Empirical Study and Model of User's Acceptance for Mobile Commerce in China

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Abstract

Merchants urgently need to investigate consumers' willingness to accept mobile commerce and what factors influence their acceptance since the spring up of mobile commerce. By means of surveying Chinese consumers with questionnaire, this paper take consumer as research object to analyze their attitude toward using and influence factors about mobile commerce based on the user acceptance theory. The research result shows that consumers' attitude toward using is influenced significantly by perceived usefulness, perceived cost, perceived entertainment and its own development of mobile commerce, especially the factor of perceived usefulness. Although the trial ability of service doesn't influence attitude toward using directly, it has indirect effect on attitude toward using through perceived usefulness.

Keywords: *Mobile Commerce, Technology Acceptance Model, User Acceptance Theory, Theory of Planned Behavior*.

1. Introduction

With the 3G license releasing, the number of intelligent mobile user increases rapidly, and a series of new mobile applications are used widely, such as mobile payment, mobile navigation map and mobile game. This situation reveals mobile commerce enters in a rapid development phase. Though mobile commerce is a new thing in China, the corresponding consumer group hasn't drawn wide attention. Thus, the analysis of how consumers use mobile commerce and the understanding of why mobile users accept mobile services is helpful to understand the basic characteristics of acceptance behavior of mobile commerce and reveal the key influence factors, which will facilitate the popularization of mobile commerce and mobile applications in China.

By taking domestic consumers as the research object, this paper makes a thorough study o their usage of mobile commerce based on the relative literature reading and analysis. We construct a conceptual model by integrating technology acceptance model with the reasoned action model and planned behavior model, and discuss domestic mobile phone users 'willingness to accept mobile commerce and influence factors, finally analyze the interrelationship among these factors.

2. Literature Review

Mobile commerce is a transaction mode and the current researches about it focus on the analysis of consumer's behaviors. From the perspective of system, the researches about mobile commerce are mainly developed on three aspects which are software developing technology, platform construction and system application. Lots of domestic and foreign scholars do empirical study in this field. Carlsson et al (2006) construct their model on the basis of technology acceptance model and their results indicate that the important factors for consumers' attitude and behavior intention about mobile commerce service are perceived usefulness, perceived interest, and perceived price[1]. Thong et al (2006) discuss how the perceived ease-of-use, perceived usefulness, user satisfaction, perceived entertainment and user experience gap influence users to use mobile service continuously, according to the user behavior on mobile network[2]. Their empirical study proves perceived ease-of-use, perceived usefulness and perceived entertainment have significant effect on users' willingness to use mobile service continuously, also have indirect effect on their continuous using through the satisfied mediation. And user experience gap is influenced by the mediation of the factors of perceived ease-of-use, perceived usefulness, user satisfaction and perceived entertainment, which influence users' continuous using mobile service. Rao Xi (2010) explores what factors significantly influence online users' continuous use based on the process of how online users make buying decision and the analysis of their purchasing motivation, and finally summarizes that the features of commodity, user's education background, price and convenience of purchasing restrict users' online purchasing. According to the characteristic of online purchasing and the maximization principle of the consumers' commodity utility, Wang Chong and Zhao

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Jinlou (2010) find out five decision indexes which are the quality of commodity, price, purchasing risk, delivery and after sales service, and construct a quantitative model of commodity utility based on these five indexes, and then build up the series curve of consumption preference of online consumers which illustrates the consumers' attitude toward using to commodity, preference and the decision-making behavior of online consumers.

Our research discusses what factors influence consumers' usage of mobile commerce from a perspective of consumer, having the characteristic of market transaction and business activities. Therefore, authors define the concept of mobile commerce from the perspective of transaction. So, the term of mobile commerce refers to do transaction through mobile terminals, such as intelligent mobile, tablet pc and lap-top computer, over the mobile network. Considering most consumer access to mobile service by means of intelligent mobile, as a result, the mobile terminal in this research refers to intelligent mobile.

