Exploring Mobile eCommerce in Geographical Bound Retailing

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Abstract

In the last couple of years, the interest of Mobile IT has arisen tremendously and future directions point towards an explosive expansive area.

The objective with this paper is to explore how mobile eCommerce services map customers' requirements in geographical bound retailing. This is done through WineGuide, a geographically bound recommendation service for wine and food 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 eCommerce services can only be established through a complete eCommerce transaction implementation. 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.

1. Introduction

Information technology has contributed to an explosive growth in both the production and consumer sectors of the retail industry within the past decades. Internet, and especially the World Wide Web, has opened new possibilities for people to conduct business and shop via the net [7, 16]. The International Data Corporation (IDC) has for example projected the global eCommerce market to be a $200 billion industry by the end of year 2000. However, shopping malls and downtown shopping areas are still important in reaching customers. These areas let people access products and services of great supply. People get reminded on what to buy when walking around in these areas. This is difficult to accomplish on the net. Net trade cannot easily remind people of what to get when browsing the Internet nor deliver the products at the time of purchase.

When it comes to recommendations on products and services, the printed newspaper is the media that most people rely on [14]. However, there are reasons to believe that recommendations in newspapers and magazines are rarely used. First, according to WSL Strategic retail survey, people are working harder but are still shopping more often and at more types of retail stores [8]. This indicates that consumption often occurs spontaneous and presumably with the magazines left at home. Second, recommendations in magazines often present ideal pictures of assortments. This is not the case in real life. The products can be sold out and customers are never guaranteed to find products in specific stores. The WSL Strategic retail survey tells that selection, convenience and price are factors that people prioritize when shopping [7].

This paper addresses the novel requirements of mobile services adapted to *geographically* bound eCommerce – a research setting that has not been brought to light before (see for example [12]]. The research of this paper is accomplished through WineGuide, a *geographically* bound recommendation service of wine and food adapted to mobile phones. The objective is to explore how mobile eCommerce services map customers' requirements in *geographically* bound retailing.

Recently, there has been an increase of recommender system solutions. These are systems that link users with similar interests. These systems are often based on profiles, which are derived from the users' purchase history or stated interests [11]. The implementation of WineGuide, however, does not depend on profiles. Instead, the recommendations of WineGuide system originate from a famous chef and a wine expert.

2. Research Approach

The research was conducted according to a research approach, which has its roots in Informatics. Dahlbom [3, p. 29] describes Informatics as: *"a theory and design oriented study of information technology use, an artificial science with the intertwined complex of people and information technology as its subject matter."*

The main concern of informatics is the use of IT. Mobile informatics is a subset and further development, which focuses exclusively on mobile activities. The following figure illustrates the approach used in the paper [9].
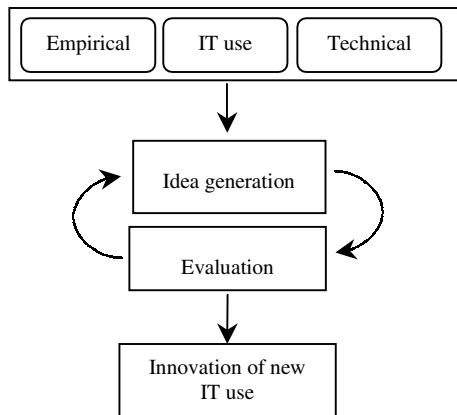
Figure 1. An illustration of the research approach.

Figure 1 illustrates two basic steps in the research, which occur in an interactive process. The innovation of new IT use is based on idea generation and evaluation. "Idea generation" starts out from empirical studies and technological possibilities. The first step produces an idea. The idea, i.e., an innovation, is then evaluated in the second step. If the evaluation is positive, the innovation is transferred to the next step in the research and development process. In other cases the concept is reconsidered in a new "idea generation" step. The objective of the research is to suggest new ways of using IT in mobile situations by exploiting the potential of technology and conduct empirical research [9].

