

User Acceptance of Mobile Payments: A Theoretical Model for Mobile Payments

Jiajun Jim Chen, Carl Adams
University of Portsmouth, Portsmouth, PO1 3AE, UK

Abstract: Mobile payment refers to the use of mobile devices to conduct payment transactions. Users can use mobile devices for remote and proximity payments; moreover, they can purchase digital contents and physical goods and services. It offers an alternative payment method for consumers. However, there are relative low adoption rates in this payment method. This research aims to identify and explore key factors that affect the decision of whether to use mobile payments. Two well-established theories, the Technology Acceptance Model (TAM) and the Innovation Diffusion Theory (IDT), are applied to investigate user acceptance of mobile payments. Survey data from mobile payments users will be used to test the proposed hypothesis and the model.

Keywords: mobile payments, user acceptance, TAM, IDT, LISREL

I. Introduction

Recent developments in mobile/wireless communication technologies have changed our daily lives. For example, we have enjoyed a high penetration rate of use of mobile devices, and the growth of usage of mobile devices has had a positive impact on the promotion of mobile commerce applications [1]. This phenomenon has happened in e-commerce, when Internet use was increasing worldwide. Forrester Research predicts that the total revenue from European Online Retail will quadruple to €67 billion between 2004 and 2009 [2]. However, there are still many unresolved issues in e-commerce applications such as security, privacy issues, and usability. These have long been an obstacle for further business growth [3-5]. Thus, it is extraordinarily important for service providers to understand these issues from the consumers' perspective, when developing mobile commerce applications.

New wireless and mobile technologies offer various mobile applications. Mobile payment is one of the fastest growing services. The business applications of mobile payment include parking tickets, vending machines, points-of-sales, and digital content. Plenty of different industry sectors have become interested in mobile payments. At the moment, one of the problems with mobile payments is the lack of standards and regulations. Mobile payment can be implemented via different solutions, such as premium SMS, infrared, RFID and so on [6]. These solutions claim to offer easier, faster and more secure methods than do competing solutions, though this is arguable. There are still issues

concerning the roles and responsibilities of various market participations and their implementation. On the other hand, consumers and merchants have the potential to influence the adoption of mobile payment.

Mobile payment is a sub-set of mobile commerce, and it plays an important role in mobile commerce applications. From the consumers' point of view, service cost is one of the major concerns determining use of mobile payment. This principle can even be applied to any new services [7;8]. It is likely that cost will be one of potential factors influencing consumers' decisions regarding mobile payment usage.

As mentioned above, privacy is another concern for consumers' confidence regarding the use of e-commerce [9;10], especially in financial transactions. This concern will have a similar impact on mobile payment, because they share the same payment transaction method, non face-to-face payment transaction. Consumers will not feel safe, as they cannot physically view and examine the actual transactions [11].

The popularity of the use of mobile devices and the potential market for mobile payment applications, demonstrates a vital need to identify and understand the determinants of consumer acceptance of mobile payments. There is little empirical evidence and research into mobile payment adoption, such as what determinants influence user acceptance of mobile payments. It is beneficial to research mobile payment systems as new technologies are waiting for user adoption. Therefore, this research will propose an integrated model. The theoretical model adopted the TAM and the IDT in order to determine consumer acceptance of mobile payments.

II. Theoretical Framework

This research's theoretical constructs are based on the TAM and the IDT. Using these two well-established theories has helped in building a rigid theoretical foundation for this research. They are two of the most influential theories in clarifying and predicting users' acceptance and adoption in a new system.

II.1 Technology Acceptance Model (TAM)

Davis (1986) developed the TAM model to explain user acceptance of new computing technologies in the organisation context. This model was drawn from Theory of Reasoned Action (Ajzen and Fishbein, 1980). The model suggests users' behavioural intentions to determine actual system use, and users' attitudes toward using influence users' behavioural intention. Moreover, perceived usefulness and perceived ease of use have affected users' attitudes toward use. TAM is a powerful theory to predict user acceptance of

technology. Some empirical tests have demonstrated that TAM is a robust model for Information Technology [12;13]. Since then, TAM has been widely used to conduct technology acceptance behaviours regarding different aspects of Information Technology [14-17]. TAM could be a tool to analyse consumers' intentions toward acceptance of mobile payments. Furthermore, numerous of e-commerce related researches have adopted TAM, in order to investigate how to achieve consumers acceptance in e-commerce [15;18].

