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# THEORIZING A TWO-SIDED ADOPTION MODEL FOR MOBILE MARKETING PLATFORMS

*Completed Research Paper*

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## **Abstract**

*From a two-sided market perspective, this paper is aimed at proposing a conceptual model for analyzing user adoption behaviors towards mobile marketing platforms. Both the consumer side and the merchant side of the platforms are modeled based on extending classical theories with newly introduced factors reflecting cross network effects, and the two sides are integrated in the overall model which reveals the dynamic interaction between the evolution processes of the two user groups through the platform. An experimental investigation and a survey study are conducted to test the consumer side and the merchant side of the model, respectively, both using the structural equation modeling (SEM) method for statistic analysis. Results from the empirical tests demonstrate that the two-sided perspective is promising for interpreting the adoption and evolution mechanisms of mobile marketing platforms. The proposed model extends the current research theme of information systems adoption to a more comprehensive viewpoint of two-sided markets, while contributes to the literature of two-sided market theories by introducing behavioral considerations.*

**Keywords:** User adoption, two-sided market, network effect, mobile marketing platform

## **Introduction**

The past decade has witnessed rapid development in mobile communication technologies. Fused with the traditional desktop Internet, mobile computing applications are creating a ubiquitous network society. Mobile communication devices, including cell phones, laptops, and netbooks, have provided people with new approaches to accessing web contents, emails, instant messaging, and commerce services in a convenient and flexible fashion which fully takes the advantages of mobility and timeliness. A large number of various mobile commerce platforms have been launched, aimed at providing better services to customers and exploring new business opportunities. Although a large volume of literature is available on mobile commerce, the topic is still under development and offers potential opportunities for further research and practice (Ngai and Gunasekaran 2007).

Among others, marketing is widely considered as one of the most promising and profitable services that can be more effectively delivered with mobile communication technologies, since mobile network offers the ability to distinctly identify its mobile users, as well as to determine their current location and time of usage (Albers and Kahly 2008). Most retail chains and brand owners today are exploring mobile marketing as a new way to improve customer interaction. Mobile marketing platforms, such as Nokia's *Media Network* and Telenity's *Canvas SmartAds*, have attracted extensive attention and started to achieve commercial success.

Similar to the case of traditional IT/IS applications, user adoption is regarded as one of the key issues in the diffusion process of mobile technologies and systems (Venkatesh and Ramesh 2006). On the other hand, unlike traditional applications, user adoption of mobile commerce systems is more subject to contextual and task-related characteristics (Bouwman and van de Wijngaert 2009). Specifically, social factors and network effects (Katz and Shapiro 1986) may impose more significant impacts on the adoption of mobile services. On this background, it would be particularly meaningful to examine the behavioral mechanism of mobile marketing platform adoption.

In this paper, we focus on the most common form of mobile marketing platforms, which are developed and maintained by independent and specialized platform providers. Merchants can post product information and advertisements on the platform so as to expose them to potential customers, while consumers may search and browse the platform for desired products. Such a mobile marketing platforms is typically a two-sided market, where two user groups (consumers and merchants) are inter-dependent with regard to platform value. In other words, a platform with more merchant users would be more attractive to consumers, and vice versa.

Although two-sided market theories have been extensively discussed in both economics and information systems areas, related literature by far has focused on pricing strategies in platform settings, such as payment systems or matching intermediaries (Economides and Katsamakas 2006). To the extent of our knowledge, no existing effort has ever addressed the issue of user adoption behaviors under the two-sided market effects. Consequently, our understanding about the behavioral mechanism in two-sided markets is still limited and it is still difficult to effectively explain and predict the behaviors of individual and organizational users.

Therefore, the current study is aimed at developing a conceptual model for explaining the user adoption behaviors of mobile marketing platforms from a two-sided market perspective. Both the consumer side and the merchant side are modeled based on extending classical theories with newly introduced factors reflecting cross network effects, and the two sides are integrated in an overall model which reveals the dynamic interaction between the evolution processes of the two user groups through the platform. The two sides of the model are tested with survey and experiment data respectively. The empirical results demonstrate that cross network effects have significant impacts on both consumer and merchant sides and the model effectively captures the adoption of such two-sided platforms.

## **Related Literature**

This study is related to three research literature themes: (1) information systems adoption, (2) two-sided market, and (3) mobile marketing. In this section, we would briefly review these three topics respectively.

### ***Information Systems Adoption***

Information systems adoption and use have remained a central concern in the field of information systems research during the past twenty years. Related efforts have produced a number of theoretical models, such as technology

acceptance model (TAM) (Davis 1989; Davis et al. 1989; Venkatesh and Davis 2000), task-technology fit model (TTF) (Goodhue and Thompson 1995), and unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al. 2003), to interpret the psychological and social mechanisms that potentially determine the behavior of technology adoption. Influential theories in other areas, including theory of planned behavior (TPB) (Mathieson 1991; Pavlou and Fygenon 2006; Taylor and Todd 1995), social cognitive theory (SCT) (Compeau and Higgins 1995; Compeau et al. 1999), technology-organization-environment framework (TOE) (Tornatzky and Fleischer 1990; Zhu and Kraemer 2005), and innovation diffusion theory (IDT) (Moore and Benbasat 1991; Rogers 1995; Zhang et al. 2008), were also borrowed into the studies of technology adoption. Meanwhile, large amounts of empirical and field studies were conducted in various regions of the world to validate the theories. It is believed that the achievements in technology adoption research could essentially help IT manufacturers and managers to better handle the development, application, and management of information systems (Zhang et al. 2009).

In recent several years, studies with regard to user adoption of mobile commerce applications and mobile information systems have started to flourish. Existing research has covered the topics such as bundle pricing and consumer behavior of location-based services (Constantiou and Damsgaard 2004), interdependencies between users' content generation and content usage behavior (Ghose and Han 2009), user acceptance of short message service in China (Chan et al. 2008; Lu et al. 2010), usage of mobile banking or mobile payment (Viehland and Leong 2008; Zhong 2009), post adoption usage of mobile data services (Kim 2008; Lee et al. 2008), and mobile learning systems adoption (Liu et al. 2009). Some cross cultural comparison has also been conducted (Harris et al. 2005). Although the studies have produced some insightful results, the area in general is still at a very early stage.