3. Model Construction

3.1 User Acceptance Theory

The user acceptance theory in this paper involves theory of reasoned action (TRA), theory of planned behavior (TPB), technology acceptance model (TAM) and diffusion of innovations theory (IDT) generally. TRA is the foundation of analysis of consumer behavior, which can measure consumer's behavioral intention and actual behavior effectively under the precondition that the occurrence of a person's behavior depend on his will power. TRA is not applicable to analyze consumers' behavior under the situation a person's behavior is influenced by non will factors like resource, capability, knowledge or assistance. For overcoming the limitations of TRA, TPB is developed later. TAM is used to explain and predict user's acceptance of information technology. IDT seeks to explain and predict how innovations are taken up by consumers.

Theory of reasoned action (TRA)[5]: Theory of reasoned action (TRA) is proposed by Fishbein in 1975, used to explain and predict a person's decision-making process, is the most influential basic theory about human's behavior. It points out behavioral intention reflect a person's relative strength of intention to perform a behavior and conscious plan, is the basic index to predict a person's behavior. Behavioral intention is influenced by two

factors. One is a person's attitude that is a kind of individual factors, reflected a person's positive or negative feeling to perform a targeted behavior. The other factor is subjective norms that is a kind of social factors, reflected a person's perceived perception on social pressure when he performs a particular behavior. A person's attitude and subjective norms is his strong belief about a particular behavior. And a person's belief is a person's subjective perception about a given consequence of performing a specified behavior. In brief, a person's belief decides his behavior, and other factors influence behavior through attitude, subjective norms or relative weights.

Theory of planned behavior (TPB)[6]: To improve the predictive power about individual behavior of model, theory of planned behavior developed from TRA is proposed by Ajzen in 1985, which focus on the relationship among attitude, intention and behavior under the situation that an individual's behavior is incompletely controlled by himself. According to TPB, a person's behavioral intention decides his behavior and his attitude and subjective norms decides his behavioral intention, which has the same viewpoint with TRA. In addition, TPB adds the concept of perceived behavioral control in its model and considers that a person's perceived behavioral controls his influences behavioral intention, so that influence behavior. The perceived behavioral control is decided by perceived control and perceived convenience, which refers to an individual's perceived ease or difficulty of performing a particular behavior. Perceived control is the sum of resources and opportunities needed by an individual to perform a particular behavior, and perceived convenience is the evaluation of importance of relative resources needed by an individual to perform a particular behavior.

Technology acceptance model (TAM)[7]: In 1986, Davis and other scholars developed TAM to explain what factors are decisive to the wide acceptance of computer technology, found that there were two factors influencing users accept information technology. One is perceived usefulness, reflecting the degree to which an individual believes that using a specified system would enhance his performance; the other is perceived ease-of-use, reflecting the degree to which an individual believes that using a specified system would be easy or difficult. Also, this model displays an individual's attitude toward using decide their intention to use, and the intention to use influence usage behavior. Previous researches show TAM is good at predicting and evaluating individual's acceptance of innovation, and explains why an individual accept innovation well.

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Diffusion of innovations theory (IDT)[8]: In 1983, Rogers espoused the theory that an innovation was a new ideas, new product or new process, and innovation can be communicated and spread through certain channels among the members of a social system. Additionally, the speed that consumers adopt innovation is influenced by the characteristics of innovation which are relative advantage, compatibility, complexity or simplicity, trial ability and observability.

3.2 Modeling

Research Thinking: Based on the above theoretical review, it can tell that TRA is the basic theory to study consumers' behavior and TAM is developed from TRA. TAM is developed to illustrate how employees accept innovation in the past originally. In this situation, employees accept new technology with passive attitude and the use cost is born by firms, and the purpose of adopting innovation is to enhance employees' performance. In the mobile network environment, consumers are volunteer, active to accept mobile application. Further, consumers should bear use cost and their purpose of using these new applications are not only increasing the efficiency of work and life, but also including entertainment and obtaining social identity. Therefore, it is not appreciated to apply TAM individually to explain consumers' acceptance of mobile service, since the mobile network environment is quite different from the past. According to TAM, consumers' perceived usefulness decides their attitude toward using, and it influences consumers when they accept commodity or service. So, this research quotas perceived cost, perceived entertainment and perceived usefulness to examine consumers' acceptance to mobile commerce.

