion mobile subscribers in 2011 and 5.4 billion in 2010. Among the 6.8 billion mobile subscribers, 29.5% are active mobile broadband subscribers while 9.8% subscribers are fixed broadband subscribers (Sanou, 2013).

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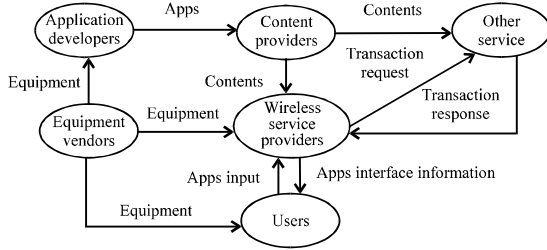
Fig. 1: m-Commerce life cycle

Researchers strongly believe that the widespread development of wireless technologies, the next phase of electronic business growth will be in the area of wireless and mobile e-Commerce. Figure 1 is showing the m-Commerce life cycle.

m-Commerce is creating entirely new opportunities both for mobile devices andservices. m-Commerce means transactions using a wireless device and data connection which result inthe transfer of value in exchange of information, services or goods.

An m-Commerce transaction isdefined as any type of transaction of an economic value that is conducted through a mobile device thatuses a wireless telecommunications network for communication with the e-Commerce infrastructure. m-Commerce differs partially from e-Commerce due to the special characteristics and constraints the mobile devices and wireless networks have.

m-COMMERCE APPLICATIONS

m-Commerce has potentially an unlimited number of applications, so researchers attempt to identify several important classes of applications and provides some examples. Table 1 shows many classes and example applications.

Mobile advertising: Mobile advertising is one of the important classes of m-Commerce applications. In this situation, mobile advertising refers to advertisement sent to mobile devices. Companies have reported that they see better response from mobile marketing or mobile advertising campaigns than from traditional campaigns. Using this application, the advertising messages can be personalized based on the earlier user's registration information or user's purchasing history. Besides, the advertisements can also be location sensitive and inform user about shops, mall and restaurant as shown in Fig. 2. Usually, this kind of advertising can be performed using Short Messaging Service (SMS) or Multimedia Messaging Service (MMS).

Other than that the advertising also c an be performed by contextual ads on search engine results pages, banner ads, blogs, rich media ads, social network advertising, interstitial ads, online classified advertising, advertising networks, dynamic banner ads, cross platform ads and e-mail marketing, including e-mail spam.

Since, the wireless bandwidth becomes more available, content rich advertising which involving audio pictures and video clips can be produced for users with the specification of inclinations, interest and needs.

Mobile financial applications: Researchers can simplify those mobile financial applications are the one of the most important components of m-Commerce since, it is contain a variety of applications such as mobile money transfer, mobile banking and brokerage service and mobile micropayments. Through these services, a mobile device can transform into Automatic Teller Machine (ATM) machine, replacing bank, business tool and even credit cards which can allow user to manage their financial transaction.

One of the examples of mobile financial application is Electronic Funds Transfer (EFT). EFT is a system of transferring money from one bank account directly to another without any study money changing hands. The growing popularity of EFT for online bill payment is paving the way for a studyless universe where checks, stamps, envelopes and study bills are obsolete. The benefits of EFT include reduced administrative costs, increased efficiency, simplified bookkeeping and greater security.

Proactive service management: This kind of applications actually is based on collecting pertinent information about current or near future user needs and providing services to users proactively. The application might involve in collecting information about the aging components of an automobile as shown in Fig. 3. Many vendors including car dealers/repair shops are acquiring information about aging components of automobile. Then, car dealers/repair shops will collected the information and then use to order components, indirectly reducing inventory costs. In a more elaborate scenario, dealers/shops can compete each others by offering the best discounts of lower rates.

