



WWW.ECONSTOR.EU

Der Open-Access-Publikationsserver der ZBW – Leibniz-Informationszentrum Wirtschaft
The Open Access Publication Server of the ZBW – Leibniz Information Centre for Economics

Nikou, Shahrokh; Mezei, Jozsef; Bouwman, Harry; Liu, Yong

Conference Paper

Factors influencing the adoption of mobile services consumers' preferences using analytic hierarchy process

22nd European Regional Conference of the International Telecommunications Society (ITS2011), Budapest, 18 - 21 September, 2011: Innovative ICT Applications - Emerging Regulatory, Economic and Policy Issues

Provided in cooperation with:

International Telecommunications Society (ITS)

Suggested citation: Nikou, Shahrokh; Mezei, Jozsef; Bouwman, Harry; Liu, Yong (2011) : Factors influencing the adoption of mobile services consumers' preferences using analytic hierarchy process, 22nd European Regional Conference of the International Telecommunications Society (ITS2011), Budapest, 18 - 21 September, 2011: Innovative ICT Applications - Emerging Regulatory, Economic and Policy Issues, <http://hdl.handle.net/10419/52151>

Nutzungsbedingungen:

Die ZBW räumt Ihnen als Nutzerin/Nutzer das unentgeltliche, räumlich unbeschränkte und zeitlich auf die Dauer des Schutzrechts beschränkte einfache Recht ein, das ausgewählte Werk im Rahmen der unter

→ <http://www.econstor.eu/dspace/Nutzungsbedingungen> nachzulesenden vollständigen Nutzungsbedingungen zu vervielfältigen, mit denen die Nutzerin/der Nutzer sich durch die erste Nutzung einverstanden erklärt.

Terms of use:

The ZBW grants you, the user, the non-exclusive right to use the selected work free of charge, territorially unrestricted and within the time limit of the term of the property rights according to the terms specified at

→ <http://www.econstor.eu/dspace/Nutzungsbedingungen>
By the first use of the selected work the user agrees and declares to comply with these terms of use.



Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics



FACTORS INFLUENCING THE ADOPTION OF MOBILE SERVICES “CONSUMERS’ PREFERENCES” USING ANALYTIC HIERARCHY PROCESS

Shahrokh Nikou¹, Jozsef Mezei², Harry Bouwman³ and Yong Liu⁴

September 2011

Abstract

The rapid and widespread development of innovations in mobile services is changing societies and improving lives around the world. Due to lagging adoption, many of these new innovations have yet failed to generate revenue that was expected by mobile network operators, application and content developers. There are several factors which are affecting the service adoption by consumers. This paper aims to provide practitioners and academics, an insight on what consumers’ preferences are by using an Analytic Hierarchy Approach (AHP). The objective of this paper is to identify factors influencing the adoption of the mobile services. In this study we have considered Payment Mode, Functionality, Added Value and PQCP (perceived quality, cost and performance) as the main service adoption factors. The survey results indicate that Functionality is the most important influencing factor for the respondents, followed by Added Value, PQCP and Payment Mode.

Keywords: Adoption, AHP, Mobile Value Services, Consumer’s Preferences

¹ Corresponding author: Shahrokh Nikou, Åbo Akademi University (IAMSR) and TUCS Graduate School
Address: Joukahaisenkatu 3-5 A 20520 Turku, FINLAND Email: snikou@abo.fi

² Jozsef Mezei is working in Åbo Akademi University (IAMSR), Email: jmezei@abo.fi

³ Professor Harry Bouwman is working in TU Delft and Åbo Akademi University (IAMSR), Email:
W.A.G.A.Bouwman@tudelft.nl

⁴ Yong Liu is working in Åbo Akademi University (IAMSR), Email: yoliu@abo.fi

1 Introduction

In recent years, mobile communications and technologies become more popular and diffused into every day's life of people. It has affected all of us, from using basic mobile services, such as voice call and Short Messaging (SMS) to more advanced and sophisticated services -like mobile email, mobile web, location based services and mobile monitoring of RFID (Radio Frequency Identification) information. The rapid and widespread development of new mobile service innovations can be considered as one of the most significant development in mobile communication history over the last decades. In contrast, many of these new innovations and mobile services have failed to generate expected revenue. Basic mobile services are still the most popular in Europe (Carlsson & Walden, 2007; Carlsson, Carlsson, Hyvönen, Puhakainen, & Walden, 2006; Carlsson, Hyvönen, Repo, & Walden, 2005; Mylonopoulos, Doukidis, & Editors, 2003), while "more advanced services have not yet found their ways into the everyday lives of consumers" (Carlsson & Walden, 2008). However, for both researchers and practitioners, it is widely acknowledged that future of mobile industry will no longer be just about the delivery of voice services. The future of mobile telephony is expected to rely on mobile services due to saturation in voice (Carlsson, Walden, & Bouwman, 2006). Compared to other countries, adoption of mobile value services -like mobile Internet in Europe appears to lag behind other countries, for instance, Japan and Korea (Insight, 2008). Emerging markets, such as China, India, Indonesia, South Africa and Nigeria, are expected to be drivers in the growth of global mobile value-added-service (Media, 2010), while in the European region, the diffusion of mobile value services is relatively slow.