The TAM model includes two important factors, perceived usefulness, and perceived ease of use. Perceived usefulness refers to "the prospective user's subjective probability that using a specific application system will increase his or her job performance within an organization context," and perceived ease of use describes "the degree to which the prospective user expects the target system to be free of effort" [13]. The TAM model has been widely adopted and verified [13;19;20]; moreover, many researchers have customised the model, so that it fits for different contexts [21;22].

Perceived ease of use

A successful user interface design has potential implications concerning the perceived ease of use to the users. Can users pay easily and quickly? The system providers have to consider this question, in order to ensure users can use the systems effortlessly. Usability has been widely used to evaluate information systems [23-25]. For example, in software products, usability looks at operations, design, and layout to evaluate how easy software would be for users to use and make it do what they want.

Research in usability has been conducted for over a century. For mobile applications, it is important to understand and improve the usability of mobile device interfaces [26]. Moreover, mobile applications raise new challenges and issues for system developers. Mobile devices have unique characteristics, such as screen size, screen resolution, input methods and so on.

In e-commerce applications, there are established guidelines available concerning design and which implement several web components for e-commerce application. However, there is limited guidance for design in mobile applications, especially mobile commerce. Design and usability guidelines are for e-commerce applications that are not compatible with mobile applications [27]. Therefore, it is crucial to understand how users interact with mobile devices, and what is important to users when using mobile applications.

In order to design and implement an easy to use application, the characteristics of the systems need to be understood. An easy to use interface is important for any application, especially for mobile applications [28]. This is because of the unique characteristics of mobile devices, such as screen size, input mechanisms, battery consumption and so on. Systems developers have to give serious consideration to design guidance for mobile applications.

Perceived usefulness

Davis et al. (1989) have concluded that perceived usefulness may be defined as the way in which a particular system could enhance users' job performance. Within the mobile payment context, people are normally looking for convenience, speed, and other rewards for using the systems. A system classified as high in perceived usefulness would lead to a positive user acceptance relationship.

II. 2 Innovation Diffusion Theory (IDT)

Before an innovation can successfully appear in the commercial market, a lot work is required to convince the potential adoptors. Individual users will make a decision whether to adopt an innovation, and this is based on knowledge and on the performance of an innovation [29-31]. Moreover, the speed of the adoption is also affected by potential adoptors' knowledge and experience of an innovation, and the knowledge and experience of their close friends and family [30;32-34]. On the other hand, different adoptors have different approaches toward an innovation. Some adoptors will use new products or services as soon as they receive it. Other adoptors may wait and see; if they are not convinced by the services, they will not accept them until they feel comfortable with them [35].

Rogers (1963) presents IDT for user adoption. This is a well-established theory, and many researchers have adopted this theory for their research [36;37]. The theory identifies the innovation decision process, and it assists in the adoption rate of innovation. Users' acceptance and use of new technology or goods are two key elements in IDT (Zaltman & Stiff, 1973), and help achieve the likelihood of an innovation adoption and the process of innovation decision. Rogers (1995) concludes that five factors could explain new technology's adoption: relative advantage, complexity, compatibility, trialability, and observability.

Relative Advantage: the degree to which an innovation is perceived as better than the existing product.

Complexity: the degree to which an innovation is perceived as being difficult to understand and use.

Compatibility: the degree to which an innovation is perceived as consistent with existing values and experience of the potential adoptors.

Trialability: the degree to which an innovation can be experimented with before adoption.

Observability: the degree to which the results of an innovation are observable to others.

As stated above, these five attributes have been identified as innovation adoption rate's predictor [30;35]. Rogers (1995) concludes that these five attributes influence the potential adoptors' attitudes and intentions during the adoption process. However, Rogers (1995) also emphasises that the attributes are conceptually different. The following section presents more details of these five attributes for innovation diffusion.

