ORIGINAL ARTICLE

Reconsidering the actual and future use of mobile services

**Harry Bouwman · Christer Carlsson ·
Pirkko Walden · Francisco J. Molina-Castillo**

Abstract   For a number of years, Finland was considered one of the most successful countries in Europe in terms of the adoption and use of mobile services. In this paper, we focus on trends in service adoption, by discussing the development in the Finnish telecommunication market and trends in actual and future user behaviour with regard to three groups of mobile services. Based on surveys from 2004, 2005 and 2006, in which the same concepts were measured, we test models in which concepts like innovativeness, flexibility, status and entertainment value are related to mobile travel service, traditional entertainment and mobile Internet services. Our analysis shows that we cannot understand the actual and future use unless we take the characteristics and user values of the specific mobile services into account.

Keywords   Mobile services · Mobile Internet services ·
Mobile telecommunications market · Service adoption ·
Structural equation model

H. Bouwman
Faculty of Technology, Policy and Management,
Delft University of Technology, Delft, The Netherlands
e-mail: W.A.G.A.Bouwman@tudelft.nl

C. Carlsson · P. Walden (✉)
Institute for Advanced Management Systems Research,
Åbo Akademi University, Lemminkäinengatan 3-5A, 20520 Åbo, Finland
e-mail: pirkko.walden@abo.fi

C. Carlsson
e-mail: christer.carlsson@abo.fi

F. J. Molina-Castillo
Dpto. De Comercialización e Investigación De Mercados,
University of Murcia, Murcia, Spain
e-mail: fjmolina@um.es

1 Introduction

Finland has one of the most advanced and sophisticated test markets for new mobile services. The distribution and penetration of mobile handsets is among the highest in the world and comparable to Sweden, Denmark, Iceland, Norway and the Netherlands, but lagging behind by Luxembourg, Italy, Czech Republic, Greece and the UK in 2005 (OECD 2007). There are approximately 5.4 million mobile phone subscribers in Finland, which represents a penetration rate of more than 100%, and growth continues to be strong, particularly in the 3G sector (Budde 2006).

The future of mobile telecommunications relies on the development of mobile Internet services, which means that the sector is moving from talk-based services towards content-based services. Mobile Internet (or data) services can be defined as an activity or a set of activities of an intangible nature that take place when consumers are mobile, and when the activity or set of activities are supported by mobile telecommunication providers who use a combination of mobile and Internet networks, allowing customers to interact, and service and/or system providers to support the service. These services are aimed at providing solutions to customer problems, adding value to customer as well as to providers, and creating customer satisfaction (http://www.mintec.fi). Content or information services are a subset of mobile Internet services designed to make information available in different modalities. Messaging services are another subset of mobile Internet services that enable the exchange of either text messages or multimedia messages. Furthermore, there is a broad set of mobile commerce services that enable transactions or specific applications, for instance travel-related services.

In this paper, we focus on trends in service adoption. The services which we examine are (1) mobile travel services, (2) early mobile services, i.e. services that were introduced relatively early and already have an established tradition, like ringtones and icons, and (3) advanced mobile Internet services. We define advanced mobile services as communication, information, transaction and entertainment services that are provided via high capacity networks, enabling the use of multimedia services that have the look and feel of the Internet on mobile devices, for example MMS, mobile video, mobile Internet, mobile games, mobile banking and mobile commerce. The reason we chose these particular services is that we wanted to have a mixture of services that appeal to different kinds of values. We use mobile services, mobile data or Internet services as interchangeable and generic concepts, while treating travel service, m-commerce or message services as more specific in nature.

Generally speaking, the market for mobile services has thus far failed to live up to the expectations industry had for a long time. Huge investments in licences and 3G mobile networks have to be recuperated by offering attractive services. However, in Finland, as in other European countries, the market for 3G services is evolving very slowly. Firms are trying to understand how consumers derive value from mobile services, while practitioners and academics (Ngai and Gunasekeran 2007) are struggling to predict the usage of mobile usage and the reasons why consumers adopt mobile services that are different from the ones they have used in the past. Insight into the factors that affect the acceptance of technology in

consumer contexts and the values that these services may offer may be gained by examining the applicability of the different theories, for instance Diffusion of Innovation (Rogers 1995) and Technology Acceptance Model (Davis 1989), that may help explain consumer behavior. The goal of this paper therefore is to understand the role of user innovativeness, the value consumers experience when they use mobile services and the effects for future use of mobile (data) services. The paper is structured as follows. In the next section, we present an overview of the Finnish mobile telecommunications market with regard to the time period under examination (2004, 2005 and 2006). We then discuss literature on which we have based our hypotheses with regard to the future use of mobile services. We test our hypotheses, which are summarized in a structural equation model, using data from surveys among Finnish respondents. Finally, we discuss our findings and the implications as far as research and practice are concerned.