3. Mobile Information Technology

The shift from the computer technology of the fifties to the mobile information technology of the twenty-first century has meant a lot of change on how work and social contexts are carried out. New techniques and devices have been developed to support people in mobile situations. The laptops enabled, for the first time, that people suddenly could bring their digital work with them wherever they were going. Gradually, smaller and faster devices and operating systems have been developed. Personal Digital Assistants (PDA) such as Psion, Palm and Windows CE based palm tops, and operating systems such as WinCE, EPOC and PalmOS have become very popular. New techniques, which enable mobile access, have lately been realized. Better, faster and cheaper technologies are also under development. The Wireless Application Protocol (WAP) is an open, global specification that enables interaction between mobile terminals and Internet services. The Digital Audio Broadcasting (DAB) provides fixed and mobile up linking with dual mono or CD quality stereo. GPRS profoundly alters and improves the end-user experience of mobile data computing, by making it possible and cost-effective to remain constantly connected, as well as to send and receive data at much higher speeds than before. Finally, Bluetooth is a high-speed, low-power microwave wireless link technology, designed to connect phones, laptops, PDAs and other portable equipment together with little or no work by the user.

The rapidly increasing use of mobile technologies has also quickly changed working conditions. The office is no longer the only place were one can perform his or her job [4]. New ways of performing electronic transactions and innovative organizational formations are more usual than a couple of years ago. Systems and services for handling information overflows have been developed. According to Dahlbom and Ljungberg [4], there are several different reasons why mobility has increased. First of all, most work in the modern company is cooperative. This leads to increase use of IT that bridges distance and mobility. Second, services and consultations need to be performed where the customers are. This differs from time to time. Third, the adaptation of mobile phones enables people to be more mobile and more accessible.

This has also had impact on life outside work. More and more services are directed to the consumer market, i.e., for private use in different social contexts. Since people are more mobile even after work, the need for support services has emerged. This has led to new services within areas such as entertainment, education, news and marketing.

Despite the rapid growth of mobile computing, the transformation of technological innovations to real use situations is still slow in the area of mobile computing [4]. The split between technological innovations and real use causes complications. The traditional stationary computing still has strong influences on mobile computing. Despite the limited size of display, the interfaces continue to be adapted to the stationary computers with large displays. This can clearly be seen with the dominating PDAs - all are based on the "desktop metaphor". This means that mobile devices are still somewhat limited and hard to interact with. According to Dahlbom and Ljungberg [4], research and development of mobile IT must take its departure in the possibilities of the technology. Focus must be on information technology use, elaborated ideas of their use, and conceptions of how to commercialize these new ways of using information technology.

Interest in Mobile IT use is very high and future directions point towards an explosive expansive area. The number of subscribers with mobile Internet access, is for instance in Japan approximately 5,9 million [5].
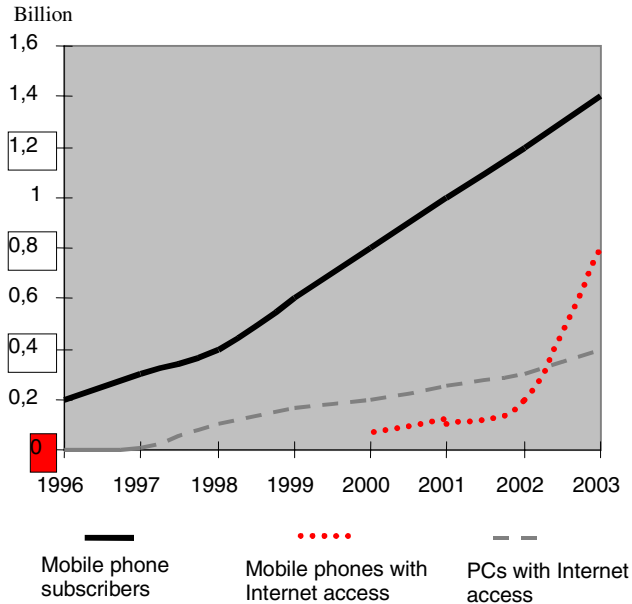
Figure 2. The Mobile Internet revolution [10].

