

The influence of national culture on the attitude towards mobile recommender systems

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3 Abstract

4 This study aimed to identify factors that influence user attitudes toward mobile
5 recommender systems and to examine how these factors interact with cultural values to
6 affect attitudes toward this technology. Based on the theory of reasoned action, belief
7 factors for mobile recommender systems are identified in three dimensions: functional,
8 contextual, and social. Hypotheses explaining different impacts of cultural values on
9 the factors affecting attitudes were also proposed. The research model was tested
10 based on data collected in China, South Korea, and the United Kingdom. Findings
11 indicate that functional and social factors have significant impacts on user attitudes
12 towards mobile recommender systems. The relationships between belief factors and
13 attitudes are moderated by two cultural values: collectivism and uncertainty avoidance.
14 The theoretical and practical implications of applying theory of reasoned action and
15 innovation diffusion theory to explain the adoption of new technologies in societies
16 with different cultures is also discussed.

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18 *Keywords:* mobile recommender system; theory of reasoned action; user attitude; cross-
19 cultural research.

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1. Introduction

Forecasting the adoption of technology in different cultural contexts is pivotal for the success of any organization. As technology grows, presenting users with enhanced features, uncertainty exists as to how such changes will affect consumer attitudes toward these new systems. In particular, consumers with different values and life styles might evaluate new technological features differently and, therefore, develop different attitudes. Extant literature provides abundant evidence that culture influences technological usage [1-5]. However, while these studies emphasize the importance of culture in understanding technology adoption, previous studies have not made clear the effect culture has on user attitudes toward new technologies. The study presented in this paper sought to reveal how cultural values and belief factors intervene in the developmental process relating to user attitudes toward mobile recommender systems (MRSs).

One group of scholars has argued that culture needs to be considered to fully understand how and why societies adopt new innovative technologies. Some scholars have noted that TAM, which was developed to explain the acceptance of systems in USA, is not valid when applied to other cultures [5]. Herbig and Palumbo [3] argued that the diffusion of innovation was different in Japan and the USA because of the differences in cultural attributes between the two countries. Al-Gahtani et al. [1] found that the Unified Theory of Acceptance and Use of Technology (UTAUT) [6], tested in North America, needed to be adjusted for Saudi Arabian culture, because the moderating effect of age and experience was negative in certain cause-effect relationships. Hwang [7] tested whether uncertainty avoidance, an important cultural variable, had a positive relationship with the perceived ease of use in enterprise resource planning (ERP).

Yet, in spite of these initial studies, how other factors differentially shape user attitudes toward new technologies in different cultural contexts has remained largely unexplored. For example, perceived usefulness and social influence are most widely referenced in the

1 literature as important factors that affect user attitude. However, perceptions of new
2 technology and interpreting social influence are both psychological processes in which an
3 individual's cultural values play a role [8]. It may be inferred that an individual who highly
4 values the group norm could be easily affected by the opinions of others therefore social
5 influence would play a more significant role in a culture in which group norms are highly
6 respected. Identifying the moderating role of culture in user attitudes toward new technologies
7 can thus help predict how new technologies will be received.

8 This paper aims to reveal the moderating role of culture in the relationships between belief
9 factors and user attitude toward MRSs. User attitude is used in this paper for the following
10 reasons. Firstly, user attitude is one of the important factors that decide the adoption of
11 innovative technologies in multiple theoretical frameworks. Lucas[9] found that attitudes of
12 systems staff toward a computer's potential predicted its use. Karahanna et al.[10] showed
13 that cultural attitudes affected IT adoption and explored how this effect was modified over
14 time.

15 Understanding how culture plays a role in shaping user attitude toward new technology has
16 wider implications for multiple theoretical frameworks seeking to understand and explain the
17 adoption of new technologies. Secondly, attitudes are one of the most widely studied areas in
18 social psychological domains involving cross-cultural and organizational factors [11]. The
19 adoption of new technologies is also a psychological process in which attitude plays a major
20 role. Thus, the findings of this study are important in interpreting the findings of existing
21 studies in a broader context, including organizational and psychological research disciplines.
22 IT researchers are similarly interested in the relationship between culture and information
23 technologies at the organizational and national levels [12]. Some studies have used attitude as
24 a dependent variable and have shown the influences of diverse constructs influenced by
25 national cultural values of culture on IT adoption and use [13-15].

26 Focusing on MRS as the target technology is timely, because it is a relatively new technology,
27 and is experiencing gradual global expansion as access to diverse applications and content

1 services become more important to current users of mobile devices. Unlike desktop or laptop
2 computers, mobile devices have limited features for navigating the Internet, including small
3 display, inconvenient keypad, and short battery life [16, 17]. Thus, the provision of
4 personalized services to mobile users, which reduces the need to navigate with mobile
5 devices, has increased in importance.

6 This paper first discusses factors influencing user attitudes toward MRSs and then examines
7 the moderating role of cultural values on these influencing factors. We address following
8 research questions.

9 (1) What features (belief factors) of MRSs are important to user attitudes toward the systems?

10 (2) Do cultural differences affect the cause-effect relationships between the belief factors and
11 attitude toward MRSs?

12 To examine the effects of cultural factors, we collect data from the UK, China, and South
13 Korea. We anticipate that an examination of these overlooked factors will help academics
14 understand how personalized systems are accepted by mobile users, and will assist
15 practitioners in strategically focusing resources to increase market share. This study also
16 sheds light on effective methods for predicting the effects of emerging mobile technologies on
17 social change.

18 This paper is organized as follows. Section 2 provides a review of existing studies on the
19 acceptance of recommender and mobile data services, and the role of culture in that process.
20 Section 3 presents acceptance factors for MRSs and hypotheses about the moderating role of
21 cultures on acceptance factors. Section 4 details the method used to test the research model,
22 and section 5 presents results. Section 6 discusses the theoretical and practical implications of
23 the findings, and section 7 presents conclusions.

24

25 **2. Conceptual Background**

26 *2.1 Mobile Recommender Systems*

1 Recommender systems provide recommendations to a user by a combined analysis of three
2 factors: a profile of the user’s preferences or history, profiles of other similar users, and/or an
3 analysis of alternative recommended content [18-22]. MRSs are applications, or the features
4 of applications, that provide personalized recommendations to mobile device users. MRSs can
5 exploit two peculiar characteristics of mobile data services: location awareness and ubiquity
6 [23]. The evolution and advancement of mobile computing have enabled location-based
7 recommender systems [24] that differ from traditional online web recommendations. A key
8 factor contributing to the complexity of MRSs, compared with that of other recommendation
9 systems, is its interface design, given that the small screens of mobile devices render the
10 presentation of sufficient information difficult, compared with the comparative ease of the
11 presentation of such information via desktop or laptop computer [25]. Moreover, fewer input
12 keys and less advanced browsers with limited functionality also render mobile information
13 services less user friendly [26, 27].

