Inf Syst E-Bus Manage (2013) 11:235–252
DOI 10.1007/s10257-012-0200-1

ORIGINAL ARTICLE

Factors affecting the smartphone users to use the mobile portal services: focusing on Korean mobile portals

Jongtae Lee · Myeong-Cheol Park

Received: 13 June 2012 / Revised: 17 August 2012 / Accepted: 4 September 2012 /
Published online: 26 September 2012

Abstract This study aims to clarify whether and how the portal sites in wired Internet environments can enhance their positions as market leaders in the mobile environment.The result may explain that the user's trust in the mobile services of portal sites (the mobile portal services) is related to the site's quality and the site's brand equity significantly and is a mediator to increase the user's intention to use mobile portal services. This study also explains that the user's experience with a smartphone can encourage portal users to expect that the mobile portal services are useful and that the experience can link brand equity in certain business environments to trust in the brand in other business environments. Site quality including the design quality of portal sites can affect the user's trust in the mobile services of the portal sites directly and can affect the user's intention to use the mobile portal services under certain conditions. Practically, this study suggests that portal sites should focus on designing and developing more usable sites with high-quality UI components—convenient menu navigation, a proper UI design, and usable content rather depend on their current position as the leading companies in the wired Internet environment.

Keywords Smartphone · Mobile service · Brand equity · Site quality · UI design · Portal site

J. Lee (✉)
Corporate Strategy Research Center, POSRI, POSRI Bldg., #514,
Bongeunsa-ro, Gangnam-gu, Seoul 135-878, Korea
e-mail: light4u@nate.com

M.-C. Park
Department of Management Science, KAIST, #5112, N22, KAIST, 335,
Daehak-ro, Yuseong-gu, Daejeon 305-701, Korea
e-mail: imcpark@kaist.ac.kr

1 Introduction

It is widely thought that the smartphone-related market will keep growing. At the end of 2009, the Korean IT industry encountered an extraordinary situation due to the release of the iPhone. Before this release, only a small portion of the entire set of mobile service subscribers had used a smartphone (The Korea Times 2012), but, after the release of the iPhone, smartphone users increased noticeably, and the ratio of this increase grew even higher in 2010, as around four million mobile service subscribers were using smartphones by the end of that year. Baik et al. (2010) expects that the economic (both direct and indirect) effect of the iPhone on the Korean IT industry will be around 2.3 billion USD in 2012. Gartner Inc., reported that worldwide mobile phone sales totaled 428.7 million units in the second quarter of 2011, an increase of 16.5 % over the same quarter in 2010, and that smartphone sales in the second quarter of 2011 surpassed 107 million units (25 % of all mobile phone sales worldwide), while sales in the second quarter of 2010 were around 62 million units (Gartner 2011). The report also explained that the sales of smartphones were up 74 % year-on-year. Along with the diffusion of smartphones, it also has been discussed that the fast diffusion of smartphones would offer Internet portal sites new business opportunities. Various e-business companies, including portal sites, now are providing or planning their own diverse mobile services and/or applications for smartphone users. For instance, Naver, Daum, and Nate are considered to be the top 3 Korean portal sites. NHN (the service provider of Naver) possessed 69.3 %, Daum possessed 14.0 %, and SK Communication Corp. (service provider of Nate and Cyworld) possessed 6.2 % of the overall online advertising market in Korea. Moreover, Korean Internet users used these three main portals at a rate of more than 90 % to search the Web (Naver: 64.3 %, Daum: 20.4 %, Nate: 9.4 %) (KISA 2010). These businesses are now offering mobile services and applications as in other countries (Funk 2009).

Internet portal sites that want to succeed in the mobile market should compete with diverse competitors in mobile environments. Internet portal sites are aware of the impact of mobile services, for instance, application stores or mobile Web services of device manufacturers such as Apple, Inc., and Samsung Electronics, mobile ISPs (Internet Service Providers) such as SK Telecom and KT, and traditional competitors such as foreign Internet service companies such as Google, Inc.

In this sense, it is easy to predict that Internet portal sites will encounter an opportunity and a crisis simultaneously—the opportunity is that mobile users can access Internet portal sites whenever and wherever they want, and the crisis is that they should compete with diverse competitors, including phone manufacturers, content providers, telephony, and others providing similar services and content in the mobile market. To attract users to use their mobile services and contents, Korean Internet portal sites already manage or plan to provide diverse functions and types of content in their mobile services. This mobile-focusing strategy now appears to be essential and important for these portal sites to position themselves as the market leaders in this new business environment. In other words, creating a new mobile services and redesigning current services as mobile-friendly would be important

business strategies for portal sites, and it would be an academically and practically important issue to investigate how great the effect of the mobile-friendly strategies will be, i.e., whether the Internet portal sites can attract the mobile users to the sites rather than allow their competitors to attract them away.

There are two opposing lines of debate regarding the mobile services of the Internet portal sites. The first is that the market-leading Internet portal sites would also be market leaders in the mobile environments. Lobo et al. (2011a) and (b) explained that smartphone users commonly participate in e-Commerce activities, access the Web portals, and enjoy diverse games and/or entertaining contents. Their studies predicted that smartphone users may access the mobile portal sites because they have used portal sites in (wired) networks. The second line of debate is that market-leading Internet portal sites would not be market leaders but would be at the same starting line with their mobile competitors because they also are the new entrants in the mobile environment. This stance is based on the perceived differences between m-commerce and e-commerce. Chae and Kim (2003) explained that mobile Internet services could be more personal and offer lower multimedia capabilities with a relatively smaller screen size to support restricted content as compared to the stationary (wired) Internet services.

This study aims to clarify whether and how the portal sites in wired Internet environments can enhance their positions as market leaders in the mobile environment. There are a range of factors that have been posited as being able to help portal sites succeed in the mobile environment, and this study concentrates on comparing the effect of the quality of the site with the effect of the brand equity of the portal sites in the wired network environment on the user's trust and intention to use mobile portal services.

