Mobile commerce applications: How the Greek people understand them and evaluate them

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Initially, I would like to thank Dr D. Maditinos who has been the supervisor of this dissertation. Dr Maditinos has helped out in the structure of this dissertation and also proposed solutions when things were looking bad. I would also like to thank friends and relatives that have been very supportive throughout this year and especially the past 3 months. I would also like to thank a few colleagues from the MSc course who were more than willing to distribute the questionnaires to people they knew. Of course, a special thanks goes to everyone who was kind enough to participate in the study. Finally I would like to thank Mr. Athanasios Ioannidis who was a partner in studying and the person who gave the idea of investigating m-commerce and m-commerce applications.
Abstract

The main objective of this study is to investigate the understanding of the Greek people as far as new mobile services are concerned and to put these new services to the test, i.e. evaluate how do three groups of people, students, business people, and employees evaluate these services. Another main goal of this research is to compare the answers given by the three groups.
Chapter 1

1.1 Introduction

Mobile communications have invaded in our lives two decades ago. The analogous mobile phone may have not been very successful back at the end of the 80s, but during the 90s digital phones have become extremely popular. With services such as SMS and MMS, new gateways of communications have opened. Nowadays, mobile phones are considered a must and a necessity, at least at the so called developed world, with Hong Kong leading the way at matters of technological innovations, with Japan and Korea to follow and the US and Europe to trail behind.

The introduction of the 3G technology has produced a breakthrough during the past 4 years. Internet services were embedded at the mobile phone amongst other services such as Multimedia services, chatting and mobile television services. In the years to follow, as science progresses, new services are going to be developed, to match the needs of their customers. Services developers though have to take into account the cultural background of each country. In other words, there may be a number of services that are common, but there are others that are designed especially for the cultural or socioeconomical conditions that stand in each society.

1.2 Aims and objectives

This is where this study is introduced. The main objective of this study is to investigate the understanding of the Greek people as far as new mobile services are concerned and to put these new services to the test, i.e. evaluate how three groups of people, students, business people, and employees evaluate these services. Another main goal of this research is to compare the answers given by the three groups. This way, a correlation can be held and we can see how much the answers of the three groups differ between one another. The specific groups of people were selected because among the services, there are a few that concern the one or the other group exclusively. It is going to be very interesting to see how the specific groups have evaluated these services.

The motivation for conducting this study has been provided by the extremely fast emerging mobile communications, as well as by the fact that thus far, there has been
very little research concerning mobile commerce, and even less about mobile commerce application design. Apart from that, my previous field of study has been mobile communications and so, it would be nice to combine mobile telecommunications with a bit of statistics.

1.3 Structure of the dissertation

This dissertation was separated into 5 main chapters, nominally, the introductory chapter, the literature review chapter, the methodology chapter, the actual study and data analysis, the overall appreciation chapter and the appendices. The following diagram shows how the dissertation is structured.

Figure 1.1: The structure of the dissertation

Chapter 1: Introduction

Chapter 2: Literature review

Chapter 3: Methodology

Chapter 4: Data analysis

Chapter 5: Overall estimation

References

Appendix
1.4 Literature review

As it was mentioned before there has been little literature concerning mobile commerce in the past, and even less in amount for mobile application design. At this part of the study it would be wise to go through rapidly some of these studies performed. Of course these studies are going to be further analysed at chapters 2 and 3, where the results and methodologies are going to be presented respectively.

Initially, the first article that was studied was by E.W.T. Ngai and A. Gunasekaran. The two scholars performed a theoretical study on the number of articles concerning the papers about m-commerce. The main idea was that over time, the papers would increment rapidly. Buellingen and Woerter on their paper discuss the prospects the new business-centered services can bring to different types of businesses and how these services can contribute to the growth of wealth. Lin and Wang on their study (2005) try to determine which factors determine customer loyalty in the mobile world. Another similar study was performed by Wang and Liao (2004) who tried to measure user satisfaction of mobile commerce in Taiwan.

Veijalainen et al (2006) recognise at least 5 different business models that are going to emerge due to the eruption of mobile technology while Pura (2005) made a very interesting effort to link perceived value and loyalty in location based mobile services. Bauer and Barnes (2005) attempted to discover which the driving forces that make mobile marketing more acceptable are, using the well known Theory of Reasoned Action.

All the above were papers concerning material irrelevant to mobile commerce applications. The papers described in brief in the following lines are going to be relevant to mobile commerce applications. Tsalgatidou and Pitoura on (2004) devide the m-commerce applications according to their processors, memory and battery capacity in 4 application capabilities (SMS, WAP, Web, I-mode), as well as physical size and weight. Bruner and Kumar (2005) tried to investigate whether the TAM (technology acceptence model) proposed in the past was also applicable in the case of handheld mobile devices. Vashney and Vetter (2001) propose a framework for
emerging m-commerce applications. A very interesting approach with respect to future mobile commerce application was made by K. S. Slavena (2002). The goal of this study was to provide a reference model for M-commerce applications. Koehne, et al (2005) proposed a model that used conjoint analysis to investigate the public’s preferences for Location Based Services. P. Tarasewich (2003) points out the crucial factors in designing m-commerce applications. More specifically, he stresses out the difficulties that arise due to a continuously changing environment. Harris, et al (2005) performed a comparison between the cultural adoptions of m-commerce, between Hong Kong and G. Britain. Jarvenpaa et al have performed another interesting study on perception and acceptance of mobile applications. Finally, Mahatanankoon et al (2004) made an effort to elicitate primarily and then rank mobile commerce applications according to the requirements of the participants in a survey held in an American University.

1.5 Methodology

The methodology of this study is described in detail in chapter 3. This methodology was a hybrid methodology that took parts from different previous studies. In order to generate the mobile applications, 15 students from 3 different faculties of the Technological Educational Institute of Kavala were selected. These faculties were the Business school, the information systems school and the electrical and electronics engineering department. These schools were chosen because most applications were affiliated to them. Their ideas were then introduced to 5 graduate students that were asked to filter these applications and add any new ones that may have been missed out. Finally the applications were compared to the ones of the literature review and new applications were added up.

1.6 Data analysis

Chapter 4 describes all the procedures that were followed so that the results are extracted. All results were ranked according to the mean scores. More specifically the results were ranked for each group of people. Thus, conclusions were drawn about the preferences of the three groups. Then, the standard deviations of the answers of each
groups were correlated. This correlation showed the different way the three groups were evaluating the applications. The same procedure was followed for male and female.

Then, the overall ranking list was used for service elimination. A factor analysis was performed and for that, all services with a mean score lower than 3 were eliminated. Factor analysis was performed with the help of the SPSS statistical software, and a number of factors were extracted. Finally confirmatory factor analysis was performed to confirm the structure of the model and to investigate the correlations of the factors between one another.

1.7 Overall estimation

Concluding this chapter an overall estimation of the results of the analysis is made. After discussing the results, some conclusions are drawn. Finally there is a section about limitations of the research and future research
Chapter 2

Literature review/ the m-commerce evolution

2.1 Introduction

At this point it would be wise to make a short introduction of the literature that has taken place throughout the years. It is worthwhile noticing that there is a variety of papers concerning m-commerce, the vast majority of which concern user satisfaction in more developed countries, such as the US, the UK, Korea, Japan and Australia. There is also a considerable number of papers proposing business and transaction models for m-commerce. Unfortunately so far, there is a very small number of papers about m-commerce applications which is the intended work of this thesis.

2.2 Theoretical background

The past few years there have been a large number of papers and publications about m-commerce, but in fact, few were the ones to proceed into a further study on the usability of m-commerce applications. A very organised work was the one held by Ngai and Gunasekaran (2003).

The two scholars have identified 149 studies on m-commerce that were published between 2000 and 2003. They concluded that the emerging mobile technology is going to force other scholars into the specific topic, since the field is new and the area of study is wide. The forementioned study also concludes that the majority of the papers are concentrated on m-commerce theory and study such as “m-commerce behavioural issues” “m-commerce economics, strategy and business models” as well as “m-commerce overview, context and usage” since mobile communications are becoming a mature discipline. It is also mentioned that in the early years a lot of technical papers were written regarding the future mobile applications. The study also states that far more study is expected on the experience with mobile commerce devices as well as different conceptualisation of the m-commerce applications by different cultural backgrounds. Finally, the two scholars identified mobile financing to
top the list of mobile applications, but there are other applications such as online gaming and entertainment have a great potential.

Buellingen and Woerter on their study (2004) state that the rapid growth in the telecommunications sector as well as the adoption of most fixed internet aspects are going to change telecoms firm strategies, which in the future are going to be headed towards other revenue sources, apart from the traditional means of gaining revenue. New features such as e-commerce firms, Internet portal providers etc and new services (m-commerce, portal services) are going to add value to the existing mobile operators as well as functionally and institutionally. According to the scholars, the changes in the economic environment can bring about advantages for the mobile network operators. Although revenues from the traditional transmission base services are going to fall, due to the UMTS infrastructure, new income is going to appear due to other services such as advertising and revenue sharing with content providers. Different internet activities, such as grouping of different services, pricing as well as billing for different services are going to broaden the business field for mobile network operators and will bring in more revenue. The success of m-commerce is guaranteed according to the two scholars, although UMTS technology is going to change the nature of customer relationship

Lin and Wang on their study (2005) try to clarify which factors determine customer loyalty in the mobile world. These determinants are customer loyalty, customer satisfaction, perceived value, trust and habit. Having recognised these determinants, the following hypotheses have been formed

\[ H1.\text{Customer satisfaction has a positive effect on customer loyalty} \]

\[ H2.\text{Perceived value has a positive effect on loyalty} \]

\[ H3.\text{Perceived value has a positive effect on customer satisfaction} \]

\[ H4.\text{Trust has a positive effect on customer loyalty} \]
H5. Trust has a positive effect on customer satisfaction

H6. Habit has a positive effect on customer loyalty

The conclusions of this study showed that all the hypotheses were proven statistically correct, with customer satisfaction playing a very important role in the rest of the determinants.