Accept or apply mobile commerce means consumers are like to accept innovative technology and application. To understand how and why consumers accept innovation, this research quota IDT to do further study. According to IDT, relative advantage, compatibility, complexity or simplicity, trial ability and observability are intrinsic characteristics of innovations that influence an individual's attitude to adopt or reject an innovation. With the number of commodity and service increase, consumers' curiosity to commodity or service and the trial of service let consumer understand its performance and characteristics, and promote consumers' demand about commodity or service. Thus, we add the trial ability of service as influence factor into our model.

Moreover, this research takes its own development of mobile commerce, namely its own development situation of information technology as the important factor by which consumers are influenced when they accept mobile commerce. Because consumers' perception and judgment will be influenced by its own development of system and the maturity of system is the dominant factor influencing user behavior. Hence, we take its own development of mobile commerce as an influence factor which influence consumers' acceptance.

In a word, our research takes perceived cost, perceived entertainment, perceived usefulness, the trial ability of service and its own development of mobile commerce as the influence factors to measure users' acceptance of mobile commerce.

Research Model: Perceived usefulness means the degree to which user believes that using mobile service would enhance his efficiency. Attitude toward using is the attitude that user's attitude toward using mobile service. And behavioral intention refers to user's intention of using mobile service. In TAM, "behavior" is decided by "behavioral intention" which is determined by "attitude toward using" and "perceived usefulness" together, and the "attitude toward using" obtains the dual influence from "the level of perceived usefulness" and "perceived ease-of-use". It is vital that user perceives mobile commerce is very useful to them, which will prompt them use mobile service and repeat use. Before user performs a particular behavior, he would like to search, analyze and study certain information on the basis of his demand, after a series of psychological evaluation or SWOT analysis, user will have behavioral intention while he considers a particular tool or system is useful and has high performance price ratio. So, the usage behavior of mobile commerce is influenced by customer need and customer experience or other useful factors analyzed from information. Based on this, authors assume:

H1: consumer's behavioral intention influences his actual usage significantly.

H2: consumer's attitude toward using influences his behavioral intention significantly.

H3: perceived usefulness influences consumer's behavioral intention of using mobile service significantly.

H4: perceived usefulness influences consumer's attitude toward using mobile service significantly.

H5: the trial ability of service influences perceived usefulness significantly.

H6: the trial ability of service influences consumer's attitude toward using mobile service significantly.

H7: perceived cost influences consumer's attitude toward mobile service significantly.

H8: perceived entertainment influences consumer's attitude toward mobile service significantly.

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H9: "its own development of mobile commerce" has a positive influence with"user's attitude toward using".

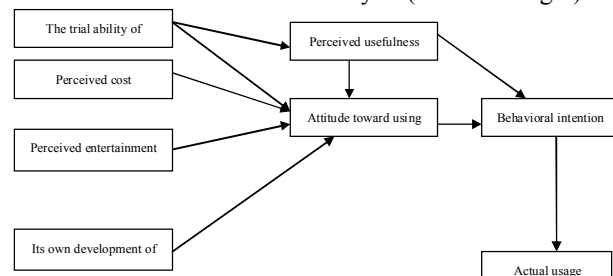On the basis of above analysis, we construct the following model of consumer behavior analysis (shown in Fig 1).

Fig. 1 Consumer behavior analysis model of Mobile commerce.

3.3 Empirical study

Questionnaire and data collection: This paper studies what factors urge consumers adopt mobile commerce, so that, the swatches of this research must satisfy two conditions, which are the respondents should be the users or potential users of mobile commerce and they must understand or have experience with mobile commerce. Besides, majority of mobile commerce consumers should experience electronic commerce before. For these reason, this paper adopts internet survey combined with paper questionnaire.

Bandura(1986) points out young consumers are sensitive to innovation, and most innovators and early adopters are young consumers [9]. In addition, authors find out the number of young consumers using individual-oriented mobile service is more than the elderly group from daily observation and communication. As a consequence, this research takes young consumers as research object. Because college students account for the majority of the young consumers, our research takes college students and young workers as the main investigation object.