Relative advantage

The potential adoptors' can gain an economic and social advantage, if an innovation is undoubtedly advantageous [30]. Unsurprisingly, the potential adaptors realise that the new products or services are more advantageous and useful than existing similar products or services, it can be predicted that they will accept it. Mobile payments are likely offer relative advantage services for consumers. For example, use of mobile phones is seemingly became part of our daily activities, where the device is not only a communication tool, but also an electronic wallet [6]. Mobile phone users can benefit from using wallet-enabled phones. If mobile payment is really advantageous for users, then mobile payment's relative advantage should have a positive effect upon users' intention toward mobile payments.

Compatibility

When an innovation provides alternative or supplementary products or services, and little effort is required to learn operations or behaviour change, potential adoptors are likely to accept it [30]. Using mobile payment systems only require understanding operation procedures and application areas, and it does not change users' behaviour with payment activities. Therefore, mobile payment compatibility should have a positive effect upon users' intentions toward mobile payments.

Complexity

When an innovation's design is sophisticated and complicated, the potential adoptors require more knowledge and instructions to operate or understand the products or services. If this happens, the adoption rates of innovation will probably be disrupted [34]. Mobile payment service is not a complex innovation, and it aims to provide an alternative and convenient payment service for consumers. Therefore, service providers have to consider system usability, and offer a simple solution. Subsequently, mobile payment complexity would have a negative upon users' attitudes toward mobile payments.

Trialability

An innovation allows users to try a product or service. If this innovation meets an individual's requirements, such as cost, quality of service and so on, then they are likely to adopt it. Otherwise, they will simply reject it. Mobile payment trialability, therefore should be related positively to individual users' intentions toward mobile payments.

Observability

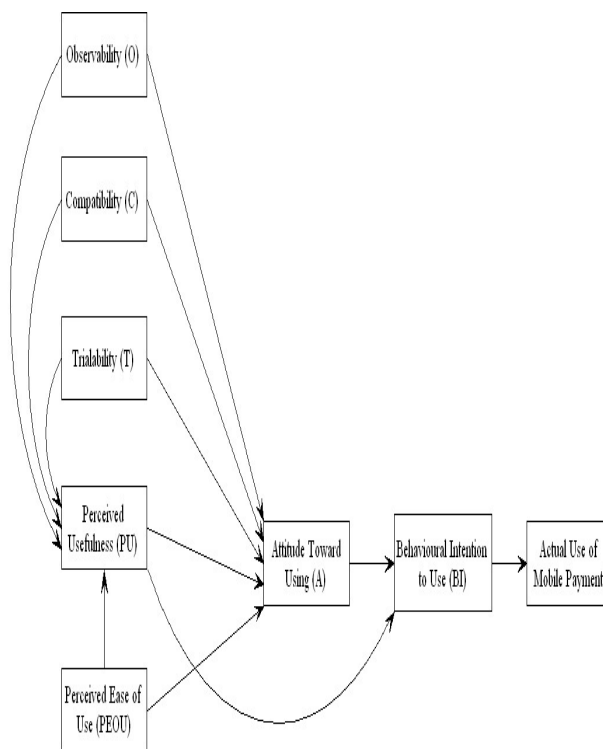
Innovations that are not easily observable have potential diffusion and adoption issues [35]. An innovation should attract the attention of the targeted user group, in order to make them aware of the service. Mobile payment is in a good situation as, when a mobile payment user uses the services in the public, it helps the service providers circulate services. This is because the potential adoptors can readily observe the innovation. Thus, the degree of mobile payment observability should have a positive effect upon users'

intentions toward mobile payments.

These attributes of IDT permit examination of the potential adoptors' decision making and are able to predict the future of innovations [30]. TAM and IDT have shown similarity in some constructs. Relative advantage is very similar to perceived usefulness in the TAM, and complexity is often viewed as the equivalent of the perceived ease of use construct in the TAM [38]. Previous researchers have combined these two theories, in order to offer a more powerful and acceptable model than the individual model [39], as shown in Figure 1.

In order to enhance consumers' enthusiasm for mobile payments, the mobile payment industry has to address the obstacles. For example, the European Central Bank has published guidelines for implementing mobile payment systems in Europe [40]. These potential factors will be incorporated as the antecedents of user acceptance of mobile payment systems as they have been considered relevant for mobile payment adoption.