Another similar study was performed by Wang and Liao (2004) who tried to measure user satisfaction of mobile commerce in Taiwan. The study and findings of their work can be found on their study. The two scholars expressed the following hypotheses:

\[ H1 \text{ A positive relationship exists between } m\text{-commerce user satisfaction and the intention to reuse the } m\text{-commerce systems} \]

\[ H2 \text{ A positive relationship exists between } m\text{-commerce user satisfaction and the extend of good word-of-mouth} \]

The results of the study have proven the hypotheses statistically correct and it was also proven that the factors that influence m-commerce user satisfaction are content quality, appearance, quality of service and ease of use.

Veijalainen et al (2006)” recognise at least 5 different business models that are going to emerge due to the erruption of mobile technology. Internet e-commerce over wireless access networks, m-banking, location based services, ticketing applications and retail shopping. “The special characteristics and constraints of the mobile network force m-commerce to operate partially in a different environment than internet e-commerce. This study mainly focuses on mobile internet and location based services. The authors conclude that m-commerce transactions, may have seemed a luxury in the past but now they have become a necessity. “The key insight is that m-commerce transactions should be seen as distributed workflows with transactional properties”. Another important conclusion for the scholars was that security and privacy issues
have to be combined differently with the transaction modelling concepts in comparison to the past. This is mainly because the new mobile devices are prone to interruptions and “stealing” by intruders. Another key factor pointed out by the three scholars is that because of its small size, a handheld device like that could be easily lost. This fact in combination with the amount of information that could be contained on a mobile device could put privacy in the mobile transactions in jeopardy. This study also points out the necessity for solutions to reduce heterogeneity due to the roaming effect.

Pura (2005) made a very interesting effort to link perceived value and loyalty in location based mobile services. According to the writer, perceived value plays a substantial role in assessing current services and for developing new ones, because different target groups may have different motives to use distinct services and thus have a different perception of mobile services. “Location based services are services in which the location of a person or an object is used to shape or focus the application or service” (Pura 2005). The purpose of her study was to analyse the effect perceived value has on components of attitude and behaviour such as commitment and behavioural intention to use location based services. In order to prove or reject this theory, 8 hypotheses were formed, according to past literature.

- **H1. Social value has a positive effect on commitment** (this hypothesis states that people tend to interact with each other in order to confirm the information given by the mobile device)

- **H2. Emotional value has a positive effect on commitment** (emotions such as joy and satisfaction have an effect in the commitment to use LSB)

- **H3. Conditional value has a positive effect on commitment**

- **H4. Conditional value has a positive effect on behavioral intentions**

These two hypotheses state that conditional value, depending on the context of the service can have a positive effect on commitment to use and behavioural intention to
use under exceptional conditions. For example, the use of a mobile device that would help a stranger find out where he/she is creates an intention to reuse the service provided.

**H5. Monetary value has a positive effect on behavioral intentions**

**H6. Convenience value has a positive effect on behavioral intentions**

These two hypotheses are referring to the fact that these location based services provide good value for money and provide convenient solutions, affecting positively the intention to reuse

**H7. Epistemic value has a negative effect on behavioral intentions**

The complexity in the use of LBS may have a negative effect on behavioural intention to use since many may find these locations hard to find or use when it is precise.

**H8. Commitment has a positive effect on behavioral intentions**

Two out of eight hypotheses (1 and 7) were not supported because the results rejected them. In fact both commitment and behavioural intention are both strongly influenced by conditional value and moreover, the context under which these services are used. This can be interpreted that the participants in the study have prioritized highly the fact that these services are going to provide convenient information in exceptional cases

Bauer and Barnes (2005) attempted to discover the driving forces that make mobile marketing more acceptable, using the well known Theory of Reasoned Action. This method was preferred to others because the acceptance of mobile marketing is ensured only through the continuous use by consumers. The two scholars, using previous work have formulated a number of hypotheses that would help them have a
feeling of the parameters that form mobile marketing acceptance. At this point it would be wise to provide a briefing on mobile marketing. Mobile marketing is a service provided by mobile phones of the latest technology that gives the opportunity to businessmen to advertise their merchandise to passengers through an SMS or an MMS.

The hypotheses formulated in the specific study are the ones below

**H1.** The more positive the attitude towards mobile marketing the higher the behavioural intention to adopt mobile marketing

**H2.** The more positive the subjective perception of social norms, concerning the adoption of mobile marketing, the higher the behavioural intention to adopt mobile marketing

**H3.** The more positive the subjective perception of social norms concerning the adoption of mobile marketing the more positive the attitude towards mobile marketing

**H4.** The higher the degree of innovativeness (intention to use new technology), the larger the individual’s knowledge about mobile communications

**H5.** The higher the existing knowledge about mobile communications the more positive the attitude towards mobile marketing

**H6.** The more distinctive the information seeker behaviour, the more positive the attitude towards advertising in general

**H7.** The more positive the attitude towards advertising in general, the more positive the attitude towards mobile marketing

**H8.** The higher the perceived utility of mobile marketing the more positive the attitude towards mobile marketing

**H9.** The higher the risk perceived (data security) the more negative the attitude towards mobile marketing
The study proved that the Theory of Reasoned Action was a valid tool for measuring Mobile Marketing Acceptance. The outcome of this study was primarily that empirical data cannot be delivered on a significantly important relationship between the consumer-based determinants and the attitude towards mobile marketing. According to the study results, there is a positive relationship between innovativeness and knowledge on mobile phones and between behaviour for information seeking and attitude towards advertising. Interpreting these results, it can be said that there is a necessity for a precise embodying of mobile marketing messages according to consumer entertainment and information requirements. This means that in order to stimulate a positive behaviour towards mobile marketing, messages must be designed so as to have an ‘entertaining factor’ and its information content should be such that would add value to the business. Finally, the negative relationship between risk and acceptance of mobile marketing was confirmed, in terms of misuse of data or unwanted messages on one’s mobile.

2.3 Mobile commerce applications

Tsalgatidou and Pitoura on (2004) divide the m-commerce applications according to their processors, memory and battery capacity in 4 application capabilities (SMS, WAP, Web, I-mode), as well as physical size and weight. It is also stated that the physical aspects of mobile devices such as smaller screens, finite battery, less memory and processor capabilities, larger risk of losing e.t.c. impose on the mobile network to be differentiated from the fixed internet network. The differentiation between fixed and mobile electronic commerce adds new challenges for the M-commerce conductors, such as autonomy in communication (disconnection and reachability problems), bandwidth restrictions and network topology (wireless communications are much more error prone to fixed wired ones), asymmetric transfer capacity (the transfer mode of the wireless communications does not support the support of “heavy” type messages).

The two Greek scholars also underline the special characteristics of m-commerce transactions in contrast to the fixed internet ones. The fact that transactions taking place in a mobile environment are location based is very much stressed on this study. Apart from that, ubiquity, mobility personalisation, adoptivity are other factors that
distinct mobile transactions to the fixed internet ones. The study also proposes some business models in order for companies to be successful in m-commerce. The term “business model” refers to a “logical architecture for products, service and information flows, including a description of the involved business actors and their roles, as well as sources of revenue.” Concluding this study underlines the differences between mobile commerce and fixed internet e-commerce. The mobile devices perform under different environments, have different technical characteristics and the network infrastructure is different to the fixed internet one. Table 2.1 indicates a number of services included on the two fellow Greek scholars’s business model.

Bruner and Kumar (2005) tried to investigate whether the TAM (technology acceptance model) proposed in the past was also applicable in the case of handheld mobile devices. The two most important factors according to the TAM were usefulness, i.e. whether people find it useful to use a specific technology and the ease of use. According to the scholars there are also some “hedonic” factors that influence intention to use. A more integrated model, the c-TAM is proposed, which includes factors such as consumer visual orientation and fun.
Table 2.1 : Business Model services proposed by Tsalgatidou and Pitoura

<table>
<thead>
<tr>
<th>Class of Applications</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile Financial Applications (B2C, B2B)</td>
<td>Banking, brokerage, and payments for mobile users</td>
</tr>
<tr>
<td>Mobile Advertising (B2C)</td>
<td>Sending user specific and location sensitive advertisements to users</td>
</tr>
<tr>
<td>Mobile Inventory Management (B2C, B2B)</td>
<td>Location tracking of goods, boxes, troops, and people</td>
</tr>
<tr>
<td>Proactive Service Management (B2C, B2B)</td>
<td>Transmission of information related to aging (automobile) components to vendors</td>
</tr>
<tr>
<td>Product Locating and Shopping (B2C, B2B)</td>
<td>Locating/ordering certain items from a mobile device</td>
</tr>
<tr>
<td>Wireless Re-engineering (B2C, B2B)</td>
<td>Improvement of business services</td>
</tr>
<tr>
<td>Mobile Auction or Reverse Auction (B2C)</td>
<td>Services for a customers to buy or sell certain items</td>
</tr>
<tr>
<td>Mobile Entertainment Services (B2C)</td>
<td>Video-on-demand and other services to a mobile user</td>
</tr>
<tr>
<td>Mobile Office (B2C)</td>
<td>Working from traffic jams, airport, and conferences</td>
</tr>
<tr>
<td>Mobile Distance Education (B2C)</td>
<td>Taking a class using streaming audio &amp; video</td>
</tr>
<tr>
<td>Wireless Data Center (B2C, B2B)</td>
<td>Information can be downloaded by mobile users/vendors</td>
</tr>
</tbody>
</table>

The results of the studied showed that “unlike what was found in a workplace context, the fun of using a device was a more powerful determinant of attitudes towards usage than the perceived usefulness of a device. Another finding of this study was that, ease of use also makes a device more fun to use. That comes on the contrary of device designers who add “cool” features on the devices with the intention to make them more fun to use, but users get discouraged because of the device complexity. Finally, it was statistically shown that users with higher visual orientation were keener on accessing the Internet using mobile devices than others with lower visual orientation. Theoretically this means that this category of consumers may be influenced to use the
innovative devices to access the web in comparison to another, less visual group of consumers. This result may lead companies the design mobile phones, PDAs etc to focus their attention on more attractive designs so as to target for the more “visual” group of consumers.