Several studies were conducted in order to diagnose the problem of the European mobile service market, most of which are based on the use of traditional acceptance theories, such as the Technology Acceptance Model (TAM). However, some researchers indicated that these theories may be inappropriate to be used in studying mobile value innovations (Carlsson, Carlsson, et al., 2006; Hyvönen & Repo, 2005). Several of previous studies have focused only on a subset of the mobile services/applications, such as M-commerce, Mobile gaming services (Koivisto, 2006), Mobile communication or information services (Siau & Shen, 2003). However, in most of them, if not all, the intention was to identify the key success factors of the mobile service adoption either based on the user requirement or mobile service provider. Service characteristics and service perceptions by users are the major issues in mobile domain which have been discussed by (Feijoo, Maghiros, Abadie, & Gumez-Barroso, 2009) and (Shao, 2009). Therefore, a study that takes another perspective on service characteristics is necessary to identify the factors influencing the adoption of mobile services. Identifying the reasons behind the slow acceptance or adoption ratio of mobile services in Europe is the key element for the success of different parties involved in the mobile telecommunication industry.

To this end, the present study aims to use a research approach by using Analytic Hierarchy Process (AHP) (Saaty, 1980) to identify the most influencing factors for mobile service adoption based on users' preferences. Because, the previous research results showed that it is difficult to point out a single criterion as the most influential one, AHP can overcome the problem. AHP is applicable when it is difficult to formulate criteria evaluations and it allows quantitative evaluation (Haas & Meixner, 2009). Needless to say, the unit of analysis in this paper is not the user intention or behavior towards the adoption of mobile services as such, but rather factors (service characteristics) which influence adoption of the mobile services. Context of use of mobile services/applications and the service characteristics are two important issues and their importance must be taken into account by services providers. This paper adopts a method other than survey research or econometric analysis to investigate the problem and seeks to offer some new insights. The remainder of the paper is structured as follows: a brief review of related literature is presented in section 2. Section 3 presents the research methodology and explains in more details the research method as well as introducing criteria and

attributes adopted for the AHP model. Section 4 introduces the research finding and discusses the result profoundly. Section 5 presents some concluding remarks and limitations.

2 Literature Review

Most of previous studies on mobile services have either focused on the adoption of mobile content services in general (Kargin, Basoglu, & Daim, 2009), or on a specific category of mobile services, for instance, mobile information services (den Hengst, van de Kar, & Appelman, 2004), cultural characteristics of mobile Internet users (Lee, Kim, Choi, & Hong, 2010), personal innovativeness (Lu, Yao, & Yu, 2005), user acceptance of mobile searches (Zhang, Huang, & Chen, 2010), adoption and impact of technology (Iacovou, Benbasat, & Dexter, 1995) or adoption challenges (Hyvönen & Repo, 2005). However, most of these studies, if not all, have focused on user related concepts within the framework of historical acceptance models, for instance Technology Acceptance Model (TAM) or related models (Davis, Bagozzi, & Warshaw, 1989; Venkatesh, Morris, Davis, & Davis, 2003), Diffusion of Innovation theory (Rogers, 1995), Theory of Reasoned Action (Ajzen & Fishbein, 1980) and Theory of Planned Behavior (Ajzen, 1985), or even combination of these theories. There are only few studies which have tackled the importance of the service characteristics (Shao, 2009) (Feijoo, et al., 2009) in relation to perception of users. Providing mobile services typically requires the collective actions of different players in mobile business eco-system, such as mobile network operators, contents and applications providers and device manufactures. Essential aspects -like context of use, distribution channels, usefulness, content quality, and flexibility of the service or an appropriate business model must be taken into account, while designing and developing a service.

Factors such as, (1) payment mode (the way usage of service is charged), (2) service functionality (simplicity or accessibility), (3) added value (mobility, entertainment and social image enhancement value) and (4) service perception (cost, quality) are the major issues which are inter-related and influence users intention towards service adoption and continuous usage.

For example, there are different ways for charging mobile service users, (Munnukka, 2006) explored pricing methods applied to charging mobile service and he found that customers' price perceptions differ significantly depending on the charging methods they had in use. Different payment methods influence significantly the users' choices and preferences. Service accessibility, simplicity with regard to service functionality has been found as a crucial factor, (Androulidakis, Basios, & Androulidakis, 2007) argued that service accessibility appears to be one of the most important issues affecting the adoption of current and future mobile services. The accessibility of a service is not limited to the cognitive aspects of the adoption of a mobile service, but also includes the availability and access to service in physical senses. Other attributes of service functionality such as, simplicity and flexibility are seen as important casual design values by (Kultima, 2009).

Moreover, added value of mobile services is also seen as an important factor (Carlsson & Walden, 2008), therefore, a clear understanding of what forms mobile value services is helping us to understand the concept of value in mobile domain. Value in mobile domain is a vague and yet a poorly understood concept, however, according to "the Braudel Rule" (Keen & Mackintosh, 2001), mobile services become mobile value services when they become part of everyday routines. Different mobile services offer various types of values to users – like entertainment and enjoyment values which can be perceived by using mobile games or mobile TV type of services or values which can be perceived by accessing the real-time information and communication, while the user is on the move. According to (Ankar & D'Incau, 2002) mobile value can be created in five different settings, (i) Time-critical arrangements, (ii) Spontaneous decisions and needs, (iii) Entertainment needs, (iv) Efficiency ambitions and (v) Mobile situations (localization services).