14 Figure 1 presents an example of MRSs available on smart phones. “Applicious” is a mobile
15 app that provides app recommendations based on previous app purchases and use patterns
16 already present on smart phones (Fig. 1-a). “Genius Playlist” creates music playlists with
17 songs similar to the song used to originate the list (Fig. 1-b). “PrkL8” is a content discovery
18 engine. Users can rate web pages suggested by PrkL8 by touching two buttons on the screen.
19 Increased use of these buttons leads to better suggestions (Fig. 1-c). Many apps which are
20 used on smart phones have recommendation features. These recommender systems can
21 increase the duration of user visits to sites by providing novel and relevant suggestions [28-
22 32]. Recommender systems are popular and widely used [33, 34] by online stores such as
23 Amazon.com and Netflix.com. When MRSs provide more proper recommendations, it affects
24 user attitude positively.

25

26 [Fig. 1. Mobile recommender systems]

27

1 2.2 Attitudes toward Mobile Data Services and Web-based Recommender Systems

2 Several theoretical frameworks have been used to explain the adoption and diffusion of new
3 technologies in organizations and societies. The theory of reasoned action (TRA) [35] is one
4 of the fundamental theoretical frameworks to explain human behaviors in general. In TRA,
5 attitude affects behavioural intention, which affects use behaviour. The overall strength of the
6 attitude-intention-behaviour relationship, however, depends in large part on the degree of
7 correspondence between attitudinal and behavioural constructs. TAM [36], based on TRA, is
8 one of the most widely used frameworks to explain the acceptance of wide spectrum of
9 technologies. TAM2 [6] extends TAM by adding social norm construct to increase its
10 explanation power for heterogeneous technologies and user groups. UTAUT [6] integrates
11 multiple theoretical frameworks to increase the explanation power of the acceptance and use
12 behaviour of information technologies. On the other hand, innovation diffusion theory (IDT)
13 [37] explains how innovative idea and technologies are spread in different cultural societies.
14 IDT originally was developed to explain the diffusion of innovative technologies in macro
15 level while the theoretical frameworks explained above explain the adoption of the
16 technologies in individual level. However, in IDT, attitude is the enabler of innovative
17 technologies adoption, and IDT literature has identified general perceptions of product or
18 service adoption that can be identified as belief factors in the construction of user attitude [38].
19 As the aim of the paper is to reveal how culture influences user attitude toward MRSs, using
20 TRA and IDT as the grounding theoretical frameworks is appropriate. Understanding how
21 belief factors affect attitudes provides insight into the adoption in individual level and macro
22 level.

23 On the other hand, TRA was used to explain the adoption of mobile marketing systems [39].
24 This framework confirmed the validity of TRA for explaining consumer behavior in the area
25 of mobile marketing and identified has investigated factors that contributed to attitudes
26 towards mobile data services norms. Social norms had only a slight direct influence on
27 behavioral intentions, but were strong indirect determinants of such intentions via personal

1 attitudes. Other studies have developed constructs and concepts to be used in research on
2 mobile data services and have investigated factors that contributed to attitudes towards mobile
3 data services [40, 41].

4 Findings must be carefully interpreted when the research model is used to examine the
5 adoption of MRSs, due to differences in the functional attributes of the two systems. Unlike
6 general mobile marketing systems, MRSs have recommendation functionality and, therefore,
7 different factors need to be considered in explaining user attitudes toward MRSs. MRSs
8 usually deliver recommendations based on “nearest neighbor” preferences of users. These
9 aspects are distinct from traditional mobile data services [20, 42]. When customers want to
10 get recommended information anytime and anywhere, MRSs need to provide qualified results
11 to users with user preference, locations, and other preferences, whereas traditional mobile
12 data services provide information based only on explicit data or common knowledge with the
13 user search. Thus, previous antecedents of mobile data services do not cover user attitude, nor
14 do they evaluate MRSs considering social influences. Investigation into the specific
15 constructs and factors related to the users’ attitude is thus required.

16 On the other hand, a few studies have identified constructs related to user attitude toward web
17 based recommender systems[19, 43, 44], and perceived usefulness is one of the most
18 commonly used constructs in that literature [20]. It has been reported that users usually
19 perceive e-Commerce sites that provide personalized recommendations to be more useful than
20 those that do not [45]. When recommender systems provide more accurate news
21 recommendations, user satisfaction has been shown to increase [42]. Users’ initial level of
22 trust in the recommendation results increased when results were accompanied by justification
23 for outcomes [29].

24 Accessibility also affected perceived ease of use for mobile data services [46]. Previous
25 studies have suggested that perceived usefulness is the most significant factor in the adoption
26 of mobile data services [40, 47, 48]. Thus, mobile data services should provide functional
27 quality and emotional value to users [49]. Complexity of the technology has also been

1 suggested as another antecedent for the adoption of mobile data services [50]. Table 1
2 presents list studies based on user attitudes toward adoption of mobile data services.

3

4 [Table 1.Studies on adoption factors of mobile data services]

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6 *2.3 The Impact of National Culture on the Attitude of Mobile Data Services and* 7 *Recommender Systems*

8 The culture has been used with different meanings in many disciplines [51]. Among the
9 definitions of culture, this paper adopts Hofstede's definition as it has been most widely
10 adopted in cultural research in information technologies. Hofstede [48] defines the culture as
11 a group's shared set of distinct basic values which are formed and retained based on their
12 national specifics. He classified the basic values into five cultural dimensions including
13 uncertainty avoidance, individualism/collectivism, masculinity, time orientation, and power
14 distance.

15 Among those five dimensions, this study focuses on collectivism and uncertainty avoidance
16 (UA) as the two dimensions are closely related with the functionality and the purpose of
17 MRSs. Other dimensions such as masculinity, time orientation and power distance have been
18 used to explain organizational cultures on company and team. Therefore we did not use those
19 dimension by considering user attitude for MRS usage [4, 51, 52]. Collectivism is considered
20 as most of the recommendation functionality is using collaborative recommendation
21 algorithm which uses preferences of a group of people who have similar age, occupations,
22 ethnic background and so on. On the other hand, UA is related with the purpose of MRSs as
23 people use MRSs to reduce alternatives therefore to reduce uncertainty in making purchase
24 decision. Collectivism is defined as the tendency to, and degree to which, people look after
25 themselves and their immediate group solely. Especially, collectivism has been considered to
26 be the important factor appearing cultural differences in previous studies [1, 8, 53]. In
27 addition, UA is defined as the extent to which people feel uncomfortable, or in some cases

1 threatened, by ambiguous situations. Unstructured situations are different from the norm: they
2 are often described as novel, unknown, or surprising, UA is the effort to minimize the
3 possibility of these situations by enacting strict laws, rules, or safety and security measures.
4 UA is also reinforced by philosophical and religious belief in absolute truth. People with high
5 UA tend to minimize the possibility of uncertain situations by using MRSs that use filters to
6 reduce alternative options [5, 54].

7 Turel et al. [55] examined the fitness of the structural model for user satisfaction with mobile
8 data services, based on the American Customer Satisfaction Index for four countries: Canada,
9 Singapore, Israel, and Finland. These four countries were selected due to their significant
10 differences with respect to Hofstede's cultural dimensions. Lee et al. [47] reported that the
11 four cultural dimensions (UA, individualism, context, and time perception) affected the
12 antecedents (perceived usefulness, perceived enjoyment, perceived ease of use, and perceived
13 monetary value) of user satisfaction with mobile internet. In addition to variables related to
14 cultural differences, and personal innovativeness [50], the "big five" traits (extraversion,
15 agreeableness, conscientiousness, emotional stability, creativity), cognitive complexity, and
16 cultural influences have also been suggested as personal factors [56, 57]. Table 2 summarizes
17 studies related to culture, mobile environments, and mobile data services.