2 Literature review and hypotheses

2.1 Site equity and site quality

Feldwick (1996) and Wood (2000) explained that brand equity can be classified into three academic approaches—the total value of a brand as a separable asset (Brand Value), a measure of the strength of consumers' attachment to a brand (Brand Strength or Brand Loyalty), and a description of the associations and beliefs that a consumer has about a brand (Brand Image or Brand Description). Chang and Chen (2008) cited the studies of Aaker (1996) and Keller (1993) on the brand quality and equity to categorize the two major dimensions of brand equity: brand awareness and brand image. Brand equity can be defined as the value the assets of a brand's name and symbol add to the perceived value of a product or service. Brand awareness and the brand's image are essential factors to create brand equity (Aaker 1996; Keller 1993; Chang and Chen 2008). Keller noted that brand equity represents a condition in which the consumer is familiar with the brand and recalls some favorable, strong and unique brand associations. Park and Srinivasan (1994) suggested that brand equity is the incremental preference endowed by the brand to the product as perceived by an individual consumer from an individual perspective and that brand

equity can be increased in two different ways, through an attribute-based component and through a non-(product) attribute-based component according to Aaker (1991) and Keller (1993).

According to previous academic studies, a website's brand, being an essential factor of a website's brand equity, can be explained in terms of how well known the site is by users to the extent that they are familiar with it from past exposure and how well they recall this specific website as useful (Walczuch and Lundgren 2004; Chang and Chen 2008). The user can recognize the site from among other competing sites. Website awareness as the site's brand equity can be described as the competitive features of the site and how they satisfy users' expectations. Brand awareness can be defined as meaningful brand equity that is positively associated with brand loyalty (Hoyer and Brown 1990; Neal 1999; Lee 2011). Consumer experience, marketing communications, word of mouth, and other factors can be sources of brand image, which is another factor of essential brand equity with which users compare the quality of the site with that of other sites (Romaniuk and Sharp 2003; Chang and Chen 2008). Following these studies, this study defines a site's brand equity (site equity) as its perceived comparative advantages over its competitors.

A traditional and popular model to measure the quality of a service is SERVQUAL, which is measured with the five dimensional factors of tangibles, reliability, responsiveness, assurance, and empathy (Parasuraman et al. 1988; Li et al. 2009). Barnes and Vidgen (2000) adopted SERVQUAL to assess the quality of a website, suggesting that these five dimensional factors should be differently weighted. Extending their suggestions, Loiacono et al. (2002) suggested 'WEBQUAL' with twelve dimensions to measure a site's quality based on the SERVQUAL—Ease of understanding, Intuitive Operation, Informational Fit-to-task, Tailored Communication, Trust, Response Time, Visual Appeal, Innovativeness, Emotional Appeal, On-Line Completeness Relative Advantage, and Consistent Image. Lee and Lin (2005) also modified SERVQUAL to propose that the dimensions of e-service quality should include the website design, reliability, responsiveness, trust and personalization. Yang et al. (2005) proposed WEBQUAL, adopting and extending SERVQUAL factors to help website designers improve the users' perceptions of the site and to be more involved in interface design. Aladwani and Palvia (2002) and Chang and Chen (2008) defined Website Quality as a multi-dimensional factor that combines technical adequacy (adoption of appropriate technologies), content quality (useful, complete, and accurate information), special content (specific details about product/services, customer support, privacy policies and others), and appearance (visual attributes of colors, fonts, and multimedia features). The site's quality is commonly accepted as affecting users' views of the site. Chiu et al. (2005) suggested that the perceived quality factor includes a user-friendly UI (user interface) design, ease of service navigation, services that users need, and complete and understandable information. Cao et al. (2005) suggested the system quality of an e-service site to be considered in terms of the design quality of the site. They proposed that system quality should be measured in terms of search facility, responsiveness, and multimedia capability factors. In diverse HCI studies, site quality is commonly considered in terms of well-designed and usable interfaces

(Mich et al. 2003). In addition, it is important to include extrinsic and intrinsic motivational factors in the user interface design to improve usability (Moon and Kim 2001). Among diverse extrinsic and intrinsic UI design factors, this study concentrates on the design quality of mobile services, including ease of menu navigation, because the big three portals may provide various, similar functions and types of content—likely almost every Internet service available in wired and wireless networks—including search services, online news services, SNS services, online games, and e-mail services.

Lowry et al. (2008) introduced the BATM (Branding-Association-Trust Model) to compare 'Website Quality' to 'Brand Awareness' as it affects 'Brand Image' and 'Initial Trusting Beliefs'. In their study, 'Brand Awareness' affects 'Brand Image' and 'Initial Trusting Beliefs' more than 'Website Quality' does. Kim et al. (2011) studied medical doctors' intentions to pursue job opportunities and explained that the hospital's brand equity can affect these intentions. The findings of Moradi and Zarei (2011) and Jalilvand et al. (2011) support the significant impact of brand equity on customers' intentions to purchase. Tsiotsou (2005) and Cronin Jr. et al. (2000) explained that service quality can affect customers' behavioral intentions effectively. Lee and Lin (2005) also proved that the user's perceived service quality may be related to the user's perceived trust and intention to use the online shopping service.

Kim (2009) proposed that the demand for mobile Internet services would parallel the demand for the wired environment due to the similarities between mobile Internet services and wired Internet services. This study assumes that the users may want their favorite portal sites also in a mobile environment due to the sites' well-known brand equity) and the fact that they provide services of a good quality (site quality). Based on these previous studies and assumptions, this study proposes two hypotheses, as shown below.

H1 The brand equity of web portal sites affects users' intentions to use the mobile services of the sites.