Figure 1. A theoretical model for user acceptance model of mobile payments



III. Research Model and Hypotheses

A user's attitude has a significant impact on his/her behavioural intentions [41;42]. Previous research has suggested that, when conducting research into usage intentions, attitude will be accepted as a more accurate predictor in research, especially in studies on electronic, digital, and wireless channels (Bobitt & Dabholkar, 2001). Moreover, a user's actual use will depend on his/her

intention. These assumptions lead to the following hypotheses:

H1: A user's behavioural intention towards using mobile payment services has a positive effect upon his/her actual use of mobile payment services.

H2: A user's attitude toward using mobile payment services has a positive effect upon his/her intention to use mobile payment services.

In the TAM model, perceived usefulness can be interpreted as being the way a system could enhance a consumer's job performance [13]. Mobility is one of the main features that mobile services offer to consumers. In theory, consumers can access the services wherever they are. Perceived usefulness may have a positive effect upon the attitude towards mobile payment services [12]. Thus, in the context of a mobile service, perceived usefulness could be considered as how consumers' view mobile payments can be integrated into their daily lives [43]. If consumers gain a more positive view of mobile payment services, they will have a positive attitude and intention toward the services. Therefore, the following hypotheses are proposed:

H3: A user's perceived usefulness of mobile payment services has a positive effect upon his/her intention to use mobile payment services.

H4: A user's perceived usefulness of mobile payment services has a positive effect upon his/her attitude toward using mobile payment services.

Perceived ease of use is another key element in the TAM model and is concerned with the extent of users' belief that a system is easy to use, to set up, or to learn [13]. Mobile applications have different environments and contexts compared with e-commerce applications, and they can offer a complex service. Perceived ease of use may have a positive effect upon the attitude towards mobile payment services, and have a positive effect upon the perceived usefulness [12]. This leads to the following hypotheses.

H5: A user's perceived ease of use of mobile payment services has a positive effect upon his/her attitude to use mobile payment services.

H6: A user's perceived ease of use of mobile payment service has a positive effect upon his/her perceived usefulness of mobile payment services.

When an innovation provides alternative or supplementary products or services, and little effort is required to learn operations or behaviour change, potential adoptors are likely to accept it. Using mobile payment systems only require understanding operation procedures and application areas, and it does not change users' behaviour with payment activities. This assumption leads to the following hypotheses:

H7: Compatibility between a user using mobile payment services and a user's beliefs, values, and needs has a positive effect upon his/her attitude to using mobile payment services.

H8: Compatibility between a user using mobile payment services and a user's beliefs, values, and needs has a positive effect upon his/her perceived usefulness of mobile payment services.

An innovation allows users to try a product or service. If this innovation meets an individual's requirements, such as cost, quality of service and so on, then they are likely to adopt it. Otherwise, they will simply reject it. Mobile payment trialability, therefore should be related positively to individual users' intentions toward mobile payments.

H9: Mobile payment services' trialability has a positive effect upon a user's attitude to using mobile payment services.

H10: Mobile payment services' trialability has a positive effect upon a user's perceived usefulness of mobile payment services.

An innovation should attract the attention of the targeted user group, in order to make them aware of the service. Mobile payment is in a good situation as, when a mobile payment user uses the services in the public, it helps the service providers circulate services. Therefore, the following hypotheses are proposed:

H11: Mobile payment services' observability has a positive effect upon a user's attitude to using mobile payment services.

H12: Mobile payment services' observability has a positive effect upon a user's perceived usefulness of mobile payment services.

IV. Research Methodology

IV.1 Measure development

Survey has been selected as the central research methodology in this research. The multi-item scales measure was applied to this research in order to test the proposed research model. The statements are written for each item, and the participants were required to indicate whether they agreed or disagreed with the statements on a Likert scale. Many measures could be used in the TAM based research. For example, performance, productivity, effectiveness, usefulness, and time saving can be used to measure perceived usefulness. Moreover, ease of learning, ease of control, ease of understanding, ease of use, and flexibility of use can be measured perceived ease of use. Some of the items in the survey were taken from previously published scales with appropriate psychometric properties research, as shown in the following table; moreover, all of the items were adopted to fit the context of mobile payments. After an extensive literature review on the topic, new items were also developed.

This section will describe the development of the list of items by constructs.

