A basic study on merchandisers' mental factors for choosing payment methods

Hidetsugu Suto, Xue Song, Jiunn-Woei Lian

Abstract—**Visiting market stalls is a popular activity for tourists who visit Japan. Many tourists enjoy market stalls in several events, called *Matsuri*. Meanwhile, it is said that Japanese prefer to use cash for shopping. Generally, many small shops do not have equipment for cashless payments. In many cases, market stalls also accept only cash. Therefore, we cannot use other methods for payments, and it inconveniences tourists from overseas. Recently, Japanese government is carrying out policy measures required for promoting cashless payments. However, it is not so popular yet in Japan. In this paper, a model of merchandisers' mental factors for choosing payment method is proposed in order to investigate the reasons. The model has been developed by means of Structural Equation Modeling (SEM) based on the UTAUT model. In order to investigate the validity of the model, an experiment has been conducted. As the result, it became clear that the basic idea of the proposed model is acceptable.**

Keywords—**Structural Equation Modeling (SEM), users' behaviors, UTAUT model, cashless payment, mobile payment.**

I. Introduction

Market stall is a small shop built temporary in open spaces, e.g. road sides and parks. In such market stalls, many local products and foods are sold, and we can enjoy the local cultures. In Japan, market stalls are popular as well, and these market stalls are used for an attraction for tourists in recent years. According to the results of surveys conducted in Fukuoka city, about 1,156,500 people visited the market stalls in the city in a year [1]. The results show that market stalls can make much profits for the city.

It is said that Japanese prefer to use cash for shopping. Generally, many small shops do not have equipment for cashless payments. In many cases, market stalls also accept only cash. Therefore, we cannot use other methods for payments, and it inconveniences tourists, especially from overseas. Recently, Ministry of Internal Affairs and Communications (MIC) of the Japanese government is carrying out policy measures required for promoting cashless payments. However, it is not so popular yet in Japan.

Cash payment also causes a lot of unnecessary troubles on shopkeepers of market stalls. The below items show examples of procedures in cash payments which lead to inconveniences and insanitation.

- Before open
  1. Prepare enough money for change
  2. Take a lot of coins to the site for change
- Open shop
  1. Receive cash as cooking
  2. Give customers change
- After closed
  1. Conduct daily account settlement
  2. Go to bank to save proceeds from sale

Many Japanese merchandisers do not keen on introducing cashless payments, despite they can avoid above mentioned problems.

Contrastively, mobile payments are very popular in China. We can use mobile payments even in small market stalls in rural area. What differences are there in mentalities for payments between Japanese and Chinese? It is the question of the study.

Mobile payment users can be divided into two types, (1) customers and (2) merchandisers. Some studies focus on relationship between customers' mental factors and behaviors of payments [2]–[4]. Results of a survey on mobile payment customers [5] shows 18.4% of 1,040 participates started to use mobile payment services because they can use in stores they use usually. It also mentioned that introducing mobile payment equipment in shops also make an impact on customers' behaviors for using mobile payments. Thus, this study focuses on merchandisers' side. The final goal the study is to propose a model which represents the relationship between merchandisers' mental factors and decisions of introducing payment methods. From the model, we can know mental factors which prevent introducing mobile payment system. In this paper, a new structure of the model is proposed as a basic study to achieve the final goal.

II. Background

Since the mid-1980s, many researches about users' acceptance of new information technologies (IT) have been conducted. Several competitive models used for explaining decisions about using IT have been proposed (e.g., Theory of Rational Action (TRA) [6], the Technology Acceptance Model (TAM/TAM2) [7], the Theory of Planned Behavior (TPB/DTPB) [8]). Each model has a set of different determinants, although their names are different, some of them are essentially the same in concept. Each model attempts to predict and interpret users' decitions with its own independent variables, and the models cannot

Hidetsutu Suto, Xue Song
Muroran Institute of Technology
Japan

Jiunn-Woei Lian
National Taichung University of Science and Technology
Taiwan

Figure 1.   UTAUT model and proposed model.
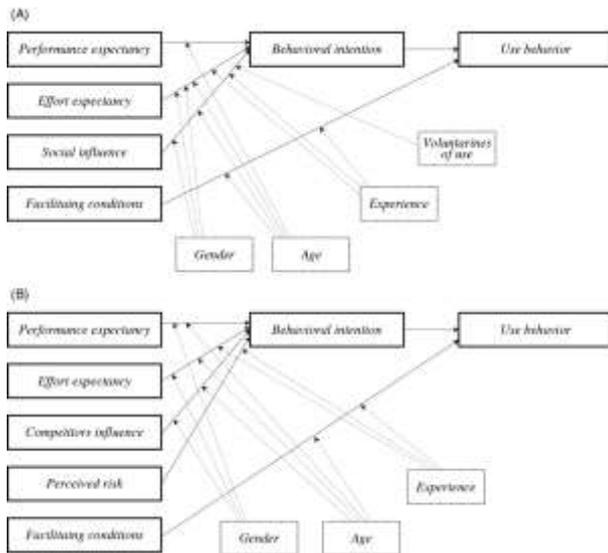
complement each other [3].

Venkatesh et al. [9] proposed the Unified Theory of Acceptance and Use of Technology (UTAUT) in 2003, and UTAUT integrated and modified eight existing IT acceptance theories and models. Fig. 1 (A) illustrates the UTAUT model. The model consists of six constructs which are represented by the solid line squares and 4 moderating variables which are represented by dotted line squares. Each arrow from constructs stands for a direction of an influence between two constructs. Each arrow from a moderator stands for the influence that the moderator affects on the relationships between the two constructs. Venkatesh et al. [9] compared UTAUT with other eight models, and they proved that UTAUT can explain 69% of the variance in user intentions to use information technology while the original models can only explain it from 17% to 53%. Consequently, the UTAUT model now serves as a benchmark for the acceptance literature [10].