H2 The quality of web portal sites affects users' intentions to use the mobile services of the sites.

2.2 Relationships among quality, trust, and intention to use

Chang and Chen (2008) cited the studies of Eroglu et al. (2001), Eroglu et al. (2003) and Davis et al. (2008) to explain the relationships among online environment cues (perceived quality and brand value), cognitive and affective states (trust and perceived risk), and outcomes (the intention to use or to purchase). The user's perceived quality and the brand value of a website can be explained as stimulus factors related to the internal and organismic states of the individual. Chang and Chen (2008) described the stimulus factors in an online context as all tangible and intangible cues of technical adequacy, content quality, the specific content, and the site design/layout (appearance). The organism factor (the cognitive and affective state) including the perceived trust and risk factors would mediate the relationship

between stimulus and response (outcome) as the intention to use or to purchase. Lee and Lin (2005), Gefen (2000), and Gefen et al. (2003) described that the trust factor is the strongest factor affecting the perceived service quality, performance, and customer satisfaction of online stores. Liu and Arnett (2000) identified a framework with the four factors of information quality, system use, playfulness, and system design quality to measure a website's quality in e-Commerce.

Swan et al. (1999) explain that online shoppers need to trust a site prior to making a purchase. According to Swan et al. (1999) and Sabel (1993), consumers hold the belief that an e-retailer will not wrongly exploit their trust. Wang suggested that cue-based trust for an e-retailer can be explained as the feeling and trust of a consumer that the e-retailer will not exploit user vulnerabilities prior to a purchase based on outward symbols and perceptions. Wang also explained that consumers' cue-based trust is positively related to the site's reputation; its perceived size; its presentation (professional appearance and likability); whether it offers pleasant, effective, and honest navigation; and to prestigious seals of approval and credit card symbols of the website of the e-retailer (Wang 2001). Wang's study supports the expected relationships between perceived trust and a site's brand equity, i.e., its image and customer awareness of the site, and between perceived trust and the site's quality. Roy et al. (2001) explained that the quality of a site's interface, which is included in the concept of the site's design quality, is strongly related to the user's perceived trust in the site.

Chang and Chen (2008), Davis et al. (2008), and Eroglu et al. (2001) discuss the stimulus factors of the site design and layout, the degree of technical adequacy, the content quality, the specific content and appearance, the site's brand equity (including site awareness and site image), and other factors as they affect organism variables, such as trust and perceived risk. In this study, perceived risk is not analyzed because high perceived risk is described as strongly related to low trust in many studies. Based on these earlier works, this study proposes the three hypotheses below.

H3 The brand equity of web portal sites affects users' trust in the mobile service of the sites.

H4 The design quality of web portal sites affects users' trust in the mobile service of the sites.

H5 Users' trust in the mobile service of web portal sites affects users' intentions to use the mobile services.

In their study on product heterogeneity, Choe et al. (2007) explained that there can be moderating effects of user experience. They divided survey participants into two groups according to their purchase experience of heterogeneous products, including agro-products and grocery products, from e-retail sites and asked each group the same questions about shopping motives, emotional states, and retail outcomes to determine the moderating effect of the experiences. Also in this study, the moderating effect of users' experiences is predicted to be the use of a smartphone (Fig. 1).

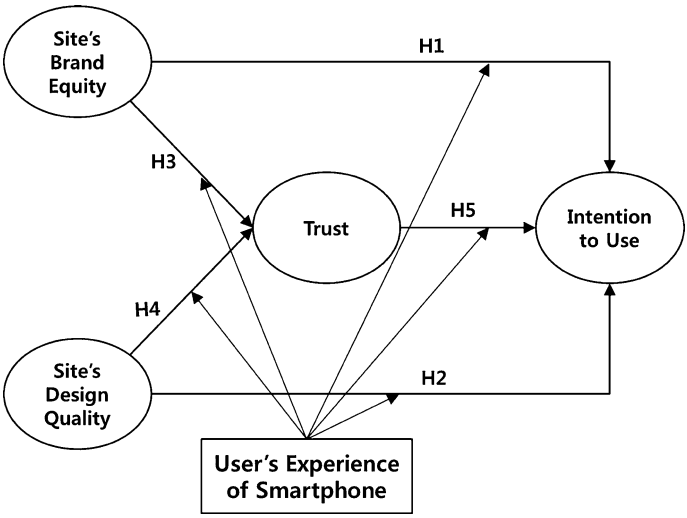

Fig. 1 Conceptual research model

2.3 Research method

An online survey was conducted to certify portal site users' intentions to use mobile portal services. All of the survey participants were users of the Internet portals of the big three Korean sites of Naver, Daum, and Nate, as these three portals are the most commonly used in Korea (around 94 % of Korean portal services users used these three portals in 2010). Table 1 depicts the survey items. Each item was measured by a five-point Likert scale (from one to five). A total of 218 randomly selected participants answered the online survey. Although there is still debate on the reliability of web-based online surveys, Kiernan et al. (2005) explained that a web survey can be as reliable and effective as a mailed survey with a significantly higher response rate than a mailed survey, especially with reference to the completion of quantitative questions.

To analyze the replies, the PLS (Partial Least Squares) path modeling methodology was used (Chin 1998; Ringle et al. 2005). The PLS methodology allows reflective and formative computations with respect to the measurement of latent variables (Chin 1998; Gudergan et al. 2007). A growing number of researchers studying subjects such as e-business, customer behavior, and marketing theories are using the PLS methodology to analyze the relationships among diverse latent variables so as to cluster consumers in groups according to their homogeneous characteristics and/or behaviors (Gudergan et al. 2007; Henseler et al. 2009; Tenenhaus et al. 2005). Chin suggested that ten samples are needed for one predictor to adopt the PLS methodology and, the predictor numbers of the latent variable possessing the most predictors should be multiplied by ten for (Chin 1998). According to this, the minimum sample size for this study would be 40. Hence, the number of survey replies is sufficient.