Actual use of a mobile payment system. Consumers' frequency of use of a mobile payment system is considered a vital element for this research. Ajzen & Fishbein (1980) recommend measuring how often the system is used and approximately how many times it is used over a given time. Some researchers have employed this method ([12;13]. Applying this method to the research, the participants will be asked to record how frequently they use a mobile payment system on a 5-point Likert scale ranging from "Very

Frequently” to “Very Rarely”. The participants using services will then be asked how many times they have used it, based on 5-point Likert scale from “1-9 times” to “Over 40 times”.

Behavioural intention to use a mobile payment service. One question has been designed to ask participants the probability of their using a mobile payment system. This is because Ajzen & Fishbein (1980) identify that actual use is influenced by behavioural intention.

Attitude toward using a mobile payment service. Users’ attitudes can be deduced from their essential beliefs [41], and several research studies have used this principle extensively [13;44]. This research will follow this procedure to measure users’ attitudes. The items are adopted from previous research [12;43], and refined for mobile payment context.

Perceived usefulness of a mobile payment service. The items used to measure perceived usefulness are adopted from previous research with the contents having been refined to match mobile payment services [12]. Based on the findings of Davis et al. (1989) concerning perceived usefulness, this research argues that using the mobile payment will enhance users’ daily activities.

Perceived ease of use of a mobile payment service. The items for perceived ease of use are also developed from previous research [12]. Davis et al. (1989) conclude that perceived ease of use refers to whether a system is easy to learn or to use.

Compatibility. The items for measuring compatibility are adopted from Moore & Benbasat (1991) and Eastin (2002). Rogers (1995) concludes that identifying the compatibility of users’ needs, existing values, and beliefs with the new technological innovation is one way to evaluate the compatibility.

Trialability. A three-item scale is also adopted from Moore & Benbasat (1991) and REF. Rogers (1995) explains that an individual trying out an innovation is one way for a user to understand the system and how it works. The IDT suggests that trialability assists innovation to be adopted more rapidly than if the innovation does not have trialability [30].

Observability. Again, the items for measuring observability are adopted from Moore & Benbasat (1991) and REF. Rogers (1995) asserts that if the results of innovations can easily be shown, users are more likely to adopt the innovations. Mobile payment is a relatively recent innovation for most of the consumers, and it is probable that the systems’ observability will increase the adoption of mobile payment systems.

IV. 2 Data Collection

Mobile payment users are the target participants for this survey, which does not necessarily suggest that the participants have adopted the services. They are invited to participate in the survey online. In the survey, the participants have to consider one particular mobile payment scheme that they used during last three months.

The questionnaire collects two major types of information. The first part concerns participants’ demographic information, and the second part is about participants’ perceptions of each of the constructs in the proposed model. The demographic information includes gender, age, level of education, and occupation. The rest of the questionnaire asks for participants’ the opinions of each item.

In order to collect the data for this study, the survey signed up with an academic purpose survey organisation, which owns a mailing list of over a thousands users who occasionally participate in online surveys.

IV. 3 Data Analysis

Following the response from the online survey, the proposed hypotheses will be tested. SEM based analysis techniques will be used to analysis the data. First, the Confirmatory Factor Analysis (CFA) will be employed to assess the validity of the measurement for the model then the proposed model will be tested using the Structural Equation Modeling (SEM), so that the causal structure of the model can be evaluated. The research will use LISREL 8.7 to analyse the measurement model and the structural model.

V. Conclusion

This study is developing and investigating an in-depth understanding of consumer behaviours and motivations regarding mobile payments. Mobile payment is a new and emerging service in the market, and research in this area is required to identify the issues and opportunities for this service, in order to provide opportunities and guidelines for its diffusion.