2 Mobile telecommunication in Finland

Finland is considered one of the most advanced markets for new mobile services. It is obvious that Nokia—a Finnish company and the world's leading mobile handset provider—plays a crucial role. The world's first commercial GSM network was launched in Finland (1991), it was the first country in the world where mobile phones outnumbered fixed connections (1998), and it was the first to launch WAP-services and licence 3G networks in Europe, based on a beauty contest (March 1999). Key mobile network operators are Telia-Sonera, Elisa Communications, DNA and Saunalahti, and there are also a number of small actors, mainly Mobile Virtual Network Operators. All the main MNO's operate GSM 900/1800 and UMTS networks. In 2006, Telia-Sonera had a market share of approximately 44%, against 38% for Elisa Communications, 17% for DNA and 1% for the others (http://www.mintec.fi)

In this paper, we focus on 3G policy and markets. In 1999, four national 20-year licenses were awarded free of charge while, in contrast to what happened in most other European countries, no requirements were made with regard to the coverage of the network, the timing of the network roll-out or deadlines with regard to the start of commercial services. Initially, licenses were awarded to Sonera and Telia Mobile. However, when these two companies merged in 2002, Telia was forced to sell one of the 3G licenses. Experiments with 3G took place in 2003 in major Finnish cities like Helsinki, Turku, Tampere and Oulu. The roll-out of the UMTS network was delayed until 2004. In 2004 and early 2005, both TeliaSonera and Elisa Communications offered UMTS on an experimental basis. In late 2005 they were followed by Finnet. Compared to 2004, the availability of high-speed services in 3G networks has improved substantially (http://www.mintec.fi). In 2006, the Finnish government offered a 20-year license for mobile television broadcasting and service, based on Digital Video Broadcast-handheld (DVB-H) mobile TV. The license was acquired by Digita Oy. In 2005, an experiment with mobile TV took place in Helsinki.

An important breakthrough in the regulatory domain was the new telecommunications bill in April 2006, which allows operators to combine telephones and

subscriptions in a single offering, which actually boosted the 3G network subscription base. Since 1999, a wide variety of services for mobile devices has been marketed, ranging from ringtones and icons, instant messaging and presence services via WAP-based mobile banking, lottery, m-commerce and travel services (in 1999), games (enabled by Nokia's N-Gage in 2003 and later smart-phones), and location-based services (on an experimental basis in 2002, and GPS-based in 2006) to multimedia messaging services (introduced in 2003), like mobile television (2005) and online music. At times it proved difficult to access these services. TeliaSonera offered video calling and MobileTV in 2006. However, the MNOs were not the only important actors when it came to pushing the use of advanced mobile services. The municipality of Helsinki, for instance, promoted the use of mobile phones to access public transport systems, and it was soon followed by Tampere and Turku.

Even though there have been many relevant initiatives, developments in advanced mobile services in Finland have recently slowed down, compared to for example Japan, Korea and Italy. Finland appears to have lost its role as a pioneer in mobile service development and the optimistic and experimental mood that prevailed five years ago has been replaced by a more conservative approach (Budde 2006) which in part can be explained by the merger between Swedish network operator Telia with Finland's main operator Sonera. There is a marked tendency to take fewer risks in the development and marketing of new services. Due to regulatory reform (number portability resulted in lower entry barriers for new entrants, higher churn-rates and eroding prices) and an increase in overcapacity after the introduction of UMTS, Finland is now considered a difficult market, as indicated by a rapid decrease of the Average Revenue per User ARPU (OECD 2007).

Compared to most other countries, mobile prices in Finland are very low (http://www.mintc.fi, 2006). Among the EU member states, Finland has the third lowest mobile call rates and the lowest 3G user costs (Budde 2006). The total value of the Finnish mobile services market in 2004 was € 246 million (a growth of 11% compared to 2003); the corresponding numbers were € 258 million in 2005 (+5%) and € 267 million in 2006 (+3%) (http://www.mintec.fi). In other words, people tend to adopt new services at an ever slowing pace (Verkasalo 2008). Carlsson et al. (2005) found that some groups of Finnish consumers who express an interest in new and more advanced mobile technology actually adopt and use mobile services, but that a majority of the users do not change their behaviour and do not show an interest in using new mobile services, even if they have new mobile devices that would support more advanced services. Insight into the reason why consumers adopt new mobile services is therefore relevant, both from a practical and from a more fundamental perspective.

3 Model development

Mobile phones have had a profound impact on the telephony industry and they have frequently been hailed as 'the new service frontier' (Kleijnen et al. 2007). They are equipped with functionalities that exceed people's communication needs and that inspire the development of new value-added mobile services (Dahlberg et al. 2007).