18

19 [Table 2. Cultural factors in the adoption of mobile technologies]

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21 As presented in this discussion, few studies have undertaken the task of explaining the role of
22 cultural differences in new technology adoption, or investigated the interactions between
23 cultural differences and personalized recommender systems. Thus, we have tried to identify
24 the effects of cultural differences on attitudes towards MRSs. We investigated the effects of
25 cultural factors on adopting MRSs by incorporating important determinants related to the
26 adoption of mobile data services and recommender systems identified by previous studies.

1 On the other hand, in collectivist societies, people are trained from birth to integrate into
2 strong, cohesive in-groups, often extended families, who protect them in exchange for
3 unquestioning loyalty. In these societies, the collectivism dimension is needed because users
4 of MRSs might more readily consider the opinion of others when making purchase decisions
5 and comply more with the general trend of society.

6

7 *3.1 Beliefs that affect Attitudes toward MRSs*

8 The functionality of mobile services is very important in that many users want to use these
9 services in innovative ways [58]. Many studies have revealed that ease of use is a major factor
10 leading to favorable attitudes toward information systems [36, 48, 49, 58]. Given the
11 difficulty of navigating the web using a mobile device, this paper argues that perceived ease
12 of use is becoming more important in the mobile computing context. Furthermore, using a
13 recommendation service requires a certain level of user input to identify preference data. We
14 hypothesized that user attitude toward an MRS would become more favorable when that MRS
15 was easy to use, and when the user felt comfortable using it. This is because user attitude
16 refers to the degree to which an individual reacts favorably or unfavorably in relation to an
17 object or behavior [59]. As a result, the first hypothesis is derived as follows:

18

19 *H1: Perceived ease of use will positively influence consumer attitudes toward MRSs.*

20

21 On the other hand, quality of the information service is frequently cited as a major factor that
22 influences attitudes toward information services [20, 55]. Given that the recommendations
23 forwarded to a mobile user are inferred on the basis of uncertain data, the accuracy of
24 recommendation services is usually worse than that of other information services, such as
25 emails, web browsing, and news feeds. The perceived usefulness of such systems is
26 improved when consumers believe that the decision-making processes and outcomes of

1 recommender systems are similar to their own [43]. In a MRS context, PRQ (Perceived
2 Recommendation Quality) is considered as perceived usefulness of MRSs. When users want
3 to search for restaurants to visit using their mobile device, they might prefer restaurants nearer
4 to their current location over those more distant. Thus, once users receive high PRQ from
5 MRS, they tend to have positive attitudes toward MRS. Thus, PRQ is becoming more
6 important in that relevant recommendations can be expected to encourage favorable attitudes
7 towards the service.

8

9 *H2: Perceived recommendation quality will be positively related to attitudes toward MRSs.*

10

11 Perceived enjoyment is defined as “the extent to which the activity of using a specific system
12 is perceived to be enjoyable in its own right, aside from any performance consequences
13 resulting from system use” [60]. Some MRSs have entertainment features such as generating
14 personalized playlists (Apple Genius Mixes) and categorizing users’ music preferences
15 (Music Aurora Pro). “Last.fm” generates music playlists based on target users’ preferences
16 and other users’ listening histories. These recommendations can guide the user to new music.
17 Although accuracy is one of the most important targets of recommendation algorithms,
18 novelty that can bring new products or services to the attention of target users also constitutes
19 an important measure of the performance of recommendation algorithms given that this can
20 provide users with an enjoyable experience [18]. As a user accumulates experiences with a
21 recommender system, the user may enjoy using its functions, and have more favorable
22 feelings toward the service in general [47, 61].

23

24 *H3: Perceived enjoyment will positively influence consumer attitudes toward MRSs.*

25

1 The second dimension concerned with the context of the service is use. Mobility refers to the
2 ability to access services while moving using various devices such as laptops, smart phones,
3 and mobile phones [62]. The benefit of mobile services is that users are able to have access to
4 services at any time or place, thereby overcoming the traditional barriers of access to these
5 services. Users have typically used mobile services in unstable environments (low usability)
6 and in various use contexts such as traveling via subway, looking for unfamiliar restaurants or
7 walking in certain places. It can be inferred that the more users appreciate the value of
8 mobility, the more the users will value the MRS [48]. Thus, the following hypothesis is
9 derived:

10

11 *H4: Mobility will positively influence consumer attitudes toward MRSs.*

12

13 The third dimension is concerned with social influences that are defined as the way in which
14 the opinions and attitudes of one or more persons affect those of others [63]. Various studies
15 including TRA and TPB, have suggested that social influences affect user attitudes towards
16 MRSs by serving as subjective norms [35, 41, 59]. The term subjective norms refers to
17 individual perceptions of the social pressure to perform a particular behavior, such as using
18 MRSs [64]. Although some variables, such as expectancy or fascinating condition, are
19 important aspects of system usages, MRSs need to be especially focused on social norms
20 because MRSs generate recommendations using similar user preferences. Therefore, users
21 consider social relationships or interactions on MRSs more than expectancy or fascinating
22 conditions. This external or interpersonal influence includes reputation or word-of-mouth
23 among users. Many users are able to access recommender systems on mobile devices, and
24 friends, colleagues, and similar users can positively influence their attitudes [40, 57].

25

26 *H5: Social influence will positively influence consumer attitudes toward MRSs.*

1

2 *3.2 The fit of cultural technology to MRSs*

3 According to the culture-technology fit theory [47], user perceptions of an IT system are
4 dependent on their individual cultural characteristics. The majority of recommender systems
5 use user characteristics, product features, and the behavior of similar users as input for
6 preparing recommendations [65]. User characteristics and behavior reflect the impact of
7 culture on recommender systems. In the context of intracultural similarities and differences,
8 the majority of users in a given culture can be less expressive in their preferences and yet
9 receive recommendations based on the greater expressiveness of others in the same culture.
10 Indeed, the cultural profiles of users shape users' views of the world. For example, users from
11 a particular cultural group tended to notice certain information and to ignore other
12 information [66], resulting in differences in ratings. These differences, created by diverse
13 cultural lenses, were used to interpret the importance of MRS features and thus affected the
14 criteria used to determine whether to adopt an MRS.

15 As collectivism enables individuals to reach more definite decisions via social interactions, it
16 can strengthen the relationship between social influence and user attitudes [47]. Highly
17 hierarchical and collectivist cultures, such as Korea and Japan, emphasize the
18 interdependence, sociability, and equality of in-group members [54]. These collectivists
19 construe themselves as interdependent with others and desire harmony within their groups.

