

How Socio-Economic Structure Influences Rural Users' Acceptance of Mobile Entertainment

Jun Liu¹, Ying Liu², Pei-Luen Patrick Rau¹, Hui Li¹, Xia Wang², Dingjun Li¹

¹Institute of Human Factors & Ergonomics

² Nokia Research Center

Department of Industrial Engineering, Tsinghua University
Beijing, 100084, China

No. 5, Donghuan Zhonglu, BDA Area
Beijing 100176, China

{june.liu.bj, plprau, hli.sunshine, ldjie05}@gmail.com

{ying.y.liu, Xia.S.wang}@nokia.com

ABSTRACT

Mobile entertainment services are rapidly and widely developing. However, in emerging markets like Chinese rural area, entertainment related services are still not fully accepted by mobile phone users. This primary research aimed to study Chinese rural people's acceptance for mobile entertainment, to provide comprehensive models, and to explain the problem from its socio-economic roots. Interview and survey data were collected. Using explorative factor analysis method, two mobile entertainment acceptance models were built: one for rural people in North China and the other in East China. The models show that "social influence" is the most influential factor for north rural users while users' "self efficacy" carries the largest weight in East China. Both factors are more important than "product and service quality". The socio-economic roots of the results were analyzed from the differences between the traditional interdependent society in North China and the more independent society in East China. It primarily reveals the possibility to predict users' technology acceptance with socio-economic variables. Implications for mobile entertainment design were discussed.

Author Keywords

Technology acceptance, socio-economic structure, mobile entertainment, Chinese rural people, explorative factor analysis.

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms

Human Factors.

INTRODUCTION

Mobile technologies and services for entertainment are rapidly and widely developing. Mobile entertainment services, including ring tones, games, MP3 player, cartoon, video, radio, TV and etc., have brought evolutions to users'

entertainment life. In emerging markets like Chinese rural areas, however, mobile entertainment services are still not fully accepted by users. In many cases, users simply want to buy a mobile phone as a necessary communication tool without paying additional cost to use it for entertainment services. Therefore, studies of such users are necessary to understand their perception of mobile entertainment services and inner motivations to adopt such services.

People in rural China are important emerging users of mobile entertainment. In 2007, there were 745 million people living in Chinese rural area, with only 18% of them using mobile phones [1]. Hence, the market still has a great potential to grow rapidly. During 2007, half of the new subscribers of mobile services were from rural areas [1]. This user group is worth studying not only because of the large potential market, but also because of their distinctive values, life styles, education levels, economic status, and social structures [2]. These unique characteristics of Chinese rural users may impact their acceptance of new technologies because personal norms and intentions are largely shaped by the social and economic environments.

Furthermore, rural areas in China are diverse in socio-economic structures. Rural areas account for more than 90% of China's land area [2]. Economic levels and social structures vary a lot in different regions. In 2008, the average net income of a rural person ranges from less than 3000 RMB (the Chinese currency) to more than 9000 RMB across provinces [2]. In general, rural areas in East and South China are more developed than rural areas in North and West China. The variances on socio-economic structures imply that the investigations of Chinese rural users should cover more than one area so that a comparative whole picture of the user group can be built and reflected. Moreover, it is interesting and innovative to analyze how socio-economic structures would influence acceptance of technologies.

Previous studies have identified several factors that affect acceptance of technologies. "Perceived usefulness" and "ease of use" are found by Davis [3] as the main factors for acceptances of a system. Compeau et al. [4] studied the effects of "self-efficacy" on adoption of computers. Taylor and Todd [5] considered the "peer influence" as an important social factor for technology acceptance. There are also some

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

CHI 2010, April 10–15, 2010, Atlanta, Georgia, USA.

Copyright 2010 ACM 978-1-60558-929-9/10/04...\$10.00.

well-known theoretical models on technology acceptance, for example, the theory of reasoned action (TRA) [6], the technology acceptance model (TAM) [3], the theory of planned behavior (TPB) [7] and the innovation diffusion theory (IDT) [8].

The previous results and models are not fully applicable when it comes to mobile entertainment services for Chinese rural users. There are three reasons. First, none of the existing models on technology acceptance is comprehensive enough to cover factors that are relevant to users, technologies and social environments. Some models seem to be comprehensive, but a close examination of the measuring items indicated that either users or technology itself were focused. Thus a comprehensive model covering more factors is still needed in the specific field. Second, few studies have been focused on acceptance or adoption of mobile entertainment services. On the other hand, mobile entertainment services are unique on many aspects; for example, mobile entertainment services are usually used in different contexts. In that sense, there is a great demand to explore the contribution factors that affect acceptance of mobile entertainment services in Chinese rural users as well as their working pattern. Third, there is no study found to investigate the effect of socio-economic factors on technology acceptance.

This research aimed to build comprehensive models to explain the main factors affecting acceptance of mobile entertainment by Chinese rural users. Two models were built: one for North China and the other for East China. The differences between the two models were discussed and explained with an analysis of the socio-economic structures in Chinese rural areas. Based on the models and discussions, we also brought up user insights and design implications for mobile entertainment services.

The rest of the paper is organized as follows: first, we define the scope of mobile entertainment; second, we briefly introduce technology acceptance theories; third, we present two steps of user studies and the process of modeling using factor analysis; fourth, the models are discussed based on an analysis of the socio-economic structures in rural China; finally, we provide the suggestions for designs of mobile entertainment services.