Vashney and Vetter (2001) propose a framework for emerging m-commerce applications which can be summarised by table above. The two scholars also included in their paper, various technologies that would contribute to the better functionality of the mobile devices such as GPRS, the GSM, the SMS, the iMode etc. Finally, 5 networking requirements are identified and their specific attributes are discussed. Concluding, there were a number of future tasks to be completed so that these smart devices would reach a desirable level of functionality. Apart from aspects such as bit rate and network coverage improvements, future works were to be concentrated on group oriented applications such as mobile auctions.

Table 2.2: The framework proposed by Vashney and Vetter

<table>
<thead>
<tr>
<th>Networking Requirements</th>
<th>Specific Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>R2: Network Reliability, Availability</td>
<td>1. Impact of component failure 2. Frequency of component failures 3. Restoral time</td>
</tr>
<tr>
<td>and Survivability</td>
<td>4. Use of Fault-tolerant design 5. Levels of network availability</td>
</tr>
<tr>
<td>R3: Location Management</td>
<td>1. Location Tracking for determining the location of an object 2. Location Database for storing and location information</td>
</tr>
<tr>
<td>R5: Quality of Service</td>
<td>1. Bandwidth requirements 2. Delay and delay variation 3. Tolerable loss ratio</td>
</tr>
</tbody>
</table>
The eruption of mobile internet during the last decade is going to lead many companies in collaborations so as to achieve better financial results through the endless possibilities this new technology has brought about according to L. Marchegianni (2004). The new technology gives out a number of chances for new value adding services to be pursued in the name of innovation and increased competition. In order for companies to claim their rights on these new market requirements, three key issues are proposed by the author: collaboration, consolidation and cooperation as alliances are built between firms in complementary industry. This means that old business models should be revaluated and new ways to do business should be investigated. These new models according to Marchegianni would highly depend upon the cooperation between network operators, content providers, application service providers and equipment manufacturers in order to develop an attractive offer and thus create added value for the different groups of customers.

Thus far, according to Leem et al (2004) most studies have been concentrated on service categorisation based on promise service/application or user intention. Apart from that fact, previous studies were also based on the future mobile applications and not that much on the mobile business model. Previous study was also focused on B2C (Business to customer) model and not that much on the B2B (Business to Business) or the B2E (Business to Employee) model. The paper also points out that the fixed Internet business model cannot be applied for the case of wireless internet because business is done in a different manner for the mobile internet.

According to this proposed scheme, the B2C is subdivided into commerce, intermediary and information models. The commerce model is to provide mobile content/services with commercial content. The intermediary model would play the role of connecting customers to other sources of content or services while the information model is to provide personal messages to each customer with useful information that the customer had previously asked for. For the B2B/B2E part of the proposed model, the firm infrastructure is to provide solutions concerning internal information management for mobile intranet. Procurement and inbound logistics model will provide solutions concerning ordering and inventory matters. The sub-model about the outbound logistics
A very interesting approach with respect to future mobile commerce application was made by K. S. Slavena (2002). The goal of this study was to provide a reference model for M-commerce applications. Slavena proposes an improved version of the media reference model proposed by Schmid (1999) which was applied in order to assess the suitability for as well as the requirements upon m-commerce applications. “The media reference model provides guidelines for how to build a medium based on information and communication technology by guiding the process of requirements evaluation and by identifying the required services. According to the media reference model there are four layers or views and 4 fundamental services.

![Figure 2.1 Slavena’s improved media reference model](image)

The **community view** focuses on predicting the reaction of the community and the target groups as far as the new applications are concerned. In detail, this can be described as the identification of potential users and identification of technological needs of the target group. The **implementation view** identifies the processes and tasks that need to be performed in order for mobile market transactions to be performed. To follow, the **service view** refers to the communication and coordination services piece of any market transaction while the infrastructure view is responsible.
for the software and communications programs implemented in the medium. For the case of mobile commerce the media reference model looks like the figure below.

Figure 2.2: Media reference model adjusted for mobile commerce

In the case of the m-commerce model, the community view of the mobile applications can be broken down into three factors: getting a very clear idea of the target group to which the technology refers to, give the specific target group initiative in order to buy the product through the added value services provided by m-commerce, and finally to give a very clear idea of the required processes and services in need of support by the intended mobile medium.

In order for these parameters to have a positive effect on the success of m-commerce applications, the transaction view suggests that transactions fulfilled through the mobile internet should be an easy procedure (for example the 1 click buying offered by Amazon.com).

In the service view, there are a number of specific steps that have to be followed in each step of the market transaction. According to Slabena, the physical aspects of phones impose developers to use the right wording when developing an online offer, which is a very difficult task or to use short codes that replace short data. Another important issue here is the search option that helps users perform buys through the m-network while on the move. This way the network can use the most visited sites and transactions of a specific customer and this way perform offers. Another point that
may be proven critical in the design of mobile applications is settlement. M-commerce applications can be more flexible in terms of delivery, logistics or payment providing more than one solutions to these problems

Koehne, et al (2005) proposed a model that used conjoint analysis to investigate the public’s preferences for Location Based Services. Other tools were rejected because there is too little comparable experience in an m-business setting. The conjoint analysis is a method that has been used to evaluate new product and services acceptance and a basis for a potential market behavioural prediction.

The study results show that the majority of the population rejects ‘non-linear pricing schemes’ such as SMS packages web-mail accounts, flat rates for broadband connections, pay-tv etc. This shows that the majority of the population does not highly appreciate the economical benefits offered by non-linear pricing schemes. It can be assumed that the majority of the participants question the real service value behind these schemes due to possible lock-in effects that may arise from subscription based pricing schemes and thus are more keen on using pay-per use-pricing

Another conclusion that was drawn was that the participants did not highly appreciate the adding value of smartphones or PDA devices despite their improved usability. This outcome tells us that device utility is not just a factor of service specific requirements (larger displays etc) but also, convenience has its own piece of the pie. “Convenience due to habit or practice can explain the preference for menu-based configuration solutions via the deployed device” (Koehne et al 2005). The web- based interface in other words, although they seem very attractive for use, cannot substitute for flexibility and convenience

P. Tarasewich (2003) points out the crucial factors in designing m-commerce applications. More specifically, he stresses out the difficulties that arise due to a continuously changing environment. According to Tarasewich, the context of m-commerce in comparison to the fixed internet one is much less predictable since it keeps changing because of the “on the move aspect”. But context itself, for mobile commerce applications can be separated in 3 context subcategories. The environment context in this model is connected to the surroundings and the environment where the transactions take place. The participant’s context refers to the status of the user (age,
sex etc) and other participants in the environment while the activity context concerns activities between, users, participants and environments. The table below indicates the representative characteristics of the context model. A number of challenges are also mentioned with a number of possible solutions proposed, such as phones that are able to adopt to continuously changing environments, minimization of the attention interfaces required, adoption of biometrics for security and identification reasons, written laws for use of mobile phones for social norms reasons etc.

Table 2.3: The representative characteristics of the context model

<table>
<thead>
<tr>
<th>Category</th>
<th>Representative Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td>Location, Orientation (of objects), physical properties, brightness and noise levels, availability, quality (of devices and communications)</td>
</tr>
<tr>
<td>Participants</td>
<td>Location, Orientation, personal properties (for example, age, gender, education, preferences), mental state, physical health, expectations</td>
</tr>
<tr>
<td>Activities</td>
<td>Tasks and goals (of participants), Events in the environment (for example, weather)</td>
</tr>
<tr>
<td>Interactions</td>
<td>Co-location, group dynamics, social situations, participant/environment relationships (for example, worker/workplace), season, time-of-day, day-of-the-week</td>
</tr>
</tbody>
</table>

Ruth, et al (2005) performed a comparison between the cultural adoptions of m-commerce. The two civilizations are proven to have great many differences in the adoption of different applications. First of all the people of Hong Kong are proven less satisfied with the use of m-commerce and they are also proven less experienced with m-commerce applications. Voice and video services appear to be more highly appreciated by the Hong Kong people than the Britons, but in terms of connecting to the mobile network, the numbers show to be more negative for the Asians. The results of the study also indicate that the use of the network in Britain is much more extensive in comparison to Honk Kong where the results show that the population there prefers the ‘hedonic’ coefficients of m-commerce. Apart from all the above, the Chinese seem to view their mobile devices much more as a tool of enhancing their lives in comparison to the Britons. The British are proven to be much more less price
sensitive compared to their counterparts in Honk Kong, but this does not seem to stop them from using a large variety of applications. On the other hand, the Hong Kong locals seem to take more seriously into account the fact that voice services cost less than other types of value-adding services. In addition, the Asians seem to be more easily influenced by offers and free trials. Finally, it was proven that word of mouth is much more efficient in Honk Kong than in Great Britain. In general, differences in cultures provide support for the initial idea that m-commerce applications are valued differently in 2 different countries. This paper is an initiative for how telecoms companies should value studies like this one in order to focus applications according to the requirements.