20 Social influence enables users to consider information and reach decisions with others [64].
21 An individual may respond to opinions from referral sources in the context of social pressure
22 to homogenize attitudes. Indeed, social influence is related to the characteristics of collective
23 groups that lead them to accept information from similar groups [40]. Mobile users usually
24 receive recommendations for MRSs from users with similar preferences. For example,
25 collaborative filtering recommends items based on the preference similarities of customers
26 because it automates the process by which the preferences of others generate

1 recommendations. Thus, we hypothesized that collectivists will be more affected than
2 individualists by social influence.

3

4 *H6: The positive effect of social influence on attitudes will be stronger in collectivist than in*
5 *individualistic users.*

6

7 Lee et al. [67] and Choi et al. [68] have suggested that UA affects the adoption of mobile
8 data services. Groups with high levels of UA exhibit a greater need to articulate technology,
9 detailed information, and clear decision-making rules [68]. These groups tend to avoid
10 uncertain situations by seeking stability and usual behaviors. Users with low TUA accept
11 uncertainty without much discomfort, take risks more readily than users high in TUA, and
12 tolerate different opinions and unfamiliar situations. However, users high in TUA have a
13 strong need to control environments and situations. Thus, individuals who exhibit high TUA
14 should place greater importance than those who exhibit low TUA on the quality of
15 recommendations. We hypothesized that perceptions of the quality of recommendations
16 would be more important to those high in TUA than to those low in TUA.

17

18 *H7: The positive impact of perceived recommendation quality on attitudes will be stronger in*
19 *users with higher TUA than in those with lower TUA.*

20

21 **4. Method**

22 We conducted online surveys in the UK, China, and South Korea to test the hypotheses. The
23 questionnaire consisted of 29 items rated on a 7-point Likert scale. Each item in the
24 questionnaire was derived from existing literature as described in Table 3. In particular, we
25 adopted the measurement items for TUA from Choi et al. [68] as they defined the items for
26 mobile commerce context therefore in line with the definition of TUA in this paper. This

1 study checked face validity and content validity by making face-to-face interviews with three
2 professors and fifteen Ph.D. students to evaluate the questionnaire validity before data
3 collection. The survey questions were developed in English in the beginning. One of the
4 authors working in the UK then had a focused group interviews with five Ph. D. students who
5 are working in IS research field. The focused group interview was to validate if all
6 interviewees have the common understanding on the questions to measure each construct.
7 Other two authors of the paper then translated the English questionnaire into Korean version.
8 The authors also had a focused group interview with two professors in Marketing research
9 field and five MSc students in IS field for the same reason. For Chinese questionnaire, a
10 Korean researcher in China had translated the Korean version into Chinese one. After that
11 translation, one Chinese professor and five graduate students in IS research field checked the
12 translated survey items to verify the meanings from original survey items. Finally, we asked
13 the Chinese professor to translate the Chinese questionnaire into English to make sure that the
14 translation process did not change the meanings of the questions.

15
16 [Table 3. Constructs and related studies]

17
18 This research involved 310 respondents from South Korea ('Smartphone café',
19 cafe.naver.com/bjphone), 105 from China (undergraduates and graduate school students), and
20 104 from the UK (Coolsmartphone Forum, <http://forum.coolsmartphone.com/>; and PC
21 Advisor Customer Forum, <http://www.pcadvisor.co.uk/forums/24/mobile/>). Participants were
22 recruited from smart phone user groups as described above in three countries in exchange for
23 a 10% chance of winning a U.S. \$10 gift card for the iTunes store. We selected smart phone
24 user groups which discussed the functions and issues on smart phones and shared their
25 personal experiences with smart phones. We posted article on the user groups to explain the
26 purpose of the survey and the incentive along with the URL of the survey web site. Before
27 responding to the survey, participants had to read a description and view pictures of mobile

1 recommender systems and push the check button to confirm that they understood the concept
2 of mobile recommender systems. If they did not push the check button, the survey was ended
3 without any further responses. Survey questions were presented in Korean, Chinese, and
4 English, respectively, in three countries. Korean and Chinese survey questions were translated
5 from English by professors and graduate students in each country. All participants voluntarily
6 participated in the online survey. Table 4 presents a summary of the descriptive statistics for
7 the participants.

8

9 Table 4. Descriptive statistics of participants

10

11 The data showed that 297 Korean (95.8%), 87 Chinese (82.9%), and 77 UK (74%)
12 respondents had experience using smart phones. The most frequently used smart-phone OS
13 was Apple iOS (Korean = 72.2%, Chinese = 42.9%, UK = 44.2%), and 196 respondents from
14 Korea (63.2%), 39 from China (37.1%), and 64 from the UK (64%) reported using
15 recommendation services on the mobile web. The most frequently used apps by respondents
16 from Korea and the UK related to entertainment, utilities, social networking, and music. On
17 the other hand, most Chinese participants used apps for entertainment, music, news, and
18 weather.

19 The questionnaires used in this study were reliable as evidenced by Cronbach's α values of at
20 least 0.7 for all dimensions. We also checked the statistical power based on Cohen (1998)
21 [69]. The number of total sample size was 92 and actual power was 0.804 while the number
22 of respondents was 297 in this study. After testing statistical power and exploratory factor
23 analysis, we confirmed the factors identified by checking the convergent and discriminant
24 validities with confirmatory factor analysis (CFA) using PLS software (smartPLS). After
25 identifying validity for constructs, we tested research model with multiple regression. In the
26 research model, we considered all items as reflective measures to test convergent and
27 discriminant validities for constructs. The use of a formative measure is well known for

1 producing misleading outcomes and for its weakness in model estimation [70, 71].
2 Convergent validity was evaluated using the criterion that construct reliability needed to
3 exceed 0.70 and that the average variance extracted (AVE) by each construct had to exceed
4 the variance due to measurement error for that construct (i.e., the AVE should exceed 0.50)
5 [72]. Table 5 shows a summary of the composite reliability and AVE according to these
6 criteria. The composite reliability for the data was 0.902–0.959 (i.e., much greater than 0.70).
7 Additionally, the AVE for the data ranged from 0.733 to 0.853, well above 0.5. These results
8 supported the adequate composite reliability and AVE of the data from the three countries.

9

10 Table 5. Scale properties of data

11

12 To check the discriminant validity of the data, we confirmed that the square root of each
13 construct's AVE was greater than the correlation of the construct with other latent variables
14 [73]. The results in Table 6 support the discriminant and convergent validity of the data set.

15 The extent of common method bias was evaluated through Harman's single-factor test [74].
16 All variables were loaded into a principal component factor analysis and the unrotated factor
17 solution conducted. The seven factors which have above 1 (Eigen value) were extracted.

18 Although one factor accounted for 38% of the total variance, it was not concluded that neither
19 a single factor emerged from the factor analysis or one general factor accounted for the
20 majority of the covariance among the measures [74].

21 [Table 6. Correlations matrix]

22

23 **5. Results**

24 Table 7 shows the results of the regression analysis for all participants with respect to the
25 proposed model. As shown in the table, H1, H2, H3 and H5 were accepted indicating that all
26 the identified factors except mobility had positive effects on attitudes toward MRSs. In

1 particular, social influence (coefficient 0.275, $p < 0.01$), perceived enjoyment (coefficient
2 0.272, $p < 0.01$), and perceived quality of recommendation (coefficient 0.258, $p < 0.01$) exerted
3 stronger effects than ease of use (coefficient 0.091, $p < 0.05$).