MOBILE ENTERTAINMENT AND TECHNOLOGY ACCEPTANCE THEORIES

Mobile Entertainment Definition

According to the Mobile Entertainment Forum [9], the term “mobile entertainment” refers to “*entertainment products that run on wirelessly networked, portable, personal devices, which includes downloadable mobile phone games, images and ring tones, as well as MP3 players and radio receivers built into mobile handsets.*” The term excludes mobile services for communication purposes including short message services (SMS) and voicemail, as well as mobile commerce applications like auctions or ticket

purchasing [9]. This research adopts this definition and reduces the device scope to mobile phones.

Technology Acceptance Theories

Technology acceptance is relatively well studied with many models and theories. The most widely used four models are the theory of reasoned action (TRA) [6], the technology acceptance model (TAM) [3], the theory of planned behavior (TPB) [7] and the innovation diffusion theory (IDT) [8].

The TRA, developed by Fishbein and Ajzen [6], shows that a person's specific behavior is determined by the behavioral intention. In turn, behavior intention is determined by the person's attitude and subjective norm. The TAM, developed by Davis [3], is adapted from TRA, and is specially focused on the behavior of information system acceptance. In this model, “perceived usefulness” and “perceived ease of use” are primarily relevant to the acceptance behaviors. The TPB is a theory of planned behavior developed by Ajzen who is also the developer of TRA [7]. It is an extension of TRA by adding the variable of “perceived behavior control”. The IDT, developed by Rogers [8], explains the behavior of innovation adoption. There are strong affiliations among the four models. First of all, TPB extends TRA with the additional factor of “perceived behavior control”. Then, TAM is based on TRA and focused on information technology acceptance. For the two theories of TAM and IDT, the core constructions are very similar: “perceived usefulness” is very like “relative advantage” and “perceived ease of use” has similar meaning with “complexity” [10].

Based on the theories and related research, in total of twenty-seven factors contributing to technology acceptance were concluded. The related measure items for each factor were also collected. As an example, there are measure items like “learning to operate information technology would be easy for me” in order to measure “perceived ease of use” [11]. The twenty-seven factors are listed below.

1. Perceived usefulness [10, 12]
2. Perceived ease of use [3, 10, 11, 12]
3. Perceived complexity [8, 13]
4. Perceived enjoyment/fun [12, 14]
5. Output quality [12]
6. Relative advantage [8, 10]
7. Compatibility [5, 8, 10, 15]
8. Perceived behavioral control [5, 7, 12]
9. Subjective norm [5, 7]
10. Peer influence [5]
11. Word-of-mouth [16, 17]
12. Job relevance [12, 18, 19]
13. Voluntariness [10, 12]
14. Innovativeness [20]

15. Self-efficacy [4, 5, 12]
16. Computer anxiety [12]
17. Computer playfulness [12]
18. Technology facilitating conditions [5]
19. Organizational support [13]
20. Visibility [8]
21. Trialability [8]
22. Being-younger [21][22]
23. Perceived modernness [23]
24. Perceived Risk [24]
25. Communication facilitating [21]
26. Perceived novelty
27. Image [10, 12]

USER STUDY PHASE ONE: PHONE INTERVIEW

In order to investigate the theoretical variables contributing to technology acceptance in the specific context of mobile entertainment, two phases of user studies were conducted. The first study was phone interviews and the second was paper-based survey.

The first phase of the phone interview aimed to explore whether there are new variables which have effects on Chinese rural users' acceptance of mobile entertainment, yet have no involvement in the twenty-seven technology acceptance variables concluded from literatures. The current section introduces the methodology and results of the phone interview.

Interview Questions

To explore factors influencing user acceptance, the open end explorative questions were formulated. The questions were mainly about participants' experiences using mobile services including entertainment services, their entertainment life, and the behaviors of surrounding people. Main questions were: 1) How do you enjoy your entertainment time in your daily life? 2) Do you or people around you use mobile phones? What functions do you/they use? 3) What kind of mobile phone entertainment service have you/they ever used? 4) What can urge you to use mobile entertainment services, or why do you want to use them? 5) To what extent does the price influence your purchase/service-using decisions?

Participants

Three Chinese rural people, two male and one female, with their ages ranged from 28 to 50 took part in the interview. They all have education levels above high school and monthly incomes more than 700 RMB. They all own mobile phones and have experienced mobile entertainment services. They were recruited from two provinces of China (Shandong and Shanxi), where the economic and life patterns are different.

Procedure

The whole interview was conducted using mobile phone with a speakerphone and recorded on PC. The interview time for each participant was 30~45 minutes. To make the communication easier, the dialect of each participant's district was used during the interview.

Data analysis

The qualitative interview data were analyzed to extract the factors influencing user's acceptance of mobile entertainment. Following the Long Table Approach [25], the transcripts from phone interview were printed out, followed with a series of cutting and categorizing of the transcripts. At the end, citations reflecting the same factor were pasted together and the factor was named and written above.