Jarvenpaa et al have performed another interesting study on perception and acceptance of mobile applications. This time both sides of the coin are identified. The scholars identify the need of new ‘must-have applications’ on the mobile phone rather than ‘nice-to-have’ applications. It is also worthwhile noticing the reaction the scholars got from people with different backgrounds or different age ranges. The study shows that the participants from the Far East valued better the mobile internet mostly for interpersonal/ emotional reasons, which would help them express themselves better while in the Western countries, participants appreciated the freedom factor as far as work is concerned and the creation of more spare time. The study also recognises how all participants in all developed countries are dependent upon their mobile phones. It also provides evidence that mobile users are keener on using SMS, speech with people in the same group (friends, family, coworkers etc) than making phone calls.

On the other hand, the extended use of mobile technology, according to the scholars seems to lead to seclusion, ignorance towards ones surroundings in the Western civilizations, while in the Far East, the needs of the group are preceding with respect to the needs of the individual. Finally, the any time-any place factor that mobility has introduced has shrunk the individual’s spare time since for most groups, and especially for professionals the phone keeps ringing, the messages keep coming etc.

An interesting study is also presented by Akesson (2006). In a European-wide study that has lasted 2 years and had its principle goal to measure perception of value proposition for both the supplier and the demand side, the scholar has used a model primarily introduced by Clarke et al (2005) in order to define the parameters that
provide value for m-commerce. The initial model proposed by Clarke included 4 parameters, namely ubiquity, convenience, personalization and localization. Ubiquity refers to the fact that users can find anything they like anytime and at any place. Convenience for mobile users means service utility. Personalization and localization take into consideration personal preferences and the geographical position of every user.

The study outcomes show that there are many similarities between value proposition and user perception for m-commerce applications. Personalization and localization have been proven valid for both the supply and the demand side. Convenience was also proven an important factor but the suggestions that m-commerce makes life easier were not included. Results also indicate that Ubiquity did not form a factor of its own, instead it was considered to be the means that led the other factors to score high. Finally another factor emerged that was not initially included. The so-called socialization factor which refers to services related to other users or other communities of users. The final model discovered has the following form

![Value proposition of mobile commerce revised](image)

Taking into account these findings, Andreou et al provide examples of services and applications for every factor of mobile commerce applications and also recognize two modes of functionality, the directory and the transaction mode and they point out the main properties of each mode.
The directory-oriented mode of m-Commerce functionalities is comprised of services that provide information to mobile users. This information can be location, content and user dependent, being customized according to location and user preferences in ways appropriate to the specific mobile user.

The transaction-oriented mode comprises various services and applications with which the mobile user conducts transactions with the service provider. The transactions contain read and write operations on behalf of the mobile user.

As for the perception of mobile commerce applications, the respondents seem to prefer the fun factor of applications such as downloading ringtones, music videos,
playing video games. The users also seemed to show a high level of interest with respect to receiving information services. Banking and other financial transactions were also used substantially by the mobile users.

Finally, Mahatanankoon et al (2004) made an effort to elicitate primarily and then rank mobile commerce applications according to the requirements of the participants in a survey held in an American University. The scholars’ expectations were that services such as mobile banking, mobile finance etc would be highly preferred by the participants but their expectations were not met. On the contrary the results showed that people intended to use their mobile phones mostly for information services such as sending/receiving email and SMS, emergency use. Once more, the mobility factor and the ‘always on’ aspect of mobile phones were proven the key factor that adds value to the new phone services. Another important finding of this survey was that the vast majority of the participants considered security to be a major issue, and this can be explained by the fact that the location based services offered by the mobile phone. The fact that these new services offer the possibility to track down the location of someone else made participants worry about security matters. This way, an extra requirement for authentication of user has appeared during the survey which is coupling the capability of pinpointing the location of a product. There were also concerns about the security of the devices while surfing the Internet, which gives an extra hint to mobile services designers to create new services taking as a prime consideration security.

The customisation aspect of mobile commerce seems to be a very attractive feature for users, and the scholars thought it was of hidden added value. These features offer the capability to the user to change his security standards on the mobile device so as to receive information about products or services that interest him/her according to previous actions (web pages visited). Finally a large portion of the participants welcomed warmly the idea of using the mobile phone as a personal manager which was a case not predicted by the scholars.
2.4 Conclusions

Mobile electronic commerce is something new to the people and in my opinion it is going to be the leading technology of the following decades. As can be seen there is a large number of literature dedicated to different aspects of m-commerce such as m-commerce user satisfaction, m-commerce perception, m-commerce acceptance and m-commerce application design. At this point it would be wise to remember that the m-commerce applications are designed according to the requirements imposed by the people. The literature about requirements elicitation of mobile commerce applications is very limited, and since the mobile internet is at its infancy in Greece, this type of study would be a really good initiative for designing future mobile commerce applications. Having as a basis the models of a few articles found for applications elicitation, in the next chapter a new hybrid model is presented.
Chapter 3
Methodology followed

3.1 Introduction

Concluding chapter 2 of this study, it was mentioned that in order to design good mobile services and application, one should take into account the opinion of his/her surroundings so that these services are correspondent to the cultural perception of m-commerce. It was also mentioned that m-commerce in Greece is in its infancy and a requirements elicitation technique is needed in order to build a basis for future mobile commerce applications design. This chapter discusses briefly methodologies used in studies concerning m-commerce user satisfaction, user perception etc, it goes into depth at methodologies used for m-commerce applications elicitation and finally presents the methodology used in this study.

3.2 Mobile commerce methodologies in general

As it was seen in the previous chapter there were various studies concerning different things other than m-commerce perception and applications. One of those studies, the one by Lim and Wang. The hypotheses that were formed can be depicted by the model below.

![Figure 3.1: The Lim and Wang Model](image)
In order to accept or reject the hypotheses formed, the scholars created a hybrid questionnaire that was a construct of previous studies.

Wang and Liao who intended to measure mobile commerce user satisfaction, also constructed a tool based on previous studies. In the previous chapter, the hypotheses formed were mentioned, and the two scholars in order to measure user satisfaction and to accept or reject their hypotheses, they constructed the following model.

In order to construct the tool, 10 items were selected for content quality, another 6 for appearance, 4 for service quality and another 4 for ease of use.

In an intention to link perceived value and loyalty in m-commerce and most likely loyalty towards location based services, Pura has constructed an item according to previous literature in order to prove or reject the hypotheses formulated.
3.3 Previous methodology on m-commerce application elicitation

As it was mentioned before, there is a number of research involving mobile commerce and mobile commerce applications, but there have been only a few studies that used the elicitation technique in order to rank the mobile applications. Primarily we introduce the study held by Akesson (2006) which was involved in the perception of m-commerce and value proposition.

The study took place in Europe and it lasted for two years, finishing in mid 2006. The research methodology involved a multi method approach firstly introduced by Mingers in 2001. The methodology applied involved 2 parts: a) interviews with digital media and news people and people responsible for new digital services, b) and an online questionnaire, applicable to the public. Their responses later on would act as a basis for a survey that would measure how everyday people perceive mobile commerce value propositions. In total, 18 interviews were made with people that were involved in development of new applications and services. The interviews covered topics related to the scope of the project, but the findings of the study were mainly concerning mobile services and value propositions. The purpose of the interview was to extract the most important services in the digital news field. The responds were all
taken down, coded and grouped into 4 different teams, services concerning ubiquity, localisation, personalisation and convenience. Responds that did not fit into one of these groups and dealt with human interactions formed another team, the socialisation team.

The second part of the research concerned an online questionnaire that was distributed to both nationwide and local newspaper homepages. This was a quite traditional way of collecting data but there existed the fear of one filing out more than one questionnaire, so one questionnaire was assigned to each IP. The tool was split to 4 parts: background data, business models for digital news services, preferences for future electronic news, and value of mobile services. For the last category, only the users of mobile services were applicable to respond.

Participants that did not complete their 15 year of age and participants that did not complete or answer the questionnaire contradictorily were excluded from the whole process. 32, 8% of the participants answered all 4 parts. The questions concerning the m-commerce applications were separated into 5 different categories, based on previous literature and the added value proposition factors identified by the news services and publishing organisations. This resulted in 31 statements with a 7 grade Lickert scale.

The results of the study were introduced into SPSS 14 for analysis. The main focus of the analysis was to produce mean and standard deviation results for each statement.
The goal was to build a picture of what seems to be greatest importance for the perception of users within each value proposition dimension. For validation reasons a factor analysis was performed in order to identify the 5 value proposition factors. The factors that presented the smallest factor loadings were excluded from the analysis.

As seen in chapter 2 Leem (2004) et al proposed an application categorisation scheme. This scheme can be seen on the figure below.

This model emerged through two case studies. In the first case study 65 mobile business solutions were provided by Korean business companies. These solutions were split up to the categories concerning business to business (B2B) and business to employee (B2E) shown in figure 3.5. The firm infrastructure services include internal information management for mobile intranet. Procurement and inbound logistics include inventory management and order management to be used for B2B. Applications included in outbound logistics involve intranet/extranet management meliorating both speed of logistics and location tracking. Finally, mobile solutions incorporated in marketing and sales engage the largest part in mobile transactions and involve all the services having to do with commerce through mobile phones.
The second case study of this research included the building of a questionnaire concerning user satisfaction of mobile transactions that occurred in Korea. The questionnaire built concerned factors such as use environment (pricing scheme, utility, data transmission), interface (interaction, data representation, content), perception (usability, easiness) and information (information service) resulting the figure below.