Table 1 Survey items

Category	Question	Description	References
Site's brand equity (SE)	SE1	Do you think the big three portals provide more useful information than others?	Aaker (1996), Davis (2008), Chang and Chen (2008)
	SE2	Do you think the big three portals provide more diverse functional advantages than others?	
	SE3	Do you think the big three portals serve more useful environments for smartphone users than others?	
Trust (TR)	TR1	Do you trust that the quality of the mobile web pages for a smartphone by the big three portals is as good as that of online pages?	Gefen and Straub (2004), Choe et al. (2007), Chang and Chen (2008)
	TR2	Do you trust that the quality of the mobile AppStores by the big three portals would be high as online pages?	
	TR3	Do you trust the functions of the mobile web pages of the big three portals for a smartphone?	
	TR4	Do you trust the functions of the mobile AppStores run by the big three portals?	
Site's design quality (SQ)	SQ1	Do you think the big three portals provide convenient interfaces to use the functions and to navigate each menu?	Palmer (2002), Urban et al. (2000), Choe et al. (2007)
	SQ2	Do you consider the sites of the big three to be well designed?	
	SQ3	Do you consider the sites of the big three to be designed with proper multimedia components?	
Intention to use (IU)	IU1	Do you intend to use mobile AppStores by the big three portals rather than those of manufacturers or Telcos?	Choe et al. (2007), Yoo et al. (2008), Liebermann and Stashevsky (2009)
	IU2	Do you intend to use the smartphone-applicable applications offered by the big three portals rather than those of manufacturers or Telcos?	
	IU3	Do you intend to use the Smartphone-applicable functions of the big three portals rather than those of manufacturers or Telcos?	

3 Analysis and results

3.1 Overall analysis of the survey data

According to Table 2, around 60 % were males, around 67 % were office workers or students, and around 83 % were 20–39 years old. This survey was conducted during the first half of 2010, and the KCC (Korean Communications Commission) reported that approximately 60 % of new smartphone users were male and that

Table 2 Demographic features of the participants

	%
Occupation	
Students (including graduate school students)	26.61
Office workers	40.37
Salespersons	2.29
Specialists in law, labor, accounting, and tax	0.92
Researchers	3.21
Owner of private company	2.29
Working in the service industry	5.05
Military, police, and fire officers	0.46
Medical doctor and pharmacists	0.92
Education-related job	1.83
Technical engineers	6.42
Officials	2.29
Other jobs	7.34
Gender	
Female	39.91
Male	60.09
Ages	
10–19 years old	5.05
20–29 years old	39.91
30–39 years old	42.66
40–49 years old	8.72
50 years old and above	3.67

77.1 % were 20–39 years old at that time (KCC 2010). Thus, it can be concluded that the survey respondents represent the ordinary smartphone users.

Table 3 shows the correlation values between the latent variables and compares these correlation values with the square roots of the AVEs of each of the latent variable. The square root values are higher than any correlation values between the two latent variables. This indicates that each latent variable shows high discriminant validity (Fornell and Larcker 1981).

Table 4 shows the cross-loading values of the construct items for each latent variable. Every cross-loading value for each latent variable exceeds 0.5 and is larger than the construct items for the other latent variables, signifying that every construct item shows high reliability (Hulland 1999). Also, this result shows high convergent validity because all composite reliabilities of the latent variables exceed 0.7 (Nunnally 1978).

Figure 2 shows the conceptual model with path coefficients. Four hypotheses—Hypotheses 2, 3, 4, and 5—are accepted and Hypotheses 1 is rejected.

In the research results, SE (the site's brand equity) does not show a significant effect on IU (the user's intention to use mobile portal services) although the path coefficient is positive (0.06). Therefore, hypothesis 1 is rejected. SQ (the site's

Table 3 Latent variable correlations and square root values of AVE

	IU	SQ	SE	TR
IU	**0.882**			
SQ	0.399	**0.749**		
SE	0.309	0.490	**0.752**	
TR	0.445	0.442	0.414	**0.765**

The bold values prove the validity and reliability of the research model and analysis result

Table 4 Cross-loading value of each construct item

	IU	SQ	SE	TR
IU1	**0.900**	0.389	0.281	0.412
IU2	**0.929**	0.385	0.264	0.415
IU3	**0.811**	0.267	0.275	0.345
SQ1	0.274	**0.724**	0.420	0.290
SQ2	0.277	**0.755**	0.423	0.334
SQ3	0.338	**0.766**	0.276	0.361
SE1	0.213	0.346	**0.732**	0.238
SE2	0.187	0.423	**0.729**	0.276
SE3	0.281	0.352	**0.795**	0.390
TR1	0.276	0.360	0.233	**0.689**
TR2	0.252	0.336	0.230	**0.713**
TR3	0.393	0.357	0.459	**0.835**
TR4	0.413	0.310	0.302	**0.814**
Composite reliability	**0.912**	**0.793**	**0.796**	**0.849**

The bold values prove the validity and reliability of the research model and analysis result

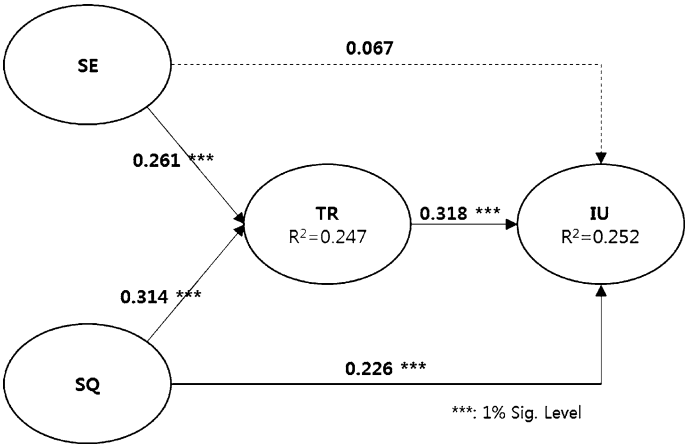

Fig. 2 Research model with path coefficient results

design quality) affects IU with a path coefficient of 0.226 at a 1 % significance level (i.e., Hypothesis 2 is accepted). This result shows that the site quality, including the design quality and convenience of the navigation menu, should be considered as an