Totally 230 questionnaires were sent out in our research, including 80 electronic questionnaires and 150 paper questionnaires. There were 213 questionnaires retrieved and among of 68 questionnaires are electronic. Available questionnaires are 195 that include 65 electronic questionnaires and 130 paper questionnaires. The total recovery rate is 91.55% (shown in Table 1).

Table 1: Questionnaire situation

	Paper questionnaires	Electronic questionnaires	total
The number of issued questionnaires	150	80	230
The number of retrieved questionnaires	145	68	213
The number of available questionnaires	130	65	195
Valid recovery rate	89.66%	95.59%	91.55%

Descriptive statistical analysis: Based on the statistical results of available retrieved questionnaires, the result of the demographics of swatch analyzed by descriptive statistics is showed in Table 2.

Table 2: Descriptive statistic

Demographic variable	Number	Percentage	Demographic variable	Number	Percentage
Gender:			Experience of wireless network :		
male	78	40%	<=1y	6	3.08%
female	117	60%	1-2y	13	6.67%
			3-5y	156	80%
			>=5y	20	10.26%
Age:			Monthly expenditure for mobile service		
<=20	21	10.77%	<=¥30	48	24.61%
21-25	117	60%	¥30-¥50	65	33.33%
26-30	50	25.64%	¥50-¥100	73	37.44%
>=30	7	3.59%	>=¥100	9	4.62%

Figure 1 illustrates the proportion of male and female is appropriated, users aged 21-25 account for the majority (60%), because this research take young consumers as research object. From the experience of wireless network, most consumers have more 3 years experience which indicates most young consumers can access to internet through their mobile. the monthly expenditure for mobile service of 95.38% consumers is below 100 RMB.

Reliability analysis: Reliability is the degree to which a person trusts the measurement results, including constancy and consistency. Higher reliability represents the score of measurement result of different item in the same scale is less influenced by error. Authors use Cronbach's α coefficient to analyze items. According to the suggestion of Guielfod (1965), the reliability is high when the value of α is more than 0.7, and the reliability is acceptable if the value of α between the zone of 0.7~0.35, while the value of α is lower than 0.35 means low reliability(shown in Table 3).

Table 3: Reliability analysis

variable	Cronbach's α	item
Perceived usefulness	0.913	6
The trial ability of	0.859	3

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service		
Perceived cost	0.895	4
Perceived entertainment	0.906	4
Its own development of mobile commerce	0.819	4
Attitude toward using	0.873	4
Behavioral intention	0.920	3

The results show that all the Cronbach's α value is large than 0.7 proposed by Nunally[10], which tell the scale compiled in this research has high reliability.

Validity analysis: Validity is used to measure the availability of result, representing whether the measurement results reflect the correctness of measure target and intention truly. The measurement results can display more actual characteristics of the measured object when the validity is higher. The determination criterion is that the load standard of each factors should be large than 0.7 and the significance level is equal or large than 0.05. Moreover, AVE (the extracted average variance value) should be large than 0.5 and the value of CR (complex reliability) should be large than 0.7. The results of each factor are listed in the following figure. It can tell that the value of all factors reach the determination criterion, which means the validity of data is high. The abbreviation of TRI, SC, EV, ED, PU denote respectively the trial ability of service, perceived cost, perceived entertainment, its own development of mobile commerce and perceived usefulness. And ATS and INS denote attitude toward using and behavioral intention respectively (shown in Table 4).