As mentioned above, user adoption and acceptance with regard to mobile marketing platforms have also been addressed to some extent (Bauer et al. 2005; Kim et al. 2007; Wu and Wang 2005). Such studies, however, usually derive conceptual models directly from traditional theories, and seldom take the special features of mobile marketing systems into account. For instance, in a recently proposed model of consumer acceptance for mobile marketing (Bauer et al. 2005), user attitude toward mobile marketing is suggested to be determined by existing knowledge, attitude toward advertising, perceived utility, and perceived risk, which are all derived from either traditional marketing theories or classical technology adoption models. In another research about mobile commerce adoption (Wu and Wang 2005), the widely addressed TAM model is extended to include perceived risk and cost as determinants for users' behavioral intention to use. In both of these two studies, the characteristics of mobile marketing platforms are not effectively considered. In this sense, a novel model considering the particular characteristics of mobile marketing platforms from a two-sided market perspective could result in significant contribution to related literature.

According to a general classification, the locus of technology adoption can be differentiated between "organization" and "individual" (Fichman 1992). For individual adoption, the most influential theory is TAM (Davis 1989; Davis et al. 1989). Recently, however, the over-intensive focus on expanding the TAM model is being criticized for the lack of innovation in the theoretical nature and the departure from the current important IT/IS management problems (Benbasat and Barki 2007; Straub and Burton-Jones 2007; Venkatesh et al. 2007), and it is recommended that the next generation of adoption and acceptance research should go beyond TAM and consider more comprehensive models such as TPB (Benbasat and Barki 2007), which has been successfully applied in some recent research about e-Commerce adoption (Pavlou and Fygenon 2006). For organizational adoption issues, most existing studies adopt the TOE framework, which has been notably utilized by Zhu et al. in a series of research of e-Business usage by organizations (Zhu and Kraemer 2005; Zhu et al. 2006).

When examining the two-sided context of a mobile marketing platform, the consumer side adoption problem is at an individual locus, while the merchant side can be regarded as an organization adoption problem. In our research, the consumer side analysis will be based on the TPB theory and the merchant side will be drawn upon an integrated model of the TOE framework and the IDT theory.

### ***Two-sided Market***

As a source of informational or potentially normative influence, a large number of users may influence an individual's adoption of a particular technology. Critical mass, defined as the point at which sufficient individuals in a system have adopted an innovation so that the innovation's further rate of adoption becomes self-sustaining (Rogers 1995), has been extensively studied in the IS discipline. However, the concept of critical mass is only

appealing in studying interactive communication technologies used by a single group of people, such as the consumer side of a mobile marketing platform.

In contrast, our study pays more attention to the interaction between the two sides of a platform, which can be interpreted as a two-sided market. Two-sided markets, also called two-sided networks, are defined as economic networks having two distinct user groups that provide each other with network benefits (Armstrong and Wright 2007; Gallagher and Wang 2002). Two-sided markets extended the concept of network effects (Katz and Shapiro 1986) to include two or more distinct customer groups who need each other and a platform which provides these customer groups with a venue for getting together to create value that could not otherwise be created. In a two-sided market one customer group chooses a good which affects another customer group's choice. Two-sided markets require an interaction between both sides through a platform, and this interaction must be able to be clearly defined (Parker and Alstyne 2005; Rochet and Tirole 2006).

The concept of two-sided market has been repeatedly addressed from an economics point of view and, consequently, pricing strategies are considered as the key problem for most analyses. From this perspective, it is also stated that a market is two-sided when the ratio of the platform prices matters in the equilibrium interactions between the two sides (Rochet and Tirole 2006). A large amount of efforts have been devoted to investigating the optimized pricing strategies in two-sided market contexts. For example, Eisenmann et al. suggest that the group which is more price-sensitive is the one that should be subsidized (Eisenmann et al. 2006).

Although it has been clearly recognized that a successful two-sided market must be characterized with a virtuous cycle where more demand from one customer group creates more demand from the other customer group (Eisenmann et al. 2006), existing research has not yet gone beyond economics analysis and inspected the interaction between the behaviors of customer groups with a social psychological lens. Almost all economics analyses assume that price is the dominant factor that determines all platform users' rational choices. From a behavioral perspective, however, it is not difficult to see that human behaviors with regard to a mobile system may not be simply driven by a pricing system. Beliefs, perceptions, and contextual factors may play important roles. We believe that our current research could be helpful for filling in this gap.

### ***Mobile Marketing***

According to the Mobile Marketing Association (MMA), mobile marketing is generally defined as a set of practices that enables organizations to communicate and engage with their audience in an interactive and relevant manner through any mobile device or network. Although the literature on mobile marketing is accumulating, the stream of research is still in the development stage, hence is highly inconsistent and fragmented (Varnali and Toker 2010). Existing efforts have covered the issues of strategy (e.g. Scharl et al. 2005), applications (e.g. Ondrus and Pigneur 2006), consumer value (e.g. Kim et al. 2007), and legal and public policy issues (e.g. Karp 2007). As the target of all mobile marketing campaigns, consumer behavior has remained one of the central interest areas. Research in the domain of mobile systems adoption and acceptance is increasingly prevailing (e.g. Bauer et al. 2005; Koivumaki et al. 2006; Wang et al. 2006; Wu and Wang 2005), yet discrepancies regarding relative importance of adoption determinants still exist (Varnali and Toker 2010).

## **Research Model**

The two-sided adoption model proposed in this paper is aimed at capturing the factors determining the adoption behaviors on both the consumer side and the merchant side of a mobile marketing platform, as well as the cross determinant effects between the two sides. In this section, we will first discuss the consumer side and the merchant side respectively, before integrating the two sides into an overall framework.

### ***Consumer Side***

The consumer side of the model is based on the well-known TPB (Theory of Planned Behavior) framework (Mathieson 1991). Classical TPB suggests that the actual technology usage of an individual is determined by his/her intention to use. Intention, in turn, is determined by attitude, subjective norm, and perceived behavior control (Taylor and Todd 1995). In an extended version of TPB that was aimed at analyzing e-Commerce adoption, perceived behavior control is further decomposed into controllability and self efficacy (Pavlou and Fygenon 2006).

