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Mobile technologies and services development impact on mobile Internet usage in Latvia

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Abstract

Technology development and the Internet have changed communication processes. By combining two most outstanding modern innovations – the Internet and mobile telephone – the mobile Internet has become one of the most popular mobile services for customers worldwide. In the Latvian mobile services market mobile Internet is still a new service. There have been no studies about tendencies of mobile Internet prevalence and about factors that impact mobile Internet acceptance and usage in Latvia. This paper discusses possibilities to determine the current level of mobile Internet use and acceptance.

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1. Introduction

The number of mobile Internet users continues to grow as smart phone positions strengthen in the world's mobile phone market and development of mobile data services continues. It is predicted that in 2014, mobile Internet usage worldwide will overtake desktop Internet usage¹.

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Because of its functionality and ease of use the mobile Internet is becoming an important communication tool for individuals and organizations. Knowledge about factors that impact adoption and the use of mobile Internet provides an opportunity to influence tendencies of mobile Internet prevalence promoting its faster acceptance and usage.

Technology adoption among users is one of the preconditions for development of new technologies. There are a number of theories explaining user technology acceptance and intentions to use new technologies. Theories, depending on their purposes, enable technology creators to assess a user's attitude towards technology before its introduction to the market or when a technology is already available.

The objective of this research paper is to develop a mobile Internet prevalence model that would let users determine levels of mobile Internet acceptance and use, and their impacting factors.

The following sentences briefly outline the main points of the paper proposed to reach the defined goal. Section 2 discusses the role of mobile Internet in today's mobile services market. Section 3 analyses technology use and acceptance theories. Section 4 presents the developed Mobile Internet Prevalence Model. Section 5 discusses the used research method. Section 6 analyses the survey and Mobile Internet Prevalence Model results. The conclusion contains a summary of the main ideas of the paper.

2. The role of mobile Internet in the mobile services market

Mobile Internet is perhaps one of the few technologies that come close to emulating the success of the fixed Internet. Backed by the entire telecommunication industry, coupled with the fact that it combines two of the hottest innovations in recent times (mobile phone and the Internet), mobile Internet is poised to succeed the fixed Internet as the next big thing².

The global mobile industry is the most vibrant and fastest growing. It is expected that the total revenue in the industry will touch approximately \$1.5 Trillion in 2012 with mobile data representing 28% of the mix³.

In 2013, there are almost as many mobile-cellular subscriptions as people in the world having more than half in the Asia-Pacific region (3.5 billion out of 6.8 billion total subscriptions). Over 2.7 billion people in 2013 are using the Internet, which corresponds to 39% of the world's population. In the developing world, 31% of the population is online, compared to 77% in the developed world. Mobile-broadband subscriptions have climbed from 268 million in 2007 to 2.1 billion in 2013. This reflects an average annual growth rate of 40%, making mobile broadband the most dynamic ICT (information and communication technology) market⁴. Although developing countries are catching up in terms of 3G coverage, huge disparities remain between mobile broadband penetration in the developing (8%) and the developed world (51%)⁵.

The percentage of individuals in the EU who used the Internet in 2012 was 73 %. About one third of individuals used the Internet on mobile devices away from home or work. Individuals in the EU27 aged 16-74 years made slightly more use of handheld devices, including mobile or smart phones and other small Internet enabling devices, than of portable computers (including laptops, notebooks, and tablets). The proportion of young people aged 16-24 using handheld devices (47 %) for Internet access was 7 percentage points higher than for those using portable computers (40 %)⁶.

Microsoft Tag has created an info graphic that shows for what purpose people have most recently used their mobile phones and mobile Internet access. Trends show that mobile Internet is most actively used in the socialization process – 91% of cases. Approximately one-third of Facebook's 600 million users are using the mobile version of Facebook and over 50% of the 165 million Twitter users are using the mobile version of this social network. People also use their mobile phones to play games (61%), find out the latest weather forecast (55%), use maps / search features (50%), listen to music (42%) or read the news (36%)¹.

The number of mobile data service users is also increasing because of a variety of external factors – the development of mobile data services technologies, emergence of new mobile devices such as smart phones or tablet computers, Internet adoption on the mobile platform.

Mobile Internet development is changing communication processes worldwide, society and organizations have to be ready for changes that the mobile Internet will bring.