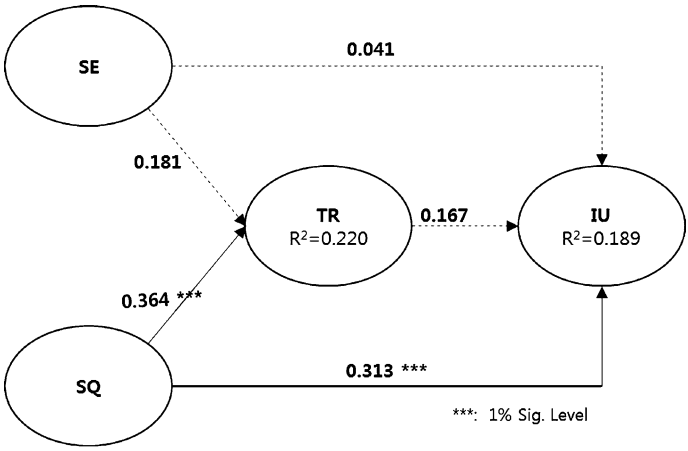

Fig. 3 Results of group NSP

essential factor pertaining to the user's intention to use the mobile services of portal sites rather than the perceived site equity, which includes site awareness. This result shows that mobile users will not use the mobile services of portal sites if they do not believe that the quality of the mobile portal services is good enough, even when they continue to use the portal services in wired Internet environments.

SE affects TR (the user's trust in the mobile services of the portals) with a path coefficient of 0.261 at a 1 % significance level, signifying that Hypothesis 3 is accepted. Also, SQ affects TR significantly at a 1 % significance level with a path coefficient of 0.314—a higher path coefficient than that for SE on TR (Hypothesis 4 is accepted). This result may also explain that the site quality is a more important factor in how it affects the user's trust as compared to site equity when portal sites try to enhance their business area from the wired to the mobile network environment.

TR affects IU positively (with a path coefficient of 0.318) at a 1 % significance level (Hypothesis 5 is accepted). Therefore, the user's trust in portal sites can be accepted as an essential mediator for the relationships between the site's equity and the user's intentions and between the site's quality and the user's intentions.

3.2 Analysis of the effect of smartphone experience

The survey participants were divided into two groups to test the moderating effect. One group of users had experience with a smartphone (Group SP, 122 people), and the other group of users had never experienced a smartphone (Group NSP, 96 people). Figures 3 and 4 illustrate the results of the PLS test of the two groups.

First, SQ significantly affects TR and IU, but SE and TR do not show significant effects on IU and SE does not affect TR significantly in Group NSP. This result may show that the site quality, including the UI design quality features, affects the user's intention to use the services and their trust in the other environment (in this study, mobile environment). In other words, mobile users in the future would expect that mobile portal services will provide them with well-designed mobile services, as the

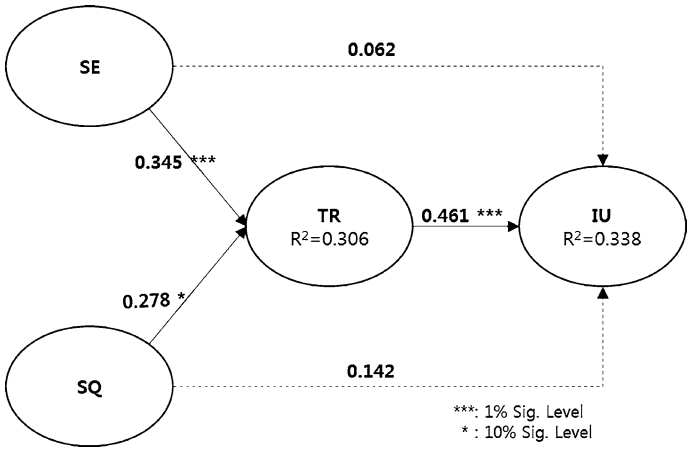

Fig. 4 Results of group SP

sites provide high-quality service in the (wired) web environment and not because the sites are well known and most commonly used. Therefore, designing a more usable mobile service should be an important strategy for portal sites who wish to entice current and future mobile users rather than to depend on their current market positions in the wired Internet environments.

Second, SE and SQ affect TR significantly (path coefficients: 0.345 and 0.278) and TR affects IU significantly (path coefficient: 0.461) more than the case of Group NSP. This may show that TR mediates the relationships between SE and IU and between SQ and IU in Group SP. The significant relationship between SE and TR may explain that users who experience a smartphones understand that portal sites can provide mobile-friendly services in the same way they do in the wired (Internet) environment. This result also may explain that the user's trust will increase after experiencing well-designed mobile services of the portal sites and realizing that the well-known sites in the wired environment provide also useful services in the mobile environments. This result may support the studies of Gefen (2000) and Gefen et al. (2003) who showed that trust should be considered as the most important factor pertaining to the user's intention to use.

4 Conclusion and implications

This study aims to certify whether and how Internet portal sites transfer and/or create their market advantages in the mobile environment. Whether a user's experience of the Internet services can affect the user's intention to use the new or potential services has raised diverse academic and practical debate in the e-business environment, and the results of this study may have several practical and academic implications for Internet portal sites.

