m-Commerce: Reality Behind the Hype

Julian L. Hunter
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Introduction

Defined by Gartner Research as "… any transaction involving the purchase of goods or services that is completed with a wireless device, such as a cellular phone, personal computer or personal digital assistant." [2001, Casonato] M-Commerce[1], has been heralded by analysts and industry leaders as the new frontier for e-Commerce.

Unfortunately, for companies with huge investments in the underlying infrastructure, the demand has not been as strong as predicted. Many reasons exist for the slow adoption rate, ranging from the current market situation[2] to the apparent user apathy towards m-Commerce. Whatever the reasons, the fact remains that despite the hype surrounding the technology the return on investment has not been nearly as high as anticipated.

Potentially, one of the biggest factors holding back widespread adoption of m-Commerce is a lack of standardization among the baseline technology. Currently, there are a multitude of technologies competing at all layers. For instance, at the physical network, you have several different transport layers, all speaking their own language. To the consumer it means their device is tied to a single network rendering it essentially useless when out of the providers coverage area (whether users realize it or not).[3] With

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[1] M-Commerce is short for Mobile Commerce, and also an obvious play on the term e-Commerce (which refers to electronic commerce).

[2] The market situation to which I refer is the meltdown that happened between late 2000 and early 2002, and may still be underway, depending on which market analysis you read.

[3] Some providers have tried to remedy this by signing agreements with providers in other locations so that subscribers from one network can continue to use their device while in the other provider's coverage area. (In Canada Rogers Wireless has made this type of deal with American providers for their corporate customers, using Research In Motion's Blackberry device.) While this works to a certain extent, the provider you sign with must have the same network type and so the coverage is never perfect.

this restriction in place, can m-Commerce be truly mobile? The answer is a resounding no.

Baseline technology is not the only limitation of current m-Commerce offerings. If it were only technical, m-Commerce probably would have taken off as predicted, but there are other shortcomings. For instance, payment systems in the mobile world will have to handle multitudes of micro payments, something which the traditional technology was not designed to handle. Additionally, there are consumer concerns over data and personal security.[4] Tied to the notion of security is privacy, mobile providers are able to track an abundance of information about individual users, this must be kept absolutely confidential and guarded against misuse.

Even with all of these seemingly insurmountable limitations m-Commerce still has a lot of potential for growth. It promises to make everyday tasks simpler, provide location based services and much more. In fact, with predictions like, "… the number of mobile phones users will exceed one billion worldwide by 2003. By 2005, 500 million mobile devices will provide Internet access – a number that surpasses Internet enabled PCs." [2002, Raczkowski] from Goldman Sachs Equity Research, m-Commerce may be as revolutionary as the telephone or television.

However, before any of this can occur on a revolutionary scale the obstacles must be overcome. This paper will attempt to provide a categorization of current and future m-Commerce initiatives. Followed by an outline of each of the current limitations facing m-Commerce and provide some insight on how they will be overcome.

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[4] In location based systems, as we will see later, the exact location (within small deviations) can be ascertained at any given time. What does this means to personal security and safety? Can it be misused, either by criminals (crackers), or even government agencies?

Baseline Technology

Baseline technology refers to the underlying infrastructure, such as physical networking hardware and other low level services, which enable wireless devices to communicate with on another. This definition can also be extended to include the devices themselves.

Networks

The network level is awash in a sea of competing standards. While some of these networking technologies are evolutionary, such as 2G, 2.5G and 3G (and NTT DoCoMo's 4G)[5] others are in direct competition with each other, like Bluetooth[6] and the IEEE's 802.11[7] standards. Interestingly, the point of a standard is to make sure that different devices can operate across all networks and vendor products. The one caveat to this is that it assumes that all providers settle on the same standard, and right now that is anything but certain.