In addition to traditional communication and entertainment services, mobile devices can be used to support a variety of advanced mobile services, for instance location-based services (Pura 2005), mobile advertising (Tsang et al. 2004), mobile banking (Lee et al. 2003; Luarn and Lin 2005), mobile commerce (Massoud and Gupta 2003; Pedersen 2005a, b), ticket reservation (Dahlberg et al. 2007), mobile chat services (Nysveen et al. 2005a), mobile gaming (Kleijnen et al. 2004; Nysveen et al. 2005b), mobile multimedia services (Pagani 2004) and mobile parking services (Pedersen 2005a, b). Generally speaking, advanced mobile services are becoming increasingly important to firms and consumers (Nysveen et al. 2005b). However, as Bhattacherjee (2000) has suggested, establishing a "critical mass" of adopters is a necessary precondition when it comes to generating revenues from these kinds of electronic services.

Although there are some relatively holistic models that explain the adoption of mobile devices (Sarkar and Wells 2003) there are still many gaps in existing literature. The diffusion research theory and the theory of reasoned action and planned behaviour (Ajzen and Fishbein 1980) provide insight into the acceptance of emerging mobile technologies and services by consumers. In IS literature, the diffusion of innovation (DOI), the technology acceptance model (TAM), the extended technology acceptance model (Davis 1989) and the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al. 2003) are used to explain possible adoption and acceptance patterns of new technologies among consumers. TAM, and the extensions of TAM, have been tested in the adoption of diverse mobile devices and services: mobile Internet (Cheong and Park 2005; Hong and Tam 2006; Lu et al. 2005), mobile services (Nysveen et al. 2005b; Wang et al. 2006), mobile healthcare systems (Wu et al. 2007), mobile games (Ha et al. 2007), mobile banking (Luarn and Lin 2005) and mobile commerce (Wu and Wang 2005).

We adopt the concept of innovativeness from Rogers (1995). In many TAM-studies, people's attitudes toward innovativeness have been ignored (Schepers and Wetzels 2007). De Marez et al. (2007) is relatively sceptical about the concept, while Hung et al. (2003), Lu et al. (2005), and Pagani (2004) show the relevance of personal innovativeness in people's decision whether or not to adopt WAP services, wireless Internet services and for third generation mobile multimedia. Our first hypothesis is that

H1: a positive attitude towards mobile innovations has a positive effect on the actual use of mobile services.

Carlsson et al. (2006) suggest that there are more or less stable patterns in the actual and future use of services. We are interested in how the concepts of (positive or negative), *actual use, entertainment, flexibility and status value are related to future use.* Because we assume that people who have begun using a service will continue to do so, we hypothesise that

H2: The actual use of mobile services will have a positive direct effect on e future use of mobile services.

We assume that *entertainment, flexibility and status value* are intermediating factors between actual use and future use. Although Bouwman et al. (2007) looked

into the role of barriers, we have the strong impression that the perceived value of services is more important than barriers. Moreover, we feel we need be aware that advanced mobile services do not exist in a virgin landscape. Although consumers may have experienced difficulties with existing services, at least they have some idea about what the value of a new service may be, which is why we want to focus on the values that are associated with the actual use of mobile services. These values act as an intermediate variable between actual and future use.

The obvious value of mobile services is related to spatial mobility. Mobile devices and services allow people to move around while maintaining access to relevant services and staying (socially) connected (Jarvenpaa et al. 2003). This aspect of mobile services is reflected in concepts like 'anytime' and 'anyplace', which are mentioned in almost every paper discussing the potential of mobile services. Pagani (2004) mentions mobility, availability (anytime, anyplace) and personalization as important values of (multimedia) mobile services. The perceived flexibility provided by mobile technology is seen as one of its most important values. Anckar and D'Incau (2002) see time critical needs, spontaneous needs/ decisions, entertainment needs, efficiency needs and mobility-related needs as relevant value sources. Not every service fulfils a specific need or all needs at the same time. News services relate to all except the mobility-related needs. Mobile Internet auctions only relate to time critical needs. Making reservations for the cinema is only related to spontaneous needs/decisions, while receiving personalized shopping offers is related to none of the sources of mobile value. In research into more advanced 2.5 G or 3G services, a wide range of value sources are related to contact services (Nysveen et al. 2005b), location-based services (Pura 2005), mobile advertising (Tsang et al. 2004), mobile banking (Laukkanen and Lauronen 2005; Lee et al. 2003; Nysveen et al. 2005a), mobile commerce (Massoud and Gupta 2003; Pedersen 2005a, b), mobile chat services (Nysveen et al. 2005a), mobile gaming (Kleijnen et al. 2004; Nysveen et al. 2005b; Verkasalo and Hämmäinen 2007), mobile multimedia services (Pagani 2004; Verkasalo and Hämmäinen 2007), mobile parking services (Pedersen 2005a, b), text messaging (Nysveen et al. 2005b; Verkasalo and Hämmäinen 2007), wireless Internet via mobile devices (Lu et al. 2003) and mobile services in general (Carlsson et al. 2005, 2006). However, none of the studies involved clearly indicate which service contributes to which values.