With regard to some of the influential factors mentioned so far, the perception of service quality, cost and performance enhancement is the last factor which will be examined in this study. Price has been observed as an important element affecting to diffusion of new products and services (Munnukka,

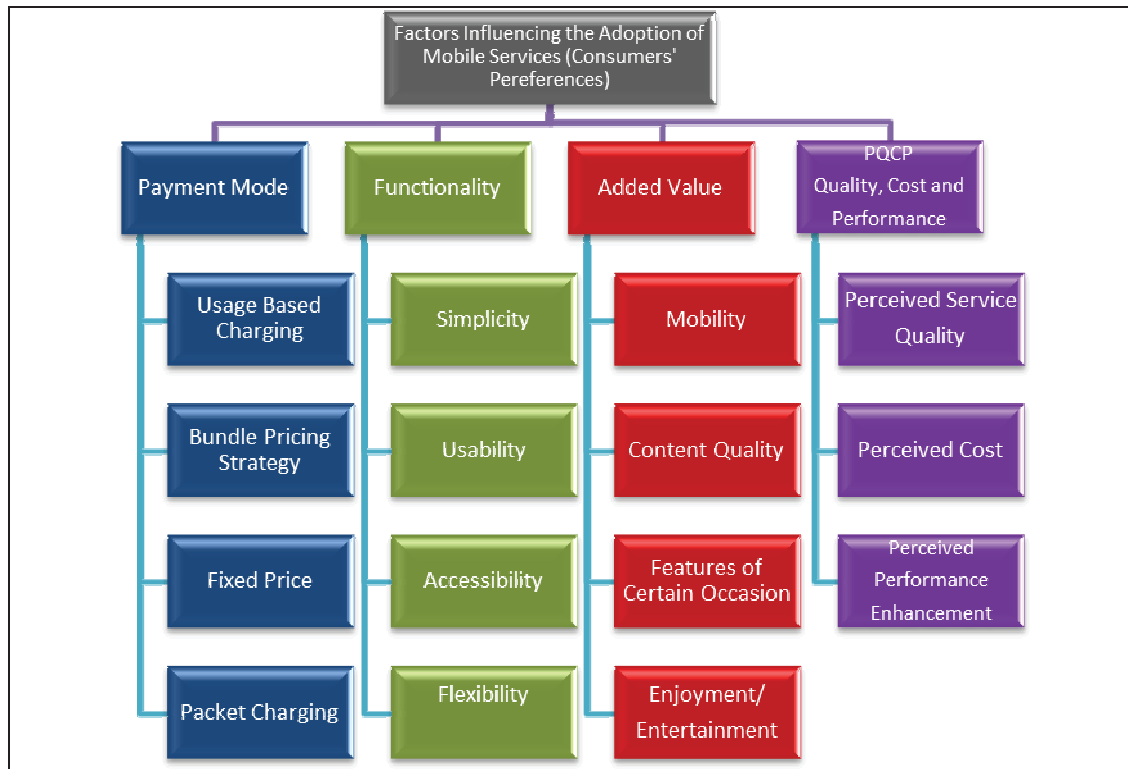
2008). Among the several factors which affect to customers' intention towards adoption, price and quality of service are significantly important (Jacoby & Olson, 1977) . In other words, this means that there is trade-off between price and service quality (Tse, 2001) which is most often considered as customer satisfaction.

Note that, customers' expectations always contain ambiguity and multiplicity of meaning. It is also recognized that human assessment on qualitative attributes is always subjective and imprecise. Hence, the conventional AHP seems to be an adequate method to explicitly capture the importance assessment for user requirements for the purpose of this paper. There are weaknesses in traditional adoption theories, for instance TAM takes only the perceived usefulness and ease of use as the main determinants of user acceptance and does not include subjective norm as a determining construct. However, TAM has been refined into TAM2 to solve the aforementioned issue. Another relative weakness which can be found in conventional theories is with Unified Theory of Acceptance and Use of Technology, (Venkatesh, et al., 2003). UTAUT is a modification to TAM and TAM2 models, and the major problem in this theory is the elimination of task characteristics and performance expectancy. To this end, we can argue that, AHP is an appropriate approach for the current study, because AHP combine all of the mentioned influential factors into an AHP model and quantitatively measure the important assessment for user requirements. Determining the correct importance weights for the factors influencing the adoption of mobile services based on users' preferences is essential since they directly affect the users' intention towards the adoption of mobile services. Determination of the importance of these factors also enables service providers, vendors and mobile service application developers to design and develop better services. Users are in principle lazy and they are reluctant to make extra effort in complex situation – like choosing a right service according to their needs. Thus, the objective of this paper is to use the analytic hierarchy process (AHP) (Saaty, 1980), which is a MCDM method to identify which factor or factors are important for consumers for using a mobile service.

AHP has been widely used in weighing user requirements and preferences in many research (Armstrong, Compton, Mullens, & Swart, 1994; Chou, Lee, & Chung, 2004; Fukuda & Matsuura, 1993; Kalakota & Robinson, 2002; Madu, Kuei, & Madu, 2002) and to evaluate users' requirement regarding the adoption of mobile commerce (Büyüközkan, 2009), different m-commerce payment systems (Chou, et al., 2004), success factors of mobile commerce (Oug, 2006), mobile phones (Isiklar & Büyüközkan, 2007) and a fuzzy model for multi-criteria inventory classification by (Rezaei, 2007). This paper, therefore, contributes to the adoption and acceptance concept by prioritizing factors which influence mobile service adoption within the user preferences. Service acceptance/adoption can be viewed as a complex multi-criteria decision making (MCDM) problem.