Figure 1 illustrates the Mobile Internet revolution. Since 1996, the number of mobile phone subscribers have increased from 0.2 billion subscribers to 0.8 billion. The approximated number of subscribers in 2003 is estimated to be 1.4 billion. PC use with Internet access has had a relative stable increase since 1997. However, the most impressive increase can be seen in the curve for mobile phones with Internet access. According to the figure, the use of mobile phones with Internet access is expected to completely explode in the next couple of years. From almost non-existence in the year of 2000, usage is expected to soar to approximately 0.8 billion users in the year of 2003.

This indicates that a new epoch is emerging, where mobile IT use will be commonplace. However, there are some problems in finding the real "killer app", which will pave the way for new mobile IT use. The next step towards eCommerce services in mobile settings will be through third generation mobile communication systems (3G), e.g., Universal Mobile Telecommunications System (UMTS)[1], and GPRS. Access times will be faster and the user will only pay for the data transferred. This means that it will probably be cheaper to use these kinds of services and it will attract more users in the long run.

4. Mobile System Examples

The focus of our research is within the field of Mobile Computing. WineGuide seeks to explore services targeted to the consumption market, but is also bound to a geographical place. Whereas a focus upon mobile IT use is emphasized in our research, our work is also important since it is occurring in a area where new transaction models are emerging and new business constellations are being shaped.

Some related research has previously been done in mobile settings of eCommerce in retailing. This chapter discusses these products and their relation to WineGuide. We shall limit our focus to mobile adapted products.

4.1. TomTom

TomTom [15] is a newly invented product by Palmtop Software. The service lets users access personalized travel information by using mobile phone or wireless information devices. It plans the users' travel routes and gives information about the location of nearby places of interest. The service is based on detailed maps, which are presented to the users. TomTom uses GSM[2] Network Operators, global positioning system (GPS)[3] as positioning system and Internet providers. It supports all existing Symbian mobile devices, WinCE devices, Palms, WAP phones and PCs with web browsers.

TomTom has many similarities with WineGuide. Both are geographically bound services in conjunction with eCommerce. While both are based on the same techniques, WineGuide uses MPS whereas TomTom uses GPS. TomTom is also profiled based which is not the case of WineGuide.

4.2. Shopper's Eye

The Shopper's Eye [6] is a system, which focuses on augmented commerce based on the users' shopping profiles. The system requires the user to create a profile that includes items he/she wishes to purchase. The profile is made available to merchants via a Personal Digital Assistant (PDA) and a wireless modem (GPS). The system is implemented to fit in a physically proximate area, e.g., a shopping mall. The merchants create special packaged offers based on the users' profiles. The offers are transmitted to the user as they pass by.

Shopper's Eye provides information to a user in a mobile situation, just as WineGuide does. The primary

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[1] UMTS will deliver low-cost, high capacity mobile communications offering data rates up to 2Mbit/sec with global roaming and other advanced capabilities. Launched commercially from 2001. Further information see www.umts-forum.org/

[2] GSM has 220 million subscribers. This makes it the largest digital wireless communication standard in the world. (http://www.gsmworld.com, 26th of January)

[3] GPS points out a users position through a satellite-based navigation system consisting of a network of 24 orbiting satellites, (cf., http://www.garmin.com)

differences lie in that Shopper's Eye is profile based. The service is also dependent on different merchants who have to continually update the system with package offers. This is not the case of WineGuide since it relies on the online web-service of the state-controlled company for the sale of alcoholic beverages (henceforth referred to as Systembolag). A further difference is that WineGuide is not limited to use indoors nor dependent upon extra hardware, which is the case with a system, which relies on GPS.

4.3. Pocket BargainFinder

A further development of mobile recommendation services is the Pocket BargainFinder [2]. This service is built around hand-held devices that compare prices between different retailers. By scanning the barcode of a physical product the system finds the lowest price for an item on the Internet. The intention is to bridge the gap between electronic and traditional commerce and receive the best price performance.

The biggest difference between WineGuide and Pocket BargainFinder is that with WineGuide products are delivered at the same time as the purchase whereas users of Pocket BargainFinder have to wait for their products to be shipped. Another difference deals with retrieving information about the products. WineGuide informs the user where to find the products and guarantees that they will be in stock. The Pocket BargainFinder, on the other hand, requires the user to scan the barcode of a physical product before receiving information about how much it costs and where it can be found.