Consequently, we propose the following hypothesis:

H 3a: The actual use of mobile travel services and mobile Internet services will contribute to flexibility, while actual use of early mobile services will contribute less to flexibility.

A number of quantitative and qualitative studies argue that self-expression (status, fashion) is an important driver in the use of (mobile) Internet services, Many studies claim that mobile services are adopted for functional reasons (usability, flexibility, costs) as well as nonfunctional reasons (social status, image, fashion) (Fortunati and Contrarello 2002; Ling 2003; Oksman and Turtiainen 2004; Pedersen 2005a, b). It is possible that, in some societies, mobile phones are a lifestyle product rather than a product of necessity (Teo and Pok 2003). Mobile phones have been

presented as modern and image-enhancing technologies (Katz and Sugiyama 2005), and in developing economies mobile devices are predominantly used as symbols of social progress (Meso et al. 2005). Indeed, some mobile users are motivated to adopt the technology merely for the status with which it is associated (Mbarika et al. 2002).

> H 3b: The actual use of mobile travel services and mobile Internet services will contribute to status, while the actual use of early mobile services will contribute less to status.

Recent research (Bruner and Kumar 2005) has focused on the important role of hedonic values for the mobile sector, indicating that higher levels of fun associated with a system lead to more favorable attitudes toward using a mobile device. Similarly, entertainment value, also described as perceived playfulness or enjoyment in relation to the acceptance of mobile systems (Cheong and Park 2005; Leung and Wei 2000; Nysveen et al. 2005a, b; Pedersen 2005a, b), may be considered an important drivers when it comes to using (mobile) Internet services

> H 3c: The actual use of mobile travel services and mobile Internet services will contribute less to entrainment values, while the actual use of early mobile services values will contribute more to entertainment value.

Based on the previous discussion, we also suspect there are several indirect effects, which is why we further hypothesise that:

> H 4a: There will be an indirect effect between the actual and future use of mobile services intermediated by entertainment value.

> H 4b: There will be an indirect effect between the actual and future use of mobile services intermediated by perceived flexibility.

> H 4c: There will be an indirect effect between the actual and future use of mobile services intermediated by status value.

These four hypotheses are bundled in models that are specified for the three services, i.e. travel services, early added value services like icons and ringtones, and mobile internet services (see Fig. 1, for a generic model) The proposed models will be tested using confirmatory factor analysis and structural equation modelling tools.

4 Methodology

4.1 Sample and data collection

The empirical data were collected in the spring of 2004, 2005 and 2006, via a self-administered questionnaire that was mailed to a sample of Finnish consumers. The sample was selected from the electronic sampling frame provided by the Finnish Population Register Centre, based on a stratified sampling procedure. To select the sample we used a simple random sampling method, and the frame we used offered a complete representation of the target population, which was defined as the Finnish
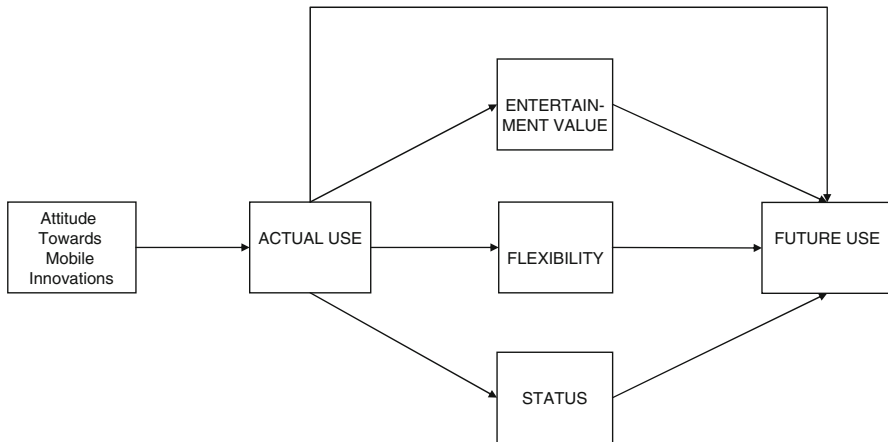
Fig. 1 Conceptual model

population between the ages of 16 and 64, whose mother tongue was either Finnish or Swedish and who resided in mainland Finland. To encourage respondents to complete and return the questionnaire, they were offered a chance to win a top-of-the-line mobile phone. The effective response rate was about 50% for the three years. The data is based on the information provided by 484 (2004), 460 (2005) and 428 (2006) respondents.