If this interoperability between networks and providers does not exist the effects on m-Commerce are potentially devastating[8]. Imagine having a wireless device you are dependant on for daily tasks, then you take a business trip to a different city with a different provider and a different network type. Your mobile device no longer works, and you are left to fend for yourself (heaven forbid). This

[5] For more information on the differences between these evolutionary technologies visit http://www.3gnewsroom.com/html/what_is_3g/index.shtml

[6] For more information on the Bluetooth standard visit http://www.bluetooth.com/

[7] For more information of the IEEE"s 802.11 standards visit http://www.80211-planet.com/

[8] I say potentially here since it is only my opinion and not a fact. However, it has been shown in the mobile phone market that losing your signal outside of coverage areas and even poor reception due to weak signals are the biggest irritants of users.

scenario begs the question, what good is m-Commerce if it is not truly mobile? Unfortunately, the answer is 'not much'.

Devices

Devices currently on the wireless market vary in size, shape, color and functionality, but they do share some general characteristics. They all have relatively small, often monochrome, displays and limited input functionality. This is not necessarily a detriment; it just warrants consideration when considering m-Commerce applications.[9]

Conveniently, the devices could also help solve the problem of interoperability between networks outlined above. If a device was capable of communicating with several different networks there is a little room for differing networks between providers.[10] Providing this however makes the device more expensive to produce and also adds to its size and weight, making it less portable.

Categorization of Mobile Applications

To better describe the possibilities of m-Commerce it is helpful to break the current offerings into categories. While the categories try to provide a logical grouping of functionality, applications can, and do, belong to more than category.

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[9] In fact, a bigger display means more weight which translates to less mobility.

[10] Again, going back to the mobile phone market, there is precedence for this. Most newer phones provide digital and analog service. Some phones, known as tri-mode phones, work in Europe and Asia, as well as North America.

Convenience

Some m-Commerce applications will not be revolutionary, but they will be very useful and convenient. Applications in this category take everyday tasks, such as refilling your parking meter, and make them easier and more efficient. For example, everyone has stood in front of a vending machine with an incredible hunger but no change, imagine for a second using your mobile phone to make the selection and then having vendor send the machine a signal telling it to dispense your purchase.

From the other side of the vending machine example, if the machines could let the owner know that they needed maintenance, refilling or just needed the money tray emptied, the cost savings of only sending out what is needed, where it is needed and when it is needed would be substantial. Technology like this already exists and is in production use today.[11]

Another potential target for this type of "convenience technology" is the taxi industry, clicking a few buttons to hail a cab would be a lot more convenient than standing on the curb in the rain.

Location Based Service

New wireless network technologies, and even some older ones, have some sense of the location of an individual device and by extension the location of the user.[12] This information can be used in a variety of ways, from delivering location

[11] For more information about this type of technology visit http://www.maingate.se/

[12] The accuracy of this technology varies, newer technologies such as GPRS and GSM can pinpoint the device within meters, while older techniques such as cellular triangulation

based weather reports, to special lunch coupons form a local restaurant. A Seattle company, Infospace Inc.[13], already has an "m-coupon" service in trial, although information on it is hard to find.

Public transportation could also benefit greatly from location based services. Knowing the exact location of a bus or train and applying an intelligent estimation algorithm would allow schedules to be accurate within minutes, even in abnormal conditions. Combine that with the ability for anyone to access that "live schedule" from their own wireless device and you have a very powerful application destined for widespread adoption. Moreover, if users can then register for a certain route at a certain time, the management of peak capacities could be handled automatically, with a backend server moving buses or trains on and off routes as necessary.

The possibilities of this, very powerful, wireless feature are limited only by imagination. For another example go back to the vending machine scenario, if the machine would be able to tell the owner exactly where it was, in fact it may even give you directions!

Wireless Portals

With the limited ability of the current wireless devices in terms of display size and input options, surfing the web will probably not play a large part in m-Commerce. To fill this void, wireless portals will be very important. Similar to

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[13] For more information visit http://www.infospaceinc.com

web portals, wireless portals will provide users with specific information customized to their needs and to their specific wireless device.