4.4. YachtPosition

The Swedish YachtPosition system [17] is a GPS-based positioning system for boat owners. YachtPosition retrieves information about the bearing and distance to the closest fuel docks, anchorages, marinas, shops and gives information about the local weather forecast, wind directions etc. All information is displayed on a map with the longitude and latitude values of the position.

The main difference between WineGuide and YachtPosition is the hardware. The first uses a GPS-watch as navigation tool and as hardware. WineGuide, on the other hand, is based on a WAP-phone and the user is neither dependent on extra hardware nor software from the positioning service.

5. The WineGuide Service

The idea of WineGuide relies on the alcohol policy in Sweden [1]. The business of alcoholic beverages is monopoly driven, and from the very outset its retailing activities were separated from any private profit. The retail enterprise consists of 403 shops and 580 local agencies. It serves about 2 million customers every week. However, it is important to emphasize that the idea of WineGuide is also applicable to other international retail stores, such as Marks & Spencer (UK) and Karstadt (D), both with considerably higher sales of wine. The concept is not technique dependent but the implementation is adapted to mobile phones. The reason for using mobile phones as a platform is that the solution makes it easier to reach a mass-market since no extra hardware or software is required. An additional contributing factor is the expected growth of mobile phones connected to Internet.

The main objectives of WineGuide are to enhance the choice of wine and to save time by notifying the users in advance what is in stock at a specific Systembolag. The service supports the user in mobile settings and makes it convenient to shop. Since the Systembolag shops in Sweden are closed on weekends and otherwise have restricted opening times (10 AM to 6 PM), the queues at the stores are a huge problem today (especially on Friday afternoons). Apparently, this is an area in which WineGuide could be of great help. However, in the future it might be possible to order the wine and food through WineGuide. It might even be possible to have it home delivered. With complete buying support, where products could be ordered through the mobile phone and home delivered, the time spent at a Systembolag could be reduced to almost none. This implies that WineGuide is able to both support customers in the shops as well as for those who do not wish to enter the stores.

5.1. Functions supported

The WineGuide system supports three options. These are wine recommendations based on:
- Wine categories, e.g., red, white.
- Food ingredients, e.g., meat, pork, fish.
- Search function, e.g., search via product number or the name of the wine.

The wine option lets the user browse different wine hierarchies, i.e. red wine, white wine, fruit wine etc., and gives suitable recommendations based on a selected category (figure 3a, b). At this instance WineGuide also recommend appropriate dishes for the wine (figure 3c). The user can select any of the dishes and receive a short description and a shopping list of the dish on the display. The whole recipe is sent home to the user either by email or fax. This kind of information layering means that different information is shown in appropriate situations and considerations are taken to the limited size of the display.

(a) The wine categories, (b) the wine match, and (c) the recommendations of dishes.

(d) The food ingredient option, (e) browsing options for a dish, (f) fax/email recipe.

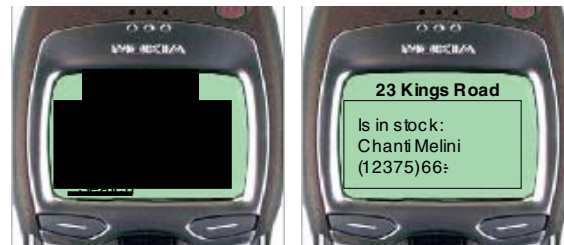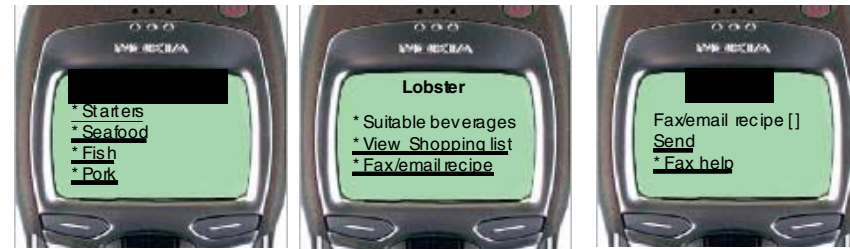(g) The search display, and (h) the result.

Figure 3. Eight display modes of WineGuide system.