To comprehensively identify the factors influencing the adoption of mobile services, we designed an AHP model (Figure 1). This model has a two-step approach: firstly, we identified the main factors (Payment mode, Functionality, Added value and Perception of Quality, Cost and Performance enhancement, hereinafter "PQCP") for mobile service adoption. These factors can be used as the bases of mobile service adoption and were identified based on an extensive review of mobile application literature (Bouwman, Bejar, & Nikou, 2011; Büyüközkan, 2009; Hyvönen & Repo, 2005; Isiklar & Büyüközkan, 2007; Kargin, et al., 2009; Kuo & Chen, 2006; Sato, 2005). The factors are considered as the main four criteria with respect to the main goal (factors influencing the adoption of mobile services) in our AHP model. Secondly, we defined several attributes for each criterion; these attributes were also selected based on an extensive review of related studies (Liang & Yeh, 2011; Mikkonen, Seppänen, & Pynnönen, 2009; Oug, 2006). The following figure shows our research model.

Figure 1, The AHP design model



The following section explains each criterion and its attributes in more details.

- *Payment method:* The way consumers are charged for using mobile services.
 - Usage Based Charging: Consumers are charged based on realized consumption. Usage-based charging capability allows mobile network operators and content provider to further monetize, be able to differentiate, and capitalize on their service offerings.
 - Bundle Pricing Strategy: Offering a number of alternative mobile services (as a package) with different price categories. Bundle pricing is a different approach that by-pass both theoretical and practical complexities of pricing for a single mobile user, or a single service. Bundle pricing has many potential benefits, including cost savings in production and transaction costs and sorting consumers according to their valuation (Constantiou & Damsgaard, 2004; Salinger, 1995).
 - Fixed Price: Consumers are charged at a fixed rate (monthly). For example, the monthly payment is the most popular payment mode in using the Internet in many countries.
 - Packet Charging: The services are charged in a packet-based method. For instance, for Internet connection users can be charged based on the number of kilobytes of data transferred. General packet radio service (GPRS) is packets oriented mobile data service on the 2G and 3G cellular communication systems and increases opportunities for higher revenues and enable new, differentiated services and tariff dimension to be offered (UCT, 2000).
- *Functionality:* The ability of the mobile services allowing a user to perform a certain task. The functionality in the mobile services is considered to be the interface between mobile technology and the user of the mobile services.
 - Simplicity: The use of the mobile services should require only minimum knowledge of the technologies. The mobile services must be very simple to learn how to use and it should

not intimidate the user by the complexity of the mobile platform. The user must be at ease by using the mobile service, as it is by using the conventional models.

- Usability: A user can quickly understand how to use the mobile services and easily use the services. Within the broader context of product development, usability is associated with the ease with which people can employ a tool or other human-made object in order to achieve a particular goal (Nielsen, 1993).
- Accessibility: The ability of the mobile services that can be accessed anytime/anywhere. The user requires mobility to be accessible everywhere and all the time, because it is the user objective when using the mobile applications. Like the access occurs in different places, the mobile applications must adapt to the several places according to the density of the request (Passas, 2009).
- Flexibility: The capability of the mobile services which can be adapted to personal profile or request. The flexibility of the mobile applications indicates the adaptation of the capacity to answer various volumes of the user according to the density of the request considered. However, the reduction of the speed and the interruption of the access caused by the density of the request will move away the user from the mobile applications (Passas, 2009).
- *Added Value*: The benefits of using the mobile services compared to the other technologies, such as services based on desk-computers. Insofar as, the mobile service user must be convinced that using a particular mobile service/application would acquire a value that the other conventional models do not provide him. It can be argued that this perception is the key user satisfaction factor. However, if a mobile service is fit for use, or it conforms to our requirements, we seem to be dealing with something that is value adding to us (Landor, 2003). Other researchers (Carlsson & Walden, 2002) argued that a mobile service will be considered as an added value service, when it improves the productivity of the users. They further suggested that mobile services must be sensitive to customer personalisation and must be adaptive to localisation.
 - Mobility: Is the capability of accessing the real-time information and communication, while the user is on the move. Mobility itself is a key profit. It provides access to services, location-and-time independent when such services would be otherwise inaccessible (Passas, 2009).
 - Content Quality: Capability of offering recent, correct and timely contents. Mobile content-service providers will be able to attract more customers as well as to sustain their current customers by allocating their resources to improve the quality of services that affect customers' satisfaction. This can only be achieved if the mobile content-service providers and other parties involved know what exactly their customers' wants and needs are. It is also important that they know the customers' usage contexts.
 - Features of Certain Occasion: The occasion where use of a particular mobile service is the only available solution (such as, buying a mobile ticket, when you do not have cash).
 - Enjoyment/Entertainment: Mobile entertainment services are considered as a capability of mobile services to fulfil entertainment needs and are also considered to be an important construct that will affect consumers' intention to use mobile services.
- *PQCP*: Since cost, service quality and performance enhancement are considered mobile service attributes and represent the critical elements of the customer's satisfaction among various mobile services, mobile network operators and mobile content provider need to improve the quality of their services, choosing an appropriate business model and create services which improve users performances.
 - Perceived Service Quality: Quality of service refers to how well a customer is being served and the impact of service quality on consumers perception.
 - Perceived Cost: The customers' satisfaction with the mobile service cost. To improve customer's satisfaction the mobile service cost must be aligned with the content quality.