4 H4, which concerned the impact of mobility on attitudes, was not supported in that its t-value
5 was 1.968 and significance was set at 0.05.

6

7 [Table 7. Regression analysis results for the proposed research model]

8

9 To test H6-H7, the moderating effects of collectivism and TUA were examined. The
10 moderating effect is the result of qualitative or quantitative variables, which affect the
11 direction or strength of the relationship between independent and dependent variables [75].
12 Dependent variables in a moderating model are determined through the interaction between
13 the independent variable and moderator. In particular, this model shows how the size of
14 interacting effect is increased, as well as whether the interaction with the moderator was
15 positive or negative. Thus, the path coefficient can be increased through an independent
16 variable * moderator [76-78].

17

18 [Table 8. Moderating effects of collectivism and TUA]

19

20 Table 8 presents confirmation that collectivism (COLL) fully moderated the positive
21 relationship between social influence (SI) and attitudes (ATT). Collectivism as an
22 independent variable was also significant at $p < 0.01$. Additionally, the interaction involving
23 SI*COLL was supported at $p = 0.01$. Thus, H6 was accepted.

24 Perceived recommendation quality (PRQ) was examined in terms of moderating effect of
25 TUA. The relationship between PRQ and ATT was partially moderated by TUA. Although,
26 TUA was not significant as an independent variable, the interaction (PRQ*UA) was

1 supported at $p < 0.05$. Thus, H7, which related to the moderating effect of UA, was supported.

2 Cultural differences among the participants from the three countries are shown in Tables 9
3 and 10. We conducted an ANOVA and a Duncan's multiple range test [79] as a *post hoc*
4 analysis for data from Korea, China and the UK, to identify the effects of collectivism and
5 TUA. As shown in the results from the Duncan test (table 10), Korea has a higher level of
6 collectivism than China or the UK, and China has a higher level of collectivism than the UK.
7 The values for TUA were greater in China and Korea than in the UK. The levels of TUA in
8 China and Korea were similar.

9

10 [Table 9. Cultural differences among Korea, China and the UK]

11

12 [Table 10. Cultural Differences among the three countries]

13

14 The results of the regression analyses for the three countries are presented in Table 11.
15 Enjoyment and social influence significantly affected the attitudes of respondents from all
16 three countries, whereas mobility did not have a significant effect on the attitude of those
17 from any of the countries. All variables in the functional dimension were significant among
18 Korean respondents. PEOU, PRQ and ENJOY were significant with path coefficients 0.122(p
19 < 0.01), 0.290 ($p < 0.05$), and 0.246 ($p < 0.01$), respectively. Among Chinese participants, PRQ
20 was not significant (0.150, $p = 0.058$), whereas the other function-related variables, PEOU
21 and ENJOY, showed significant effects on attitudes according to the path coefficient: 0.177 (p
22 < 0.05) and 0.298 ($p < 0.00$) respectively. In particular, enjoyment emerged as the most
23 important factor contributing to user attitude.

24 Among those from the UK, the significance of PEOU was not supported with a path
25 coefficient of 0.075 ($p > 0.1$), whereas the other functional variables, PRQ and ENJOY, were
26 significantly related to attitudes. According to the results obtained from respondents from the

1 three countries, it cannot be said that mobility is a significant belief factor that affects
2 attitudes toward MRSs, and the significance of PEOU and PRQ for attitude varied among
3 nations.

4

5 [Table 11. Regression analysis for Korea, China and the UK]

6

7 In addition, multi-group comparisons were conducted, through regressions with dummy
8 variables, in order to identify differences among the three models for each country (see Table
9 12). This study takes into account the presence of multi-group structure data, implying the
10 estimation of the same model for different groups. In the regression analysis framework, the
11 most widely adopted statistical methods for comparing regression models are based on the
12 comparison of the estimated model parameters [80, 81]. In the comparison between Korea
13 and China, all path coefficients proved to be not significantly different. For Korea and the UK,
14 the path coefficients for PEOU→ATT, ENJOY→ATT and SI→ATT were significantly
15 different between the two countries. For China and U.K, the path coefficients of Enjoy→ATT
16 and SI→ATT were significantly different between the two countries. Therefore, we identified
17 that each country had differences in their belief factors for MRSs.

18

19 [Table 12. Multi-group comparisons for Korea, China and the UK]

20

21 **6. Discussion**

22 The theoretical contribution of this paper is threefold.

23 Firstly, to the authors' knowledge, this paper is one of the first studies demonstrating the
24 moderating role of cultural variables for relationships between belief factors and attitudes

25 toward new technologies based on data from three culturally diverse countries. Though

26 existing studies have revealed that technology adoption models need cultural adjustments in

1 different countries [1, 5, 7], it was previously unknown how cultural values specifically
2 affected attitude-building processes. This study extends our understanding of how culture
3 plays a role in building attitudes toward new technologies by including the cultural dimension
4 in the research model. It also shows how cultural variables moderate the cause-effect
5 relationships between belief factors and attitudes toward new technologies. Collectivism
6 moderates the relationship between social influence and attitudes, just as TUA moderates the
7 relationship between perceived recommendation quality and attitudes. The findings thus
8 provide scholars with insights for applying TRA and IDT to explanations of new technology
9 adoption and diffusion. For TRA, belief factors that affect attitude toward new technologies
10 have different impacts on attitudes in different cultures. The role of culture in applying TRA
11 was one of the main research issues investigated by scholars. For example, Park [2000] found
12 that individual attitude had a stronger impact on behavior intention than social attitude in
13 Korea, while the opposite result was obtained in a US study [82]. The moderating role of
14 culture in the relationships between purchase intention and its causal factors was also reported
15 [83]. This paper is one of only a few empirical studies reporting that attitudes can be
16 differently shaped through different belief factors, depending on a society's dominant cultural
17 values. In Rogers' IDT, technology adopters are classified into five categories: innovators,
18 early adopters, the early majority, the late majority, and laggards. Adopters in each category
19 are reported to have different characteristics, including that of attitude [37].

20 While features of innovative technologies, including radicality and scope, affect the extent
21 and the speed of innovation diffusion [84], it was not fully understood why or how some new
22 technologies diffused in some countries quicker than in other countries. This study
23 demonstrated that collectivism and TUA moderate the relationships between belief factors
24 and attitudes and this may explain why some technologies more quickly diffuse in some
25 countries in which collectivism is more highly valued. For example, Korea is one country
26 where mobile and broadband technologies diffused faster than any other. This may be
27 explained by high collectivism that facilitates favorable attitudes toward technologies. The

1 cultural variables are also expected to affect the distribution of five categories of adopters,
2 and, therefore, generate different shapes of diffusion curves in these countries.