![Figure 3.6: the questionnaire structure](image)

The third study that was considered important as far as mobile applications are concerned was a cross-cultural study between Britain and Hong Kong. Harris et al (2005) did not perform an elicitation of requirements for mobile applications but they measured preference of existing mobile applications. In order to do so, the scholars distributed questionnaires to 200 young people aged 18-30 (100 from each country). The questionnaire was split up in 3 parts including behavioural, attitudinal and demographic/ socio-economic parts. The questionnaires were as identical as possible, with alterations applied for currency reasons, network capabilities and cultural background. The questionnaire was written in English, since Hong Kong is an ex-British colony and the English language is widespread. Part 2 of the questionnaire...
applied a 5 point Lickert scale that helped the participants rate the services according to frequency of use, perceived usefulness and expensiveness and their perceived satisfaction with each m-commerce application.

Before distributing the questionnaire to the participants, a group of volunteers helped the scholars verify that the questionnaire was correctly worded and well understood. Using SPSS 14 metrics such as mean, median and standard deviation, the scholars identify the most popular services used in both countries, the factors that influenced the participants in using m-commerce, and finally how the participants perceive m-commerce usefulness, ease of use, satisfaction of different mobile applications.

Finally Mahatanankoon et al, in a study quite similar to our, enabled the brainstorming technique in order to elicitate the requirements of students as far as mobile applications are concerned. In order to elicitate the mobile application requirements, the study was split up in 2 parts. In the 1st part of the study, 60 undergraduate and 15 graduate students of a big Midwest state University proposed a number of applications. This list of applications turned out to be quite various. These applications were then rephrased so as to give a full idea of what the students were referring to. For validity reasons, 28 students majoring in information systems were given the initial list of applications. Normality tests were performed in order to assure the validity of applications.

The 2nd stage of the research was about ranking the applications. A large number of students (273) people took part in our research in ranking the applications. For one to participate in the study, it was a necessity that he/she owned a mobile phone and he/she entered the Internet. 12 of the participants did not own a mobile phone and thus their responses were not taken into account. Another 10 did not use the Internet and their responses were also not taken into account. That left the scholars with 251 filled out participants. Their answers were all passed on to SPSS 11 and with the help of descriptive statistics, the histogram of each application was examined and they were ranked according to preference. Later on, exploratory factor analysis was used in order to provide an initial classification of the operation modes of the mobile devices and to cross out the applications with low factor loadings. Finally 1st and 2nd order confirmatory factor analysis was performed in order to validate the construct, i.e. to classify the different types of services for mobile phones. The proposed model can be
3.4 The methodology of this study

In this part of the thesis the proposed methodology and model are going to be presented. There are three steps in this process. First of all the application list generation, then the sample selection and finally the SPSS software analyses.

2.4.3 Application list generation

As seen from the previous studies, in order to get a good idea of what mobile commerce applications would be, one needs to elicitate mobile commerce applications, according to the needs of the participants in the study. The study is going to be quite similar to the one by Mahatanankoon et al (2004). Instead of using the brainstorming method, the applications are going to be proposed from 3 different departments of the Democritus University of Thrace: The information systems department, the electrical and electronics engineering department and the business department. The applications from all 3 departments were gathered, rephrased and passed on to a team formed by graduate and undergraduate students of the Information Systems Department of the University of Thrace in Xanthi for validation reasons. The cooperation with all 3 departments of the Democritus University of Xanthi was crucial, since all 3 departments express the different types of service that...
will be offered to the users of mobile phones in the near future. The Information Systems department will be responsible of checking which of the proposed applications were highly likely to be incorporated, crossed out the inapplicable ones and also proposed a number of services that the members of the team considered necessary.

3.4.3 Sample selection

This final list of applications was distributed to participants from allover Northern Greece. Participants had to be both users of the internet and also have a mobile phone of their own. It was also necessary that the participants stated age, gender, status (employee, student or businessman/woman) so that they can be classified during the statistical analysis. The businesses selected were local ones. Franchise businesses were aborted, since the owners would not have any interest on the B2B (Business to Business) or B2C (Business to Customer) services. The students called to answer the questionnaire were studying at different departments of the University of Democritus Thrace in Xanthi, Alexandroupolis and Komotini, the Aristotle University of Thessaloniki and the Technical Education Institute of Kavala. Other participants of the survey were through the Internet. The questionnaire was sent through the Internet to friends living across Greece with specific guidelines about how the questionnaires are to be filled out. A number of these participants volunteered to hand out a few questionnaires to friends and acquaintances

3.4.4 Application ranking and the 3 concurrent studies

The participant students provided a list of applications, and those applications formed a questionnaire. The people who were asked to participate, provided with demographic data such as age and gender and they had to fill out whether they were students, employees or employers. This way 3 ‘concurrent’ studies are going to take place each of which would measure perception of mobile commerce for the 3 different groups of people. The participants are asked to rank the mobile commerce applications according to their needs on a Microsoft office document. Their responses are going to be classified into the category they belong in the first place. Once the 3 analyses terminate, all responses are going to be classified again according to age groups and according to gender
Using the SPSS software, an Exploratory Factor Analysis is going to be held in order to suss out the operational modes of the mobile internet. Taking a really big sample was also helpful in discovering any preferences of different age groups of different preferences of the two genders or between different age groups. To follow Confirmatory Factor Analysis is going to be applied in order to validate the construct of the model. The methodology followed can be depicted on figure 3.8

The proposed model of our study is depicted in Figure 3.9. A number of applications are ranked by each group and this ranking is going to help us investigate what applications attract which group and so forth. It would be interesting to see if the different groups value the same applications in similar or different ways. This model can be depicted in figure 3.10.
3.5 Questionnaire

The questionnaire was split up in the different ‘theoretical transaction modes’ of mobile applications, discovered by the different scholars, i.e. transaction based, location based, Internet based, B2B, B2C services et al. All services needed to be copied from other scholars’s research, were translated in Greek. On the top left of the questionnaire there were guidelines on how one should fill out the list of services. The only confusing fact was that the students didn’t know what level of education to take down, but this was quickly clarified. All applications were grouped into different groups that were similar to factors extracted on different studies. This was done because psychologically one would have similar answers to similar services, especially when these services are neighboring in the questionnaire.

3.6 Conclusion

In this chapter, different methodologies concerning mobile commerce have been studied. Primarily, studies that had little to do with mobile commerce applications were studied, followed by the ones concerning mobile applications elicitation and ranking. As mentioned before, the number of these studies was proven small, but based on this literature and with the use of a complex process, a new model was constructed. This model is a hybrid model, employing different parts of the literature.
review, especially of the one performed by Mahatankoon et al. At the rest of this chapter, other different aspects of the study are observed, such as the questionnaire, the sample selection methods and the hypotheses. Following this chapter, the results of the study are going to be presented
Chapter 4: Data Analysis

4.1 Introduction

In the previous chapter the model proposed for mobile commerce application ranking was presented. As mentioned before, this research is going to be focused on how three different groups of people evaluate the mobile commerce applications. Initially 52 mobile applications were extracted, using the method described in the previous chapter. 191 people participated in the specific research from the area of Eastern Macedonia and Thrace and Thessaloniki, 100 of which were male and 91 female. 51 of the participants were businessmen, 64 employees and 76 students. Three tools helped finish off the research, Microsoft Excel, SPSS 15 and LISREL for Windows. The mean age of the participants was 27.61 years.

4.2 The services

In chapter 3, the methodology of eliciting the mobile services was discussed. In this chapter, the services that the Greek people selected are going to be presented. It can be said that these services are concentrated in 6 groups: Location Based services, emergency services, entertainment services, Content delivery services and Business orientated services. These factor names were taken from the Mahatankoon et al paper apart from the business orientated services which is a grouping of B2B (Business to Business) and B2C (Business to Client). Under Content delivery services, all the Internet-orientated services such as email, online surfing etc were concentrated. Transaction based services have to do with financial transactions such as paying physical stores, buying goods from vending machines, mobile banking services etc. Entertainment services include MMS services, Online Games, Chatting etc, while the Business orientated services include all the functionalities a mobile phone is going to offer for organizing a business, organizing its inventory, being 24 7 online with providers etc. The Location based services are the ones supported by GPS technology and thus offer small-scale network local facilities, such as receiving offers by nearby stores through SMS services, making reservations at a local restaurant or booking
cinema tickets. Finally Emergency services are also supported by GPS technology providing roadmaps, information about local authorities etc. Of course there is a number of services that would not be easily grouped under these services such as video conferencing, distance learning services, taking part in Auctions et al. The list of services provided by the Greek people is attached as an appendix and the end of this coursework. Finally it should be mentioned that, since the people that participated in the extraction of the services, already knew about the mobile services that have conquered the developed world, they proposed common services. Of course, there have been propositions of services that fit the Greek mentality

4.3 Process

Having collected 191 questionnaires with the 52 variables (age, gender, status, if people had mobile phones, if people were users of the internet plus current and future services) all data was passed on to an SPSS file (TEST.sav). The age of the users was passed on as a scale variable, the rest of the variables (sex, if people are using the net etc) were passed on as nominal variables and the proposed services were passed on as ordinal variables (1 to 5 Likert scale). Through the SPSS file we were able to extract the preferences of each group. The Cross-tabs test was used (row variable the status and column variable the services) and the results were copied and pasted to an Excel file. The Cross-Tabs test gives how many Businessmen/Employees/Students were not interested, a little interested, just interested etc. Figure 4.1 and 4.2 show the Crosstabs test interface and an example of how the output of the test looked like for a specific service. Passing on the data to Excel was made easy because of the pivot table feature of SPSS 15 which allowed copying and pasting of the numbers to the respective Excel cells.