The food ingredient option is based on different food ingredients, e.g., meat, vegetarian, fish, seafood etc (figure 3d). Browsing through the food hierarchies the user can receive a more specific match of the dish he/she is interested in. The selected dish is matched with recommendations of appropriate wines (figure 3e). Here too, the user has the opportunity of selecting different dishes, browsing the shopping list and sending the whole recipe home (figure 3f).

The last option lets the user search for specific wines (figure 3g). The user enters the name or the product number of the wine and receives information whether or not the wine is in stock, based on the assortment of the closest store (figure 3h). The user can also select other Systembolaget outlets and receive search results from these stores.

WineGuide is a geographically bound service. The recommendations of the system are based on a chef's expertise in food in combination with a wine expert's recommendation of wine, stored in a database. After retrieving information about a user's location, WineGuide synchronizes the experts' recommendations with the assortment of the closest store. This is accomplished by accessing the Systembolag database via their web server.

In this manner, WineGuide finds out which wine brands that are in stock. Thus, the list presented on the user's display contains only the wines that matched the chef's and wine expert's recommendations and those in stock.

5.2. Technical details

The WineGuide system has a client-server architecture. Communication with the client is done with the Wireless Application Protocol (WAP), which enables interaction between mobile terminals and Internet services. The current implementation is in Perl with an SQL-compatible database running on a Sun Solaris server with an Internet connection. The client-side hardware is a WAP mobile phone, in our case a Nokia 7110.

The Mobile Positioning System (MPS) is a newly released service, offered only by a few telecom operators in Sweden. The MPS points out the user's position through the Global System for Mobile communication (GSM) antenna triangulation with the accuracy of about 300 meters. Unlike positioning via satellite, MPS does not require any modifications to standard GSM phones and works both indoors and outdoors. The MPS is, however simulated in WineGuide, since MPS was not available on

the market for private people at the time of the implementation.

The expert recommendations of WineGuide are easily updated through a web interface and synchronization with the assortments at the Systembolaget is performed through query-strings to the Systembolaget web server.
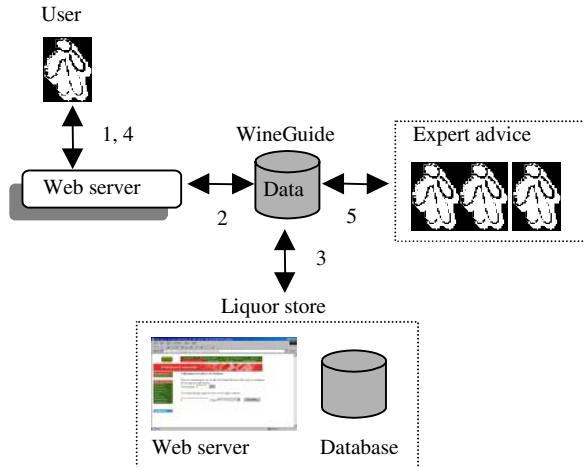

Figure 4. The WineGuide architecture.
1. Send MPS code to web server containing user position.
2. Retrieve requested information from database.
3. Synchronize data with the database of the Systembolag through their web server.
4. Present wine list to the user.
5. A web-based interface keeps the database easily updated.

5.3. A user scenario

The following section describes a scenario where a complete mobile eCommerce approach is illustrated by a user's interaction with WineGuide. The ordering function to the Systembolag and supermarket is, however, not implemented in the first version of WineGuide. This mainly due to the Swedish alcohol law.

Nils Andersson is working as a seller, which means that he spends a lot of time out of the office walking between different places. It is Thursday afternoon, and Nils is just about to return to the center of town after having visited customer. On the way, Nils calls his wife at work to check who is going to shop for food for the weekend and drops by the Systembolag. She has to work late and they decide that Nils will do the errands before the stores close at 6.00 PM.