3
4 Secondly, this paper identified the belief factors that affect attitudes toward MRSs. MRSs
5 include multiple features stemming from two individual systems: a recommender system and
6 a mobile application. The findings from this study have confirmed that user attitudes toward
7 MRSs need to be understood by considering belief factors for the two individual systems.
8 Previous studies reported that perceived recommendation quality and perceived ease of use
9 influenced attitudes toward both mobile data services and recommender systems [23, 28, 42,
10 43]. These studies reported perceived ease of use as one of the most important contributors to
11 the adoption of recommender systems [6] and mobile data services [43]. The impact of
12 perceived ease of use on attitudes toward MRSs was confirmed in this study as well. In
13 particular, users in Korea and China, with a higher tendency for TUA, noted the importance
14 of this factor with respect to MRSs. Given that social influence has been noted as among the
15 most important factors for using mobile data services [40], it seems reasonable that this factor
16 would also be applicable to MRSs, which have inherited the general characteristics of mobile
17 data services. From the perspective of recommender systems, the concept of social presence,
18 the “psychological connection formed between a website and its visitors,” differed from
19 social influence, and was one of the most important factors influencing the adoption of MRSs
20 [19]. Although the data collected from the three countries supported the direct relationships
21 between all identified belief factors (with the exception of mobility), attitudes toward MRSs,
22 the perceived quality of recommendation, enjoyment from the functional dimension, and
23 social influence exerted the greatest impacts on attitude. Thus, we need to understand MRSs
24 in the context of mobile data services and recommender systems rather than as simply another
25 mobile data service or recommender system.

26
27 Thirdly, this study did not find a significant relationship between mobility and attitude toward

1 MRSs. Mobility or responsiveness has been considered to be one of the factors affecting
2 attitudes toward mobile data services [85, 86]. This may be explained by rapid advances in
3 mobile telecommunications technologies, which have now become a part of the everyday life
4 of users. Most wireless service companies in the three countries surveyed provided reliable
5 3G or 4G networks that offered appropriate speed for mobile web users. Thus, it may be
6 inferred that users may take it for granted that they have access to the Internet on the move.
7 Given that users of mobile data services need information according to their location while
8 they are moving, it is not surprising that users expressed concerns about the mobility of
9 mobile data services during the early days of mobile wireless networks. This assertion needs
10 to be verified in future studies.

11
12 The results of this study have the following practical implications.
13 Firstly, belief factors were found to have a different impact on attitudes toward MRSs
14 depending on the cultural characteristics of the target societies. This suggests that
15 practitioners should consider the impact of culture on the functional and social dimensions of
16 new technologies incorporating mobility and recommender systems. Countries differ with
17 regard to the optimal way in which recommendations should be displayed by MRSs. Service
18 providers can reflect users' characteristics, including collectivism and TUA, in their
19 recommendations and their explanations of those recommendations. For example, in countries
20 where collectivism is a cultural feature, like South Korea and China, it may be expected that
21 MRSs using collaborative filtering methods [87], which consider other similar users'
22 purchase decisions as well as the user's past purchasing history, could increase favorable
23 attitudes toward MRSs. Korean and Chinese consumers, who value social rules highly, tend
24 to appreciate other users' opinions in order to minimize their risks of wrong purchases when
25 they are not certain of their preferences for target products. Secondly, the findings from this
26 study indicate that MRS providers need to pay special attention to enjoyment in the
27 recommendation process for Korean and Chinese users, as these users tend to value

1 enjoyment more highly than do UK users.

2

3 **7. Conclusion**

4 This paper revealed the moderating effect of cultural values on relationships between belief
5 factors and attitudes toward MRSs. More specifically, based on TRA, this paper identified
6 belief factors relating to MRSs, taking into consideration functional, contextual, and social
7 dimensions, and tested the cause-effect relationships between these factors and attitudes using
8 data collected in three culturally diverse countries: the UK, South Korea, and China. This
9 paper also confirmed that the relationship between social influence and attitude was
10 moderated by the collectivism variable, and that the relationship between perceived
11 recommendation quality and attitude was moderated by the TUA variable. The findings of the
12 study should help scholars understand how cultural values impact user attitudes when new
13 technology is introduced into a society. The findings should also help policy makers and
14 technology providers, who may consider the cultural values of target markets when making
15 marketing and policy decisions.

16 The limitations in this study include followings. Firstly, the proposed research model was
17 tested in the context of MRSs therefore the cultural influence on user attitude toward different
18 information technologies which have different purposes and functionalities may be different
19 from the findings in this paper. Secondly, the research model was tested on data collected
20 from three culturally distinct countries in Europe and Far East. Thus the managers in different
21 region need to be cautious in interpreting the findings. In addition, the compared groups had a
22 difference in that Korea and UK samples were web forums whereas Chinese data were from
23 college students. Therefore, Chinese data might have subtle differences from the results for
24 Korea and UK. However, the participants in Korea and UK also were mainly in their 20s and
25 smartphones are heavily used by young generations. Third, though the three countries have
26 different cultures in terms of collectivism and uncertainty avoidance, the countries are not
27 representative for the cultures. Thus, the generalization of the results in this study is limited.

1 The future research directions include testing the models in more countries including other
2 regions of the globe to increase the generality of the findings. Also, it would be interesting to
3 see how cultural values moderate the speed and shape of innovation diffusion based on IDT
4 based on experimental setting.

5

6 **Acknowledgments**

7 The authors acknowledge anonymous reviewers' comments that were vital to improve the
8 paper significantly. This work was supported by the National Research Foundation of Korea
9 Grant funded by the Korean Government (NRF-2012S1A5A2A01018257).

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Table 1. Studies of mobile data services

Literature	Study Field	Research Constructs	Methodology
Negi [88]	Antecedents of adopting mobile data services	SERVQUAL, Satisfaction	Survey, Regression
Jun and Lee [89]		Mobility, Fashion, Information, Entertainment, Functionality, Multimedia service, Sociability, Attitude, Intention	Survey, Structural Equation Modeling(SEM)
Xu [61]		Entertainment, Informativeness, Irritation, Credibility, Personalization, Attitude, Intention	Survey, ANOVA, PLS
Pagani [48]		Price, Knowledge, Perceived innovation, Enjoyment, Attitude, Intention to use	Phone interview Survey, Adaptive conjoint analysis
Dunlop and Brewster [16]		Mobility, Pervasiveness, Limitations in input/output facilities, Context	Conceptual study
Yang and Jolly [49]	Value classifications of mobile data services	Functional value, Emotional value, Social value, Monetary value, Attitude	Online survey, SEM (AMOS)
Gebauer and Shaw [58]		Technology and task characteristics by function, usage, impact	Case study
Lee et al. [67]		Functional value, Emotional value, Social value, Monetary value, Satisfaction, Preferred service	Web survey (Korea and Japan), Regression
Yang and Jolly [49]		Functional value, Emotional value, Social value, Monetary value, Gender, Age, Intention to use	SEM
Wang and Benbasat [29]		Influencing factors to intentions to use of mobile data services	Decision strategy, Perceived quality, Explanation, Perceived cognitive effort, Perceived restrictiveness, Intentions to use
Hong and Tam [40]	Five sets of factors related to adoption		Survey, SEM (LISREL)
Bauer et al. [39]	Usefulness, Perceived utility, Knowledge, Social utility, Perceived risk		Online survey, SEM (LISREL)
Meso et al. [46]	Mobility, Cultural influence, Age, Gender, Business Use of mobile technology		Survey, PLS
Venkatesh et al. [6]	Unified theory of acceptance and use of technology		SEM