4.2 Questionnaire

The questionnaire consists of three parts, the first of which contains questions about devices and subscriptions. In the second part, items are presented that have to do with people's values and attitudes towards mobile devices, services and innovation, comparable to items that are used in (Anckar and D'Incau 2002; Cheong and Park 2005; De Marez and Verleye 2004; Nysveen et al. 2005a, b). With regard to people's attitudes towards mobile innovations, we adjusted items comparable to those used by Midgley and Dowling (1978) to mobile innovations. We used five point-Likert scales. In the third part, questions with regard to the actual and future use of 31 mobile services available on the Finnish market are presented to the respondents. We used five points self-report scales, ranging from non-use to (likely) intensive use. The items are used as a starting point for the measurement tools used for our core constructs.

4.3 Measurements and scales

Before testing the hypotheses, we discuss the scale depuration and reliability of all the measures in this study. We conducted a confirmatory factor analysis (CFA) using LISREL 8.7 (Jöreskog and Sörbom 1996) for travel services (reservation of hotel, tickets, timetables), early mobile services (ringtones and icons) and mobile Internet (MMS, Mobile email, news and surfing) for each year. The nine factor

Table 1 Scale properties for 2004 data

2004 Data	Mean	SD	# Items in scale	Cronbach's α	Eigen value	Lowest t value	SCR[a]	AVE[b]
Entertainment value	1.72	0.92	2	0.86	1.75	20.80	0.86	0.75
Flexibility value	3.17	1.03	3	0.74	1.98	11.75	0.75	0.50
Status value	1.59	0.90	2	0.86	1.75	17.90	0.87	0.77
Innovators	1.91	0.82	4	0.76	2.37	13.88	0.77	0.50
Actual ring	1.80	0.83	2	0.93	1.86	24.80	0.92	0.86
Future ring	2.75	1.30	2	0.94	1.88	25.54	0.94	0.90
Actual mob data	1.35	0.60	4	0.73	2.23	11.29	0.74	0.50
Future mob data	2.95	0.95	4	0.83	2.63	14.80	0.83	0.55
Actual travel	1.14	0.41	4	0.87	2.96	13.62	0.88	0.67
Future travel	2.85	1.06	4	0.90	2.37	15.83	0.91	0.72

model including each of the services, attitudes toward innovations and values, suggested a good fit.

For the data collected in 2004, the goodness of fit measures are $\chi2 = 1078.90$, $df = 389$, $P = 0.00$, GFI = .87; CFI = 0.95; RMSEA = 0.06; IFI = 0.95 (see also Table 1). (CFI = comparative fit index; GFI = Goodness of fit index; IFI = incremental fit index; RMSEA = Root mean square error of approximation)

For the 2005, these indicators are: $\chi^2 = 1235.63$, $df = 389$, $P = 0.00$; GFI = 0.85; CFI = 0.95; RMSEA = 0.07; IFI = 0.95 (see also Table 2).

For the 2006, the indicators are: $\chi2 = 1330.05$, $df = 389$, $P = 0.00$; GFI = 0.84; CFI = 0.94; RMSEA = 0.07; IFI = 0.94 (see also Table 3), which also suggested a good fit

All loadings of the items on their respective constructs were large (smallest loading = 0.61) and significant (smallest t value = 14.10), which provides evidence of convergent validity (Bouwman et al. 2007). The reliability of the multi-item scales was assured by calculating the Bagozzi and Yi (1988) composite reliability index and Fornell and Larcker (1981) average variance extracted index. Finally, discriminant validity for the dependent and independent variables in each year was assessed using the method proposed by Anderson and Gerbing (1988). We calculated the 99% confidence intervals around the correlation parameter estimates between all possible pairs of scales. None of these intervals included 1, which demonstrates discriminant validity.

5 Results

5.1 Descriptive results

First of all, we want to look at the trends with regard to the services that are actually being used. Figure 1 shows the levels of actual use of the services that we included

Table 2 Scale properties for 2005 data

2005 Data	Mean	SD	# Items in scale	Cronbach's α	Eigen value	Lowest t value	SCR[a]	AVE[b]
Entertainment value	1.75	0.96	2	0.81	1.68	17.96	0.82	0.69
Flexibility value	3.39	1.09	3	0.76	2.03	12.44	0.76	0.52
Status value	1.52	0.86	2	0.86	1.77	21.32	0.87	0.78
Innovators	1.98	0.85	4	0.78	2.42	14.15	0.79	0.50
Actual ring	1.73	0.77	2	0.90	1.81	23.38	0.90	0.81
Future ring	2.74	1.25	2	0.95	1.88	25.31	0.95	0.90
Actual mob data	1.56	0.80	4	0.82	2.62	14.96	0.83	0.55
Future mob data	3.09	0.98	4	0.83	2.60	15.78	0.83	0.55
Actual travel	1.22	0.61	4	0.91	3.17	16.81	0.92	0.73
Future travel	2.90	1.06	4	0.90	2.41	16.89	0.90	0.69