- Perceived Performance Enhancement: The functionality of the service meets users' needs and improves the users' performance by using a particular mobile service.

3 Research Methodology

Based on the above discussion, this study uses AHP approach in order to *identify the most important factors influencing the adoption of mobile services based on consumers' preferences as the research objective*. We used paper-and-pencil questionnaire, consisted of series of questions. The questionnaire was designed through informal interviews with experts on AHP. After the draft was completed, the questionnaire was pre-tested by experts and administered by eight respondents who were familiar with mobile domain and Analytic Hierarchy Process (AHP) to verify the accuracy of the questionnaire and to check for ambiguous expressions. Next an adjusted questionnaire was distributed to 100 students, researchers, lecturer and employees in two different Universities in Turku/ Finland in September 2010. We received 66 (which makes the response rate 66%) questionnaires, after careful investigation we finally used 43 questionnaires which were completed and met the consistency ratio (CR) requirement. As a general rule, a consistency ratio of 0.10 or less is considered acceptable (Saaty, 1980). In practice, however, consistency ratios exceeding 0.10 occur frequently. 23 of the questionnaire were either incomplete or had higher consistency ratio than (0.12 in our case⁵). Consistency Ratio measures how consistent the judgments have been relative to a large sample of purely random judgment. The results of the questionnaire showed that at some points comparing the attributes was difficult even for an expert, although, in our research the respondents were technology focus oriented. Table 1 shows the respondents' gender and their professions. The average age of the respondents is 30.1 years old.

Table 1, Demographic information of the respondents

Gender N=43	Female	28%	12
	Male	72%	31
Profession N=43	Student	78%	35
	Non-Student	22%	9

The AHP analysis is often conducted with a small group of experts who are capable of performing subjective pair-wise comparisons of decision criteria (Pynnönen & Hallikas, 2006). AHP assumes that the model can be completely expressed in a hierarchical structure showing the relationships of the goal, objectives (criteria), and alternatives. The data collected from respondents is a list of pair-wise comparisons concerning the relative importance of each criterion. By using the AHP methodology, we are able to find the degree of preference of one factor to another with respect to each criterion. The respondents express their opinion on a numerical scale, where every number can be associated with the importance level of one factor over the other (see Appendix).

Pair-wise comparisons are made by identifying the less dominant of two elements and using it as the unit of measurement. Then, using the 1-9 scale, the respondent determines how many times more important the dominant member of the pair is. Then we construct the matrix of pair-wise comparisons where the reciprocal value of the judgement is automatically used for the comparison of the less dominant element with the more dominant one. After we determined the priority weights for every participant, we aggregate the individual judgements using the geometric mean value method. Making the right decision has always been a complex task; therefore we used AHP methodology in our

⁵ In our data analysis, we decided to accept questionnaires which had consistency ratio up to 0.12.

questionnaire to help the respondents to find one that best suits their goal and their understanding of the problem (see Appendix).

4 Findings and Discussions

Payment Mode, Functionality, Added Value and PQCP were defined as the main criteria (Factors) in our AHP model. The result of the questionnaire interestingly reveals that Functionality had the highest weight (0.34) among the other criteria. According to the result, it can be argued that for most of the respondents the usability and the accessibility of mobile services are important. Moreover, based on our findings it can be assumed that there are relationships between different factors, for instance, respondents are more concerned about the service (content) quality or mobility value of the services, rather than the service cost. This means, respondents are willing to pay more for using the services, if they can be used with less effort and be accessible anywhere/anytime. Different features in mobile service functionality such as, flexibility, accessibility and usability are considered to be the interface between mobile technology and the user of the mobile services. Also, our study found that Added Value (0.27) is the 2nd most important factor followed by PQCP (0.23) as the 3rd and Payment Mode (0.16) as the 4th place for the respondents. Table 2 shows the result of the priority ranking and weight of the main factors.

Table 2, *Priority ranking and weight of the main factors*

Priority Ranking	Factors influencing the adoption	Weight	Consistency ratio (CR)
1	Functionality	0.34	0.12
2	Added Value	0.27	
3	PQCP	0.23	
4	Payment Mode	0.16	

Table 3 shows the distribution of priority rankings for the 4 main criteria. 42% of the respondents ranked Functionality as the most important influencing factor. Although Added Value and PQCP were ranked as the most important by 23% of the respondents, the difference in the overall weights comes from the observation that only 5% ranked Added Value as the least important.

Table 3, *Distribution of the main factors' priority ranking*

Factor	Rank 1	Rank 2	Rank 3	Rank 4
Functionality	42%	26%	26%	8%
Payment Mode	12%	5%	9%	74%
Added Value	23%	42%	30%	5%
PQCP	23%	28%	35%	14%

Table 4, lists the local weight of the factor items (with respect to the corresponding factor). Within the PQCP category we cannot find any significant difference between the items, they all have almost equal importance. With respect to Payment Mode, Fixed Price is the most popular choice followed by Usage Based Charging, Bundle Pricing and Packet Charging which are less important ones. In Functionality and Added Value we can observe that the items can be partitioned into two groups: Accessibility and Usability with respect to Functionality, Content Quality and Mobility with respect to Added value are the most important items having similar weight values and they are prioritized strongly over the remaining items. Considering only the local weights, Enjoyment/Entertainment has the lowest value with respect to its main factor.