References

- [1] W. T. Rupp and A. D. Smith, "Mobile commerce: new revenue machine or black hole?," *Business Horizons*, no. July-August, pp. 26-29, 2002.
- [2] Omwando, K., Favier, J., and Tongeren, T. V., (2004). *Europe's eCommerce: The next five years. Forecast: Europe's Online Retail Sales, 2004 to 2009* [Online]. Available from: <http://www.forrester.com/find?No=0&Ntt=global+mobile+commerce+forecast&Ntk=MainSearch&Ntx=mode+matchallany&N=0> [Accessed 12-4-2005]
- [3] B. Friedman, P. H. Khan, and D. C. Howe, "Trust online," *Communications of the ACM*, vol. 43, no. 12, pp. 34-40, 2000.
- [4] S. Jones, M. Wilikens, P. Morris, and M. Masera, "Trust requirements in e-business," *Communications of the ACM*, vol. 43, no. 12, pp. 81-87, 2000.
- [5] B. Shneiderman, "Designing trust into online experiences," *Communications of the ACM*, vol. 43, no. 12, pp. 57-59, 2000.
- [6] J. J. Chen and C. Adams, "Short-range wireless technologies with mobile payments systems," M. Janssen, H. G. Sol, and R. W. Wagenaar, Eds. Delft: ACM, 2004, pp. 649-656.
- [7] P. Y. Chen and L. M. Hitt, "Measuring switching costs and the determinants of customer retention in Internet-enabled business: a study of the online brokerage industry," *Information Systems Research*, vol. 13, no. 3, pp. 255-274, 2002.
- [8] C. R. Plouffe, J. S. Hulland, and M. Vandenbosch, "Research report: richness versus parsimony in modeling technology adoption decision -