Table 3 Scale properties for 2006 data

2006 Data	Mean	SD	# Items in scale	Cronbach's α	Eigen value	Lowest t value	SCR[a]	AVE[b]
Entertainment value	1.75	0.93	2	0.80	1.66	18.57	0.80	0.67
Flexibility value	3.32	1.07	3	0.77	2.08	15.32	0.77	0.54
Status value	1.49	0.80	2	0.82	1.70	18.98	0.83	0.70
Innovators	1.93	0.86	4	0.82	2.57	14.97	0.82	0.53
Actual ring	1.68	0.76	2	0.92	1.84	24.17	0.92	0.85
Future ring	2.57	1.20	2	0.90	1.83	23.14	0.91	0.83
Actual mob data	1.62	0.80	4	0.80	2.46	15.04	0.80	0.50
Future mob data	3.06	0.92	4	0.79	2.42	14.41	0.79	0.50
Actual travel	1.22	0.56	4	0.89	2.98	14.10	0.89	0.67
Future travel	2.84	1.07	4	0.90	3.12	17.32	0.91	0.72

in the survey over the period 2002–2006. On average, we see a slow increase in the use of the services, with the exception of ringtones, icons and logos, which show a slightly decreasing trend. A possible explanation for this trend is that most mobile phones come with a wide range of different ringtones, icons and logos, and some users simply are content with the existing pre-installed and free-of-charge services. Nevertheless, every second Fin is using these services, and ringtones are the third-most used service, after SMS (90–96% of the respondents) and search services (62–70% of the respondents). The use of most mobile services increases slowly over the years. MMS is growing in popularity, with more than 40% of the respondents using the services in 2006. Mobile e-mail, news and weather forecast services are becoming more popular as well, with some 30% of the respondents using the services in 2005 and 2006. Surprisingly, travel and tourism services are still among the least favoured. Making reservations and purchasing travel tickets is expected to

be a value-adding service, but so far this service has reached a relatively limited group of users (10–15% of the respondents). Checking timetables is a somewhat more popular service, but here the actual use is also rather limited (below 20%), with a slight decrease between 2005 and 2006.

5.2 Testing the hypotheses

We only discuss three models in this paper, one for each type of service (travel services, early services and data services). Once we checked the reliability of all the measures, we tested our hypotheses using LISREL 8.7 and through separate structural equation models for each of the services in 2004, 2005 and 2006. The overall adjustment indexes are also within the recommendations of existing literature for each of the models; RMSEA values are below 0.08, while CFI, GFI are above 0.90.

As can be observed in Figs. 2, 3 and 4, most of the relationships were confirmed. Also, there are important differences among the years, which clearly confirmed that users vary in their perceptions of the values and of the actual and future use of each kind of service.

Specifically, the positive impact of attitude towards innovation on the actual use of services was verified for all the years, which supports hypothesis H1, although important differences can be observed. We see a dip in 2005 with regard to the impact of being innovative. The effect of being innovative is the strongest for Mobile Internet services, while for services like Icon and ringtones or Travel services, the relationship is weaker.

If we take a more detailed look at the intermediate role of values, we can confirm that they play an important role. Nevertheless, only some of the hypotheses (H 3 a, b and c and H4 a, b and c) were confirmed for some services. This demonstrates that certain types of values are more important in the eyes of customers when they asses
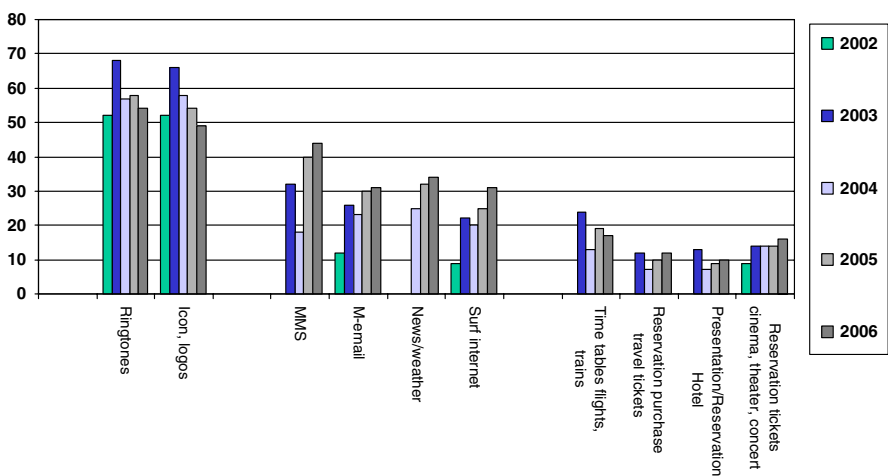