Table 2. Cultural factors in mobile environments

Literature	Cultural factors		Results	Methodology
Choi et al. [68]	Cultural	Contextuality, Individualism/Collectivism, Uncertainty avoidance	Found cultural differences among Korea, Finland, and Japan	Interview
	User experiences	GUI, Information architecture, Content		
Lee et al. [47]	Uncertainty avoidance, Individualism, Context, Time perception		Found cultural dimensions regarding Korea, Taiwan and Hong Kong	SEM, MANOVA & ANOVA
Xu [61]	Credibility, Personalization, Informativeness, Entertainment, Irritation		Analysis of mobile user attitudes according to personalization	SEM
Park et al. [41]	Moderator: Gender, Age, Usage Experience of IT Social influence, Attitude toward using mobile data services		Suggested factors affecting attitudes toward mobile devices Performance expectation, Effort expectation, Social influence Facilitating condition was not significant	SEM
Parveen and Sulaiman [50]	Perceived usefulness, Perceived ease of use, Technology Complexity Personal Innovativeness Intention to adopt WIMD		New strategies and plans to increase the usage of WIMD in Malaysia	Correlation analysis
Goren-bar et al. [56]	Five personality traits of mobile users (Extraversion, Agreeableness, Conscientiousness, Emotional stability, Creativity)		Suggested BIG5 traits by Experiment	Regression
Nam et al. [90]	Relative advantages, image, safety, personal characteristics, propensity to use the mobile internet, personal payment environment, perception of advantages of mobile communication)		Adoption of M-payment	Regression and clustering analyses
Van Biljon and Kotze [57]	Cultural influence Mediators: Demographic, Socioeconomic, Personal factors		Suggested human nature (motivational human needs)	Personal factors mediated proposed model
Turel et al. [55]	Perceived quality, Prior expectations Cultural dimension according to Hofstede's constructs regarding customer satisfaction		Extended the marketing-based American model Conducted in various areas of Canada, Singapore, and Finland	SEM

Table 3. Constructs and related studies

Construct	Literature	Survey Item
Perceived recommendation quality	Venkatesh [91] Hong and Tam [40]	I think that mobile recommendations are a good source for my decisions about purchasing products.
		Mobile recommendations provide me with the recommended results I need.
		Mobile recommender systems provide proper items for me.
		Recommended items are suited to my interests.
Perceived ease of use	Davis [60] Hong and Tam [75]	I expect that learning how to use mobile recommender systems would be easy for me.
		I expect that my interactions with mobile recommender systems would be clear and understandable.
		I would find mobile recommender systems to be easy to use.
		I expect that it would be easy for me to become skillful at using mobile recommender systems.
Mobility	Hill and Roldan [92]	I use a cell phone because I can use it anywhere.
		I use a cell phone because I can use it whenever I want.
		I use a cell phone because I can use it while I am doing anything else.
		I use a cell phone because I can move from place to place while I am using it.
Attitude	Xu [61]	Generally, I find recommendations a good thing.
		I appreciate receiving recommendation messages via the mobile phone.
		I like the idea of using mobile recommender systems.
		Using mobile recommendation is a wise idea.
Enjoyment	Xu [61] Hong and Tam [40]	I expect that using mobile recommender systems would be enjoyable.
		I expect that using mobile recommender systems would be pleasurable.
		I expect to have fun using mobile recommender systems
		I expect that using mobile recommender system would be interesting.
Social influence	Venkatesh and Morris [64]	People who influence my behavior think that I should use the mobile recommender system for purchase.
		People who are important to me think that I should use the mobile recommender systems for purchase.
		In general, the same interest group has supported the use of the mobile recommender systems for purchase.
Collectivism	Choi et al. [68] Hofstede [52, 53]	I want to know others' interests and take comfort in having such knowledge.
		I take pleasure in sharing other people's interests with others.
		I will maintain or develop relationships by sharing interests with others.
Uncertainty avoidance	Choi et al. [68] Hofstede [52, 53]	I worry about losing things in ambiguous situations.
		I feel safe when following the opinions of experts or peers.
		I prefer situations and events that are familiar, predictable and stable.

Table 4. Characteristics of participants

Country	Korea	China	UK	Country	Korea	China	UK
Demographics	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	Demographics	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
Gender				Used Applications			
Male	294(94.8)	79(75.2)	57(54.8)	Books	44(14.8)	65(61.9)	16(15.4)
Female	16(5.2)	26(24.8)	47(45.2)	Business	69(23.2)	14(13.3)	10(9.6)
Age				Education	44(14.8)	18(17.1)	17(16.3)
Below 18	27 (8.7)	10(9.5)	1(1.0)	Entertainment	172(57.9)	47(44.8)	37(35.6)
18-25	63 (20.3)	57(54.3)	30(28.8)	Finance	15(5.1)	16(15.2)	6(5.8)
26-30	93 (30.0)	28(26.7)	35(33.7)	Healthcare & Fitness	26(8.8)	5(4.8)	13(12.5)
31-35	78(25.2)	6(5.7)	15(14.4)	Lifestyle	97(32.7)	14(13.3)	20(19.2)
36-40	33(10.6)	3(2.9)	11(10.6)	Medical	4(1.3)	6(5.7)	4(3.8)
41-45	15(4.8)	1(1.0)	6(5.8)	Music	104(35.0)	53(50.5)	32(30.8)
46-50	0(0.0)	0(0.0)	2(1.9)	News	41(13.8)	51(48.6)	22(21.2)
Above 51	1(0.3)	0(0.0)	4(3.8)	Weather	44(14.8)	45(42.9)	9(8.7)
Smartphone experience				Photo	38(12.8)	13(12.4)	4(3.8)
Yes	297(95.8)	87(82.9)	77(74.0)	Reference	65(21.9)	27(25.7)	36(34.6)
No	13(4.2)	18(17.1)	27(26.0)	Social networking	105(35.4)	26(24.8)	15(14.4)
Used OS for smart phone				Sports	15(5.1)	17(16.2)	15 (14.4)
Windows Mobile	64(20.6)	18(17.1)	0(0.0)	Travel	41(13.8)	14(13.3)	19(18.3)
iOS	224(72.2)	45(42.9)	46(44.2)	Utilities	115(38.7)	3(2.9)	17(16.3)
Android	1(0.3)	8(7.6)	7(6.7)	Recommendation experiences			
Symbian	9(2.9)	15(14.3)	1(1.0)	On mobile & fixed web	196(63.2)	39(37.1)	40(38.5)
BlackBerry	6(2.0)	2(1.9)	24(23.1)	Only on fixed web	68(21.9)	36(34.3)	24(23.1)
				Never	46(14.8)	30(28.6)	40(38.5)

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Table 5. Scale properties of data