- understanding merchant adoption of a smart card-based payment system," *Information Systems Research*, vol. 12, no. 2, pp. 208-222, 2001.
- [9] A. K. Ghosh and T. M. Swaminatha, "Software security and privacy risks in mobile e-commerce," *Communications of the ACM*, vol. 44, no. 2, pp. 51-57, 2001.
- [10] T. T. Moores and G. Dhillon, "Do privacy seals in e-commerce really work?," *Communications of the ACM*, vol. 46, no. 12, pp. 265-271, 2003.
- [11] J. H. Wu and T. L. Hisa, "Analysis of e-commerce innovation and impact: a hypercube model," *Electronic Commerce Research and Applications*, vol. 3, no. 4, pp. 389-404, 2004.
- [12] F. D. Davis, "Perceived Usefulness, Perceived Ease of Use and User Acceptance of Information Technology," *MIS Quarterly*, vol. 13, no. 3, pp. 319-340, 1989.
- [13] F. D. Davis, R. P. Bagozzi, and P. R. Warshaw, "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," *Management Science*, vol. 35, no. 8, pp. 982-1003, 1989.
- [14] S. Taylor and P. A. Todd, "Understanding Information Technology Usage: A Test of Competing Models," *Information Systems Research*, vol. 6, no. 2, pp. 144-176, 1995.
- [15] D. Gefen and D. W. Straub, "The Relative Importance of Perceived Ease of Use in IS adoption: A study of E-Commerce Adoption," *Journal of the Association for Information Systems*, vol. 1, no. 8, pp. 1-30, 2000.
- [16] G. Rose and D. W. Straub, "Predicting General IT Use: Applying TAM to the Arabic World," *Journal of Global Information Management*, vol. 6, no. 3, pp. 39-46, 1998.
- [17] D. W. Straub, M. Keil, and W. Brennan, "Testing the Technology Acceptance Model Across Cultures: A Three Country Study," *Information & Management*, vol. 33, no. 1, pp. 1-11, 1997.
- [18] D. Gefen, E. Karahanna, and D. W. Straub, "Trust and TAM in Online Shopping: An Integrated Model," *MIS Quarterly*, vol. 27, no. 1, pp. 51-90, 2003.
- [19] D. Adams, R. Nelson, and P. Todd, "Perceived usefulness, ease of use, and usage of information technology: A replication," *MIS Quarterly*, vol. 16, no. 2, pp. 227-247, 1992.
- [20] A. L. Lederer, D. J. Maupin, M. P. Sena, and Y. Zhuang, "The technology acceptance model and the world wide web," *Decision Support Systems*, vol. 29, no. 3, pp. 269-282, 2000.
- [21] W. Hong, J. Y. L. Thong, W. M. Wong, and K. Y. Tam, "Determinants of user acceptance of digital libraries: An empirical examination of individual differences and system characteristics," *Journal of Management Information Systems*, vol. 18, no. 3, pp. 97-124, 2001.
- [22] E. Karahanna and M. Limayem, "E-mail and v-mail usage: Generalising across technologies," *Journal of Organizational Computing and Electronic Commerce*, vol. 10, no. 1, pp. 49-66, 2000.
- [23] R. Agarwal and V. Venkatesh, "Assessing a firm's Web presence: a heuristic evaluation procedure for the measurement of usability," *Information Systems Research*, vol. 13, no. 2, pp. 168-186, 2002.
- [24] P. Tarasewich, "Wireless devices for mobile commerce: user interface design and usability," in *Mobile commerce: technology, theory, and applications*. B. E. Mennecke and T. J. Strader, Eds. Hershey, PA: Idea, 2003, pp. 26-50.
- [25] V. Venkatesh, V. Ramesh, and A. P. Massey, "Understanding usability in mobile commerce," *Communications of the ACM*, vol. 46, no. 12, pp. 53-56, 2003.
- [26] Y. E. Lee and I. Benbasat, "Interface design for mobile commerce," *Communications of the ACM*, vol. 46, no. 12, pp. 49-52, 2003.
- [27] P. Tarasewich, "Designing mobile commerce applications," *Communications of the ACM*, vol. 46, no. 12, pp. 57-60, 2003.
- [28] Y. Chou, C. Lee, and J. Chung, "Understanding m-commerce payment systems through the analytic hierarchy process," *Journal of Business Research*, vol. 57, no. 12, pp. 1423-1430, 2004.
- [29] T. S. Robertson, *Innovative behavior and communication*. New York: Holt, Rinehart and Winston, Inc., 1971.
- [30] E. M. Rogers, *Diffusion of innovations*. New York: The Free Press, 1995.
- [31] L. E. Ostlund, "Diffusion: a dynamic view of buyer behavior," in *Buyer behavior: theoretical and empirical foundations*. J. A. Howard and L. E. Ostlund, Eds. New York: Alfred A. Knopf, 1973, pp. 501-523.
- [32] L. Brander and B. Kearl, "Evaluation of congruence as a factor in adoption rate of innovations," *Rural Sociology*, vol. 29, no. 3, pp. 288-303, 1964.
- [33] M. D. Dickerson and J. W. Gentry, "Characteristics of adopters and non-adopters of home computers," *Journal of Consumer Research*, vol. 10, no. 2, pp. 225-235, 1983.
- [34] H. Gatignon and T. S. Robertson, "A propositional inventory for new diffusion research," *Journal of Consumer Research*, vol. 11, no. 4, pp. 849-867, 1985.
- [35] S. Chakravarty and A. Dubinsky, "Individual investors' reactions to decimalization: innovation diffusion in financial markets," *Journal of Economic Psychology*, vol. 26, no. 1, pp. 89-103, 2005.
- [36] E. Karahanna, D. W. Straub, and N. L. Chervany, "Information technology adoption across time: a cross-sectional comparison of pre-adoption and post-adoption beliefs," *MIS Quarterly*, vol. 23, no. 2, pp. 183-213, 1999.
- [37] S. Taylor and P. Todd, "Decomposition and crossover effects in the theory of planned behavior: a study of consumer adoption intentions," *International Journal of Research in Marketing*, vol. 12, no. 2, pp. 137-155, 1995.
- [38] G. C. Moore and I. Benbasat, "Development of an instrument to measure the perceptions of adopting an information technology innovation," *Information Systems Research*, vol. 2, no. 3, pp. 192-222, 1991.
- [39] L. D. Chen, M. L. Gillenson, and D. L. Sherrell, "Enticing online consumers: an extended technology acceptance perspective," *Information & Management*, vol. 39, no. 8, pp. 705-719, 2002.
- [40] ECBS, "Implementation guidelines for mobile payments," IG606, 2005.
- [41] I. Ajzen and M. Fishbein, *Understanding attitude and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall, 1980.
- [42] M. Fishbein and I. Ajzen, *Belief, attitude, intention and behavior: an introduction to theory and research*. London: Addison-Wesley, 1975.
- [43] M. Kleijnen, M. Wetzels, and K. Ruyter, "Consumer acceptance of wireless finance," *Journal of Global Information Management*, vol. 8, no. 3, pp. 206-217, 2004.
- [44] S. L. Jarvenpaa and P. A. Todd, "Consumer reactions to electronic shopping on the World Wide Web," *International Journal of Electronic Commerce*, vol. 1, no. 2, pp. 59-88, 1997.