Table 4, *Local weight of the factor items*

Factor	Factor item	Weight	Consistency ratio (CR)
Functionality	Accessibility	0.33	0.11
	Usability	0.30	
	Flexibility	0.19	
	Simplicity	0.18	
Payment Mode	Fixed price	0.33	0.09
	Usage Based Charging	0.27	
	Bundle Pricing Strategy	0.20	
	Packet Charging	0.20	
Added Value	Content Quality	0.33	0.12
	Mobility	0.30	
	Features of Certain Occasions	0.21	
	Enjoyment/Entertainment	0.16	
PQCP	Perceived Performance Enhancement	0.35	0.07
	Perceived Cost	0.33	
	Perceived Service Quality	0.31	

Accessibility and the Usability as of attributes of the Functionality were ranked as the first two most important attributes, while Content Quality and Mobility which are attributes of the Added Value factor were ranked as the 3rd and 4th in the table. Surprisingly Payment Mode and its attributes were the least important factors based on the respondents' opinions. Usage Based Charging (0.04), Bundle Pricing Strategy (0.03) and Packet Charging (0.03) were ranked as the last 3 attributes respectively. Table 5 shows priority ranking and relative weight of factor items. The items belonging to the PQCP factor were ranked in position 5, 6 and 7, because of the similar local weight. According to the respondents, although the weight of the Cost and the Service Quality are very close to each other, still the price of the services come first when they want to make the decision to use a service.

Table 5, *Priority ranking and relative weight of factor items*

Priority ranking	Factor item	Relative weight	Factor Category
1	Accessibility	0.11	Functionality
2	Usability	0.10	Functionality
3	Content Quality	0.09	Added Value
4	Mobility	0.08	Added Value
5	Perceived Performance Enhancement	0.08	PQCP
6	Perceived Cost	0.08	PQCP
7	Perceived Service Quality	0.07	PQCP
8	Flexibility	0.07	Functionality
9	Simplicity	0.06	Functionality
10	Features of Certain Occasions	0.06	Added Value
11	Fixed price	0.05	Payment Mode
12	Enjoyment/Entertainment	0.04	Added Value
13	Usage Based Charging	0.04	Payment Mode
14	Bundle Pricing Strategy	0.03	Payment Mode
15	Packet Charging	0.03	Payment Mode

5 Conclusions and Limitations

Mobile domain and service adoption have been the topic of research interest for years. Different theories and models were formulated to assess consumers' perceptions and their intentions towards service adoption. However, the identification of consumers' preferences and their overall perception of service characteristics have been a less concerned issue. There are extensive body of literatures investigating consumers' service perception, for example, (Büyüközkan, 2009) argued that the most important influencing factors for M-Commerce services' adoption are profitability, functionality and credibility and (Oug, 2006) listed the most important success factors as contents quality, system quality, middleware and usability for mobile commerce services adoption. Nevertheless, due to the gap in the body of literature in mobile domain, the current study proposes an analytic framework for the identification of the most influencing factor for the mobile service adoption based on the consumers' preferences.

The present study confirms that an Analytic Hierarchy Process (AHP) approach in mobile domain can enhance our understanding of consumers' intentions towards service adoption and their preferences. This method enables consumers to select the most influential mobile service factor among other factors, and can help telecom operators and service providers to understand consumers' preferences of mobile value-added services as well.

The most obvious finding to emerge from this study is that, according to the questionnaire results the adoption of mobile services strongly depends on the service Functionality, as it is considered the most important factor according to most of the respondents. The results, however, indicate that Added Value is the 2nd and the PQCP considered as the 3rd most influencing factor. The Payment Mode is considered the least important factor among the others. This means, if offered services can fulfil the consumers' expectation such as, service quality and accessibility, then the service cost and payment modes are less concerned.

The analytical result show that the Enjoyment/Entertainment which is the attribute of the Added value factor has the smallest local weight value; this presumably can be caused by the fact that the respondents were all chosen from Information Technology department within the two Universities, and for them the entertaining aspect of the mobile services is the least important.

The second major finding is that Accessibility and Usability which were defined as the attributes of the Functionality in this study, are ranked as the first two most important attributes, while Content Quality and Mobility which were considered as the attributes of the Added Value factor are ranked as the 3rd and 4th in the priority ranking table (see table 5). Surprisingly, the Payment Mode and its attributes are the least important factors based on the respondents' opinion. Moreover, according to the results, we can argue that respondents prefer to have better functionality on the mobile services rather than how they are charged for the usage of the mobile services. Another interesting point our study indicates is that, Simplicity and Flexibility which are the attributes of Functionality ranked 8th and 9th in the priority ranking table (see table 5).

In the current study, the findings have several academics and practical implications. An academic implication is that the findings indicate the gaps in the body of literatures for similar approach as taken in this study. The current study, however, is a relatively new approach for investigating consumers' preferences in mobile domain using AHP method. Our findings have also some practical implications, for instance, service designers or application developers should pay necessary attention to consumers' preferences. They must design and develop services which are more appealing to consumers with regard to service Functionality. Insofar as, other influential factors such as, Added Value, PQCP (perception of quality, cost and performance) and Payment Mode are as important.

Finally, a number of important limitations need to be considered. First, this was a preliminary study which will be continued by a further study with a larger sample size. For future study, according to our

findings, success factors of mobile services will be assessed. Additional information will be obtained by conducting research on larger group studies.