Drawing upon the extended TPB model, on the consumer side of our two-sided adoption model for mobile marketing platforms, we introduce two new factors that reflect the cross effects from the other side of the platform, namely perceived merchant abundance, indicating the extent to which a consumer believes that the platform provides abundant merchants for his/her selection, and perceived product abundance, indicating the extent to which a consumer believes that the platform provides abundant products for his/her selection.

Mobile marketing platforms create value for consumers through supplying them with a wide range of selection. Consumers would expect that they can search, retrieve, and compare product and price information on the platform. Consequently, when a consumer perceives that a platform provides abundant merchant and product information, he/she would reasonably take a more positive attitude towards the platform. Therefore, we hypothesize that both perceived merchant abundance and perceived product abundance have positive impacts on attitude, as follows.

Ha1: *Perceived merchant abundance will have a positive effect on attitude.*

Ha2: *Perceived product abundance will have a positive effect on attitude.*

Meanwhile, when a platform provides more merchants for selection and comparison, a consumer would usually feel that he/she has better control for realizing a good deal. Therefore, it is hypothesized that merchant abundance will have a positive impact on controllability. In addition, merchant abundance may also impact on the consumer's perception on product abundance. Therefore, we have the following hypotheses.

Ha3: *Perceived merchant abundance will have a positive effect on controllability.*

Ha4: *Perceived merchant abundance will have a positive effect on perceived product abundance.*

Other factors affecting consumers' behavioral intention to use were largely adapted from the extended TPB model for e-Commerce adoption (Pavlou and Fygenson 2006), which includes perceived usefulness, perceived ease-of-use, information protection, and facilitating conditions. To address the network effect from the same side, we also include the factor of perceived network externality, which has been repeatedly discussed in previous studies about communication technologies (Strader et al. 2007) such as instance messaging (Wang et al. 2004) and short message service (Lu et al. 2010). These studies have revealed that individuals' behavioral intention to use a mobile technology is often related to the number of existing users. Therefore, we incorporate this factor for considering same side network effects.

We hypothesize that perceived product abundance would have a positive impact on perceived usefulness, because when a consumer perceives that the platform provides a large amount of product for his/her selection, he/she would usually tend to feel that the platform is useful.

Ha5: *Perceived product abundance will have a positive effect on perceived usefulness.*

Other hypotheses are largely derived from existing literature. We formulate these hypotheses as follows. Due to the page limit, we will not discuss them one by one in this paper. Consolidating all the hypotheses (Ha1~Ha16) the consumer side of the mobile marketing platform adoption model is shown in Figure 1.

Ha6: *Perceived usefulness will have a positive effect on attitude.*

Ha7: *Perceived ease-of-use will have a positive effect on attitude.*

Ha8: *Perceived ease-of-use will have a positive effect on controllability.*

Ha9: *Perceived ease-of-use will have a positive effect on self efficacy.*

Ha10: *Perceived information protection will have a positive effect on controllability.*

Ha11: *Perceived facilitating conditions will have a positive effect on controllability.*

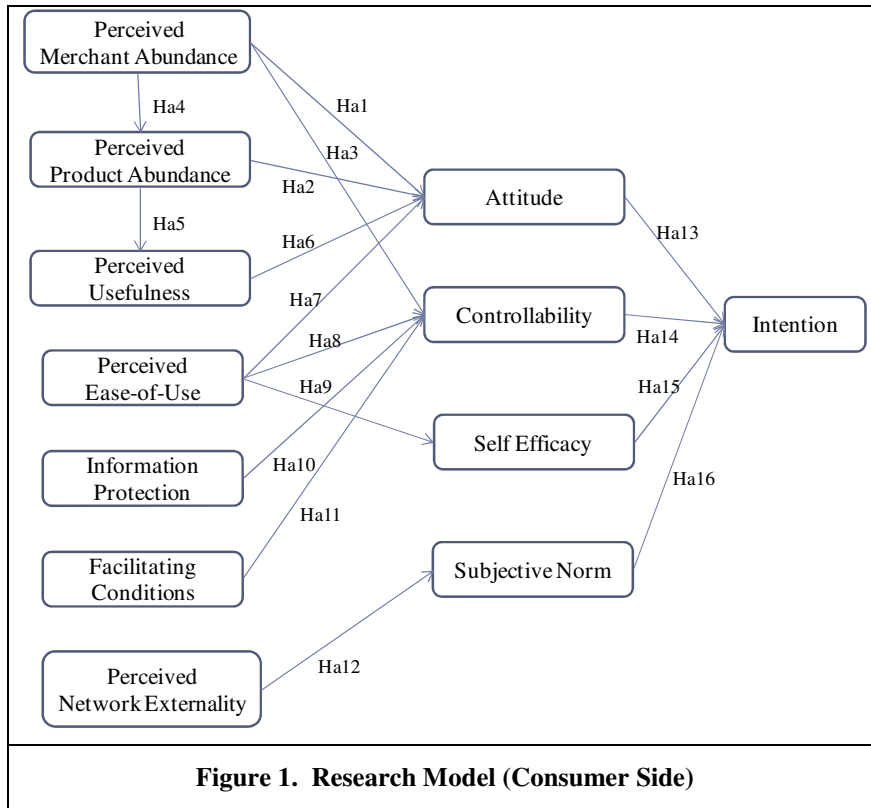
Ha12: *Perceived network externality will have a positive effect on subjective norm.*

Ha13: *Attitude will have a positive effect on behavioral intention.*

Ha14: *Controllability will have a positive effect on behavioral intention.*

Ha15: *Self efficacy will have a positive effect on behavioral intention.*

Ha16: *Subjective will have a positive effect on behavioral intention.*



**Figure 1. Research Model (Consumer Side)**

**Merchant Side**

The merchant side of our model has been drawn upon a combination of the TOE (technology-organization-environment) framework (Tornatzky and Fleischer 1990) and the IDT (innovation diffusion theory) theory (Rogers 1995). This combined framework was originally developed by Zhu et al. (Zhu et al. 2004) and was applied in a number of cross-country research on e-Business adoption and digital transformation in organizations (Zhu and Kraemer 2005; Zhu et al. 2006). Empirical results have effectively demonstrated the soundness and interpretive capability of this framework (Zhu et al. 2006).