3. Technology use and acceptance

Technology development in the 21st century is rapid and dynamic. Technology acceptance research is a constantly developing field, as new technologies keep evolving all the time.

Two major disciplines have contributed to the development of models and theories addressing technology acceptance, adoption and usage. Psychology and sociology focus on technology acceptance behaviour, whereas Information Systems focuses on systems' characteristics in relation to technology acceptance⁷.

Information system research has long studied how and why individuals adopt new information technologies. Within this broad area of inquiry, there have been several streams of research. One stream of research focuses on individual acceptance of technology by using intention or usage as a dependent variable. Other streams have focused on implementation success at the organizational level and task-technology fit, among others⁸.

Theories, depending on their purpose, let technology creators assess a consumer's attitude towards a technology before it is introduced into market or when the technology is already available.

Although each theory and model has a different investigative thrust towards the acceptance process, there are some common threads and themes among these models⁷. Many of the models are developed by supplementing an existing model or combining multiple models.

Venkatesh et. al.⁷ noticed that IS or IT researchers were confronted with a choice among a multitude of models and were bound to choose constructs across models or choose a favoured model, thus ignoring the contribution from alternative ones. They felt the need for a synthesis in order to reach a unified view of users' technology acceptance⁸.

Venkatesh et. al.⁷ reviewed and compared the eight dominant models that have been used to explain technology acceptance behaviour. These models included Theory of Reasoned Action, Theory of Planned Behaviour, Technology Acceptance Model, combined TAM - TPB, Diffusion of Innovation Theory, Social Cognitive Theory, Motivational Model and Model of PC Utilization.

The authors then empirically compared the eight models in longitudinal field studies conducted in four different organizations among individuals that were introduced to a new technology in the workplace. The measurement was carried out at three different points in time: post training, one month after implementation and three months after implementation; while actual usage behaviour was measured over the six-month post training period. The data was divided into two samples for the eight models according to the mandatory and voluntary settings.

The authors also studied the effect of some moderating variables that in previous research have been reported to effect the usage decision. These were experience, voluntariness, age, and gender. Results showed that, with exception to MM and SCT, the predictive validity of the models increased after including the moderators⁷.

The authors then examined commonalities among models and found seven constructs to be significant direct determinants of intention or usage in one or more of the individual models. They hypothesized that four of them play a significant role as direct determinants of user acceptance and usage behaviour. Based on user acceptance literature and results of model comparison, attitude, computer self-efficacy, and anxiety were hypothesized not to have a direct

effect on behavioural intention. The constructs that do have a direct effect on behavioural intentions and usage are: performance expectancy, effort expectancy, social influences, and facilitating conditions⁷.

Unified Theory of Acceptance and Use of Technology (UTAUT) was developed by using those four constructs and moderators (age, gender, experience, voluntariness of use). Venkatesh⁷ continued research in the field of technology use and acceptance and in 2012 developed Extended Unified Theory of Acceptance and Use of Technology (UTAUT2). If UTAUT analysed technology use and acceptance in an organizational context, then UTAUT2 analyses technology use and acceptance in the consumer use context. UTAUT2 included all elements of UTAUT and three new elements – hedonic motivation, price value and habit. Technology use and acceptance was also analysed in a voluntary context. Moderator voluntariness of use was excluded from the model, because consumers have no pressure to use technology as do employees in organizations⁹.

Currently UTAUT and UTAUT2 are some of the most widely used technology use and acceptance theories in the world.

4. Mobile Internet prevalence model

To develop the mobile Internet prevalence model different theories of technology use and acceptance have been reviewed and analysed. The Mobile Internet Prevalence Model was created using elements from UTAUT and UTAUT2, two elements created by the author of this research were added to the model. The model consists of seven core determinants of intention and usage, and up to three moderators of key relationships (see Fig. 1).