After that the information that collected will send to manufacturers to analyzed and improve their design and manufacturing of future products. In this case, BMW is one of the manufacturers that offer the car components as part of the warranty for new cars. So, it can reduce the

Table 1: Details and networking requirements of m-Commerce applications

| Class of Applications	Explanation	Examples
Mobile advertising (B2C)	Applications turning the wireless infrastructure and devices into a powerful marketing medium	User specific and location sensitive advertisements
Mobile financial applications (B2C, B2B)	Applications where mobile device becomes a powerful financial medium	Banking, brokerage and payments for mobile users
Proactive service managements (B2C, B2B)	Applications attempting to provide users information on services they will need in very near future	Transmission of information related to aging (automobile) components to vendors
Mobile inventory managements (B2C, B2B)	Applications attempting to reduce the amount of inventory needed by managing in house and inventory on move	Location tracking of goods, boxes, troops and people
Wireless re-engineering (B2C, B2B)	Applications that focus on improving the quality of business services using mobile devices and wireless infrastructure	Instant claim payments by insurance companies
Mobile entertainment services and games (B2C)	Applications providing the entertainment services to users on per event or subscription basis	Video on demand, audio on demand and interactive games
Mobile auction or reverse auction (B2C, B2B)	Applications allowing users to buy or sell certain items using multicast support of wireless infrastructure congestion problem)	Airlines competing to buy a landing time slot during runway congestion (a proposed solution to air-traffic
Mobile distance education (B2C)	Applications extending distance/virtual education support for mobile users everywhere	Taking a class using streaming audio and video
Mobile office (B2C)	Applications providing the complete office environment to mobile users anywhere any time	Working from traffic jams, airport and conferences
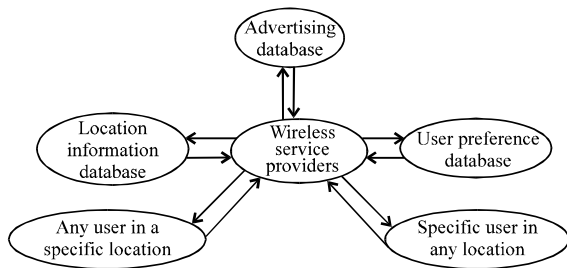
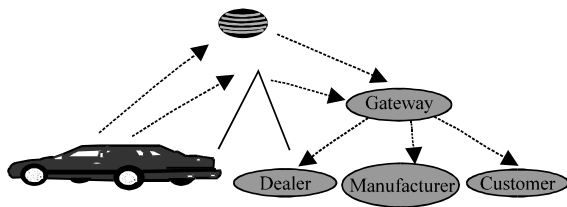Fig. 2: Mobile advertising and shopping

Fig. 3: Information transmission on aging automobile components to dealers

anxiety levels of owners and then improve the generel conditions of automobiles on the road leading to a reduced number of traffic jams, accidents and even fatalities. The automobiles can be equipped with smart sensors that keep track of how much wear and tear a car component has gone through. This information can then be transmitted using a radio/microwave/satellite system to a specified service center or other location.

Mobile inventory managements: In the m-Commerce environment, inventory management was evolved into mobile inventory management. The latter is different from

the traditional inventory management in many ways where advantages are cost savings, increased efficiency, warehouse organization, updated data, data security and insight into trends.

This application involves location tracking of goods, services and people. The tracking may help service providers in determining the time of delivery to customer thus improving customer service and obtaining a competitive edge over other businesses.

One of the mobile inventory management applications is just in time delivery/movement of components in an assembly plant based on the rate of consumption of existing components. "Just in time" means making "only what is needed when it is needed and in the amount needed". Supplying "what is needed when it is needed and in the amount needed" according to this production plan can eliminate waste, inconsistencies and unreasonable requirements, resulting in improved productivity. So, a variety of new components can be moved a certain speed after receiving a wireless signal from the components reaching the assembly line or from a device on the assembly line itself. If the new components are delayed for some reason then signals can be sent to assembly line for possible adjustment of the assembly speed to match the arrival time of new components. This application can reduce the inventory cost while increasing productivity by matching the speed of new component arrival to the rate of assembly.