In the TOE-IDT combined framework, it is proposed that e-Business usage by an organization is determined by the innovation characteristics (IDT factors) as well as the current contexts of the organization (TOE contexts). Innovation characteristics include relative advantage, compatibility, costs, and security concern. TOE contexts include technology competence, organization size, competitive pressure, partner readiness, and regulatory support. The impacts of costs, security concern, and organization size are negative, while those of the other factors are positive (Zhu et al. 2006). For the merchant side of our two-sided adoption model for mobile marketing platforms, we adopt seven factors from the TOE-IDT combined framework, except for technology competence and partner readiness, since these two factors were majorly developed for inter-organizational e-business systems and do not apply well in the context of mobile market platforms.

We introduce two new factors that reflect the cross effects from the consumer side, namely exposed consumer group size, indicating the size of the consumer population that the platform provides to fit a merchant’s marketing targets, and exposed consumer group value, indicating the market value of the consumer population in the view of a merchant organization.

We hypothesize that consumer group size would have a positive impact on consumer group value, since larger consumer population usually tend to create larger market value for merchants. Consumer group size would have a positive impact on the relative advantage of the mobile marketing platform, because possessing a large body of consumer users could naturally make the platform more attractive. These hypotheses are formulated as follows.

Hb1: *Exposed consumer group size will have a positive effect on exposed consumer group value.*

Hb2: *Exposed consumer group size will have a positive effect on relative advantage.*

Consumer group value would have positive impacts on relative advantage, and competitive pressure. These hypotheses were derived based on the understanding that larger consumer group value would make the platform more meaningful with regard to the merchant's strategic needs, and therefore more necessary in enhancing competitiveness and maintaining customer relationship. These hypotheses are formulated as follows.

Hb3: *Exposed consumer group value will have a positive effect on relative advantage.*

Hb4: *Exposed consumer group value will have a positive effect on competitive pressure.*

Other hypotheses are adapted from the above mentioned literature, as formulated in the following. Incorporating the two newly introduced consumer related factors with the constructs derived with the TOE-IDE combined framework, the merchant side of the mobile marketing platform adoption model is shown in Figure 2. Unlike the consumer side, same side network effects are not considered on the merchant side, due to the fact that there is no theoretical support or empirical evidence for this kind of effects in existing literature.

Hb5: *Relative advantage will have a positive effect on a merchant's decision to use the mobile platform.*

Hb6: *Compatibility will have a positive effect on a merchant's decision to use the mobile platform.*

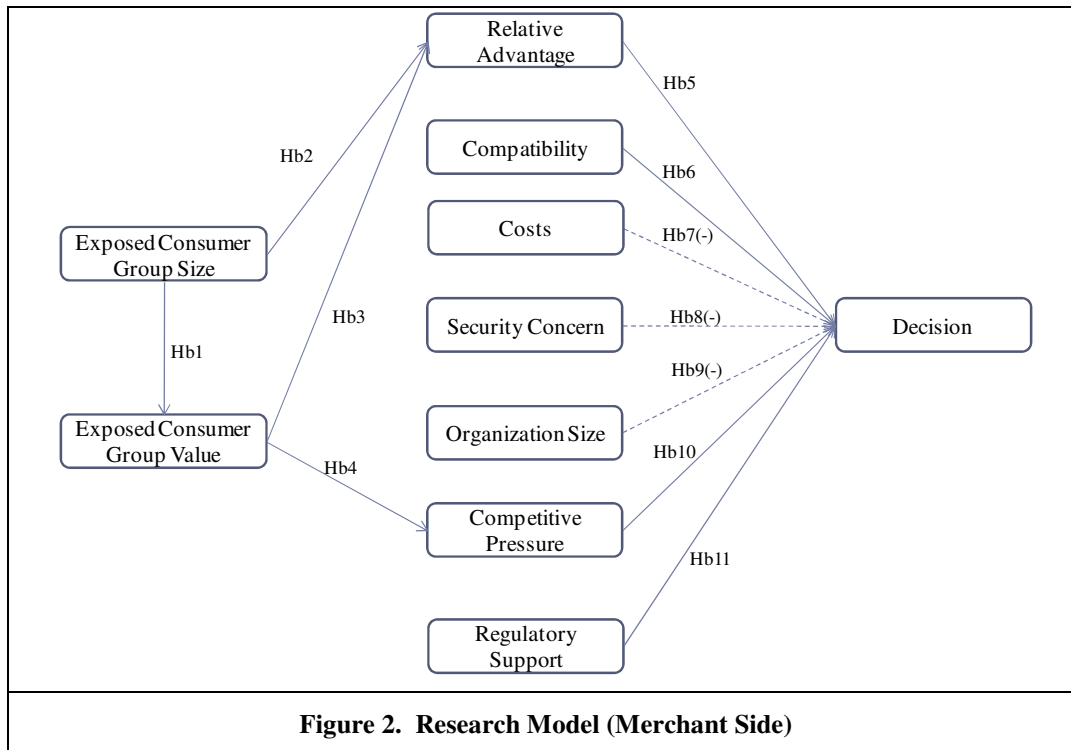
Hb7: *Costs will have a negative effect on a merchant's decision to use the mobile platform.*

Hb8: *Security concerns will have a negative effect on a merchant's decision to use the mobile platform.*

Hb9: *Organization size will have a negative effect on a merchant's decision to use the mobile platform.*

Hb10: *Competitive pressure will have a positive effect on a merchant's decision to use the mobile platform.*