First, this result may explain that the user's trust in the mobile services of portal sites (the mobile portal services) is related to the site's quality and the site's brand

equity significantly and that it is an important mediator to increase the user's intention to use mobile portal services. This result appears to support the findings of Gefen (2000) and Gefen et al. (2003). This study may prove that a user would expect the mobile services to be as usable and as useful as the (wired) Internet services and/or would accept the mobile services as a variation of the Internet services. Users can expect that the portal's design quality should be maintained in a multi-platform environment. Interestingly, the current design quality of the online service providers can help the portal sites to succeed in the mobile environment. In this study, the path coefficient between the user's trust and the user's intention to use the mobile services was found to be greater than any other path coefficient and the site's brand equity did not directly affect the user's intention to use but did affect the user's intention through a mediator—the user's trust in the mobile portal services.

Second, in the analysis result, this study explains that the user's experience with a smartphone can encourage portal users to expect that the mobile portal services are useful and that the experience can link brand equity in certain business environments to trust in the brand in other business environments. If a portal user has experienced a smartphone, the user will trust that his/her favorite portal sites will provide useful mobile services, as they do in the wired network environments. This result may prove that the experience should be treated as an important factor to moderate the relationship between the user's trust and their intention to use. This result may also explain that the user's perceived brand equity and site quality can be transferred to other service platforms if the user has experience with the new platforms and finds similarities between the two different platforms.

Third, the results of this study may explain the steps involved in the user's intention to use a service. At the first step, users who have never experienced a service and device would try the service because the service provides a useful and easy interface, not because they have trust in the service. At the second step, the users would choose their favorite services while they use the new services. The user's trust and brand equity would be developed at this step, and the users would choose to use the service because they have trust in the service with high brand equity. There are two opposite academic areas of debate in the m-business and HCI (Human–Computer Interaction) fields. The first is that the UX (User eXperience) features—an extended definition of UI—in the wired Internet environment may be far from the required features in a mobile environment; the second is that the UX features in the wired Internet environment should be adopted in the mobile environments for portal sites to succeed in the mobile market. Therefore, developing the UI/UX components so that they are suitable for mobile environments will be an important process for portal sites because the portals would still be powerful as effective content distributors based on their very large user scale and their UX design (Kang 2008; Cho 2009). According to the results, site quality including the design quality of portal sites can affect the user's trust in the mobile services of the portal sites directly and can affect the user's intention to use the mobile portal services under certain conditions.

Practically, it can be difficult for managers of portal sites to predict the desirable advantages of their current reputations in the wired network environment. Diverse

portal sites should compete with potential and current competitors in the smartphone era. The results of this study suggest that portal sites should focus on designing and developing more usable sites with high-quality UI components—convenient menu navigation, a proper UI design, and usable content rather depend on their current position as the leading companies in the wired Internet environment. The site equity of portal sites in wired environments will not be enhanced in the mobile environment without any effort to provide a more diverse and useful range of unique mobile services than their competitors, as brand equity may not significantly result in the user's intention to use the mobile portal services without the user experience. Therefore, managers should remember that a site's current brand equity will never motivate users to use their mobile services without the user's trust and experience in the mobile services, and they should not expect to coast on their current brand value (or equity) as a market leader in the wired environment in the mobile markets. As a new entry, managers should concentrate on developing and maintaining usable service quality—especially an easier and more usable service UI. Gröne et al. (2009) explained that branded mobile portals can build interactive relationships with mobile users because the portals can identify the users in terms of their personal identity, behavior, and other diverse information including geographic and social features. Portals should gather and use this important relationship and information to increase the user's trust in their mobile services.

5 Limitations and suggestions for future studies

Although this study is one of the earlier studies to concentrate on the factors related to smartphone user intentions to use the mobile portal services, this study has several limitations of concern for those who undertake future studies in this area.

First, although according to Chin, the sample size is sufficient for the analysis (218 replies were analyzed in this study), the result can differ under different conditions. For example, around 60 % of all participants were male, more than 80 % were aged from 20 to 39, and more than 60 % were students and office workers when the survey was conducted. Moreover, the penetration rate of smartphones was quite lower compared to the present rate.

Second, there remain many unclear issues, and the smartphone-related business environment may not be a stable market environment, despite the fact Korea has shown relatively rapid growth in the smartphone-related business area. There can be extraordinary, overheated, and distorted expectations and estimations for smartphone-related markets, whereas there is still not a sufficient academic background and body of literature on smartphone-related issues.

Third, this study surveyed and analyzed the answers of users of the big three portals of Naver (naver.com), Daum (daum.net), and Nate (both cyworld.com and nate.com), which possess more than 90 % of the entire online advertising market share of Internet business in Korea. These three portals are now positioned respectively as the first, the second, and the third-ranked businesses among all Korean Internet services (Table 5). Although concentrating on the users of the three portal sites appears to be appropriate, it is possible that the users' levels of trust are

Table 5 U/Vs and P/Vs of internet portal services in Korea (October, 2010, Korean click)

Ranking	Service domain	U/V	%	P/V	%	Note
1	naver.com	31,120,038	7.20	14,674,775	18.76	Same service
2	daum.net	28,676,753	6.64	10,560,107	13.50	
3	cyworld.com	21,751,943	5.03	5,298,221	6.77	
4	nate.com	24,404,482	5.65	7,964,690	10.18	
17	google.co.kr	8,812,587	2.04	1,086,808	1.39	
26	google.com	6,722,625	1.56	805,453	1.03	

too strong because the sites already have strong user awareness and strong reputations.

Fourth, this study focuses on comparing the effects of the sites' brand equity and the sites' quality on user trust and intention to use the mobile services, although there are numerous other factors that affect trust and intention to use, such as the user's satisfaction and the level of social influence.