Interview Results

Eighteen factors were explored from the interviews. Seventeen among them are matched with those concluded from literatures. They are: 1) perceived usefulness; 2) perceived ease of use; 3) perceived complexity; 4) perceived enjoyment/fun; 5) output quality; 6) relative advantage; 7) compatibility; 8) perceived behavioral control; 9) job relevance; 10) voluntariness; 11) innovativeness; 12) technology facilitating conditions; 13) organizational support; 14) visibility; 15) perceived risk; 16) communication facilitating; and 17) perceived novelty. One new factor which cannot be matched to the ones from literatures was defined as "cost". "Cost" represents the charges of a particular service which could influence users' acceptance. Citation examples are like: "Is listening to music for free?" and "I hope the service is totally for free."

Other than the eighteen factors, there are ten factors obtained from literatures that were not explored during the phone interview; but we cannot disregard them at this step due to the limit of sample size. The aim of the interview was to check if there are factors lost besides the twenty-seven theoretical based factors rather than to choose among those factors. Therefore, all those twenty-eight factors were tested and analyzed in the next phase of survey.

USER STUDY PHASE TWO: SURVEY

With the twenty-seven theoretical acceptance variables and one new variable, "cost", found from the interview, we designed a questionnaire and surveyed Chinese rural users from two different regions. The objective was to model the relationships between the variables and Chinese rural users' mobile entertainment acceptance intention and to compare if there was cross regional differences due to socio-economic structure. Explorative factor analysis method was used to develop the models.

Questionnaire Construction

There were two steps in designing the items. First, five expert students of the area grouped the twenty-eight acceptance variables into three categories: personal variables (thirteen variables), social environment (seven variables), and technical/service property (eight variables).

Economic Index	Dezhou in North China	Taizhou in East China
GDP (Billion RMB)	118.082	120.182
Percentage of Primary Industry in GDP (%)	13.4	8.56
Rural Households Per Capita Average Net Income (RMB)	4986	6469
Rural Households Per Capita Living Expenditures for Consumption (RMB)	2300	4459
Rural Resident Consumption Level (RMB)	2299	5775

Table 1. Economic index of Dezhou and Taizhou.

Then questionnaire items were designed for each variable, category by category, to reflect the real meaning of the variable and involve different categories comprehensively.

Finally, twenty-nine items were designed based on the factors found from the interview. For the “perceived usefulness” factor, for example, an instance of designed item was “I often need to use mobile entertainment in my daily work and life.” For the “cost” factor, the new one found from the interview, we designed three items to further test its effect on acceptance. There were two variables, like “job relevance” and “compatibility”, without any questions. They were either work-related or they required advanced technology experiences; therefore, they were not considered as suitable in rural context.

The 7-point Likert scales were used to measure different levels of agreement to the items from “1=totally disagree” to “7=totally agree”. For easier understanding, mobile entertainment definition and terms of services involved were provided at the top of each page of the questionnaire. For further analysis, questions regarding personal information, mobile phone and related technology experience were also included in the questionnaire.

Participants

In order to depict different types of socio-economic structures in Chinese rural area, two samples of participants were recruited from two different regions. One is Dezhou in Shandong province, North China; and the other is Taizhou in Jiangsu province, East China. Dezhou, about 320km far from Beijing, has typical traditional extended family society and agriculture-related economic structure. The main income sources for the rural people in Dezhou are agriculture and its related industry. Most of the rural areas in North China have social-economic structures similar with Dezhou. In contrast, Taizhou, which is 225km away from Shanghai, has independent small family society and industry-related economic structure, which are very usual in East China. Rural people in Taizhou earn most of their

income through manufacture industry. According to the China Statistical Yearbook 2008 [2], the economics in Taizhou is better developed than that of Dezhou. For instance, Taizhou rural resident consumption level is more than twice of Dezhou’s level. Table 1 also shows the different economic levels with other economic index. In the following of this paper, the samples will be named with the region name, i.e. North sample (Dezhou, Shandong province) and East sample (Taizhou, Jiangsu province).

For the sample size, Gorsuch recommended that the subject to item ratio should be larger than 5 in a factor analysis research [26]. As we have twenty-nine items in the questionnaire, at least 145 cases should be collected. In our research, we got 150 valid cases for the North sample and 146 valid cases for the East sample.

All the participants were either farmers or migrant workers from rural areas in Dezhou or Taizhou. They were recruited either from their houses or their working places. Gender was balanced for each sample. Most participants (90% of North sample, 84% of South sample) were from 20 to 50 years old. In North sample, 50.7% of the participants had an education level of junior high school; in East sample, 58% were graduated from senior high school. All the participants were currently using mobile phones. Most have used mobile phones for 2-6 years. In North sample, 50.7% of the participants were using mobile phones that cost 500-1000 RMB; in East sample, 64.7% were using more expensive mobile phones that cost 1000-2000 RMB. In both samples, most spent 30-50 RMB per month for mobile services.

Procedure

Since most rural users were not familiar with web-based questionnaires, paper-based questionnaires were provided on person to person basis. In order to keep the validity of each questionnaire, the entire process of answering the questions was assisted by the survey conductor. After filling the survey, each participant received 20 RMB as a reward.