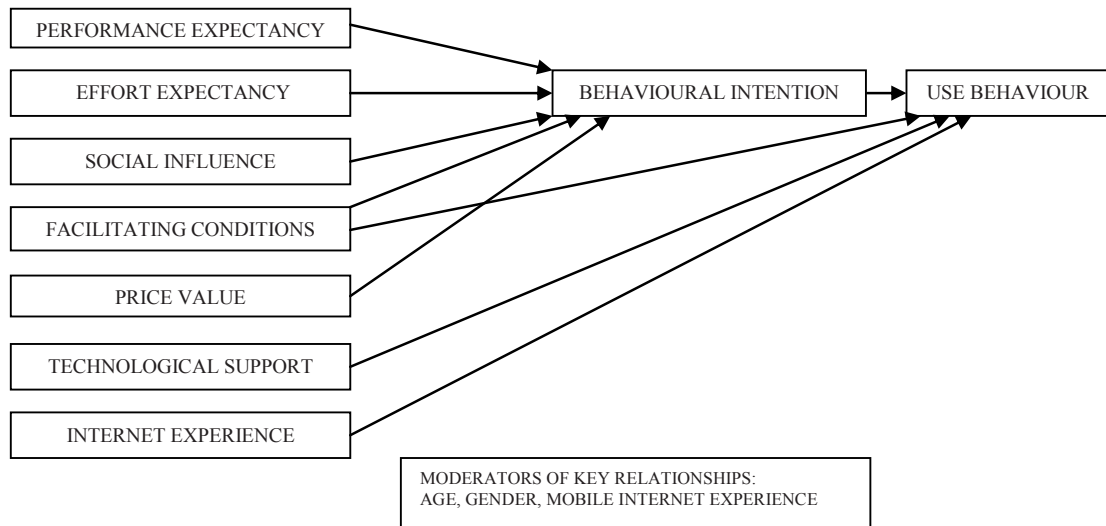


Fig. 1. Mobile Internet prevalence model.

4.1. Seven core determinants of intention and usage

4.1.1. Performance expectancy

Performance expectancy as an element from UTAUT and UTAUT2 reflects the perceived utility associated with using mobile Internet. Mobile Internet frees users from temporal and spatial limitations, and enables them to acquire information or services at anytime from anywhere. This can improve users' living and working performance and efficiency. According to the expectation confirmation theory, when users' expectation is confirmed, they will be satisfied. Thus performance expectancy will affect user satisfaction. Extant research has also noted the effect of perceived usefulness (similar to performance expectancy) on satisfaction. In addition, performance expectancy will

also affect continuance intention. When users form positive expectation towards mobile Internet utility, they may continue their usage. The effect of perceived usefulness on continuance usage has been verified in previous research¹⁰. Performance expectancy directly impacts behavioural intention, two moderators (gender and age) influence the relationship between these elements.

4.1.2. Effort expectancy

Effort expectancy as an element from UTAUT and UTAUT2 reflects the perceived difficulty of using mobile Internet. The constraints of mobile terminals such as small screens and inconvenient input have made it relatively difficult for users to search for information on mobile Internet. If users need to invest great effort in learning to use or skilfully using mobile Internet, they cannot feel satisfied. Thus effort expectancy will affect user satisfaction. In addition, users may discontinue their usage if mobile service providers cannot present an easy-to-use interface. Prior research has revealed the effect of perceived ease of use (similar to effort expectancy) on user satisfaction and continuance usage¹⁰. Effort expectancy directly impacts behavioural intention, three moderators (gender, age, experience) influence the relationship between these elements.

4.1.3. Social influence

Social influence as an element from UTAUT and UTAUT2 reflects the effect of referees' opinion on individual user behaviour. According to social influence theory, users tend to comply with other important referees' opinions. Thus when others who are important to a user recommend him or her to use mobile Internet, he or she may follow their suggestions. Social influence has a significant effect on the continuance intention of mobile data services¹⁰. Social influence directly impacts behavioural intention, three moderators (gender, age, experience) influence the relationship between these elements.

4.1.4. Facilitating conditions

Facilitating conditions as an element from UTAUT and UTAUT2 mean that users have the resources and knowledge necessary to use mobile Internet. Users need to bear the costs of using mobile Internet, such as communication fees and service fees. In addition, they need to be equipped with the necessary knowledge to operate mobile Internet, which represents an emerging technology. If users do not own these resources and knowledge, they may not continue their usage of mobile Internet¹⁰. Facilitating conditions directly impacts behavioural intention and use the behaviour three moderators (gender, age, and experience) influence on the relationships between facilitating conditions and behavioural intention. The relationships between facilitating conditions and use behaviour are influenced by the moderators' age and experience.