Having inserted all the numerical values to Excel, these numbers were all expressed as a fraction of the total answers of businessmen, employees and students respectively. That was done because we were interested in correlating the answers of businessmen to the ones of the employees and students respectively. Two more excel spreadsheets were created that included the answers of men and women. In order to rank the applications, the mean value of each service was calculated alongside the standard deviation of each service. Next, the mean values of the preferences of the
participants were plotted on a bar scale and thus it was made easy to rank the services for each group. Then, correlation between the standard deviations of the services was performed so as to test how the answers of one group match the answers of the others.

Figure 4.1 The Crosstabs test interface

![Crosstabs test interface](image)

Table 4.1 The Crosstabs output

<table>
<thead>
<tr>
<th>Businessman student or employee</th>
<th>email services</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>not</td>
<td>little</td>
</tr>
<tr>
<td>Businessman</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Employee</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Student</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>30</td>
</tr>
</tbody>
</table>
Then through the Descriptive test of SPSS the mean value and standard deviation of all services were calculated. Clicking on the statistics button leads to the following table where mean and standard deviation features are selected. This way the entire participant’s answers are calculated and total ranking is made easier.

The next step is to perform exploratory factor analysis. This process will group a number of services into factors. The KMO and Bartlett test are performed so as to test if the sample is high enough. In addition, the Anti-image test is performed to prove the Bartlett test right. The KMO factor has to be greater than 0.5 so as to have a valid sample. The Anti-image test is valid if the main diagonal factors are all greater than 0.5 as well. The coefficients of the different services that would logically form a factor have to be greater than 0.6

If a service loading is less that 0.6 this service is excluded from the factor analysis and this way, the final model of the mobile services research will only include a number of factors and not services on their own. Figure 4.4 gives an example of 4 services that were grouped up together to form a factor. The KMO and Bartlett loading was higher than 0.5, as well as the main diagonal of the 4 by 4 Anti-image matrix, while the factor loadings of each service were higher than 0.6. Summing up, these four services, that were logically called to form a factor, did form one.
A first feeling of the number of factors that may be extracted can be obtained by the correlation matrix of the services. In other words, 2 services with high correlation loadings are expected to appear in the same factor. One thing that should be noticed is that the services should not be very inter-correlated to one another because this can cause difficulties in distinguishing the contribution of a service into a factor.

It should be mentioned here that there were two possibilities of performing this task. One was factor analysis and the other one principal component analysis. Factor analysis is more complicated but results are more trustworthy, that’s why it was chosen. The next question to be put is what factors should be excluded from the analysis. This question is answered by the SPSS factor analysis. Factors with eigenvalues over 1 were selected. Finally, varimax rotation was selected, the factor score coefficient matrix was also selected from the options menu while listwise exclusion was also selected, sorting by size and suppression of absolute values less than 0.50 in the options menu. The value of 0.5 was selected because the sample is not very big. Then, varimax rotation was selected from the rotation option, chose to make the factor score coefficient matrix from the scores option and also selected the listwise exclusion selection sorting by size and suppression of absolute values smaller than 0.50 because the sample of people questioned was considered small.
4.4 Results

Having analysed the whole procedure, the results of this research are going to be presented. There was a common point for all three categories of people interviewed. This thing was that the emergency services scored very high in all 3 categories. For the category of businessmen, searching information over the internet scored the highest with a mean value of 3.91. Second on the list came the service of making use of the mobile phone during inactive times. This can be explained by the fact that this category of people values highly their spare time and since usually they lack personal time, they found this service representative for them. A proof that shows that businessmen have a high interest on internet services on their mobile is the high mean values of services such as online guide tools (yahoo, lycos et.al) and spending a lot of time on surfing online. Most probably, the people questioned ignored the fact that the mobile phone has small keypads, small screen and finite battery, or they probably thought that things are going to be optimized in the future.

Oddly enough businessmen did not seem to appreciate very highly services that were concerning them directly, such as organizing the inventory of their businesses, being on a common network with clients and providers, and tracking down lorries with products that concern a businessmen so as to make delivery time of a product much smaller, apart from the service that concerned keeping track of what is going on at their businesses through ERP software and being able to access this data at any time from any place. This can be explained judging by the experience of businessmen with ERP software technology. Since most businesses are organized through ERP software, on their computers, it was logical enough to evaluate these services high. As for the rest of business type services it could be said that the participants did not understand how these services are going to function in the near future and thus did not give them a high score. Figure 4.5 shows the mean scores of the business people category.

As it is obvious the business people group did not show a high interest in services that concerned entertainment, such as file sharing, chatting downloading or listening to music. Banking and general transaction services also did not score as high as expected (mean values below 3). This means that they did take it into consideration as an important feature, but it was expected that this group of people would appreciate more
these services since this way transactions are made much easier. This is probably where the data security factor plays an important part in weather accepting or not these types of services, or maybe because it is the psychological advantage of knowing how much they have at ones pocket that makes them a bit reluctant about this service.

Figure 4.4: The mean scores of business people scoring

![Businessmen Preferences](image)

As far as the employees are concerned, the Internet services also seem to be of the highest interest. With a mean value of 3.96 for searching information while being online a mean value of 3.2 for surfing for many hours during the day and a mean value of 3.92 for email services, it is clear that people that have been using the internet, again have valued online services high. It is also clear that emergency services have again scored high. For the case of employees, some location based services also scored high such as making reservation for the theatre or the cinema but in general, location based services were not considered a priority, since all mean scores of this type of services were around 3, i.e. the employees thought they were important services. As Business type services, employees did not value them high, probably because they did not think the mobile can provide such services over the
internet. Finally, transaction services alongside with entertainment services were not evaluated high by the participants, at least they did not receive the attention expected. Figure 4.6 shows the preferences of the employees

Finally, the students apart from evaluating emergency and internet services high, seem to have a larger interest on entertainment features such as online gaming, file sharing online, MMS services, multimedia chatting services etc. This could be very easily interpreted since the mean age of students participating in the survey is 21,2 years. The research was also extended to answers according to the gender of the participants. There were no big differences expected in the way both groups answered. This was proven by the fact that the mean values of female and male participants gave a correlation percentage of 83,4%. Once again the internet and emergency services showed the highest scores.

At this point it is worthwhile noting that the employees, the students and the bussines people answers showed little correlation between them. To be more precise students-employees showed a correlation of 50%, students-businessmen 46,9% and students-
employees a correlation of 61.4%. This proves how differently the three group representatives were thinking when filling out the questionnaire.

Appendix 1 includes a table of results out of SPSS 15. It shows, in descending order of the mean values how the services scored.

4.5 Factor Analysis

At part 4.3, the process of performing the factor analysis was described. In this part we are going to analyse the results of this factor analysis. The services that were selected from the initial descriptive statistics analysis were the services that scored above the mean value of 3. That led services such as video conferencing, vending machine purchases, mobile auctions etc out of the analysis. The initial 52 services were reduced down to 22. Running the factor analysis using the parameters mentioned in part 4.3 SPSS extracted 7 factors. These factors represent Internet and online tools, emergency services, Business services, comfort services, location based services and human locating services.

Taking things from scratch, the KMO test showed a score higher than 0.5 and the Bartlett’s sphericity test showed that the model was critically representative of the data ($\chi^2/\text{df}=3.87$).
Table 4.2 KMO and Bartlett’s Test

| Kaiser-Meyer-Olkin Measure of Sampling Adequacy | \( .747 \) |
| Bartlett’s Test of Sphericity | Approx. Chi-Square |
| | df |
| | Sig. |
| | 2724.226 |
| | 703 |
| | .000 |

The correlation matrix was positive definite and the determinant calculated 0.01 which means the variables were not multicollinear. Then the anti-image matrix main diagonal had all elements above 0.5 which also meant that probably the sample was representative. The 7 factors extracted accounted for a cumulative variance explained of 65.351%. To be more precise the services that represent each factor can be seen in figure 4.8. A further explanation of which were the services that were taken into consideration is given in Appendix A. The rotated component matrix also provides a guide upon which services were the representatives of the 7 factors.

It is worthwhile mentioning here that entertainment services which were always present in previous research, were excluded from this research because they did not score high enough. Of course it should be pointed out that, in comparison to the Mahatanankoon study, where the participants were young students of a specific university of Arizona, the sample of this study was much more vast, since it included two more groups of people, bussiness people and employees which were of an older age in general compared to the students.

It should also be remarked that at the beginning, the factor analysis was performed with all services being present so that an initial feeling of the tendency of the peoples preferences is taken. At this initial ‘warm up’ study 2 more factors were extracted, both of them being associated with entertainment. We could call the first one
Mobile commerce applications: How the Greek people understand them and evaluate them

entertainment with services such as music download, online tv, listening to music and the other one multimedia communication services with services like MMS. It was rather strange to observe that the participants evaluated differently the one category compared to the other.
<table>
<thead>
<tr>
<th>Component</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency services, road maps</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.859</td>
<td></td>
</tr>
<tr>
<td>Send emergency info</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.827</td>
<td></td>
</tr>
<tr>
<td>A service that allows us to track people (email, address)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.820</td>
<td></td>
</tr>
<tr>
<td>Area phone book services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.804</td>
<td></td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
  a. Rotation converged in 5 iterations.
Figure 4.7: Factor loadings
4.6 Confirmatory factor analysis

A) Theory

Having extracted the factors that comprise the future mobile services, at least how the Greek people imagine they would be, this research proceeds further on to confirmatory factor analysis. As its name sais, it is used to confirm the variables that are being used to measure specific structures. In this case, the desirable result would be to be able to provide correlation paths between the different factors and to examine the construct validity of the model. The confirmatory factor analysis was performed with the contribution of the LISREL 8 student edition. Unfortunately, the specific software accepted for factor analysis only 15 variables and thus the analysis is going to be performed partially i.e. the factor analysis was performed for all possible combinations of factors. The results that interest us the most in order to confirm the construct of the model and to examine the adjusting capability of the model are shown in table 4.3. This table also includes the ideal scores for the model to be adjusted.