Data Analysis

The two samples were analyzed separately. For each sample, the internal consistency of the questionnaire was tested by Cronbach Alpha calculation [27] (Cronbach, 1951). Then, exploratory factor analysis was used to find relationships among these factors. We used principle components extraction method, analyzed through correlation matrix, extracted factors with eigenvalue over 1, and rotated with varimax method with Kaiser Normalization. After the factor analysis, some of the original factors were eliminated or grouped. Finally, a visualized model was build to describe the results comprehensively.

Survey Results

Results of North Sample

First, the Cronbach’s alpha of the twenty-six items is 0.805. For each item, this index cannot increase significantly if the item is deleted. From literatures, an alpha (α) value of 0.70 or above is considered to indicate strong internal

consistency [28]. For exploratory research, an alpha value of 0.60 or above is also considered significant [29]. Such results indicate that all the twenty-six items in our study has a high internal consistency; therefore, they were all included for further analysis.

Second, exploratory factor analysis was conducted. There were three iterations of factor analysis. After the first run, according to the criteria from literatures [29, 30], we eliminated a single-item factor, and an item with factor loadings significantly less than 0.45. In the second run, seven factors were extracted from the left twenty-four items. However, from the scree plot, there is no significant decrease from factor 7 to factor 8 in their eigenvalue but an obvious change between factor 6 and factor 7. Therefore, a third iteration was run with a fixed factor number of 6. After the third iteration, six factors were extracted from the left twenty-four items, with 57.476% of variance be explained. For all the iterations, the exploratory factor analysis method is appropriate because the KMO are 0.783 for the initial twenty-six items, and 0.793 after eliminating the two items, both more than 0.7; and the Bartlett's Tests have significances less than 0.001.

The extracted factors were named by the common meanings of the items included (see Table 2). The items that have relatively higher factor loadings were more referred to. The first factor "social influence" shows that others' suggestion

and social norms can influence users' acceptance for mobile entertainment. Also people tend to accept the products if they promote their social image or enhance social communication. This factor is associated with the theoretical factors of subjective norm, word-of-mouth, peer influence, being-younger, and organizational support. The second factor "technology and service quality" is about the quality and convenience of mobile entertainment technology and service. It includes the former theoretical factors of output quality, trialability, relative advantage, visibility, innovativeness, and technology facilitating conditions. The third factor "entertainment utility" means the emotional and entertainment utility of mobile entertainment. It is related to the theoretical factors of perceived enjoyment/fun, voluntariness, perceived usefulness, perceived modernness, and perceived risk (negative correlated). The fourth factor "self-efficacy" is self-perception of ability to use the service or product. It is related to theoretical factors of perceived ease of use, self-efficacy, and perceived behavioral control. The fifth factor is the "cost" of monthly fare, mobile itself, and familiar or unfamiliar mobile entertainment services, which is a new factor found from our user study. The last factor "perceived novelty" indicates that people are likely to accept novel products and services; it is related to theoretical factors of perceived novelty and perceived complexity.

The reliability and validity of the questionnaire are

Factor Name	Items Involved
Social influence	20. I feel that people around (family member, friends, etc.) think I should use some mobile entertainment.
	18. If my friends tell me some mobile entertainment service, I will try it.
	14. If my friends think I should use mobile entertainment, I will try it.
	12. Mobile entertainment can make me feel younger.
	17. Mobile entertainment provides me more chances to communicate with others (family, friends, etc.).
Technology and service quality	22. If the mobile phone can take clear and good-quality photos and videos, I would like to use the function.
	29. I hope I can try a ring tone before download it.
	23. I think it's more convenient to take photos/videos using a mobile than using a particular camera.
	15. Many people around me use mobile entertainment.
	28. I like novel mobile games rather than those people are familiar with.
Entertainment utility	27. If some problem happens during mobile entertainment process, I hope to get help and instruction easily.
	5. I find mobile entertainment enjoyable.
	7. I like to take mobile as an entertainment tool, and play with it voluntarily.
	1. In daily work and life, I often need to use mobile entertainment.
	8. Mobile entertainment can keep me up with the times.
Self efficacy	9. I think there are risks in some mobile entertainment process. (negative loading)
	2. I will give up a mobile entertainment if it's too hard to use.
	10. I can use mobile entertainment without any help.
Cost	6. I'm capable enough to use mobile entertainment.
	25. I concern a lot of mobile monthly tariff.
	24. A low price is very important for me to buy a mobile.
Perceived novelty	26. I decide whether to use a mobile entertainment by its price.
	11. Mobile entertainment is novel to me.
	16. I don't feel trouble in using mobile entertainment.

Table 2. Factor naming - North sample.

Factor Name	Items Involved
Self efficacy	6. I'm capable enough to use mobile entertainment.
	7. I like to take mobile as an entertainment tool, and play with it voluntarily.
	10. I can use mobile entertainment without any help.
	20. I feel that people around (family member, friends, etc.) think I should use some mobile entertainment.
	5. I find mobile entertainment enjoyable.
	8. Mobile entertainment can keep me up with the times.
Technology and service quality	17. Mobile entertainment provides me more chances to communicate with others (family, friends, etc.).
	27. If some problem happens during mobile entertainment process, I hope to get help and instruction easily.
	28. I like novel mobile games rather than those people are familiar with.
	22. If the mobile phone can take clear and good-quality photos and videos, I would like to use the function.
	15. Many people around me use mobile entertainment.
Social influence	14. If my friends think I should use mobile entertainment, I will try it.
	12. Mobile entertainment can make me feel younger.
	18. If my friends tell me some mobile entertainment service, I will try it.
Simpleness	21. I don't feel anxious to use some of the entertainment functions in my mobile phone.
	23. I think it's more convenient to take photos/videos using a mobile than using a particular camera.
Cost	24. A low price is very important for me to buy a mobile.
	25. I concern a lot of mobile monthly tariff.
Perceived ease of use	2. I will give up a mobile entertainment if it's too hard to use.
	16. I don't feel trouble in using mobile entertainment.
Certainty of risk control	9. I think there are risks in some mobile entertainment process.
	11. Mobile entertainment is novel to me.
	1. In daily work and life, I often need to use mobile entertainment.