The most important limitation lies in the fact that the sample population for this research was not chosen randomly. Therefore, the findings of this paper just represent the opinions of the respondents who hold some sort of academic degree. The current study was unable to analyse the entire received questionnaires (66) due to Consistency Ratio (CR) limitation, we could have had different results if we were able to analysis all of the questionnaires, otherwise.

The current study has only examined a relatively limited number of respondents within two Universities in Turku/Finland; similar approach in other studies in different places might have different outcomes.

This research has thrown up many questions in need of further investigation, for instance, performing similar study (with the same factors and their attributes), but with different method to see if the factors have the same importance. Further work needs to be done to establish whether we will get the same results, when we consider the same factors. More broadly, the future research might explore/investigate other factors, such as context-of-use of mobile services and different types of mobile service characteristics.

6 References

- Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. *IN: J.*
- Ajzen, I., & Fishbein, M. (1980). Understanding attitudes and predicting social behaviour.
- Anckar, B., & D'Incau, D. (2002). Value-added services in mobile commerce: An analytical framework and empirical findings from a national consumer survey. In (pp. 1444-1453): IEEE.
- Androulidakis, I., Basios, C., & Androulidakis, N. (2007). Survey Findings towards Mobile Services Usage and M-Commerce Adoption. In.
- Armast, R. T., Compton, P. J., Mullens, M. A. a., & Swart, W. W. (1994). An AHP Framework for Prioritizing Custom Requirements in QFD: An Industrialized Housing Application. *IIE Transactions*, 26, 72-79.
- Bouwman, H., Bejar, A., & Nikou, S. (2011). Mobile services put in context: a Q-sort analysis. *Telematics and Informatics*.
- Büyükoçkan, G. (2009). Determining the mobile commerce user requirements using an analytic approach. *Computer Standards & Interfaces*, 31, 144-152.
- Carlsson, C., & Walden, P. (2007). The Sleeping Giant-A Longitudinal Study Surveying the Mobile Service Market in Finland.
- Carlsson, C., Carlsson, J., Hyvönen, K., Puhakainen, J., & Walden, P. (2006). Adoption of mobile devices/services—searching for answers with the UTAUT.
- Carlsson, C., Hyvönen, K., Repo, P., & Walden, P. (2005). Adoption of mobile services across different technologies. *Proceedings of the 18th Bled eConference-eIntegration in Action, Bled*.
- Carlsson, C., & Walden, P. (2002). Further quests for value-added products & services in mobile commerce. In: Citeseer.
- Carlsson, C., & Walden, P. (2008). Mobile Network Operator Strategy: An Obstacle for Mobile Value Services? *ACIS 2008 Proceedings*, 20.
- Carlsson, C., Walden, P., & Bouwman, H. (2006). Adoption of 3G+ services in Finland. *International Journal of Mobile Communications*, 4, 369-385.
- Chou, Y., Lee, C., & Chung, J. (2004). Understanding m-commerce payment systems through the analytic hierarchy process. *Journal of Business Research*, 57, 1423-1430.
- Constantiou, I. D., & Damsgaard, J. (2004). Bundle Pricing for Location Based Mobile Services.
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management science*, 35, 982-1003.
- den Hengst, M., van de Kar, E., & Appelman, J. (2004). Designing mobile information services: user requirements elicitation with GSS design and application of a repeatable process. In (pp. 10 pp.): IEEE.
- Feijoo, C., Maghiros, I., Abadie, F., & Gumez-Barroso, J. È. L. (2009). Exploring a heterogeneous and fragmented digital ecosystem: Mobile content. *Telematics and Informatics*, 26, 282-292.
- Fukuda, S., & Matsuura, Y. (1993). Prioritizing the customer's requirements by AHP for concurrent design. *ASME DES ENG DIV PUBL DE., ASME, NEW YORK, NY(USA)*, 1993, 52, 13-19.
- Haas, R., & Meixner, O. (2009). An Illustrated Guide to the Analytic Hierarchy Process. *Institute of Marketing and Innovation, University of Natural Resources and Applied Life Sciences. Vienna, Austria*.
- Hyvönen, K., & Repo, P. (2005). The Use of Mobile Services in Finland: Adoption Challenges Diffusion Theory. *GESTS International Transactions on Computer Science and Engineering*, 20, 166-178.
- Iacovou, C. L., Benbasat, I., & Dexter, A. S. (1995). Electronic data interchange and small organizations: Adoption and impact of technology. *MIS quarterly*, 465-485.
- Insight, T. m. (2008). Mobile Internet Services in Europe and USA: Initiatives to Drive Adoption and Usage.
- Isiklar, G., & Büyükoçkan, G. (2007). Using a multi-criteria decision making approach to evaluate mobile phone alternatives. *Computer Standards & Interfaces*, 29, 265-274.