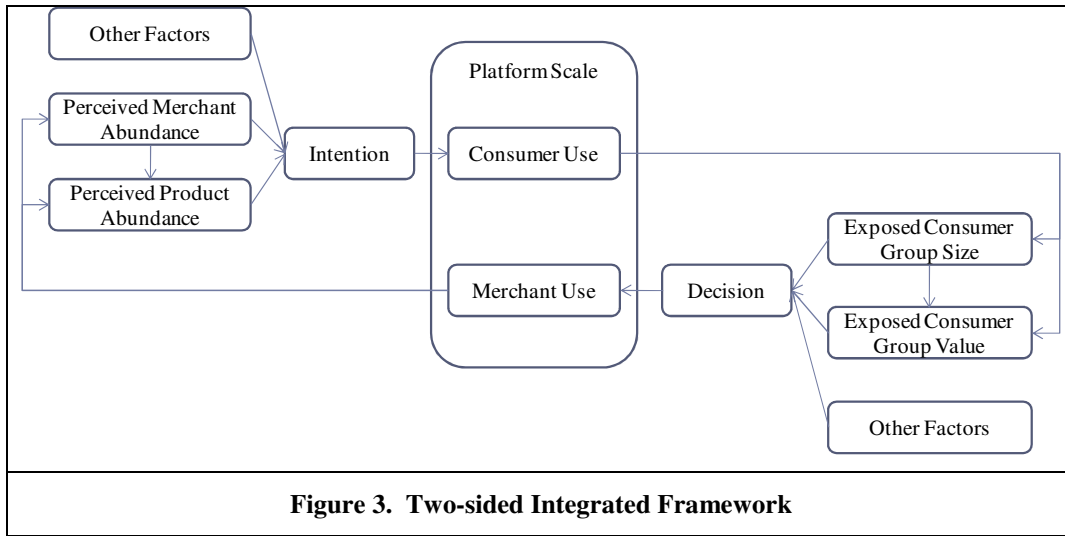
Hb11: *Regulatory support will have a positive effect on a merchant's decision to use the mobile platform.*



### Combined Framework

Combining the consumer side and the merchant side with the platform, the integrated model for considering the adoption of mobile marketing platforms from a two-sided perspective is illustrated in Figure 3. As shown in the framework, the consumer side model (as illustrated in Figure 1) and the merchant side model (as illustrated in Figure 2) are linked together through the platform. To save space in the illustration, factors adapted from previous research (including TPB constructs, external belief factors such as trust, perceived usefulness, and perceived ease-of-use, TOE contexts factors, and IDT innovation factors) are all omitted. In other words, this is a compact view of the integrated model, both sides of which can be easily expanded with the above discussed detailed structures.





The integrated model reveals the interactions between the two sides. On the consumer side, the two cross effect factors, perceived merchant abundance and perceived product abundance, determine the users' behavioral intention along with other external belief factors. Higher behavioral intention would lead to increased consumer use on the platform which, in turn, impacts on the user adoption on the merchant side. Specifically, increased consumer use would drive the exposed consumer group size to expand and increase the exposed consumer group value. These two cross-effect factors, exposed consumer group size and exposed consumer group value, would determine the merchants' decision to use the platform along with other context factors. Subsequently, merchants' decision to use the platform would lead to increased merchant use on the platform which, in turn, impacts on the user adoption on the consumer side.

The interactions between the two sides of the platform form a closed cycle which drives the evolution of the overall platform use. The managerial issue in this dynamic context would be how to create and maintain a favorable environment at the platform, so that the dynamic interactions between the two sides could evolve in a positive direction. In other words, since consumers and merchants depend on each other, the platform provider would face the fundamental question of "who comes first?" Hopefully, our current research would help provide better understanding for tackling this essential problem.

It is worth noting that, unlike the separated models on the two sides, this integrated model reflects the process of dynamic interactions and cannot be tested with a single survey. A longitudinal study is required for validating such a model. In the rest of this paper, we will start with solving the separate problems on the two sides, so as to accumulate insights and theoretical tools for tackling the obstacles to essentially examining the integrated model.

## Research Method

In order to validate the above proposed model for two-sided adoption of mobile marketing systems, we designed a plan to conduct a series of surveys and case studies to collect empirical data. Measurement items and instruments are developed based on existing literature and exploratory field studies. From November 2009 to June 2010, we conducted an experimental investigation and a survey study to test the consumer side and the merchant side of the model respectively, both using the structural equation modeling (SEM) method for statistic analysis. Based on the validation on both sides, the overall model will be tested with a longitudinal study which incorporates both quantitative and qualitative data collection and analysis methods.

### Measurement Items

Measurement items used in the research instruments are largely adapted from related literature. The four newly proposed constructs, namely perceived merchant abundance, perceived product abundance, consumer group size, and consumer group value, are measured using scaling items developed through group discussion and exploratory

field interviews. We first discussed within our research group to obtain a set of candidate items. Then we interviewed several potential users of the mobile marketing platform and asked for their understanding about the item. Finally, the items that were easily understood by the interviewees and consistently reflected the meanings of the corresponding constructs were preserved. The sources of measurement items for all constructs are summarized in Table 1.

<b>Table 1. Source of Measure Items</b>		
Side	Construct	Measurement Items
Consumer	Intention	(Pavlou and Fygenson 2006; Taylor and Todd 1995)
	Attitude	(Pavlou and Fygenson 2006; Taylor and Todd 1995)
	Subjective Norm	(Pavlou and Fygenson 2006; Taylor and Todd 1995)
	Controllability	(Pavlou and Fygenson 2006)
	Self Efficacy	(Pavlou and Fygenson 2006)
	Merchant Abundance	Group discussion and exploratory field interviews
	Product Abundance	Group discussion and exploratory field interviews
	Usefulness	(Pavlou and Fygenson 2006; Zhang et al. 2009)
	Ease of Use	(Pavlou and Fygenson 2006; Zhang et al. 2009)
	Facilitating Conditions	(Taylor and Todd 1995)
	Perceived Externality	(Lu et al. 2010; Taylor and Todd 1995; Wang et al. 2004)
	Information Protection	(Pavlou and Fygenson 2006)
Merchant	Usage Decision	(Zhu et al. 2006)
	Relative Advantage	(Moore and Benbasat 1991; Zhang et al. 2008; Zhu et al. 2006)
	Compatibility	(Moore and Benbasat 1991; Zhang et al. 2009; Zhu et al. 2006)
	Costs	(Zhu et al. 2006)
	Security Concern	(Zhu et al. 2006)
	Organization Size	(Zhu et al. 2006; Zhu and Kraemer 2005)
	Competitive Pressure	(Zhu et al. 2006; Zhu and Kraemer 2005)
	Regulatory Support	(Zhu and Kraemer 2005)
	Consumer Group Size	Group discussion and exploratory field interviews
	Consumer Group Value	Group discussion and exploratory field interviews
Platform	Consumer Use	Platform records
	Merchant Use	Platform records