Table 3. Factor naming - East sample.

confirmed. The internal consistency index Cronbach's Alpha was tested to measure the reliability of the questionnaire. After eliminating two items during factor analysis, the Cronbach's alpha of the whole scale is 0.803 for twenty-four items, which indicates strong reliability according to former discussion. The sub-scales' Cronbach's alpha are 0.770 (social influence), 0.751 (technology and service quality), 0.537 (entertainment utility), 0.324 (self efficacy), 0.495 (cost), and 0.365 (perceived novelty); the relatively lower index are due to limited number of items. The six factors account for 57.476% of the total variance and factor loadings range from 0.443 to 0.779. So the construct validity of the instrument is acceptable.

Results of East Sample

First, the Cronbach's alpha of the twenty-six items for the Jiangsu sample is 0.551, which does not meet the criteria for factor analysis as discussed formerly. However, from the item-level analysis, this index can increase to 0.637 after eliminating an item. As a result, this item was deleted to make sure the rest twenty-five items has enough internal consistency (Cronbach's alpha=0.637) for further analysis.

Second, exploratory factor analysis was conducted. There were two iterations of factor analysis. After the first run, according to the criteria from literatures [29, 30], we eliminated two single-item factors. In the second run, seven factors were extracted from the left twenty-three items, with

57.284% of variance be explained. For both iterations, the exploratory factor analysis method is appropriate because the KMO are 0.711 for the initial 25 items, 0.750 after eliminating the two items, both resulting more than 0.7. And the Bartlett's Tests have significances less than 0.001.

Again, the extracted factors were named by the common meanings of the items included (see Table 3). The items that have relatively higher factor loadings were more referred to. The first factor "self-efficacy" is self perception of being able to use the service or product. It is related to theoretical factors of perceived behavioral control, voluntariness, self-efficacy, subjective norm, perceived enjoyment/fun, and perceived modernness. The second factor "technology and service quality" is about the quality and utility of mobile entertainment technology and service. It includes the former theoretical factors of organizational support, technology facilitating conditions, innovativeness, output quality, and visibility. The third factor "social influence" shows how others' words can influence the users' acceptance for mobile entertainment. Also people are likely to accept the products that promote their social image. This factor is related to the theoretical factors of word-of-mouth, peer influence, and being-younger. The fourth factor "simpleness" means that the entertainment feature is simple and convenient enough for users to adopt it without feeling anxious. This factor is related to the theoretical factors of

mobile anxiety and relative advantage. The fifth factor is the “cost” of mobile itself and the monthly fare, which is a new factor found from this user study. The sixth factor “perceived ease of use” means that the mobile entertainment manipulation can be perceived as easy and would not cause troubles to the users. Related theoretical factors are perceived ease of use and perceived complexity. The last one, “certainty of risk control” addresses the perceived risks caused by a relatively new entertainment service or by the possible risky effects to normal work and life. It is related to the theoretical factors of perceived risk, perceived novelty, and perceived usefulness.

The reliability and validity of a questionnaire are confirmed. After eliminating two items during factor analysis, the Cronbach’s alpha of the whole scale is 0.770 for twenty-three items, which indicates strong reliability according to former discussion. The seven sub-scales’ Cronbach’s alpha are 0.712 (self efficacy), 0.620 (technology and service quality), 0.526 (social influence), 0.410 (simplicity), 0.460 (cost), 0.461 (perceived ease of use), and 0.290 (certainty of control); the relatively lower index are due to limited number of items. The seven factors account for 57.284% of the total variance and factor loadings range from 0.384 to 0.841. So the construct validity of the instrument is acceptable.

MOBILE ENTERTAINMENT ACCEPTANCE MODEL OF CHINESE RURAL PEOPLE

Mobile Entertainment Acceptance Model of Rural People in North China

According to the results of factor analysis with Shandong sample, the mobile entertainment acceptance (MEA) model of rural people in North China was built (Figure 1). The model has two main aspects:

First, six factors that influence people’s mobile entertainment acceptance are represented by the six ellipses in the visualized model.

Second, the factor importance is ranked according to their eigenvalue: 3.317 for social influence, 2.977 for technology and service quality, 2.479 for entertainment utility, 1.735 for self-efficacy, 1.732 for cost, and 1.553 for perceived novelty. Factor eigenvalue is the measurement of explained variance; the higher the factor eigenvalue, the more variance it can explain. Therefore, a higher factor eigenvalue generally implies the importance level of a factor. In our visualized model (see Figure 1), the area of each ellipse represents the importance grade. For example, the first ranked factor “social influence” has the largest area. It should be noticed that the rotation method in factor analysis can also slightly influence the factor eigenvalue. Therefore, it is more meaningful to discuss the relative importance ranks of two factors with large eigenvalue difference (e.g. social influence and self-efficacy) than to stick on the factors with minor differences (e.g. self-efficacy and cost).