For just in time example, Kanban system as shown in Fig. 4 is a unique production control method in the Toyota Production System (TPS). Kanban System also known as "Super market Method" because the idea behind it was borrowed from supermarkets. Such, mass merchandizing stores use product control cards upon
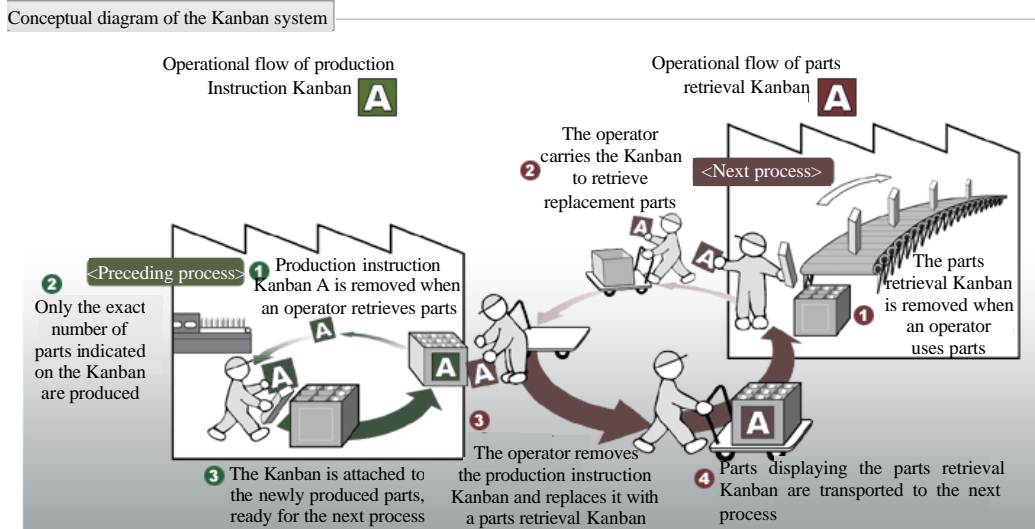
Fig. 4: Conceptual diagram of the Kanban system

which product related information such as a product's name, code and storage location are entered. The method came to be called the "Kanban system" because Toyota employed kanban signs for use in their production processes. At Toyota when a process refers to a preceding process to retrieve parts, it uses a kanban to communicate which parts have been used (Suyanto, 2010).

Wireless business re-engineering: According to Hammer and Champy (2009) their best selling book "Reengineering the Corporation" they suggested seven principles of reengineering to streamline the work process and thereby achieve significant levels of improvement in quality, time management and cost.

The seven principles are organize around outcomes, not tasks, identify all the processes in an organization and prioritize them in order of redesign urgency, integrate information processing work into the real work that produces the information, treat geographically dispersed resources as though they were centralized, link parallel activities in the workflow instead of just integrating their results, put the decision point where the research is performed and build control into the process and capture information once and at the source.

For the wireless business re-engineering example, IBM Credit Corporationis in the business of financing the computers, software and services that the IBM Corporation sells. The IBM Credit's Operation comprises of five steps as follows:

- The IBM field sales representative called in with a request for financing, one of the operators in the central office wrote down the request on a piece of study
- The request was then dispatched to the credit department where a specialist checked the potential borrower's credit worthiness, wrote the result on the piece of study and dispatched to the next link in the chain which was the business practices department
- The business practices department was in charge of modifying the standard loan covenant in response to customer request. The special terms to the request form would be attached to the request if necessary
- The request went to the price department where a pricer determined the appropriate interest rate to charge the customer
- The administration department turned all this information into quote letter that could be delivered to the field sales representative

This entire process consumed 6 days on average. From the sales representative's point of view, this turnaround was too long that the customer could be seduced by another computer vendor. Furthermore, no one would tell where the request was and when it could be done. To improve this process, IBM Credit tried several fixes. They decided for instance to install a control desk so they could answer the sale representative's question about the status of the request. That is instead of forwarding the request to the next step in the chain each department would return the request to the control desk where an administrator logged the completion of

each step before sending out the request again. This fix did indeed solve the problem however, at the expense of adding more time to the turnaround.

These tasks fall well within the capability of a single individual when he or she is supported by an easy to use computer system. IBM Credit therefore developed a new, sophisticated computer to support the generalists. In most situations, the system provides guidance and data to generalists. In really tough situations, he or she can get help from a small pool of real specialists who are assigned to work in the same team. The new turnaround becomes 4 h instead of 6 days. The company achieved a dramatic performance breakthrough by making a radical change to the process (O'Neill and Sohal, 1999).

Mobile auction, entertainment and other services: Many m-Commerce applications can be offered to people through mobile devices and wireless networks. These applications include mobile auction/reverse auction, video on demand services and other entertainment oriented services.