At a red light crossing, Nils picks up the mobile phone and connects to the WineGuide service. Automatically, the system determines Nils' location. The welcome page offers him three services; recommendations based on

either wine or food and a search function. Nils does not know what he is going to cook, but he does know that they have some fillet of beef at home, which they could use. He enters the food service and selects the beef alternative. WineGuide now displays a lot of food recipes based on beef (figure 5). Nils sticks to the Boeuf en Daube. He views the recommended wines suitable for the dish and notices at the same time that the Systembolag on King Street is closest, and that it has a very good wine assortment. He selects his choice of wine, enters the address and sends the order to the Systembolag before he disconnects from the service and the traffic light turns green.
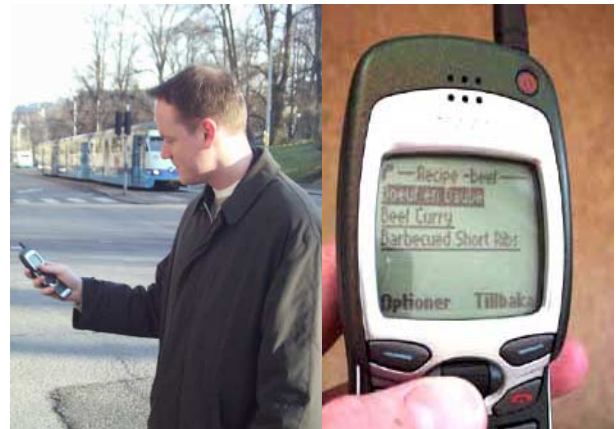

Figure 5. Nils looking at different suitable recipes on WineGuide.

At the next red light stop he picks up the phone again and connects to the WineGuide service to view the shopping list (figure 6). Since it is the end of the working week the queues might be quite long. Furthermore, the food bags usually are quite heavy to carry home. Nils decides instead to send the shopping list straight to the supermarket and email the whole recipe home.

Figure 6. Nils viewing the shopping list on the mobile phone.

As illustrated in the user scenario it is simple for a user in advance to plan his/hers shopping trip using the different entrances of the WineGuide service. This is also easily carried out in mobile situations.

6. Field Evaluation

The WineGuide service was evaluated in two steps, first via an initial field evaluation during the Swedish Rally event and later with a more comprehensive evaluation at two IT-companies. The first field evaluation can be seen as more limited since the test population tried the system at the same time as other services were offered. The latter field evaluation refers to a wider area - for WineGuide and similar services.

6.1. The initial field evaluation

The initial field evaluation was conducted in cooperation with the IT-company FramFab and the broadcast station Sveriges Radio (SR) during the Swedish Rally (March 2000). The event was geographically situated in the forests of the middle of Sweden. There are quite few towns in the area and there are at most only one or two Systembolag outlets in each town. The intentions of the initial evaluation were to test the system in real use situations, record user interaction through log files, and deal with occurring complications.

Participants were selected based on an interest announcements on the homepage of SR. Twenty participants were equipped with Nokia 7110s and had free access to a WAP portal where WineGuide and other services could be found. The evaluation lasted for four days. Log files were, during that time, continually analyzed for user statistics.

The initial field evaluation provided a good opportunity to try out the system in a real use environment and to test the relevance of the service in relation to the formulated research questions. By analyzing the log files it was possible to check user interactions with WineGuide, how different input fields were selected and how data were sent. It appeared that users sometimes misinterpreted the intentions of the service. The evaluation resulted in some modifications of the WineGuide system. The resulting modifications focused on helping future users gain a better understanding of the service.

6.2. The second field evaluation

The second field evaluation was conducted with participants from two IT-companies in Sweden. Approximately twenty people participated during a three weeks period (April 2000). The choice of the test groups, consisting of staff from the companies, was based on the

very low number of WAP mobile phones owners in Sweden. In Sweden, at the time of the initiation of the project, it was difficult to buy Nokia 7110s from telecom distributors. Only an exclusive group of companies could import the phones straight from the factories in Finland. One of the IT-companies was in this exclusive group while the others successfully bought them from telecom distributors. Thus, the of WAP mobile phone owners was quite high in those two companies.