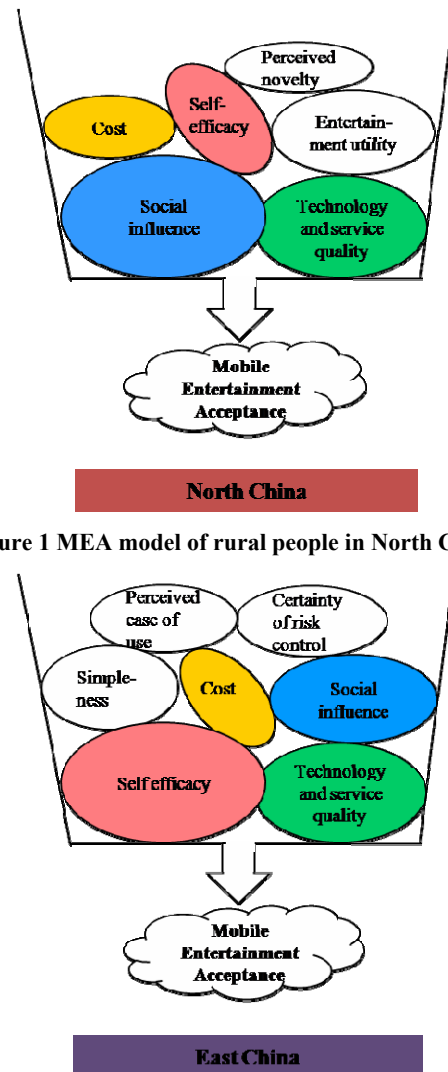


Figure 1 MEA model of rural people in North China.

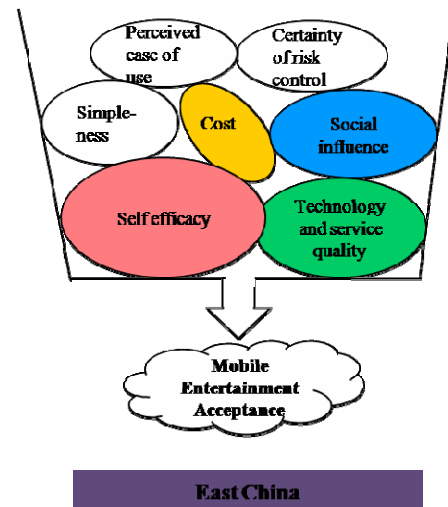


Figure 2 MEA model of rural people in East China.

Mobile Entertainment Acceptance Model of Rural People in East China

According to the results of factor analysis with Jiangsu sample, the mobile entertainment acceptance (MEA) model of rural people in East China was built (Figure 2). Similar to the North China model, this model also has two main aspects:

First, seven factors that influence people’s mobile entertainment acceptance are represented by the seven ellipses in the visualized model.

Second, the factor importance is ranked according to their eigenvalue: 2.733 for self efficacy, 2.469 for technology and service quality, 2.071 for social influence, 1.546 for simplicity, 1.486 for cost, 1.458 for perceived ease of use, and 1.412 for certainty of risk control. Again, the area of each ellipse represents the importance grade of each factor.

According to the figures above, North China model and East China model are different in factor importance orders as well as elements for factors with lower importance;

however, they have more similarities in factors with higher importance such as social influence, technology and service quality, self-efficacy, and cost, which are colored in the figures. Those differences and similarities between the two models will be further discussed.

DISCUSSION

Socio-Economic Structure Influences Users' Acceptance

Comparing the MEA models of North China and East China, there is an interesting difference lying in the most important factor of each model: “social influence” for rural people in North China and “self efficacy” for rural people in East China. We suppose that the difference can be explained by analyzing the socio-economic structures of each region.

Dezhou, representing rural area of North China, has traditional extended family society and agriculture-related economic structure [2]. This socio-economic structure makes “social influence” the primary factor that affects acceptance of new technologies, especially when the technologies, like mobile entertainment, are not the necessities for life. This is because extended family-based agriculture society, which has existed in China for thousands of years, relies on the interdependent relations among people. In an agriculture-based society, such interdependent social structure has at least three advantages: high efficiency, high safety, and steady collaborative relationship.

First, interdependent relationship has high efficiency in agriculture-based society because the social responsibilities and obligations are naturally defined within a large group of family members. As an essential economic cell in agriculture, each family has specific laws and shared interest to ensure the members efficiently contribute to the whole family.

Second, the interdependent social structure provides economic safety to its members. In an agriculture-based society, the weak social insurance and banking system plays little role. Instead, social security is obtained through the interdependent relations among extended family members. Wealth belongs to the whole family and it is managed by some members with higher social status. Therefore, the members' economic activities are highly interdependent.

Third, the interdependent social structure ensures collaborations among the family members to achieve common objectives in agriculture-based society. As a result, individuals in such a society are not highlighted. People live with shared norms, shared values, and shared objectives. Therefore, “social influence” becomes the primary factor affecting people's acceptance of new technology.