- Jacoby, J., & Olson, J. C. (1977). Consumer response to price: an attitudinal, information processing perspective. *Moving ahead with attitude research*, 39, 73-97.
- Kalakota, R., & Robinson, M. (2002). M-Business: The Race to Mobility. In: New York: McGraw-Hill.
- Kargin, B., Basoglu, N., & Daim, T. (2009). Factors affecting the adoption of mobile services. *International Journal of Services Sciences*, 2, 29-52.
- Keen, P., & Mackintosh, R. (2001). The freedom economy: gaining the m-commerce edge in the era of the wireless Internet', Berkeley, CA: Osborne/Mcgraw-Hill.
- Koivisto, E. M. I. (2006). Mobile games 2010. In (pp. 1-2): Murdoch University.
- Kultima, A. (2009). Casual game design values. In (pp. 58-65): ACM.
- Kuo, Y. F., & Chen, P. C. (2006). Selection of mobile value-added services for system operators using fuzzy synthetic evaluation. *Expert Systems with Applications*, 30, 612-620.
- Landor, P. (2003). Understanding the Foundation of Mobile Content Quality A Presentation of a New Research Field.
- Lee, I., Kim, J., Choi, B., & Hong, S. J. (2010). Measurement development for cultural characteristics of mobile Internet users at the individual level. *Computers in Human Behavior*, 26, 1355-1368.
- Liang, T. P., & Yeh, Y. H. (2011). Effect of use contexts on the continuous use of mobile services: the case of mobile games. *Personal and Ubiquitous Computing*, 15, 187-196.
- Lu, J., Yao, J. E., & Yu, C. S. (2005). Personal innovativeness, social influences and adoption of wireless Internet services via mobile technology. *The Journal of Strategic Information Systems*, 14, 245-268.
- Madu, C. N., Kuei, C., & Madu, I. E. (2002). A hierarchic metric approach for integration of green issues in manufacturing: a paper recycling application. *Journal of environmental management*, 64, 261-272.
- Media, I. T. (2010). Global mobile data market to be worth US\$340 billion by 2014.
- Mikkonen, K., Seppänen, M., & Pynnönen, M. (2009). Building Theory for Systemic Value Creation: Case Apple. *The European Conference on Entrepreneurship and Innovation ECEI 2009 Antwerp/Belgium*.
- Munnukka, J. (2006). Pricing method as a tool for improved price perception. *Journal of Revenue and Pricing Management*, 5, 207-220.
- Munnukka, J. (2008). Customers' purchase intentions as a reflection of price perception. *Journal of Product & Brand Management*, 17, 188-196.
- Mylonopoulos, N. A., Doukidis, G. I., & Editors, G. (2003). Introduction to the Special Issue: Mobile Business: Technological Pluralism, Social Assimilation, and Growth. *Int. J. Electron. Commerce*, 8, 5-22.
- Nielsen, J. (1993). *Usability engineering*: Morgan Kaufmann.
- Oug, G. (2006). Selection of the Success Factors of Mobile Commerce and Evaluation using AHP.
- Passas. (2009). A location and context aware service for assisting consumers during their shopping time.
- Pynnönen, M., & Hallikas, J. (2006). Building a customer value model in mobile communication business. In.
- Rezaei, J. (2007). A fuzzy model for multi-criteria inventory classification. In *Proceedings of the 6th international conference on analysis of manufacturing systems (AMS 2007)*, (pp. 11-16). May Lunteren: The Netherlands.
- Rogers, E. M. (1995). *Diffusion of innovations*: Free Pr.
- Saaty, T. L. (1980). *The analytic hierarchy process: planning, priority setting, resource allocation*: McGraw-Hill International Book Co.
- Salinger, M. A. (1995). A graphical analysis of bundling. *The Journal of Business*, 68, 85-98.
- Sato, Y. (2005). Questionnaire Design for Survey Research: Employing Weighting Method. In.
- Shao, G. (2009). Understanding the appeal of user-generated media: a uses and gratification perspective. *Internet Research*, 19, 7-25.

- Siau, K., & Shen, Z. (2003). Mobile communications and mobile services. *International Journal of Mobile Communications*, 1, 3-14.
- Tse, A. C. B. (2001). How much more are consumers willing to pay for a higher level of service? A preliminary survey. *Journal of Services Marketing*, 15, 11-17.
- UCT. (2000). General Packet Radio Service (GPRS).
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.
- Zhang, J., Huang, J., & Chen, J. (2010). Empirical Research on User Acceptance of Mobile Searches*. *Tsinghua Science & Technology*, 15, 235-245.

Appendix:

The linguistic description of the numerical scale in AHP

Intensity of Importance	Definition	Explanation
1	Equal importance	Two activities considered equally important
3	Moderate importance of one over another	One activity is marginally favoured over another
5	Essential or strong importance	One activity is strongly favoured over another
7	Very strong importance	One activity is very strongly favoured and its dominance is demonstrated in practice
9	Extreme importance	The evidence favouring one activity over another is of the highest possible order
2, 4, 6, 8		Intermediate values between two adjacent judgments

Example of the pair-wise comparison questionnaire

	Factors Influencing the Adoption of Mobile Services (Consumers' Preferences)	
Payment Mode	⑨⑧⑦⑥⑤④③②①②③④⑤⑥⑦⑧⑨	Functionality
Payment Mode	⑨⑧⑦⑥⑤④③②①②③④⑤⑥⑦⑧⑨	Added Value
Payment Mode	⑨⑧⑦⑥⑤④③②①②③④⑤⑥⑦⑧⑨	PQCP
Functionality	⑨⑧⑦⑥⑤④③②①②③④⑤⑥⑦⑧⑨	Added Value
Functionality	⑨⑧⑦⑥⑤④③②①②③④⑤⑥⑦⑧⑨	PQCP
Added Value	⑨⑧⑦⑥⑤④③②①②③④⑤⑥⑦⑧⑨	PQCP