### **Research Site**

The empirical research was conducted with regard to a mobile marketing platform provided by Ting-Wang, a mobile commerce service provider headquartered in Beijing, China. With a long history focused on providing Internet content services over mobile communication networks, Ting-Wang has been continually developing mobile service systems to provide intermediary supports for commerce activities. The mobile marketing platform that we investigated in our research is called *Ting-Wang Discount* (wap.7758527.cn), which is a mobile website where merchants, including restaurants, fashion shops, etc., can release their advertisements and promotion information while consumers can search for desired merchants or products and redeem electronic coupons. The platform was launched in early 2009 and the user population is still relatively small so far.

Obviously, Ting-Wang Discount is a typical mobile marketing platform which is characterized with the features of a two-sided market. The business development of this platform is still at an early stage. Therefore, it provides us with an ideal context for conducting longitudinal investigation and observing the progress and evolution of user adoption with regard to the platform.

### ***Testing the Consumer Side***

We conducted an experimental investigation to test the consumer side of the model. We chose the experiment method, instead of a sampling survey, partly because it was difficult to locate the potential user population of the platform. Meanwhile, an experiment provides better control over user attributes, so that sampling bias can be avoided to some extent. Participants were recruited among students from universities in Beijing China. Through advertisements posted on social network websites, BBS systems, and student publications, we managed to recruit 255 volunteers for the experiment. The design of the experiment is to make the participants familiar with the *Ting-Wang Discount* platform and then measure their perceptions, intention, and actual use of the system with questionnaires, so as to test the consumer side of our model. To motivate participation, each participant was promised to be rewarded with vouchers worth 50 RMB, which can be used to pay for their mobile phone expenses, as long as they finish the experiment and submit the questionnaires.

During a time period about one month, we sent each participant a newsletter via email every five days, introducing merchants and products on *Tingwang Discount*, as well as functional features of the platform. The intention of such newsletters was to make the participants familiar with the platform. To diversify the recognition of the participants, we prepare multiple versions of newsletters every time, so that different participants may receive different newsletters.

After this introduction period, a questionnaire, which includes the measurement items discussed above, was posted on a website. All the participants were required to login on the website and fill in the questionnaire. All the items in the questionnaire were measured using a seven-point Likert-type scale, ranging from “strongly disagree” (1) to “strongly agree” (7). Within one week, 174 participants submitted their responses, among which 169 are used for analysis, after eliminating the several responses that suffer from too many missing values. In the 169 responses used, 46.2% are male and 53.8% are female. All these responses are from students, with 50.3% of under-graduate students and 49.7% of graduate students (including master and Ph.D.). Most of the participants have a low income (below 1500 RMB per month), which potentially suggests that they may be sensitive to discount information provided by the platform.

The internal consistency reliability (ICR) of the study was assessed by computing composite reliability coefficients (Fornell coefficients), of which values higher than 0.8 generally indicate acceptable reliability (Gefen and Straub 2005). In our study, the ICR values range from 0.886 (for use behavior) to 0.96 (for perceived network externality). With none of the values below 0.8 (see Table 2), the reliability of the scales can be accepted.

Convergent validity was evaluated by the average variance extracted (AVE). According to related studies, AVE values higher than 0.5 are acceptable (i.e., the square root of AVE is higher than 0.707). For a satisfactory degree of discriminant validity, the square root of AVE of a construct should exceed inter-construct correlations that reflect the variance shared between the construct and the other ones in the model (Gefen and Straub 2005). In our research, as shown in Table 2, although some of the variables' inter-correlations are relatively high, convergent and discriminant validities of the model both attain a satisfying level, with all the AVE square root values above 0.8.

### ***Testing the Merchant Side***

To test the merchant side of the model, a survey was conducted among potential merchant users of the *Ting-Wang Discount* platform. The contact information of the merchants was provided by the Ting-Wang company. The questionnaire was designed according to the measurement items discussed above. Most of the items in the questionnaire were measured using a five-point Likert-type scale, ranging from “strongly disagree” (1) to “strongly agree” (5). The questionnaire was distributed to over 400 merchants via express mail, addressed to the owners or top managers of the businesses. One week later, three researchers visited these target merchants to collect the responses. In total, 153 usable responses were collected. Most of the response merchants are small companies, with less than 50 employees. Types of merchants include restaurants (35%), cosmetology/hair dressing (15%), hotels/motels (10%), and others.

The assessment of reliability and validity followed the same methods as in consumer side study. Table 3 illustrates the analysis results, showing that the reliability and validity of this study are all on a satisfying level.

**Table 2. Reliability and Validity of Consumer Side Study**

	I	A	SN	C	SE	MA	PA	PU	PEOU	PNE	FC
ICR	0.951	0.947	0.938	0.929	0.911	0.971	0.961	0.926	0.900	0.960	0.942
AVE	0.907	0.899	0.835	0.867	0.836	0.944	0.924	0.806	0.817	0.889	0.845
Mean	4.538	5.027	4.278	5.225	5.154	4.749	4.240	4.917	5.210	3.968	5.256
S.Dev	1.478	1.265	1.255	1.111	1.285	1.320	1.475	1.171	1.282	1.094	1.352
I	0.952										
A	0.675	0.948									
SN	0.537	0.594	0.914								
C	0.458	0.421	0.286	0.931							
SE	0.199	0.156	-0.015	0.459	0.914						
MA	0.317	0.509	0.441	0.207	0.089	0.972					
PA	0.454	0.440	0.441	0.265	0.086	0.482	0.961				
PU	0.575	0.663	0.575	0.373	0.255	0.403	0.552	0.898			
PEOU	0.383	0.382	0.213	0.470	0.663	0.148	0.354	0.513	0.904		
PNE	0.445	0.441	0.566	0.198	0.073	0.344	0.533	0.428	0.283	0.943	
FC	0.245	0.123	0.096	0.368	0.630	0.078	0.115	0.311	0.510	0.133	0.919