Fifth, there could be common method bias (CMB), as the survey data were from a single source and because all factors were measured with self-reports. There is much academic debate on the real effect of CMB. Doty and Glick (1998) explained that common method variance results in a 26 % bias in the observed relationships among constructs and that this level of bias may not invalidate research findings, while Podsakoff et al. (2003) showed a low level of concern about the effect of CMB.

Sixth, there may be business issues which were not addressed in this study—the differences in favored UI colors, applications and content, and menu navigation styles among countries, for instance, among diverse societies and among the different service types.

Seventh, the user's perceived risk, which was ignored in this study, can be analyzed in future research. In more detail, analyzing the effect of perceived risk on other portal sites with weaker reputations and lower user awareness can be considered in future studies.

Finally, it is expected that there are diverse moderating effects, such as the user's experience and/or preferences for mobile services and smartphone-compatible applications by mobile device manufacturers or mobile service providers, and that these are related to the user's intention to use. We suggest that these moderating effects need to be analyzed more concretely in future studies.

Acknowledgments This research was supported by the MKE (The Ministry of Knowledge Economy), Korea, under the ITRC (Information Technology Research Center) support program supervised by the NIPA (National IT Industry Promotion Agency) (NIPA-2012-H0301-12-1004).

References

Aaker D (1991) Managing brand equity: capitalizing on the value of a brand name. Free Press, New York
Aaker D (1996) Building strong brands. Free Press, New York

Aladwani AM, Palvia PC (2002) Developing and validating an instrument for measuring user-perceived web quality. Inf Manag 39(6):467–476
Baik JB, Baek JW, Hong BS, Lee SH, Choi MH (2010) Analysis on socioeconomic effects of iPhone. Digieco Research Report (written in Korean)
Barnes S, Vidgen R (2000) WebQual: an exploration of website quality. In: Proceedings of European conference on information systems (ECIS), Paper 74
Cao M, Zhang Q, Seydel J (2005) B2C e-commerce web site quality: an empirical examination. Ind Manag Data Syst 105(5):645–661
Chae M, Kim J (2003) What's so different about the mobile Internet? Commun ACM 46(12):240–247
Chang HH, Chen SW (2008) The impact of online store environment cues on purchase intention. Online Inf Rev 32(6):818–841
Chin WW (1998) The partial least squares approach for structural equation modeling. In: Marcouldies GA (ed) Modern methods for business research. Lawrence Erlbaum Associates, Hillsdale, pp 295–336
Chiu CM, Hsu MH, Sun SY, Lin TC, Sun PC (2005) Usability, quality, value and e-learning continuance decisions. Computers & Education 45(4):399–416
Cho SW (2009) Mobile internet—change the rule of the game. Digieco Research Report, http://www.digieco.co.kr/KTFront/report/report_strategy_view.action?board_id=strategy&board_seq=1952&sort_order=new (written in Korean)
Choe YC, Hwang DR, Kim MY, Moon JH (2007) Product heterogeneity: moderating effect on online consumer behavior. In: Proceedings of the 40th Hawaii International Conference on System Sciences
Davis D (2008) Branding a B2B service: does a brand differentiate a logistics service provider? Ind Mark Manag 37(2):218–227
Davis L, Wang S, Lindridge A (2008) Culture influences on emotional responses to on-line store atmospheric cues. J Bus Res 61(8):806–812
Doty DH, Glick WH (1998) Common methods bias: does common methods variance really bias results? Organ Res Methods 1(4):374–406
Eroglu SA, Machleit KA, Davis LM (2001) Atmospheric qualities of online retailing: a conceptual model and implications. J Bus Res 54(2):177–184
Eroglu SA, Machleit KA, Davis LM (2003) Empirical testing of a model of online store atmospherics and shopper responses. Psychol Mark 20(2):139–150
Feldwick P (1996) Do we really need brand equity? J Brand Manag 4(1):9–28
Fornell C, Larcker DF (1981) Evaluating structural equation models with unobservable variables and measurement error. J Mark Res 18:39–50
Funk JL (2009) The emerging value network in the mobile phone industry: the case of Japan and its implications for the rest of the world. Telecommun Policy 33:4–18
Gartner (2011) Gartner says sales of mobile devices in second quarter of 2011 grew 16.5 percent year-on-year; Smartphone Sales Grew 74 Percent, http://www.gartner.com/it/page.jsp?id=1764714
Gefen D (2000) e-Commerce: the role of familiarity and trust. OMEGA Int J Manag Sci 28(6):725–737
Gefen D, Karahanna E, Straub DW (2003) Trust and TAM in online shopping: an integrated model. MIS Q 27(1):51–90
Gefen D, Straub DW (2004) Consumer trust in B2C e-commerce and the importance of social presence: experiments in e-products and e-services. Omega 32(6):407–424
Gröne F, Friedrich R, Hölbling K, Peterson M (2009) The March of mobile marketing: new chances for consumer companies, new opportunities for mobile operators. J Adv Res 49(1):54–61
Gudergan SP, Ringle CM, Wende S, Will A (2007)Confirmatory tetrad analysis in PLS path modeling. J Bus Res 61:1238–1249
Henseler J, Ringle CM, Sinkovics RR (2009) The use of partial least squares path modeling in international marketing. Adv Int Mark 20:277–320
Hoyer WD, Brown SP (1990) Effects of awareness on choice for a common repeat-purchase product. J Consumer Res 17(2):141–148
Hulland J (1999) Use of partial least squares (PLS) in strategic management research: a review of four recent studies. Strateg Manag J 20(2):195–204
Jalilvand MR, Samiei N, Mahdavinia SH (2011) The effect of brand equity components on purchase intention: an application of Aaker's model in the automobile industry. Int Bus Manag 2(2):149–158
Kang HJ (2008) Market changes and expectations on the era of mobile web 2.0, SERI Issue Paper (written in Korean)