4.1.5. Price value

An important difference between a consumer use setting and the organizational use setting, where UTAUT was developed, is that consumers usually bear the monetary cost of such use whereas employees do not. The cost and pricing structure may have a significant impact on consumers' technology use. Price value as an element from UTAUT2 is consumers' cognitive trade-off between the perceived benefits of the applications and the monetary cost for using them. The price value is positive when the benefits of using a technology are perceived to be greater than the monetary cost and such price value has a positive impact on intention⁹. Price value directly impacts behavioural intention two moderators (gender and age) influence on the relationship between these elements.

4.1.6. Technological support

Mobile phones have a significant impact on the mobile Internet use experience. The user cannot use mobile Internet if the mobile phone does not provide such functionality or provides it partially (is not suitable for using mobile Internet). Mobile phone functionality, screen size and other technical factors have a significant impact on the mobile Internet use experience. Features offered by smart phones give a user the ultimate positive experience compared to older mobile phone models. The author of this research believes that technological support (an element introduced by the author of this research) is essential when making a decision to use mobile Internet. Technological support directly impacts use of technology two moderators (gender and age) influence on the relationship between these elements.

4.1.7. Internet experience

Mobile Internet is developed by merging two technologies – the Internet and mobile phones. Previous Internet experience (an element introduced by the author of this research) may affect a user's decision to use the Internet in a different way – by mobile phone. Users who use the Internet every day and are more experienced will more often choose to use mobile Internet. Users who have not previously used the Internet and do not have experience will rather choose to start their Internet experience on a computer than on a mobile phone. Technological support directly impacts use of technology two moderators (gender and age) influence on the relationship between these elements.

4.2. Moderators of key relationships

There are three:

- **Gender** – affects all seven core determinants of intention and usage. Importance of some determinants can differ between genders. For example, importance of determinants effort expectancy, social influence, facilitating conditions and price value are stronger for women, performance expectancy for men;
- **Age** - affects all seven core determinants of intention and usage. Importance of some determinants can differ between age groups. For example, importance of determinant performance expectancy is stronger for young users, importance of determinants effort expectancy, social influence and facilitating conditions are stronger for older users;
- **Experience** – defined as previous mobile Internet usage experience. It affects three core determinants (effort expectancy, social influence, facilitating conditions). Importance of some determinants can differ between experience groups. For example, importance of determinant effort expectancy are more important for users with small mobile Internet experience, but importance of determinant facilitating conditions for users with grater mobile Internet experience.

4.3. Behavioural intention and use of technology describing elements

There are:

- **Behavioural intention** – combines values of five core determinants - performance expectancy, effort expectancy, social influence, facilitating conditions and price value. It shows a user's behavioural intention to use the mobile Internet;
- **Use of technology** – combines values of three core determinants – facilitating conditions, Internet experience, and technological support – a behavioural intention element. It shows the level of mobile Internet acceptance and usage.

By using the Mobile Internet Prevalence Model it is possible to determine a user's behavioural intention to use the mobile Internet and the level of mobile Internet use and acceptance. The results of the Mobile Internet Prevalence Model let users make conclusions about mobile Internet prevalence and its impacting factors.

5. Methodology

A questionnaire was used to obtain information about a user's behavioural intention to use the mobile Internet and level of mobile Internet use and acceptance in Latvia.

During the UTAUT creation process theory author Venkatesh⁷ developed a standardized questionnaire for the UTAUT model that can be adapted and used in different technology use and acceptance research together with the UTAUT model⁸. During the UTAUT2 creation process Venkatesh⁷ developed a questionnaire for analysing mobile Internet use and acceptance, based on an original UTAUT model questionnaire⁹.

UTAUT and UTAUT2 questionnaires consist of 3-4 statements about each core determinant, to evaluate each statement seven point scales were used for all of the constructs' measurements, with 1 being the negative end of the scale and 7 being the positive end of the scale. The UTAUT questionnaire has to be filled out at three different

points in time of technology acceptance: post-training (T1), one month after implementation (T2), and three months after implementation (T3).

Actual usage behaviour was measured over the six month post-training period. There can be some modifications of UTAUT use, for example the questionnaire can be made in one point in time, surveying users in different technology use and acceptance phases to get a general idea of technology use and acceptance⁸.

The created Mobile Internet Prevalence Model questionnaire is based on the questionnaire of the UTAUT2 model.