In contrast, Taizhou, representing rural area in East China, has a relatively independent society with more emphasis on the “self”. Manufacturing industry shares large proportion

in the economic structure. Rural people have higher income and consumption level [2]. Along with the economic development, individuals in the society become more independent for mainly three reasons.

First, the roots of responsibilities and obligations among people change from family relations to social division of labor as the economic structure changes its emphasis from agriculture to manufacturing, resulting higher efficiency in such economic structure. For this reason, the shared interest of an extended family is replaced by the individual interest.

Second, the modern banking and insurance system play more important roles, ensuring the safety of individual wealth. Such changes spontaneously lead to economic independence of individuals.

Third, economic development requires social collaborations in broader areas rather than within a family. It is the reason why individuals become relatively independent from the family and play as independent members of the society. As a result, “social influence” becomes less important for people to accept new technologies while “self efficacy”, which means considering from the individual's own side, comes to the first priority.

The discussions above try to explain technology acceptance factors from socio-economic point of view. It reveals the possibility to predict users' technology acceptance with socio-economic variables, which is a very innovative approach for further investigations.

Social Influence and User Self Efficacy are More Important than Product Quality

There is an interesting phenomenon that in neither of the two acceptance models, “technology and service quality” plays the primary role. This is contrary with most practitioners' beliefs that good device and good service can always get users. As discussed before, social influence plays more important role in traditional agriculture-based Chinese rural areas, for the user to accept a product than the quality of the product itself. In modern manufacturing industry-based Chinese rural areas, self efficacy is more important. No matter how good the product is, the product will not be accepted if the user is not confident in mastering it. Such results can be meaningful for designers and practitioners who wish their product to be well accepted by rural users.

Implications for Mobile Entertainment Design

The MEA models can be utilized by device and service designers and marketing practitioners to better understand the rural users in North and East China. It can also help to improve acceptability of their products. The implications of the MEA models can be analyzed from two points of view: first with contributing factors involved and second with the relative importance ranks among them. The differences between the two models should also be considered.

The contributing factors show that the users' acceptance of a mobile entertainment product, for both East and North China, is heavily influenced by the society around them, the product's quality, the level of self-efficacy to handle it, and the cost of the product. Therefore, designers and practitioners may manipulate those aspects to increase their products' acceptability. Below are the possible suggestions. Five elements to ensure positive social influences to the rural users are:

- Involve an interpersonal recommendation function through short message(SM) or internet.
- Involve an interpersonal invitation function through SM or internet.
- Let the user know who else is using it and how many other users there are.
- Recommend related products through social computing; for example, "people who play game A also play game B."
- Do not influence negatively on the users' social impression; because, for example, a product that looks out of date may result in an impression of "being out of date" of its user by others.

Three elements to ensure a high quality in users' perception are:

- Be clear, readable, responsive and attractive enough to show a reliable quality, especially for the first impression.
- Provide simple but effective help and demonstration.
- Provide users with trials before they decide to pay for it.

Four elements to ensure appropriate self-efficacy of the rural user are:

- Make it easy to use.
- Avoid using too many characters on the interface; it may use appropriate symbols and icons instead.
- Put significant hotkeys on the main interface.
- Encourage users to feel at ease and confident when introducing a product. One example saying could be "just press one key" or "don't worry about any bad consequence", etc.

Three elements to ensure affordable cost to the users are:

- Explain the possible cost clearly when users first see it.
- Empathize that the cost is really low. One example saying could be "only 2 RMB per month, equal with the cost of an apple".
- Allow users to get a discount by contributing to the product. For example, if a user invites five or more users for a service, let him/her to use it freely for one month.

Beside the common factors shared by both models of East China and North China, there are some unique individual factors in each model as well. Therefore, we also have

possible suggestions for designers who are developing products for a specific region.

For North China rural people:

- Make sure that the product looks playful and interesting enough that it can entertain users well.
- Provide users with novel design.

For East China rural people:

- Show that the product does not have so many risks as in the user concern. An example saying could be "it won't cause any additional charges".
- Use prestigious brand to give a credible impression.

However, the suggestions provided above are not equally important when they are applied to a specific context. According to the MEA models, some factors have more effective influence on users' acceptance. Therefore, those suggestions generated by the more important factors should have higher priorities. For instance, in North China, suggestions generated from the factor of "social influence" obviously worth the most attention. As a result, we give out the twentieth suggestion as:

- Always focus on the most influential practices according to the MEA models.

CONCLUSIONS

Mobile entertainment acceptance is an important topic, especially for emerging markets like Chinese rural areas. In this research, we studied and modeled contributing factors of mobile entertainment acceptance for Chinese rural users. Two visualized models were presented, one for North China and the other for East China. The models show that "social influence" is the most influential factor for north rural users, while users' "self efficacy" carries the largest weight in East China. Both factors are more important than "product and service quality". The socio-economic roots of the results were analyzed from the differences between the traditional interdependent society in North China and the more independent society in East China. Twenty design suggestions were generated based on the models.

To the best of our knowledge, our work is the first study that analyzes the influences of socio-economic structure on technology acceptance. It is also the first to investigate the technology acceptance of Chinese rural users.