<table>
<thead>
<tr>
<th>Table 4.3: Metrics for good model adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi square and its P value</td>
</tr>
<tr>
<td>RMSEA</td>
</tr>
<tr>
<td>CFI</td>
</tr>
<tr>
<td>GFI</td>
</tr>
<tr>
<td>Loadings</td>
</tr>
<tr>
<td>Construct reliability</td>
</tr>
<tr>
<td>Variance extracted</td>
</tr>
</tbody>
</table>

B) Practice using LISREL

As mentioned before the LISREL student edition can handle up to 15 variables for an analysis. The following description includes an analysis for the first for factors,
nominally the Internet services, the Business services, the Comfort services and the Location Based services. Initially a new SPSS file was created including only the variables that comprise the factors (new.sav). This file was loaded up on LISREL as a Prelis data file (new.prf). To continue, the variable types were set to ordinal (fig 4.8), the variables were renamed (I1 I2 I3 I4 I5 for the internet services, B1 B2 B3 for business services etc) for programming convenience reasons. Then a correlation matrix and an asymptotic covariance matrix were created in the variables/ cases select. These matrices are going to provide the necessary data for our analysis. The matrices were stored under IBCL.PML for the correlation matrix and IBCL.ACP for the covariance matrix. Then a syntax data file was created on LISREL (IBCL.ls8) and can be seen on figure 4.8.

The first line on an ls8 file is an arbitrary title of the file. The second line always starts with command DA, NI states the number of selected variables, NO gives the number of observations and the command MA=PM states the type of the analysis which in our case is the Polychronic Matrix Analysis. Line 3 (LA) asks for the names of the determinant variables which in our case can be seen on line 4 (I1, I2, I3 etc). Line 5 and line 6 determine the name of the correlation and covariance matrix from which the data is taken. In line 6 the command MO expresses the creation of the model. Commands NX=15 and NK=4 determine the number of the independent determining variables and the numbers of factors created. Line 7 shows how each variable is connected to a factor. For example LX 1 1 means that variable 1 (I1 in this case) belongs to factor 1, LX 6 2 associates B1 with the second factor and so on. Command PD in line 8 asks LISREL to provide with the path diagram of the variables. Line 9 has a number of commands that are used for the format of the results, typical errors, the t values, the factorial values of regression the dregs and different general results of the analysis. By saving and running the LISREL file we get the path diagram and the results that were asked by the file. Figure 4.9 provides the path diagram of the 4 factors. A number of other tests have been run which are attached to the cd provided with this dissertation.

Figure 4.8: The syntax file
C ) Results

The results that are going to be provided are not representative of the whole model but only for the 4 factors. The output file of this analysis indicates that the model has 84 degrees of freedom, a Chi square value of 248 and a p value less than 0.05. The ratio of Chi square over df returns a result of 2.95 which is between 1 and 5. This is a sign of good model adjustment. The root mean square error adjustment returned a value of 0.102, critically above the maximum acceptable limit. The CFI score was 0.94 which is greater than the lower acceptable limit of 0.9.

The value of GFI and AGFI were well above the 0.90 lower limit (0.96 and 0.94 respectively), the t-values were well away from the forementioned space and thus the loadings are considered statistically important. Next, using Excell, the construct reliability is going to be calculated. The resulted outcome is 95.2% which is a pretty good result. The extracted variance was calculated to be 61.28%. These calculations were made through formulae 4.1 and 4.2

\[
\text{Construct reliability} = \frac{\Sigma (\text{std loading})^2}{(\Sigma (\text{std loading})^2 + \Sigma \epsilon_i)} \quad (4.1)
\]

\[
\text{Variance extracted} = \frac{\Sigma \text{std loading}^2}{\text{std loading}^2 + \Sigma \epsilon_i} \quad (4.2)
\]

where std loading is the standard deviation of the factor loadings of each service and \( \epsilon_i \) the error of measurement for each service. All the above results lead to the fact that if there were just the 4 forementioned factors included in the analysis, they would confirm the factor extraction.
Having run a number of tests with a number of combinations of factors, it can be seen that practically all combinations produce good results. Of course that cannot lead us to the conclusion that if the analysis was run in total it would produce similar results.

Figure 4.8 The path diagram of the first attempt

4.7 Conclusions

At this chapter, all the necessary analysis was performed. First of all by a simple frequencies test, the mean values of all services was computed. Then through a simple cross-tabulation test, the answers of the three different groups of people were summed up and, on an EXCELL file, the mean values of services for all groups were calculated and bar diagrams were drawn of the services with respect to the services mean values. The same thing was also done with respect to the gender of the participants. The standard deviations of the services were also calculated. This was done in order to correlate the answers of the three groups.

Having overall results of the mean values of services, this research proceeded further on with the factor analysis of the services. Initially, all services were included in the factor analysis. Nine factors was extracted, which were about internet and online
tools, business services, location based services, comfort services (services that contribute in making every day life simpler), emergency services, data tracking services such as area phonebook services and personal data tracker, financial transaction services, entertainment and multimedia communication services. Since the main goal of this factor analysis was to analyse which of these services are considered important by the respondents, all services that had a mean value less than 3 were excluded from further research. This led to the complete disappearance of the 2 factors that were associated with entertainment, since the respondents answers may have correlated well but they scored low mean values. The factor analysis showed also that the number of participants was high enough so that the results of this study be considerable

Knowing which factors comprise the mobile phone operation modes, confirmatory factor analysis was performed. Unfortunately this analysis was done partially due to problems of technical nature. Unfortunately, the software chosen for the analysis could only handle 15 variables at a time, and unfortunately, the study had to deal with 21 variables. Despite that fact, a number of tests combining a range of variables from the 21 described by the model, were performed and all these tests fulfilled all expectations about validity of the model. In chapter 5 a brief description of the whole study is performed and also further research topics are being proposed.
Chapter 5: Total Overview of the study

5.1 Overview

Concluding this dissertation, the writer has decided to make an overall estimation of his work. Overall, the intention of this study was to investigate how Greek people view the mobile applications of the future. The initiative was given by the rapid growth of telecommunications and Internet technology during the last decade. In order to investigate how Greek people understand the mobile applications, a procedure was followed which was a bit complicated, involved the participation of many people but resulted in many applications, a large number of which coincided with applications that were encountered in different scientific papers. Of course, there were a number of other services that did not match past literature. This makes sense, coming to think about the year each research has taken place and the location it has taken place.

As for the way the research was performed, in other words the way the questionnaires were distributed, it was considered more logical to group all applications in the different groups that form the factors extracted in previous literature. Psychologically, that would help people evaluate similar services the same way, and help in the factor extraction. Also, in order to achieve maximum response, it was considered better to have a questionnaire that explains in full all the services that were brought up, since it would be time consuming for the groups of employees and businessmen to fill out the questionnaires while they were working. Also, the study was held during the summertime and it was quite difficult to contact students, since most of them were away from the location of study. That’s why the last 15 days of the study was dedicated to students (end of August-mid September).

Having received all the raw data needed, the study proceeded in measuring the importance of each service for the three different study groups. Some results were well expected while others were surprising. For example, expectations were met concerning emergency services. It is common sense that since this type of services was brought up, it would be highly rated. Another expected result was the high score of Internet related services. 15 years after the appearance of the world wide web it...
would be very awkward to see that these services were not appreciated highly, since it has become a very useful tool of everyday life. A result that came out of the research and it was really surprising was the fact that entertainment services were not estimated high enough in order to be a part of the research. It was not expected that services such as downloading songs on the mobile or watching TV would score as high as emergency or Internet services, but in any case, it wasn’t expected that they would be left out of the research. Probably, the physical aspects of the phone, such as small keypads, finite battery small screens, as well as security matters (sharing files online on peculiar downloading websites still remains a problem of internet technology) held back participants from evaluating these services high.

Another surprising result was the inclusion of transaction services such as mobile banking and paying goods at shops using the mobile phone. It was surprising because Greece has not got the necessary infrastructure internetwise (Broadband networks have been having success only the last few years) to explain such a reaction from the participants. A good explanation may be that these services were valued high because they make life simpler and also open a world wide market place to a user’s hand. The rapid growth of eBay and other transaction websites should also be taken into account.

To continue, comfort services or ‘content delivery services’ as Mahatanankoon et al (2004) have described them were expected to be popular amongst the other services. This is probably because they offer simplicity in life, are more time saving and more efficient. Finally location based services were also steemed high by the participants because, them as well provide facilities that help a persons life improve qualitywise. Ofcourse not all location based services scored high. The ones that scored high and were included in the research were the ones concerning classified adds about job searching or other personali information, while the ones concerning time and location centric advertisments or location based reservations did not score high.

Finally it was worthwhile mentioning that by correlating the answers of students, business people and employees, the correlation scores were somewhere around 60% for the relationship between employees and business people and somewhere around 50% for the correlation of the forementioned groups to the students group, while the male to female correlation scored around 80%. This again proves the different way of
thinking of the 3 groups on the way they treat mobile services and also that male and female answers showed no big differences

5.2 Limitations

As mentioned at chapter 4 some technical aspects of the LISREL 8.8 student edition did not allow full form confirmatory factor analysis. By performing a number of tests, some conclusions, which are not completely safe, were drawn. The software was not found cracked through the internet and it was not thought wise to buy the software for one use. The software was also not found installed on any computer at the Technological Education Institute of Kavala.