5.1. Measurement

All of the scales were adapted from Venkatesh's prior research⁷ and two scales (technological support, Internet experience) were developed by the author of this research. The questionnaire (see Appendix A) consists of 4 statements about each core determinant. The items are included in the Appendix. The scales for the UTAUT and UTAUT2 constructs (i.e., performance expectancy, effort expectancy, social influence, facilitating conditions, price value and behavioural intention) were adapted from Venkatesh⁷. All items were measured using a seven-point Likert scale, with the anchors being "strongly disagree" and "strongly agree." Age was measured in years. Gender was coded using a 1 or 2 variable where 1 represented men. Experience was measured in months.

The questionnaire was adapted for research in Latvia by translating it into Latvian and Russian. The decision to translate the questionnaire into two languages was made because according to the data of the Latvian Central Statistical Agency 34% of the Latvian population uses Russian as an everyday spoken language¹¹. The adaptation of the questionnaire in two languages provides an opportunity to attain correct data about mobile Internet use and adaptation from different audiences.

5.2. Participants and Data Collection Procedure

Information about users' behavioural intention to use mobile Internet and level of mobile Internet use and acceptance in Latvia was collected surveying users with different mobile Internet experience once. The research method was Internet survey or CAWI (Computer assisted web interview). The objective of this research was to clarify factors that influence mobile Internet adoption and usage in Latvia.

It was decided to survey Latvian Internet users in age group 15-60. Such a limitation is based on the assumption that users who already have Internet experience will more often choose to use mobile Internet, users who have not previously used the Internet and do not have experience will rather choose to start their Internet experience on a computer than a mobile phone. The age group was selected based on data from the Latvian Central Statistics Agency about Internet use in Latvia, after the age of 60 the proportion of Internet users is rapidly shrinking¹².

The survey was implemented throughout Latvia from October 5th until October 12th, 2012 by the GfK Custom Research Baltic research agency. From all completed electronic questionnaires 2000 were identified as valid. Partially filled out questionnaires were removed.

In general, an electronic questionnaire was completed by 972 men (49%) and 1028 women (51%). Distribution of respondents by age groups were accordingly 15-24 years (29%), 25-34 years (25%), 35-44 years (23%), 45-60 years (23%). 60% of respondents were Latvians and 40% other nationalities living in Latvia.

6. Results

Results of the survey showed that only 30% of Latvian Internet users use the mobile Internet, most of them already use it for more than one year, a relatively smaller number of respondents has begun to use mobile Internet in the last year.

Examining the relationship between the mobile Internet user experience and the users' age, the author concludes that the mobile Internet is most actively used in the 15-34 age group, users in this age group often also have greater experience. Mobile Internet is used less frequently among respondents in the 35-60 age groups. This trend can be explained by the fact that any new technology spreads among younger users more easily and quickly.

After analysing differences in technology use between genders in Latvia, the author concludes that mobile Internet is used equally active by both sexes.

To make calculation processes of mobile Internet acceptance and usage levels easier, the Mobile Internet Prevalence Model has been created in the Stella modelling environment.

All results of mobile Internet acceptance and use were calculated in seven point scales, where 1 - totally not accepting mobile Internet and will never want to use it, 7- totally accept mobile Internet and want to use it.

The calculated behavioural intention coefficient is 4,70. It can be concluded that Latvian Internet users have a positive attitude towards mobile Internet usage and they are willing to try mobile Internet. The trend generally shows that a large portion of Internet users could start using the mobile Internet.

Behavioural intention is most strongly affected by these elements: performance expectancy, effort expectancy, and facilitating conditions. Internet users know the benefits and options of mobile Internet. Internet users have the necessary knowledge to use the mobile Internet; they also assess the support provided by their mobile operator.

Behavioural intention is less affected by social influence and price value. Mobile Internet services are considered relatively expensive and users do not see clear benefits they will get by paying for mobile Internet. Media and society have a neutral impact on a user's decision to use the mobile Internet.

The calculated mobile Internet use and acceptance coefficient is 4,96. Latvian Internet users partly accept mobile Internet and could start using it.

Facilitating conditions, Internet experience and technological support have the strongest effect on mobile Internet use and acceptance. For actual and potential mobile Internet users it is essential that mobile operators provide an adequate quality of service and support for mobile Internet use. Mobile Internet is more easily accepted if users have previous Internet experience. This correlation is consistent with the author's previously expressed view that users who already have Internet experience will more often choose to use mobile Internet, users who have not previously used the Internet and do not have the experience will rather choose to start their Internet experience on a computer than on a mobile phone.