Items	AVE	Construct Reliability	Cronbach's α
PEOU	0.757	0.926	0.893
PRQ	0.853	0.959	0.942
Enjoy	0.807	0.944	0.920
Mobil	0.733	0.916	0.878
SI	0.853	0.946	0.914
COLL	0.736	0.893	0.822
UA	0.653	0.847	0.753
ATT	0.769	0.930	0.899

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WORKING VERSION

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Table 6. Correlations matrix

	PEOU	PRQ	ENJOY	MOBIL	SI	COLL	UA	ATT
PEOU	0.870							
PRQ	0.419	0.924						
ENJOY	0.602	0.668	0.898					
MOBIL	0.330	0.270	0.323	0.856				
SI	0.384	0.547	0.543	0.211	0.923			
COLL	0.260	0.353	0.313	0.256	0.284	0.858		
UA	0.204	0.222	0.197	0.223	0.159	0.276	0.808	
ATT	0.491	0.644	0.669	0.307	0.613	0.270	0.196	0.877
AVE	0.757	0.853	0.807	0.733	0.853	0.736	0.653	0.769

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Table 7. Results of the regression analysis of the proposed research model

R ²	F	Sig.	Path	β	t	Sig.
0.576	139.586	0.000	PEOU \rightarrow ATT	0.091	2.480	0.013
			PRQ \rightarrow ATT	0.258	6.384	0.000
			ENJOY \rightarrow ATT	0.272	6.046	0.000
			MOBIL \rightarrow ATT	0.061	1.968	0.050
			SI \rightarrow ATT	0.275	7.655	0.000

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Table 8. Moderating effects of collectivism and uncertainty avoidance

		Variables	R ²	F	Sig.	β	t	Sig.
SI * COLL → ATT	1	SI	0.372	306.070	0.000	0.610	17.495	0.000
	2	SI	0.381	159.014	0.000	0.581	16.114	0.000
		COLL				0.101	2.808	0.005
	3	SI	0.389	109.446	0.000	0.224	1.573	0.116
		COLL				-0.147	-1.441	0.150
		SI*COLL				0.497	2.600	0.010
PRQ * UA → ATT	1	PRQ	0.412	362.798	0.000	0.642	19.047	0.000
	2	PRQ	0.415	182.850	0.000	0.633	18.430	0.000
		UA					1.455	0.146
	3	PRQ	0.420	124.519	0.000	0.356	2.779	0.006
		UNCER				-0.184	-1.674	0.095
		PRQ*UA				0.402	2.239	0.026

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Table 9. Differences among Korea, China and the UK along cultural dimensions

Cultural Factors	Country	N	Mean	S.E.	F	Sig.
Collectivism	Korea	310	5.686	0.051	30.340	0.000
	China	105	5.406	0.131		
	UK	104	4.686	0.145		
Uncertainty Avoidance	Korea	310	5.114	0.058	5.145	0.006
	China	105	5.152	0.124		
	UK	104	4.724	0.130		

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Table 10. Cultural Differences among the three countries

Collectivism	Country	1	2	3
	Korea	5.686	5.406	4.686
	China			
	UK			
Uncertainty Avoidance	Countries	1	2	N/A
	China	5.152	4.724	
	Korea	5.114		
	UK			

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Table 11. Regression analysis for Korea, China and the UK

Countries	R^2	F	Sig.	Path	β	t	Sig.
Korea	0.601	91.611	0.000	PEOU→ATT	0.122	2.578	0.010
				PRQ→ATT	0.290	5.810	0.000
				ENJOY→ATT	0.246	4.320	0.000
				MOBIL→ATT	0.068	1.744	0.082
				SI→ATT	0.246	5.146	0.000
China	0.709	48.351	0.000	PEOU→ATT	0.177	2.621	0.010
				PRQ→ATT	0.150	1.919	0.058
				ENJOY→ATT	0.298	3.743	0.000
				MOBIL→ATT	0.054	0.880	0.381
				SI→ATT	0.431	6.501	0.000
UK	0.411	13.684	0.000	PEOU→ATT	-0.075	-0.706	0.482
				PRQ→ATT	0.289	2.268	0.026
				ENJOY→ATT	0.294	2.065	0.042
				MOBIL→ATT	0.041	0.481	0.631
				SI→ATT	0.205	2.266	0.026

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Table 12. Multi-group Comparison for Korea, China and the UK

Path	Comparison	R ²	F	Sig.	β	t	Sig.
PEOU → ATT	KOR-CHN	0.299	58.298	0.000	0.022	0.216	0.829
	KOR-UK	0.265	49.276	0.000	0.237	2.432	0.015
	CHN-UK	0.216	18.826	0.000	0.215	1.638	0.103
PRQ → ATT	KOR-CHN	0.441	108.192	0.000	0.086	1.115	0.265
	KOR-UK	0.414	96.403	0.000	0.154	1.804	0.072
	CHN-UK	0.624	43.579	0.000	0.068	0.645	0.520
Enjoy → ATT	KOR-CHN	0.484	128.374	0.000	-0.048	-0.617	0.537
	KOR-UK	0.437	106.052	0.165	2.000	2.126	0.034
	CHN-UK	0.436	52.795	0.000	0.212	2.124	0.035
Mobil → ATT	KOR-CHN	0.126	19.824	0.000	-0.062	-0.531	0.596
	KOR-UK	0.086	12.922	0.000	0.156	1.509	0.132
	CHN-UK	0.120	9.331	0.000	0.218	1.649	0.101
SI → ATT	KOR-CHN	0.435	105.415	0.000	-0.159	-1.958	0.051
	KOR-UK	0.349	73.352	0.000	0.212	2.708	0.007
	CHN-UK	0.389	43.500	0.000	0.371	3.630	0.000

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1 APPENDIX 1. The explanation for Mobile Recommender Systems for the survey

Instruction

Mobile Recommendation

- Personalized recommendation is acknowledged as one of important features of a business-to-consumer website since it provides the suitable contents or services segmented each customer's preference on PCs or mobile phones.
- Recommendations are based on the customer's preferences, purchase histories, and similar users, and then recommended items are delivered with the aim of helping customers make decisions from a variety of choices.
- Mobile service providers operate various location-based services, such as suggesting recommendations about nearby restaurants and 'searching friends', to notify users about where their friends are. This way can reduce customers' search efforts and increase satisfaction on mobile commerce.

Figure 1) Purchase of Mobile Applications

Figure 1 is recommendations of mobile applications. Recommendations are based on previous purchases and the reasons of recommendation were shown as "Based on _(previously purchased app)_".

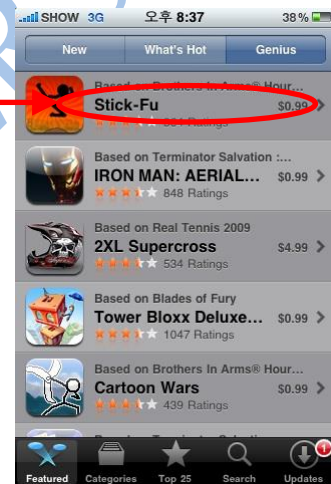


Figure 2 is recommendations for music playlist for mobile users. It makes the recommendation from favorite songs of the user and his or her listening habit. information.

Figure 2) Music Recommendation using Habits for Listening Style for Music