Reverse auction is a type of auction in which the roles of buyer and seller are reversed. In an ordinary auction, buyers compete to obtain a good or service by offering increasingly higher prices. In a reverse auction, the sellers compete to obtain business from the buyer and prices will typically decrease as the sellers undercut each other. So, reverse auction is similar to a unique bid auction as the basic principle remains the same however a unique bid auction follows the traditional auction format more closely as each bid is kept confidential and one clear winner is defined after the auction finishes.

Reverse auction is one of the most commonly terms in government or private sector procurement. For this situation, the buyer's only consideration is just not only the process but they also compare suppliers' quality, prices, reputation andexperience before they making a purchasing decision. Reverse auctions can be also used by buyers to find vendors with whom they want to research in the future.

The technologies needed includemobile devices with capabilities to match desired applications, wireless networks with high bandwidth and suitable mobile middleware. Besides, a continued connectivity is most important issue since it might affect the perceived quality of service for entertainment/information services. For auction/reverse auction, frequent disconnectionmay seriously affect the usefulness of this service unless it can be guaranteed that if users get disconnected, the state of auction will be maintained and disconnected users will not suffer any loss during periods of disconnection.

WIRELESS NETWORKING INFRASTRUCTURE

In realizing the m-Commerce applications, networking support from wireless networks is very crucial in addition to mobile devices and middleware. In this study, researchers present and discuss the wireless networking requirements for the various m-Commerce applications. Wireless Local Area Network (WLAN) links two or more devices using some wireless distribution method and usually providing a connection through an access point to the wider internet (Juwaini *et al.*, 2012). This gives users the mobility to move around within a local coverage area and still be connected to the network. Most WLANs are based on IEEE 802.11 standards, marketed under the Wi-Fi brand name.

A Wireless Distribution System (WDS) is a system that enabling the wireless interconnection of access points in an IEEE 802.11++ network. WDS allows a wireless network to be expanded using multiple access points without the traditional requirement for a wired backbone to link them. The notable advantage of WDS over other solutions is it preserves the MAC addresses of client frames across links between access points. Therefore, an access point can be either a main, relay or remote base station.

Usually, a main base station is typically connected to the (wired) Ethernet then a relay base station relays data between remote base stations, wireless clients or other relay stations to either a main or another relay base station. Last but not least, a remote base station accepts connections from wireless clients and passes them on to relay stations or to main stations. Connections between clients are made using Medium Access Control (MAC) addresses (Al-Hubaishi *et al.*, 2013).

All base stations in a wireless distribution system must be configured to use the same radio channel, method of encryption (none, WEP or WPA) and the same encryption keys. They may be configured to different service set identifiers. WDS also requires every base station to be configured to forward to others in the system (Lashkari *et al.*, 2009).

One of the examples of m-Commerce applications is mobile financial applications. It requires locating a device, user or building for making financial transactions. This kind of transaction required a very high level of wireless infrastructure dependability to allow a user to make these transactions from anywhere and anytime. Just like many other m-Commerce applications, they may require location management support.