The author concludes that the main prerequisites for mobile Internet adoption and usage are previous Internet usage experience, quality of the mobile Internet service and mobile operator support, mobile phone suitability for using mobile Internet, as well as a desire to use mobile Internet.

By analysing model results, we can see an interesting connection - mobile Internet adoption and use is slightly higher than the behavioural intention to use mobile Internet. Any technology adoption among users is positive, but users' behavioural intention or desire to try the same technology is also important. The actual situation and the results can be explained by the fact that many Internet users are not yet mobile Internet users. Mobile Internet is

accepted among Internet users, because they already use the Internet, but they do not intend to use the mobile Internet services provided by mobile operators. Mobile phones are increasingly equipped with Wi-Fi technology, with the result that the vast majority of such phone users connect to Internet using Wi-Fi technology. But it should be noted that the Wi-Fi capabilities compared to the mobile Internet are limited, so over time Wi-Fi users can start to use the mobile Internet, or they may need to do so.

Overall, Latvian Internet users have partly accepted mobile Internet. While most of them would like use mobile Internet, its usage still creates doubt. This can be explained by the low impact of social influence and price value on behavioural intention. Internet users think that the actual cost of mobile Internet is greater than the benefits of its usage. A majority of people make decisions based on other people's recommendations and information in the media. Mobile Internet is a new technology for Latvian mobile service users. Society and media have not yet formed a unified view about mobile Internet.

7. Conclusion

Comparing the number of mobile Internet users in Latvia to developed countries in the world where mobile Internet is used by 51% of Internet users and development countries where mobile Internet is used by 8% of Internet users, it is possible to conclude that the mobile Internet development process in Latvia has begun and current figures mark a positive trend for the future. In Latvia mobile Internet is still a relatively new service and mobile operators are actively working on mobile Internet network infrastructure development and user involvement.

The Mobile Internet Prevalence Model provides data about factors that impact adoption and use of mobile Internet and ensures an opportunity to influence tendencies of mobile Internet prevalence, promoting faster acceptance and usage of mobile Internet. By using the model and a standardized questionnaire it is possible to determine the level of mobile Internet use and acceptance, and to formulate conclusions about mobile Internet prevalence and its impacting factors. The model can be used by research agencies and mobile operators for mobile Internet prevalence studies.

Appendix A. Survey items

Performance Expectancy

- PE1. I find mobile Internet useful in my daily life.
- PE2. Mobile Internet usage makes my life easier.
- PE3. Using mobile Internet helps me accomplish things more quickly.
- PE4. Using mobile Internet increases my productivity.

Effort Expectancy

- EE1. Learning how to use mobile Internet is easy for me.
- EE2. My interaction with mobile Internet is clear and understandable.
- EE3. I find mobile Internet easy to use.
- EE4. It is easy for me to become skilful at using mobile Internet.

Social Influence

- SI1. People who are important to me have advised me to use mobile Internet.
- SI2. People who influence my behaviour think that it is easy to learn and start use mobile Internet.
- SI3. Information in media recommends trying mobile Internet.
- SI4. People who are important to me think that I should use mobile Internet.

Facilitating Conditions

- FC1. I have the knowledge necessary to use mobile Internet.
- FC2. My mobile operator provides qualitative mobile Internet service.

FC3. I can find instructions and information about mobile Internet usage in my mobile operators' service centers and website.

FC4. I case of uncertainties I can easy get consultation from my mobile operator.

Price value

PV1. Mobile Internet is reasonably priced.

PV2. Mobile Internet is a good value for the money.

PV3. At the current price, mobile Internet provides a good value.

PV4. Mobile Internet fee does not significantly affect my monthly bill for mobile services.

Technological support

TS1. My mobile phone provides/support mobile Internet function.

TS2. My mobile phone is suitable for mobile Internet usage.

TS3. My mobile phone screen is large enough and I can easy overlook all information while using mobile Internet.

TS4. If necessary, I can quickly and easily buy a new mobile phone to enhance my mobile Internet user experience.

Internet experience

IE1. I use Internet daily.

IE2. I have an Internet connection whenever it is necessary.

IE3. I think I'm experienced Internet user.

IE4. People around consider me an expert on the use of Internet and ask advices in case of problems.

Behavioural Intention

B11. I use mobile Internet daily (Answer: YES/NO).

B12. I know that I will start to use mobile Internet in next six months.

B13. I think that I could start use mobile Internet in next six months.

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