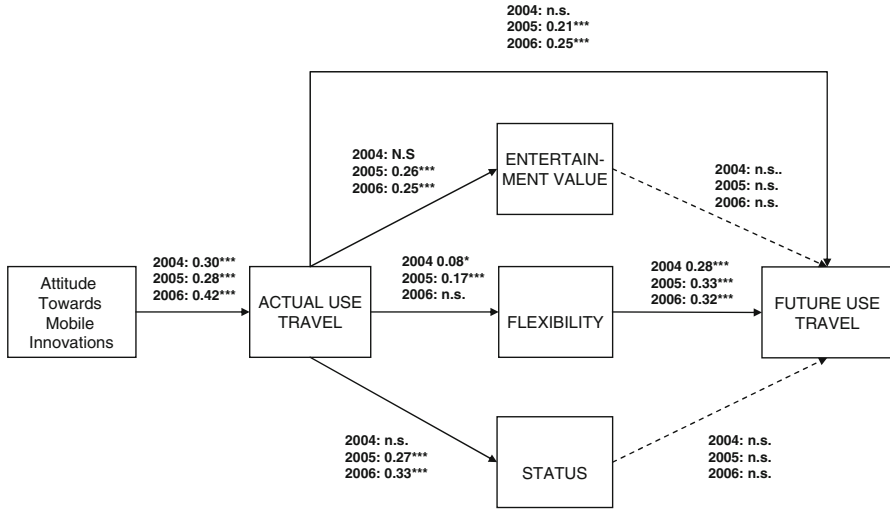**Fig. 2** Actual use of services 2002–2006: percentage of respondents that have actually used the service

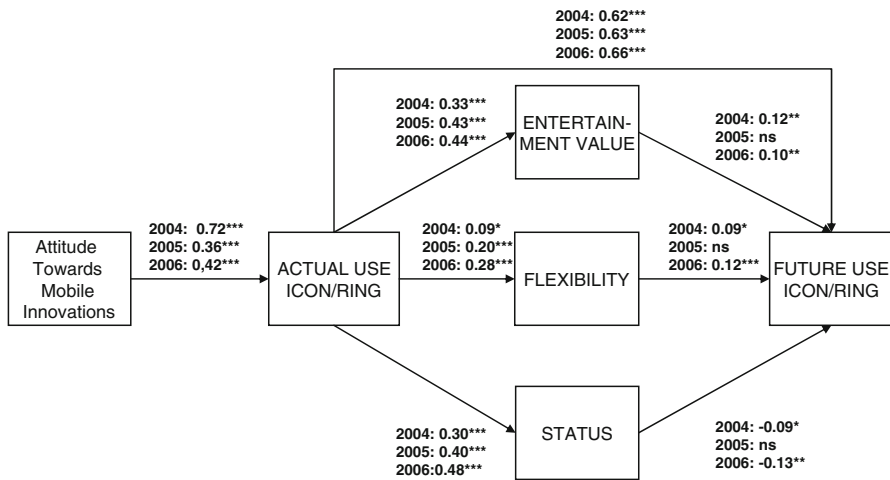**Fig. 3** Actual and future use of mobile travel services

Fig. 4 Actual and future use of early mobile services

the value of specific types of services. The actual use of Mobile internet services relates moderately to entertainment, flexibility and status value, as do Icons and ringtones. The values are the least explicit for actual use of travel services. We would expect flexibility to be more relevant in the case of travel services than with regard to entertainment or status value.

The relationship between the actual and future use of services can be observed for all three types of services. As a result, we can argue that people who use a
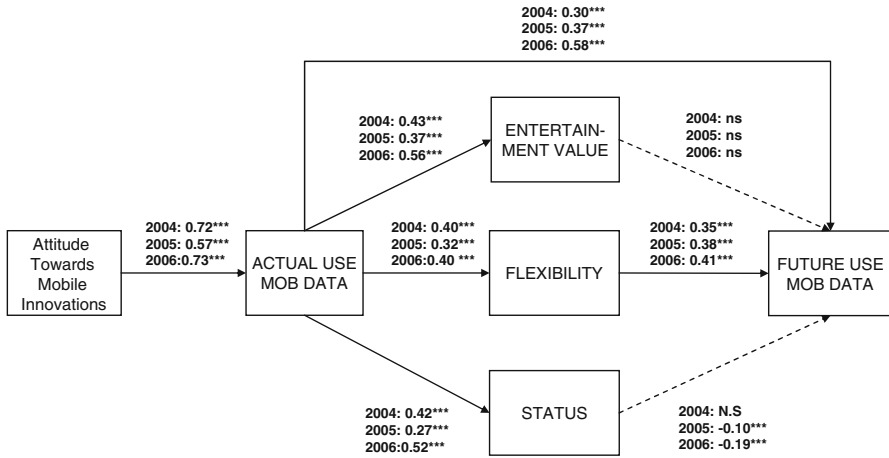
Fig. 5 Actual and future use of mobile Internet services

certain service will continue to do so in the future, which confirms hypothesis H2 (Fig. 5).