The study provides a comprehensive model of technology acceptance, involving factors of people, technology, and social environment, which is a new contribution to technology acceptance theories.

Further investigations for other representative parts of China will provide a great interest to better understand Chinese rural people. It will also be beneficial to further research into predicting users' technology acceptance with socio-economic variables.

REFERENCES

1. Linging, Y., Chung, Y. Voice services: To continue to grow steadily and support for industry. *Posts & Telecommunications News (in Chinese)*, 15, (2007), 1-3.
2. National Bureau of Statistics of China. China Statistical Yearbook 2008. <http://www.stats.gov.cn/tjsj/ndsj/2008/indexch.htm>
3. Davis, F. D. *A technology acceptance model for empirically testing new end-user information systems: Theory and results*. Doctoral dissertation, MIT Sloan School of Management, Cambridge, MA, 1986.
4. Compeau, D. R., Higgins, C. A. Computer self-efficacy: Development of a measure and initial test. *MIS Quarterly*, 19, (1995), 189–211.
5. Taylor, S., Todd, P. A. Understanding information technology usage: A test of competing models. *Information Systems Research*, 6, 2 (1995).
6. Fishbein, M., Ajzen, I. *Belief, attitude, intention and behavior: An introduction to theory and research*. Addison-Wesley, Reading (1975).
7. Ajzen, I. The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 2, (1991) 179–211.
8. Rogers, E.M. *Diffusion of Innovations*, 4th edn. Etats-Unis Free Press, New York, USA, 1995.
9. Wiener, S. N. Terminology of mobile entertainment: An introduction. *Mobile Entertainment Forum*, 2003.
10. Moore, G.C., Benbasat, I. Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, 2, 3 (1991).
11. Davis, F.D. Perceived usefulness, perceived ease of use and user acceptance of information technology. *MIS Quarterly* 13, 3, (1989) 319–340.
12. Venkatesh, V., & Davis, F. D. A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, 46, 2, (2000) 186–204.
13. Igarria, M., Parasuraman, S., Baroudi, J. A motivational model of microcomputer usage. *Journal of Management Information Systems*, 13, 1, (1996) 127–143.
14. Hsu, C.-L., Lu, H.-P. Consumer behavior in online game communities: A motivational factor perspective. *Computers in Human Behavior* 23, (2007) 1642–1659.
15. Igarria, M., Schiffman, S.J., Wieckowski, T.S. The respective roles of perceived usefulness and perceived fun in the acceptance of microcomputer technology. *Behaviour and Information Technology* 13, 6, (1994) 349–361.
16. Lee, S.M. South Korea: From the land of morning calm to ICT hotbed. *Academy of Management Executive* 17, 2 (2003).
17. Webster, C.: Influences upon consumer expectations of services. *Journal of Services Marketing* 5, 1, (1991) 5–17
18. Black, J.B., Kay, D.S., Soloway, E.M. Goal and plan knowledge representations: From stories to text editors and programs. In: Carroll, J.M. (ed.) *Interfacing Thought*, pp. 36–60. The MIT Press, Cambridge, USA, 1987
19. Davis, F.D., Bagozzi, R.P., Warshaw, P.R. Extrinsic and Intrinsic Motivation to Use Computers in the Workplace. *Journal of Applied Social Psychology* 22, 14, (1992) 1111–1132.
20. Park, C., Jun, J.-K. A cross-cultural comparison of Internet buying behavior: Effects of Internet usage, perceived risks, and innovativeness. *International Marketing Review* 20, 5, (2003) 534–553.
21. Boulton-Lewis, G.M., Buys, L., Lovie-Kitchin, J., Barnett, K., David, L.N. Ageing, learning, and computer technology in Australia. *Educational Gerontology* 33, 3, (2007) 253–270.
22. Stark-Wroblewski, K., Edelbaum, J.K., Ryan, J.J. Senior citizens who use E-mail. *Educational Gerontology* 33, 4, (2007) 293–307.
23. White, J., Weatherall, A. A grounded theory analysis of old adults and information technology. *Educational Gerontology* 26, 4, (2000) 371–386.
24. Dowling, G.R., Staelin, R. A model of perceived risk and intended risk-handling activity. *The Journal of Consumer Research* 21, 1, (1994) 119–134.
25. Krueger, R., Casey, M. *Focus Groups: A Practical Guide for Applied Research*, 3rd edn. Sage Publications, Inc, Thousand Oaks, 2000
26. Gorsuch, R.L. *Factor analysis*, 2nd edn. Lawrence Erlbaum, Hillsdale, 1983
27. Cronbach, L.J. Coefficient alpha and the internal structure of tests. *Psychometrika* 16, 3, (1951) 297–334.
28. Nunnally, J.C.: *Psychometric Theory*. McGraw-Hill, New York (1978)
29. Hair, J.F., Anderson Jr., R.E., Tatham, R.L., Black, W.C. *Multivariate Data Analysis*. Prentice-Hall International, New Jersey, 1995
30. Stiggelbout, A.M., Molewijk, A.C., Otten, W., Timmermans, D.R.M., van Bockel, J.H., Kievit, J. Ideals of patient autonomy in clinical decision making: A study on the development of a scale to assess patients' and physicians' views. *Journal of Medical Ethics* 30, 3, (2004) 268–274.