KCC (Korea Communications Commission) (2010) The second analysis report on the smartphone usage in Korea. Available at: http://www.itstat.go.kr/board/boardDetailView.htm?identifier=02-008-110106-000002&pub_code= (written in Korean)
Keller KL (1993) Conceptualizing, measuring, and managing customer-based brand equity. J Mark 57(January):1–22
Kiernan NE, Kiernan M, Oyler MA, Gilles C (2005) Is a web survey as effective as a mail survey? a field experiment among computer users. Am J Eval 26(2):245–252
Kim W (2009) Mobile WiMax, the leader of the mobile internet era (WiMax report). IEEE Commun Mag 47(6):10–12
Kim KH, Jeon BJ, Jung HS, Lu W, Jones J (2011) Effective employment brand equity through sustainable competitive advantage, marketing strategy, and corporate image. J Bus Res 64(11):1207–1211
KISA (Korean Internet & Security Agency) (2010) Korea internet white paper
Lee GG, Lin HF (2005) Customer perceptions of e-service quality in online shopping. In J Ret Distrib Manag 33(2):161–176
Lee YC (2011) m-Brand loyalty and post-adoption variations for the mobile data services: gender differences. Comput Human Behav 27(6):2364–2371
Li H, Liu Y, Suomi R (2009) Measurement of e-service quality: an empirical study on online travel service. In: Proceedings of European conference on information systems (ECIS), Paper 191
Liebermann Y, Stashevsky S (2009) Determinants of online shopping: examination of an early-stage online market. Can J Adm Sci 26(4):316–331
Liu C, Arnett KP (2000) Exploring the factors associated with web site success in the context of electronic commerce. Info & Manag, vol 38, pp 23–33
Lobo D, Kaskaloglu K, Fox H, Srisangkhajorn T (2011a) A synergic approach to web usability for smartphones. In: Proceedings of 2011 international conference on information and electronics engineering, IPCSIT, vol 6, pp 65–69
Lobo D, Kaskaloglu K, Kim CY, Herbert S (2011b) Web usability guidelines for smartphones: a synergic approach. Int J Inf Electron Eng 1(1):33–37
Loiacono ET, Chen DQ, Goodhue DL (2002) WebQual revisited: predicting the intent to reuse a web site. In: Proceedings of Eighth Americas conference on information systems, pp 301–309
Lowry PB, Vance A, Moody G, Beckman B, Read A (2008) Explaining and predicting the impact of branding alliances and web site quality on initial consumer trust of e-commerce web sites. J Manag Inf Syst 24(4):199–224
Mich L, Franch M, Gaio L (2003) Evaluating and designing web site quality. IEEE Multime'd J 10(1):34–43
Moon JW, Kim YG (2001) Extending the TAM for a world-wide-web context. Inf Manag 38(4):217–230
Moradi H, Zarei A (2011) The impact of brand equity on purchase intention and brand preference—the moderating effects of country of origin image. Aust J Basic Appl Sci 5(3):539–545
Neal WD (1999) Satisfaction is nice, but value drivers loyalty. Mark Res, vol 99, pp 21–23
Nunnally JC (1978) Psychometric theory, 2nd edn. McGraw-Hill, New York
Palmer JW (2002) Web site usability, design, and performance metrics. Inf Syst Res 13(2):151–167
Parasuraman A, Zeithaml VAM, Berry LL (1988) ERVQUAL: a multiple-item scale for measuring consumer perceptions of service quality. J Retail 64(1):12–40
Park CS, Srinivasan V (1994) A survey-based method for measuring and understanding brand equity and its extendibility. J Mark Res 31(2):271–288
Podsakoff PM, Mackenzie SB, Lee JY, Podsakoff NP (2003) Common method biases in behavioral research: a critical review of the literature and recommended remedies. J Appl Psychol 88(5):879–903
Ringle CM, Wende S, Will S (2005) SmartPLS 2.0 (M3) beta. Hamburg, http://www.smartpls.de
Romaniuk J, Sharp B (2003) Measuring brand perceptions: testing quantity and quality. J Target Meas Anal Mark 11(3):218–229
Roy MC, Dewit C, Aubert BA (2001) The impact of interface usability on trust in web retailers. Int Res 11(5):388–398
Sabel CF (1993) Studied trust: building new forms of cooperation in a volatile economy. Hum Relat 46(9):1133–1170
Swan JE, Bowers MR, Richardson LD (1999) Customer trust in the salesperson: an integrative review and meta-analysis of the empirical literature. J Bus Res 44(2):93–107
Tenenhaus M, Pages J, Ambroisine L, Guinot C (2005) PLS methodology to study relationships between hedonic judgements and product characteristics. Food Q Prefer 16(4):315–325

The Korea Times Aug. 21st (2012) Korean snartphone users to top 30 million. Available at http://www.koreatimes.co.kr/www/news/biz/2012/09/123_117820.html (visited Sep 14 2012)
Tsiotsou R (2005) Perceived quality levels and their relation to involvement, satisfaction, and purchase intentions. Mark Bull 16, Research Note 4
Urban GL, Sultan F, Qualls WT (2000) Placing trust at the center of your internet strategy. Sloan Manag Rev 42(1):39–48
Walczuch R, Lundgren H (2004) Psychological antecedents of institution-based consumer trust in e-retailing. Inf & Manag 42(1):159–177
Wang SJ (2001) Cue-based trust in an online shopping environment: conceptualization and propositions. http://www.sbaer.uca.edu/research/sma/2001/98.pdf
Wood L (2000) Brands, and brand equity: definition and management. Manag Decis 38(9):662–669
Yoo CW, Kim YJ, Moon JH, Choe YC (2008) The effect of herding behavior and perceived usefulness on intention to purchase e-learning content: comparison analysis by purchase experience. Asia Pacific J Inf Syst 18(4):105–130 (written in Korean)