**Table 3. Reliability and Validity of Merchant Side Study**

	CGS	CGV	RA	Comp	Costs	SC	CP	RS	Deci
ICR	0.872	0.766	0.846	0.826	0.768	0.896	0.911	0.839	0.831
AVE	0.696	0.527	0.526	0.543	0.552	0.746	0.837	0.569	0.621
Mean	3.083	3.183	3.284	3.083	2.401	2.813	3.458	3.142	3.529
S. Dev	0.785	1.019	0.891	0.888	0.883	0.866	0.929	0.778	0.830
CGS	0.834								
CGV	0.580	0.726							
RA	0.524	0.636	0.725						
Comp	0.385	0.465	0.545	0.737					
Costs	0.174	0.302	0.144	0.246	0.743				
SC	-0.062	-0.048	-0.155	0.063	0.277	0.864			
CP	0.040	-0.034	0.133	-0.129	-0.059	-0.052	0.915		
RS	0.419	0.443	0.285	0.421	0.213	0.116	-0.022	0.754	
Deci	0.321	0.557	0.524	0.318	0.092	-0.193	-0.100	0.275	0.788

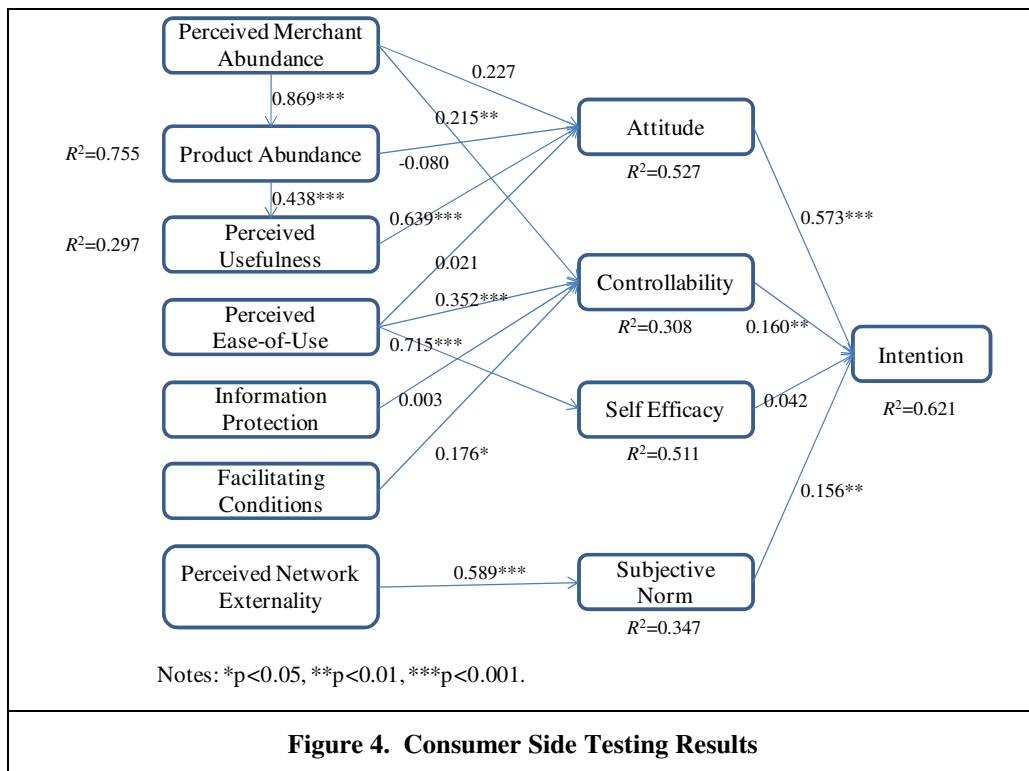
## Results and Discussions

Both the consumer side and the merchant side of the model are tested using partial least squares (PLS), a structural equation modeling (SEM) technique suitable for highly complex predictive models (Chin 1998). We used the PLS-Graph software (version 3.0) for the analysis, utilizing the bootstrap re-sampling method (300 re-samples) to determine the significance of the paths within the structural model (Chin et al. 2003; Gefen et al. 2000).

### Consumer Side Results

Figure 4 shows the testing results of the consumer side of the proposed model. With most of the hypotheses significantly supported by the statistical results, this consumer side model explains over 60 percent of the variance of users' intention to use the mobile platform. It is reasonable to accept that the consumer side of the proposed model could help us better understand the adoption of consumers under the cross network effects from the merchant side.

However, it is notable that neither of the impacts of merchant abundance and product abundance on user attitude is significant. In other words, the cross network effects from the platform do not influence users' attitude toward the platform directly. Instead, the effect of product abundance is shown through the mediation of perceived usefulness, while merchant abundance impacts on product abundance and controllability. Meanwhile, the effect of information protection is also non-significant. This result possibly indicates that for marketing-oriented mobile platforms, privacy and security are not a serious concern to individual consumer users. Furthermore, perceived network externality displays a strong impact on subjective norm, which in turn influence behavioral intention, illustrating that, along with cross platform interactions, the network effect from the same side of the platform is also of significant importance.



### Merchant Side Results

The testing results of the merchant side of our proposed model are shown in Figure 5. The results clearly reveal that relative advantage is the most important determinant for merchants' decision to use the mobile marketing platform. Most of the other factors fail to show significant impacts on adoption decision.

Unexpectedly, competitive pressure displays a negative impact on adoption decision, which is contrary to our initial hypothesis. This result is very hard to explain and deserves further investigation. A plausible interpretation is that, when the competitive pressure is high, the merchant would tend to focus more on traditional core functions such as operations and put more emphasis on cost control. Consequently, they would be less active in pursuing marketing benefits from the mobile platform. If this explanation holds, it can be inferred that the use of mobile network has not yet become an integral part of competitiveness for such merchants.