In addition, a wireless portal gives wireless service providers the opportunity to deliver services to only those users that have expressed an interest. As well as, a chance to make money by taking a percentage of all transactions facilitated by the portal. In fact this is already happening, most wireless providers, such as Rogers AT&T in Canada, currently control their own wireless portals, and charge service providers for the privilege of delivering content to the it's users.[14]

Instant Messaging

Instant messaging is a "killer application" in the traditional world of wired internet access, and it is threatening to become a killer application in the wireless world as well. An example of its popularity can be seen in the explosion of SMS, or Short Messaging Service, in Europe. In fact, marketers are having an easier time marketing via SMS than via direct mail marketing campaigns[15], which can only bode well for MMS, or Multimedia Messaging Service, which allows those marketing campaigns to be conducted with multimedia content rather than plain text.

When mainstream messaging systems from the wired world, like ICQ and MSN Messenger, go mobile, it will only help to drive the sale of wireless devices, among non-technical and non-business users. Helping to seed the marketplace

[14] It is worth noting that this limits the user to only those services who have paid the portal owner's fee and may prove to be the undoing of this business model and spring independent portals analogous to yahoo.com in the traditional web world. Also, Rogers AT&T's web portal is currently not personalized to the user.

[15] For proof of this please visit http://www.nua.ie/surveys/index.cgi?f=VS&art_id=905357598&rel=true

with the requisite hardware, this in turn will help further adoption of other m-Commerce applications.

Games and Gambling

"Enthusiasm for mobile gaming and gambling is based on analyst forecasts such as the one issued by financial institution Merrill Lynch recently, which suggested that one per cent of total global consumer spending in 2000 (about £107 billion) was accounted for by gambling." [2001, Ulster Business] In addition to that, games have always served to drive the adoption of ever faster PCs and there is no reason to think they cannot have a similar effect on the adoption of wireless services. Moreover, combined with the location based aspect of the wireless world we may see a whole new breed of games, where your location in the real world, impacts your location/performance in the game itself.[16]

It is interesting to note that gaming and gambling are similar but not exactly the same. For instance to gamble in most jurisdictions you need to be, at least, the age of majority. Again wireless devices have a unique advantage in this area, not only being able to tell which jurisdiction you are in, making it easy to apply the correct laws, but also, because a wireless service is subscribed to by a person it will be able to tell your age (or at least whether or not you are above the age of majority).

These will not be the only advantages gambling gains from going wireless. Imagine being given special odds because you are actually at the event you are

[16] This may open a whole new set of social problems, but that is a topic for another paper by someone more qualified than me.

betting on, or placing bets from your seat or in your car on the way to the race track. These options and more will soon be available to you, right on your mobile phone or wireless PDA.

Future Categories

In the future other categories will come to light, mirroring technologies just now gaining steam on the internet. Potentially, peer to peer networks will develop in the wireless world, although no such technology exists today[17]. For instance, going back to the vending machine example, what if vending machines in a certain area, say a college campus, could talk to each other in a peer to peer fashion. When a machine runs out of a certain type of product, and a user shows up and requests that product, the machine can refer the user to the closest machine which does have the product in stock. Possibly even forwarding the money already entered to the new machine. This is just one example of the many technologies, most not yet even thought of, that will undoubtedly develop under the umbrella of m-Commerce.

Current Obstacles

Usability

With the small screen size and lack of easy input methods of mobile devices, usability is going to be a key concern when designing the user interface of mobile applications. If it is hard to use or difficult to get information from, only

[17] No peer to peer networks exist for wireless devices today, to the best of my knowledge, if you know of one please contact me at julianh@rogers.com.

a small subset of the features will be used, or worse, the application will be ignored completely.

Wireless portals will provide some relief from this, by filtering the massive amount of information available and allowing only the information the user has expressed an interest in through. Another possible source of relief may be the use of voice recognition as a replacement for the keyboard and mouse. Although, this approach is still in its infancy, and requires a lot of computational horsepower to process, so for now, users will be stuck with the traditional methods, and UI design will remain paramount.

Cost

In order for m-Commerce to gain a significant foothold there can be no added cost. That is to say, users will not pay for the privilege of using m-Commerce, if it is going to be adopted it has to be free or nearly free. Therefore, in time the wireless connection market will be driven to commodity, just like the internet access market has been. Vendors are going to have to pay the upfront capital costs themselves and hope to recoup the cost in the volume of traffic, and traffic will be there if the price is right.