For mobile advertising case, it needs asymmetric multicast to send messages to certain users in certain locations but such multicast does not have to be real time.
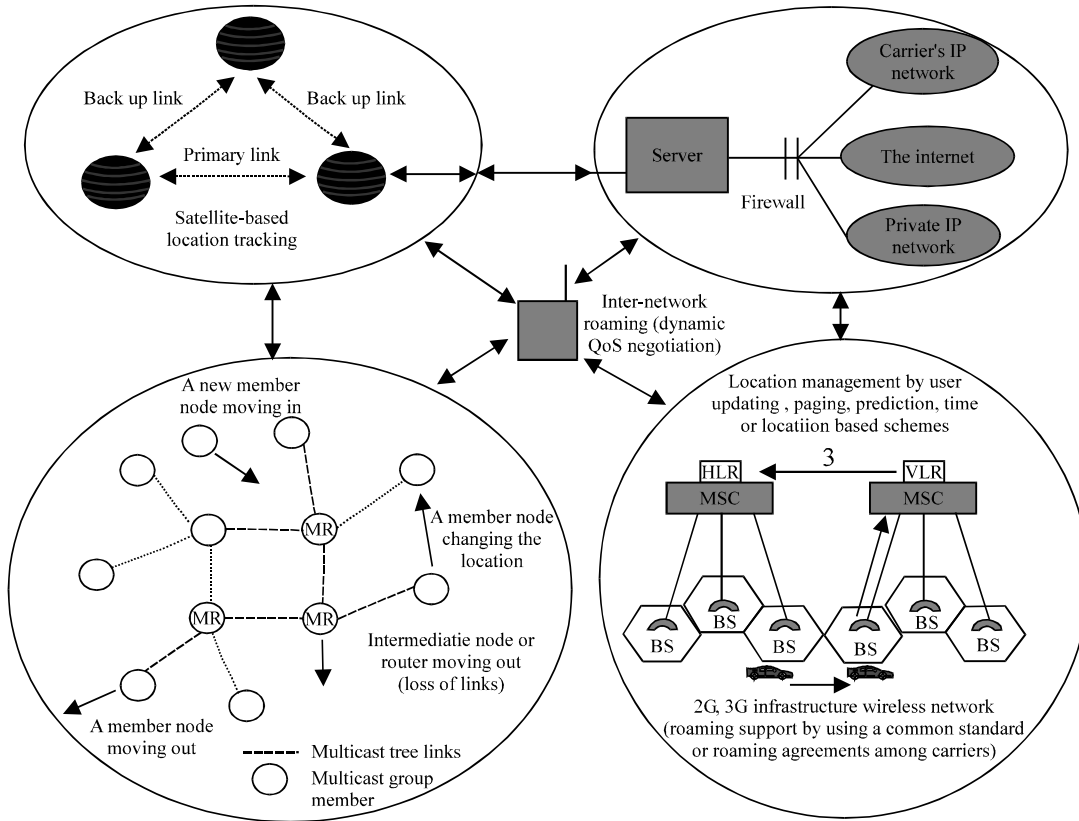
Fig. 5: A global comprehensive wireless infrastructure for m-Commerce

However, mobile advertising's network dependability requirements may not be stringent as loss of some messages could be tolerated. Mobile advertising is also need a quality of service in terms of bandwidth and delay.

Researchers can simply conclude that m-Commerce applications would present five general networking requirements which are location management, multicast support, network dependability, support for quality of service and the ability to roam across multiple wireless networks. Then, researchers present a global and comprehensive wireless infrastructure for m-Commerce applications as shown in Fig. 5.

A mobile user can use m-Commerce applications in several different ways. It could be through infrastructure-based wireless networks such as cellular and Global System for Mobile communications (GSM) networks or could be through an ad hoc wireless network that can connect to the IP-based networks via satellites. A user could connect directly via Satellite Based Systems (Agar, 2013).

m-COMMERCE ISSUES ON WIRELESS CARRIERS AND DEVELOPERS

Wireless carriers play an important rolein the m-Commerce applications and services. This is because wireless carriers have the power of numbers and user data using which they can team up with mobile marketers to provide their customers a better overall mobile experience. Besides, wireless carriers also can receive the details of consumer user data and behavior in a real time situation. Anyways, there are still lots of technical and non-technical hurdles that need to be overcome before wireless carriers become the most major players in m-Commerce (Tarasewich et al., 2001).

The different standard used in cellular and GSM System in the worldwide directly affects the interoperability and global roaming of mobile users. Differences in standards along with other interests have also led to delays in the deployment of next generation of wireless/mobile systems. Other than the technological issues, wireless carriers are facing challenges about the m-Commerce price. They need to compete with each other and divide revenues among themselves. However, there

still have lots of important issues to overcome before m-Commerce widely deployed such as the development of new business models for service prices, the maturity of application software, middleware support, vendor support and user trust necessary (Bacchetta *et al.*, 2009; Banzal, 2010; Tandon *et al.*, 2003).

CONCLUSION

m-Commerce is an interesting and evolving area of e-Commerce where the users can interact with service providers through a mobile and wireless network by using a mobile device. In this study, researchers have looked into a few new classes of applications, reviewed networking requirements and discussed application development support. Therefore, researchers hope that m-Commerce services and applications can be adopted through different wireless and mobile networks with the aid of several mobile devices. There are still having some issues on influencing the performance of the various mobile systems that need to be considered in the design of m-Commerce services and applications. Researchers also believe that users will play a crucial role in acceptance and widespread deployment of m-Commerce applications.

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