Although it seems that most of the factors adapted from the IDT-TOE combined framework do not play an important role in the adoption of mobile marketing platforms on the merchant side, the two newly introduced factors that reflect cross network effects are found to have significant impacts. Both consumer group size and consumer group value significantly influence relative advantage, which is the principal determinant for adoption decision. Such results reveal that, the IDT-TOE combined framework, which was originally developed in the context of inter-organizational e-business adoption, may not be a suitable foundation for investigating mobile marketing platforms, but the two-sided cross effects are indeed fundamental driver for small businesses to adopt this kind of platforms. Therefore, it is confirmed here that the two-sided perspective is proper for examining the merchant side adoption and future efforts could draw upon this funding to develop more comprehensive model centered on the two-sided effects.

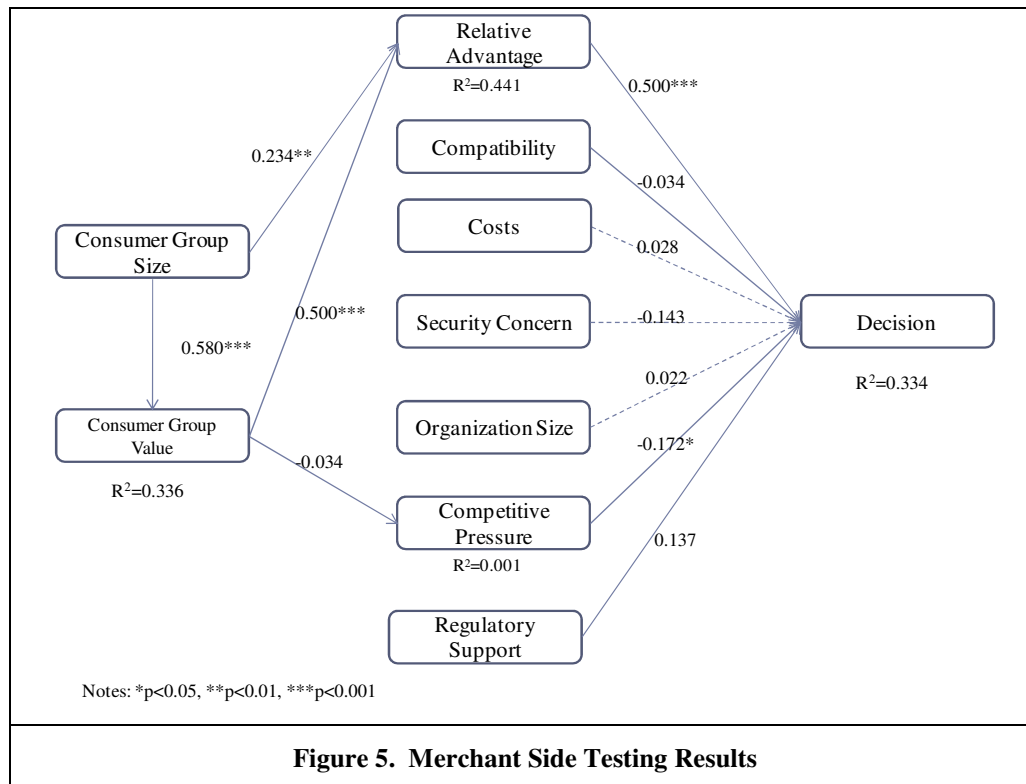


Figure 5. Merchant Side Testing Results

## Conclusion

In this paper, we propose an integrated conceptual model for analyzing user adoption behaviors towards mobile marketing platforms from a two-sided market perspective. The consumer side of the model is based on the classical social psychological theory of TPB to interpret the behavioral mechanism of individual user adoption, and the merchant side is drawn upon the influential organizational behavior framework of TOE to explain the decision logic of corporate users. The two sides are integrated in the overall model which reveals the dynamic interaction between the evolutions of the two user groups through the platform.

An experimental investigation and a survey study have been conducted to test the consumer side and the merchant side of the model respectively. The results on the consumer side support most of the hypotheses and illustrate that the model well explains the adoption behaviors of consumer users. On the merchant side, although several factors adapted from the IDT-TOE framework are found to be non-significant to adoption decision, the new factors

reflecting the two-sided effects are all proved to be of great importance. These findings demonstrate that the two-sided perspective is promising for interpreting the adoption and evolution mechanisms of mobile marketing platforms. Future research could further adjust the model on both consumer and merchant sides, so as to improve its applicability. With the two sides validated respectively, the overall model could be tested with longitudinal studies, taking advantages of instruments developed through the journey.

The two-sided adoption model proposed in this paper extends the current research theme of information systems adoption to a more comprehensive viewpoint of two-sided markets. Although existing literature has addressed the impacts of network effects (Katz and Shapiro 1986; Strader et al. 2007), the cross network effects between different user groups have not yet been studied in depth. In this sense, the proposed model would have the potential to generate particularly meaningful contributions to the information systems research area.

On the other hand, the current research also contributes to the literature of two-sided market theories. As discussed, existing research with regard to two-sided markets mostly follows an economics analysis approach and seldom takes human behavioral considerations into account. Therefore, it is worthwhile to go beyond the price-dominant assumptions and inspect the interactions between the behaviors of customer groups with a social psychological lens. We believe that the model proposed in this paper would also be a promising endeavor in this direction.

The major limitation of the current research lies in the fact that we tested the two sides of the model separately, with two basically independent studies. However, we believe that, in order to probe into the overall integrated model, it is necessary to start with dividing it into two parts. After solving the separate problems on the two sides, we will accumulate sufficient insights and tools for tackling the obstacles to essentially examining the integrated model. Along this line of thought, a longitudinal research to validate the overall integrated model is also being designed.

Another limitation of this paper lies in sample size, which is relatively small considering the number of constructs dealt with in model. We have 169 responses for the consumer side, in which there are 12 constructs, and 153 responses for the merchant side, in which there are 10 constructs. It used to be argued that the PLS method, which is used in this paper, only requires a sample size of 5 to 10 times the most complex relationships within the research model (Chin 1998). According to this "10 times" rule, the sample size in this paper is sufficient for tests. A recent study, however, challenges this rule and suggests that larger sample sizes should be secured (Goodhue et al. 2006). Therefore, on-going research is aimed at extending the current study to more practice sites and testing the proposed model more extensively with more empirical data..

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