Payment Options

"How users will pay for their m-Commerce purchases presents one of the key obstacles to the development of the market, no matter what region of the world is involved." [2001, McGuire] Traditional payment infrastructures, credit and bank card systems, were not designed to deal with volume, or micro-size, of

payments that m-commerce will generate. For instance, if instant messages cost fractions of penny, and a user sends dozens in a short time frame, how would a credit card company bill for that. Currently they would be unable to accommodate it.

Luckily this has been a very active area of development in the m-Commerce world and several vendors and new start-ups are offering solutions, but much like the network infrastructure, in the end only a couple of these will gain widespread acceptance and use.[18] One that may survive is a joint initiative by VISA, MasterCard and American Express, who are proposing a secure standard for credit card processing and presumably, micro payments.

"To date, mobile commerce has failed to meet the needs of consumers, including the capability of handsets and the speed of wireless networks, and the content providers have not figured out what consumers want to purchase when they are mobile," Joe Chouinard, vice president of new e-commerce channels at e-Visa International, told the E-Commerce Times. "Also, the lack of secure transactions has inhibited the growth of mobile commerce." [2001, Martinez]

That statement really sums up the current state of m-Commerce in general, and the payment system specifically. Few people have any idea what users will pay for or how they will pay for it. Obviously, this will develop overtime, but the industry needs to start sooner, rather than later, so that the solution can eveolve along with the problem.

[18] For a list of some of the current initiatives and white papers in this are, please see the bibliography.

Security Concerns

Security concerns come in two flavours when m-Commerce is concerned. The first is security of data. Mobile devices, by definition are easy to lose and steal, so how do we protect the data contained within them and prevent misuse. Currently, not many devices store critical data locally, so this is not a large concern immediately, but in the future as the device itself is used to store sensitive data about the user, this will become a much larger issue. Devices could employ a thumb print or even voice recognition as a means of activation. Whatever the solution it will have to satisfy the users desire to know that their personal information is secure.

Data is also susceptible to theft while it travels through the air to the wireless receivers and then across the internet to the servers processing the request. To provide protection from this type of information theft encryption will play a large role. In fact, even while surfing the web on a current handheld via Rogers AT&T, all traffic is encrypted and keys are generated and exchanged each time the browser is restarted.

Aside from data security, there is personal security. If a users location is able to be deciphered with pinpoint accuracy, then some method has be developed to keep this information from being abused. If not, users will be reluctant to use the technology, fearing things such as stalking and harassment. Similarly, privacy concerns are also a concern, conceivably, a user's entire day could be mapped out via positioning of the mobile device. The question must then be posed: Who would have access to this, and what would they do with it? This has already been

an issue on the World Wide Web with companies tracking users' movements, and using the information for marketing purposes. While this is more of a civil liberties concern, at some level the technology will have to deal with it (even if the rules are legislative the technology must still make them work).

None of these issues are particularly difficult to overcome technically, however they are worth mentioning because of the effect they have on people's attitudes. If users lack confidence in the technology's ability to keep their private information secure, then they will either use it sparingly or not at all, either way it is bad news for m-Commerce market.

Conclusion

While, there are obstacles in the way of the current crop of m-Commerce offerings, some technical others psychological, it does not diminish the tremendous opportunities afforded by wireless technologies. So the industry is faced with "… the classic early-adopter dilemma. M-Commerce players yearn for widespread adoption of web-enabled devices but know that the technology is not really ready to support a positive experience." [2001, Whiteman] As of this writing in April of 2002, this decision has been made and companies are starting to move forward with wireless initiatives hoping that devices and networks are advancing just fast enough to provide the user with an experience enjoyable enough to keep them coming back.

In the end however, as with other technologies in their infancy, the kinks will eventually be ironed out and the devices will communicate regardless of underlying technology. There will be rich sets of value added services available and users will adopt

m-Commerce just as they have e-Commerce and the world will continue its trend towards and always on always connected society.

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