Five people were selected for structured interviews. Our intent was to receive as varying a data collection as possible. Since the interviews represented a qualitative method, the respondents were limited to a small number. The objective was to inform the WineGuide design based on the interviews [cf., 13]. The recorded interviews lasted between 30 to 60 minutes. Afterwards, they were transcribed, analyzed and compared to the log files to find corresponding patterns. All respondents had at some time used different WAP services. The use of WAP services differed from two weeks to up to six-seven months. Still, the motivation for using these kind of services due more to technical curiosity and the charm of novelty, rather from any necessity or perceived benefit. The average use of the WAP services was therefore approximately twice a week. However, all participants agreed that they would use them more often if the functionality was better and if the services were more attractive.

Users had to enter their initials each time they requested the service. The initials were matched with the log file to see the users' interactions. Later they were also analyzed and compared to the answers given during the interviews. An analysis of the user statistics showed that none of the three entrances were prioritized, rather the user interactions were spread evenly between them. An analysis of the log file statistics showed 426 user requests to the WineGuide service. It proved that the requests had been carried out by 78 user sessions from 16 different hosts. Unfortunately, the test period did not long enough to find recurring patterns in the user interactions.

When we asked whether the participants would pay for a service like WineGuide no one was prepared to pay for it as long as the service did not address the complete transaction chain. Money is already spent on telecom operator fees. Adverts on the WAP service were not an alternative for getting it for free. However, several thought that if they came across a really functional service, which save time and was convenient, then they were prepared to pay for it. One example of this would be that the WineGuide service could actually send the shopping list straight to the supermarket, which packaged the products and delivered them to their home. The same function could also be implemented at the Systembolag. In the latter case there are, however, some limitations due to the Swedish alcohol law and the policies of the Systembolag. Currently, none of the respondents were aware of a service, which saved time or was convenient.

WineGuide addresses, as seen in our studies, several consumer problems such as convenience, comfort and selection. The full eCommerce potential of the WineGuide system could not be evaluated since some parts were simulated and complete eCommerce transactions were not implemented. There are still some areas that remain to be explored with the WineGuide service. To date the implementation of MPS is simulated, but the full functionality can be integrated at any moment since the telecom operators have realized the service for public use. The pricing for the service represents another subject for experimentation. How much are people prepared to pay for the service or should advertising revenue cover the expenses?

However, some of the interview questions dealt with these complications and the overall view on these matters have been discerned. The respondents have a very optimistic vision of the future of mobile Internet, mobile technology and mobile IT use. Everyone believed it would have strong influences on all working areas, leisure time and entertainment. Some compared it to the IT revolution in the nineties with the successful adaptation to PCs, Internet and mobile phones. They believed that Mobile Internet would be a part of everyone's life.

7. Conclusions

This research seeks to explore how mobile IT can support mobile eCommerce in geographically bound retailing. It has shown several different user occasions with the WineGuide service. The service is adapted to mobile phones and supports the user in mobile settings by: (1) offering expert recommendations; (2) notifying where products are available; (3) distributing information in appropriate situations; (4) letting the user search for products. The physical stores could still offer manual service. Services such as WineGuide would then work as means to fasten up buy- and decision processes for a better and faster service. It could also be possible to order goods directly from the Systembolag, where the products are packaged and later picked up. This would speed up business transactions.

Despite the optimistic view of the future of mobile eCommerce, the interviews in our research indicated that people are not satisfied with existing applications. They can neither support the user's demand nor substitute the functionality of a stationary computer. People have less time today, so mobile eCommerce services should save time and make it convenient to shop. However, given the way in which the WineGuide service works today, people are not prepared to first use the service, and then have to walk to the store to get what they want anyway. Rather, a change in logistics for transportation and distribution network is necessary. Furthermore there is a need for new business models, which are adapted to mobile eCommerce. The full potential of the service can only be established through an implementation of a complete eCommerce transaction chain. Thus, food and wine could be ordered and paid for from the phone, packaged together and home delivered. It should be possible to do all of this with a single push on a button on the phone. In this sense, retail chains have to cooperate and shape new relations in order to be able to compete in the new market where mobility and "instant demands" are commonplace. The rapid adaptation of mobile phones and the smash success of PDA products do suggest where the customers are. Unfortunately, organizations are quite slow adapters in comparison to individuals in the market. Accordingly, a challenge for retail chains is to rapidly mobilize the best resources to satisfy the customers' needs.

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