Another limitation of this research has been the way of conducting the research. It is highly likely that results may have been completely different if personal interviews were applied. Face to face communication and personal contact always works for better results. It should be noted that even though all respondents were Internet users and had a mobile phone, many of these services were not familiar to them and with a face to face communication and expansion they would value these services differently.

Finally, results may have been different if some technical aspects of the phone or financial charges of mobile companies for different services were known. For example, a respondent would evaluate a service such as mobile television or online games, if he/she was familiar with the fact that keypads are expected to be larger, the battery would last much longer and the screen would be big enough. Another example that is associated with the services is the pricing scheme of all services. Different results would have come out if the participant knew that the services are going to be charged with a fixed pricing scheme or a per bit charge.

5.3 Future research

As mentioned before, one thing that one may do to go one step further is to associate price to all these services. It would be interesting to see how results may be altered when charges get in the picture. In general this type of research has been held in the past in countries technologically more advanced, such as France, Germany the U.K. et al. and have shown that pricing plays a key part in evaluating a service.
For the case of Greece, since the heavy industry of the country is tourism, a survey may be held amongst tourists of what supplementary services should a mobile phone should embed so that people enjoy their vacations and have the telephone as a personal guide that would indicate the best hotels, the best resorts, the best places to go out. This means that a more precise research focused on Location Based Services should be held and also, new ideas for services should be applied such as site guides like the ones employed at modern museums across the world.
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Appendix 1: The overall ranking of the services

Descriptive Statistics

<table>
<thead>
<tr>
<th>Service Description</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emergency services, road maps</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.83</td>
<td>.982</td>
</tr>
<tr>
<td>Send emergency info</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.80</td>
<td>.926</td>
</tr>
<tr>
<td>Yellow pages services</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.58</td>
<td>1.001</td>
</tr>
<tr>
<td>Area phone book services</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.50</td>
<td>1.095</td>
</tr>
<tr>
<td>Email services</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.50</td>
<td>1.235</td>
</tr>
<tr>
<td>Searching info over the internet</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.45</td>
<td>1.059</td>
</tr>
<tr>
<td>Taking care of business during inactive times</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.30</td>
<td>1.110</td>
</tr>
<tr>
<td>Using the phone as an agenda</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.29</td>
<td>1.150</td>
</tr>
<tr>
<td>Surfing many hours online</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.29</td>
<td>1.131</td>
</tr>
<tr>
<td>Controlling devices from home</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.24</td>
<td>1.001</td>
</tr>
<tr>
<td>Taking care of business during inactive times</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.22</td>
<td>1.028</td>
</tr>
<tr>
<td>Online guide tools</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.16</td>
<td>1.114</td>
</tr>
<tr>
<td>Product allocation with respect to location</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.13</td>
<td>1.075</td>
</tr>
<tr>
<td>Receiving real time info</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.13</td>
<td>.870</td>
</tr>
<tr>
<td>Receiving personalised messages about job searching</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.10</td>
<td>.971</td>
</tr>
<tr>
<td>Reading sending adds</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.08</td>
<td>.980</td>
</tr>
<tr>
<td>Microsoft tools</td>
<td>233</td>
<td>1</td>
<td>5</td>
<td>3.07</td>
<td>1.155</td>
</tr>
<tr>
<td>Paying goods at physical shops</td>
<td>192</td>
<td>1</td>
<td>5</td>
<td>3.07</td>
<td>1.195</td>
</tr>
<tr>
<td>A service that allows u to track people</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.07</td>
<td>1.156</td>
</tr>
<tr>
<td>Buying goods over the m-net</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.06</td>
<td>1.122</td>
</tr>
<tr>
<td>Ordering new products from providers</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.06</td>
<td>1.089</td>
</tr>
<tr>
<td>Organising sales store through a special software</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.06</td>
<td>1.072</td>
</tr>
<tr>
<td>Mobile Banking services</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.01</td>
<td>1.201</td>
</tr>
<tr>
<td>Booking seats at theatre restaurant airticket</td>
<td>191</td>
<td>1</td>
<td>5</td>
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<td>Service Description</td>
<td>Rating</td>
<td>Selection</td>
<td>Preferences</td>
<td>Usability</td>
<td>Value</td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------</td>
<td>--------</td>
<td>-----------</td>
<td>-------------</td>
<td>-----------</td>
<td>-------</td>
</tr>
<tr>
<td>Using the mobile as a bank account and transferring money</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>3.01</td>
<td>1.054</td>
</tr>
<tr>
<td>Suggesting new services or products to shops or businesses</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.93</td>
<td>.909</td>
</tr>
<tr>
<td>MMS services</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.91</td>
<td>1.077</td>
</tr>
<tr>
<td>Mobile television</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.91</td>
<td>.883</td>
</tr>
<tr>
<td>Pop up advertisements received due to cookies from explorer</td>
<td>192</td>
<td>1</td>
<td>5</td>
<td>2.91</td>
<td>.993</td>
</tr>
<tr>
<td>Download upload music/videos</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.88</td>
<td>1.115</td>
</tr>
<tr>
<td>Tracking trucks with goods that interest a businessman</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.87</td>
<td>1.044</td>
</tr>
<tr>
<td>Mobile Seminar</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.82</td>
<td>1.165</td>
</tr>
<tr>
<td>Travel offer alert from a travel agency</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.69</td>
<td>1.145</td>
</tr>
<tr>
<td>Shopping advising data centre based on personal style and preferences</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.65</td>
<td>1.094</td>
</tr>
<tr>
<td>Listening to music</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.65</td>
<td>1.030</td>
</tr>
<tr>
<td>File sharing online with friends</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.62</td>
<td>1.088</td>
</tr>
<tr>
<td>Taking part in SExch through the net</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.59</td>
<td>1.001</td>
</tr>
<tr>
<td>Multimedia chatting</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.56</td>
<td>1.212</td>
</tr>
<tr>
<td>Tracking down through adds spare reserves for the car</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.52</td>
<td>1.070</td>
</tr>
<tr>
<td>Paying a parking ticket on the spot</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.49</td>
<td>1.200</td>
</tr>
<tr>
<td>Reports for damages for insurance companies</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.47</td>
<td>1.222</td>
</tr>
<tr>
<td>Video Conferencing</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.45</td>
<td>1.127</td>
</tr>
<tr>
<td>Advertisement of goods by stores in nearby distances</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.36</td>
<td>1.119</td>
</tr>
<tr>
<td>Watching online videos</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.35</td>
<td>1.141</td>
</tr>
<tr>
<td>Buying goods from a vending machine and charging them to the mobile</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.28</td>
<td>1.126</td>
</tr>
<tr>
<td>Reading books on mobile phone</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.25</td>
<td>1.146</td>
</tr>
<tr>
<td>Games on the mobile phone</td>
<td>191</td>
<td>1</td>
<td>5</td>
<td>2.24</td>
<td>.985</td>
</tr>
<tr>
<td>Alert for row at different public service companies</td>
<td>190</td>
<td>1</td>
<td>5</td>
<td>2.21</td>
<td>.913</td>
</tr>
</tbody>
</table>
Appendix 2: The steps followed in SPSS 15: A print-screen analysis

I. Descriptive statistics

Crosstabs test: it helped separate the answers of the 3 groups
II. **Factor analysis: Choosing the parameters of the analysis**

Descriptives parameters
KMO, Anti-mage, Correlation matrix determinant

Clicking on the Extraction button where we choose to extract factors with factor loadings above 1

Choosing varimax rotation
Choosing to output the factor coefficient matrix

Choosing to display the coefficient matrix where factor loadings below 0.50 are neglected

Choosing to display the coefficient matrix where factor loadings below 0.50 are neglected
Appendix 3:

a) Abbreviations of the services for more convenience in the use of LISREL 8.8

<table>
<thead>
<tr>
<th>Service Description</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordering new products from providers</td>
<td>B1</td>
</tr>
<tr>
<td>Organising physical store of a business through the mobile</td>
<td>B2</td>
</tr>
<tr>
<td>Tracking trucks with goods that interest a businessman</td>
<td>B3</td>
</tr>
<tr>
<td>Organising sales store through a special software</td>
<td>B4</td>
</tr>
<tr>
<td>Suggesting new services or products to shops or businesses</td>
<td>B5</td>
</tr>
<tr>
<td>Yellow pages services</td>
<td>I1</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----</td>
</tr>
<tr>
<td>online guide tools</td>
<td>I2</td>
</tr>
<tr>
<td>Searching info over the internet</td>
<td>I3</td>
</tr>
<tr>
<td>Surfing many hours online</td>
<td>I4</td>
</tr>
<tr>
<td>email services</td>
<td>I5</td>
</tr>
</tbody>
</table>

| Taking care of business during inactive times | C1 |
| Microsoft tools | C2 |
| Emergency services, road maps | C3 |
| Controlling devices from home | C4 |

| Product allocation with respect to location | L1 |
| Receiving personalised messages about job searching | L3 |
| Reading sending adds | L4 |

| Mobile Banking services | T1 |
| Paying goods at physical shops | T2 |
| Using the mobile as a bank account and transferring money | T3 |
| Buying goods over the m-net | T4 |
b) Steps followed for the confirmatory factor analysis in LISREL

Defining type of variable

Choosing type of variable: ordinal for our case

Choosing the variables that are going to participate in the analysis
Choosing to save correlation and covariance matrices in two files
References


19. Stanoevska-Slabeva K. “Towards a Reference Model for M-Commerce Applications” working paper