Table 4: Validity analysis

factor	Test item	Load standard	T value	AVE	CR
PU	PU1	0.72	10.68	0.61	0.84
	PU2	0.81	10.96		
	PU3	0.84	11.17		
	PU4	0.74	10.80		
	PU5	0.79	10.83		
	PU6	0.71	10.51		
TRI	TRI1	0.71	11.24	0.60	0.82
	TRI2	0.86	14.24		
	TRI3	0.75	12.02		
SC	SC1	0.84	14.35	0.81	0.90
	SC2	0.96	17.36		
	SC3	0.80	12.67		
	SC4	0.86	14.24		
EV	EV1	0.93	16.58	0.67	0.89
	EV2	0.98	24.88		
	EV3	0.66	12.04		
	EV4	0.65	8.40		
ED	ED1	0.64	7.99	0.63	0.89
	ED2	0.74	13.02		
	ED3	0.89	16.24		
	ED4	0.71	11.83		
ATS	ATS1	0.87	15.47	0.77	0.87
	ATS2	0.89	17.52		
	ATS3	0.84	14.81		
	ATS4	0.85	15.12		
INS	INS1	0.88	14.86	0.77	0.91
	INS2	0.89	18.41		
	INS3	0.87	17.74		

The examination of model assumption: Each path assumption in research model is examined by LISREL, and the computed results are showed in the following figure. The research points out the data of swatches support seven assumptions among the nine assumptions mentioned above and all path coefficients reach significant level (p<0.001) (shown in Fig. 2).
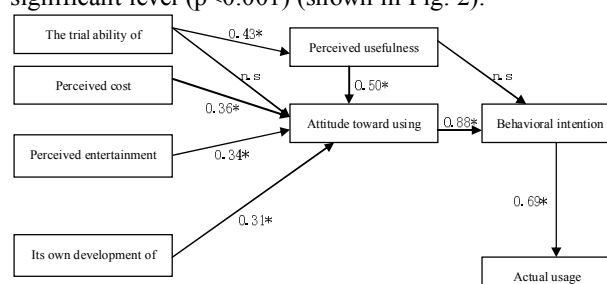

Fig. 2 Model modification.

Note: *, P<0.05 ; **, P<0.01 ; ***, P<0.001 ; n.s. : Not significant.

4. Conclusions

By taking college students and young workers as research object, this research proposes an integrated model to examine what influence factors influence consumers' usage behavior to mobile commerce through integrates TRA and TPB with TAM. And then we conduct an empirical study on the date from the investigation and draw a conclusion that:

The attitude toward using is influenced significantly by perceived usefulness, perceived cost, perceived entertainment and its own development of mobile commerce. Among these four factors, perceived usefulness is the biggest influence factors to consumer's attitude toward using, namely consumers are most concerned about the usefulness brought by mobile commerce currently, which even exceeds the influence of perceived cost, perceived entertainment and its own development of mobile commerce. So that, offering useful services by aiming at consumers' actual demand will be perfectly acceptable by consumers. Also, the results show consumers is easy to have behavioral intention when they feel good about the whole mobile commerce, which lead to actual usage behavior finally.

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Our research verifies the corresponding assumptions in TAM model, but the perceived usefulness doesn't influence consumer's behavioral intention directly in this research. It may be caused by the influence of mobile commerce on individual's daily life. For example, although the short message subscription (weather, news, stock information and so on) is useful to consumers, they can get this information from other channels (internet surfing, TV, etc.) conveniently. So the usefulness of mobile commerce could be replaced by other services.

The results support the assumption that the trial ability of service influences perceived usefulness significantly. That presents that consumers need to try unused service to enhance the feeling about usefulness of mobile service. Currently, the development of mobile commerce is so fast, and lots of services are unknown to consumers, also it is difficult to accept these unknown services quickly. So that, it is necessary to let consumers try services before subscription.

Although the trial ability of service doesn't influence consumers' attitude toward using directly, it has indirect influence through perceived usefulness. Besides, perceived usefulness can influence consumers' behavioral intention indirectly. Perceived usefulness and attitude toward using has significant mediation in these two relationships.

The test results of model's assumptions shows that, except the influence from perceived usefulness to consumer's behavioral intention, TAM is still effective under the mobile commerce environment, and the trial ability of services has direct influence on perceived usefulness. Service providers should investigate what factors influence consumers' behavioral intention to mobile commerce, offer more trial to consumers, enhance the performance price ratio of service, further explore consumer's demand and expectation, increase consumers' perceived usefulness from different aspects, and finally attract more consumers use more service.

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