If we look at the intermediating role of the values, some interesting conclusions can be drawn. Flexibility becomes the most important mediator, both for Travel services and for Mobile internet services. The intermediating role of values is least relevant in the case of icons and ringtones. The effect is even negative where status is concerned. Basically, in combination with the fall in the actual use of ringtones and icons, as indicated in Fig. 1, this illustrates the decreasing relevance of this type of services to mobile users. Where the indirect effects of the actual use of mobile services on future services are concerned, we have demonstrated the key role of flexibility in this relationship. Thus, our data to a moderate extent supports hypothesis H4b for the various types of services for the three years under study. Hypotheses 4a and 4c, regarding the intermediating role of entertainment and status values, are only supported for mobile services that are widely used and that are most familiar to users. To summarize, hypothesis 1 and 2 are supported, hypothesis 3 only partly, and hypothesis 4b, regarding the intermediating effect, is only supported for flexibility for all services, whereas the other hypotheses with regard to intermediary effects of entertainment and status are rejected, with the exception of the well-established icon and ringtone services.

6 Conclusion, limitations and discussion

In the years we have investigated we found relatively stable patterns in the preferences of Finnish consumers with regard to mobile services. The actual use of services is increasing slowly but steadily. The emergence of a so-called "killer application" is not expected. Based on earlier analyses (Bouwman et al. 2007), we have seen that the role of barriers is decreasing and values are becoming more

important. Furthermore, our research shows that the markets for mobile services are very differentiated and that a careful analysis of specific clusters or bundles of services is needed (Verkasalo and Hämmäinen 2007). As Bouwman et al. (2007) have argued earlier, it is necessary to look at the specific characteristics of the mobile services. Technology can not be treated as a black box, in the way it is treated, for instance, in TAM and UTAUT research. Mobility in itself needs further conceptualization. It is not only about the idea of mobile services being available anywhere and anytime, but it is also about mobile communications in terms of the availability of information, applications and services, in a specific situation at a specific moment, available due to the fact that users carry around their devices almost all the time. Understanding the differences between the various types of services and applications and the kind of value they offer is of key importance in understanding the potential of services in a context of mobility. Specific values are related to specific services. Implications for TAM research should be that the concept of perceived usefulness is more nuanced, and customer value or values have to be studied in relation to specific service characteristics.

In the research as presented in this paper we related specific services to different types of values. Our first hypothesis is supported for all services. Hypotheses 2 (direct relationship between actual and future use) is supported only to a limited extent for travel services, and to a much higher extent for the other two services. Hypotheses 3 a, b and c show a mixed picture. In particular with regard to travel services, there is a shift from a lack of entertainment and status value in 2004 towards an increased entertainment and status value in 2006. With regard to flexibility, there is an opposite effect. Hypothesis 4 is almost only supported consistently for flexibility, while entertainment and status only have predictive value when it comes to the use of icons and ringtones.

Actual use predicts future intention to use. Basically, this finding is as much a tautology as the assumption used in TAM/UTAUT research, that intention to use leads to actual use. However, in contrast to TAM/UTAUT, we have used reported behaviour measurements. Hypothesis 6b is supported. Perceived flexibility is a relevant predictor of future use. Hypothesis 6a is rejected and hypothesis 6c shows a weak negative effect rather than a positive effect.

If we look at our results in greater detail, we see that, although the actual use of travel services attribute to all the three values, future use mainly depends on flexibility. This is also the case for advanced Mobile Internet services. However, for more established services, like ringtones and icons this is also the case, although the other type of values are more relevant. In the three year under investigation, we see that in two years all three values play a role: both as a dependent variable that is predicted by actual use and as an intermediary variable that predicts the future use of ring tones or icon services. Based on these differences, we may conclude that understanding the subtle mechanisms behind use and values may help managers and marketers of mobile services target their services. From a practical point of view, we furthermore have to conclude that service composition is critically important to the success of 3G and beyond. Our research clearly shows that complementary services are dependent on positive attitudes towards mobile innovations, and on assumed entertainment and status values as well as perceived flexibility. Research

into the subtleties involved in the preferences regarding specific mobile services will become more and more important if these mobile services are to be widely used and investments in mobile networks regained. Apparently services have to be aimed at specific contexts in which users want to adopt mobile services.

With regard to further research, we will focus on multigroup analysis under LISREL 8.7, to analyze the differences between the years. This procedure can be used to verify the significant and non-significant differences for each of the models. Another important recommendation will be to test these models in different countries, allowing us to look for differences in consumer behaviour with regard to the use of different types of services. Finally, including demographic factors or the type of handset may provide interesting insights. We know from earlier analysis (Bouwman et al 2007; Carlsson et al. 2006) that gender, age and income as well as availability play an important explanatory role.

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