The authors focused on the construct of *Social influence* in UTAUT model. When merchandise choose a payment method, he/she could get some influences from social. However, some factors encourage he/she to use a new technology payment method, and some factors discourage he/she from using it. Thus, original UTAUT is not suitable for representing merchandises' mental model for choosing a payment method.

III.   Proposed Model

In this paper, a model for explaining the relationships between the mental factors and users' decisions for using mobile payments is proposed based on UTAUT model.

Fig. 1 (B) illustrates the proposed model. The model consists of seven constructs which are represented by squares formed by solid lines and three moderators formed by dotted squares. Each arrow from constructs stands for a direction of an influence between two constructs. Each arrow from the moderators stands for the influence that the

moderators affect on the relationships between the two constructs.

Original UTAUT model includes *Voluntariness* as a construct. However, it is not included in the proposed model, because usually merchandisers use mobile payments voluntary rather than mandatory [11].

The details and hypotheses related to the model are explained below:

A. *Performance Expectancy*

Performance expectancy is defined as "The degree merchandisers believe that using mobile payments would improve their efficiencies and save the labors" based on the original definition of Venkatesh et al. [9]. Park et al. [12] concluded that performance expectancy significantly affects the customers' adoption of mobile technologies. In a study on gender differences [13], researchers pointed out that males care more about tasks and achievements than females. Therefore, performance expectancy as a factor that is closely related to the completion of tasks, is significant for males. Previous studies have shown that young people pay more attentions to the external value of new technologies and pay more attentions to performance-related rewards, thus being more strongly affected by new technologies [14]. Thus, we can assume that age and gender influence the relationships between performance expectancy and behavioral intentions.

H1: *Performance expectancy* affects *Behavioral intentions* of using mobile payments positively. This relationship is moderated by age and gender.

B. *Effort Expectancy*

Effort expectancy is defined as "the degree merchandisers think it is easy to use mobile payments in their jobs" based on the original definition of Venkatesh et al. [9]. Prior empirical study of mobile payments adoption support effort expectancy has positive influences on behavioral intentions [2]. Furthermore, it is confirmed that effort expectancy is one of the biggest determinants of the adoption of a technology [15], [16].

Venkatesh and Morris [17] suggest that *Effort expectancy* is more salient for females than males, as a result, the intentions of females are more easily influenced by the constructs related to effort expectancy.

In a survey, when describing the reasons for accepting new technological devices, younger adults were more concerned about price and performance while elder adults were more concerned about ease of use [18]. Even when computer and Internet experience are controlled at the same level, elder adults encounter more problems with the Internet than younger people [19]. Accordingly, we can assume that effort expectancy is more important for female, especially for elder female with relatively little experience with mobile payments.

H2: *Effort expectancy* affects behavioral intentions of using mobile payments positively. This relationship will be moderated by age, gender and experience.

C. Competitors Influence

Competitors Influence is defined as "the degree merchandisers' behaviors are influenced by how they think competitors will observe them after using mobile payments" in a previous study [20].

A theory suggests that females are more concerned about others' opinions, so they are more likely to be influenced and determined by social influence when forming the intentions of using new technologies [11].

A study of age effects shows that elder workers are more likely to be affected by social influences, and this influence decreases with increasing experiences [11].

Therefore, we can assume that social influence is more important for younger females, especially inexperienced mobile payments users.

H3: *Competitors influence* affects behavioral intentions of using mobile payments positively. The relationship is moderated by age, gender and experiences.

D. Facilitating Conditions

Facilitating conditions are defined as "how merchandisers believes that an organization and technical infrastructure can support them use mobile payments" by Venkatesh et al. [9]. They also aurged that when *Performance expectancy* and *Effort expectancy* exist in a model, relationship between *Facilitating conditions* and *Behavioral intentions* is nonsignificant. In this case, *Facilitating conditions* affect *Users' behaviors* directly [9].

In many practical situations, as users have more and more experiences in asking for helps, the effect increase [21]. Hall and Mansfield [22] pointed out that elder workers pay more attention to receiving help at work.

Therefore, we can assume that *Facilitating conditions* are more important for elder workers with increasing experience on mobile payments.

H4: *Facilitating conditions* affects users' behaviors of using mobile payments directly and positively. The relationship is moderated by gender and experience.

E. Social Influence

In the original UTAUT model, *Social Influence* is considered as a construct which affects *Behavioral Intention* positively. However, in the case of mobile payments, both of positive and negative elements are assumed.

As a positive element, *Competitors Influence* can be considered. Usually, merchandisers are interested in their competitors' trends, and they always change their business strategies because of influences of their competitors [23]. If many competitors are using mobile payments, they could think to introduce the system. In this meaning, *Competitors Influence* affects *Behavioral Intention* positively.

On the other hand, *Perceived Risk* can be considered as a negative element. In recent years, with the rapid development of services on the Internet, many misleading and fraudulent practices have emerged on the Internet [24]. Some researchers believe that online trading involves more risks than any other traditional transactions [25].

Perceived risk is defined as "the degree merchandisers believe that they may be exposed to certain risks such as social, financial, temporal, psychological or physical risks" based on the definition of Zhang et al. [26]. It reflects the user's view on the uncertainty of results, which is mainly related to the information of searching and selecting products or services before making any purchase decision [27].

Perceived risk has a huge impact on many online financial transactions [28]. It has been found that the endless hacker attacks and phishing force users to refuse to provide personal sensitive information to websites or even refuse to use Internet-based services. In a survey of mobile payments, more than 50% of respondents said they have not used mobile payments because they were worried about the security risks [29]. Therefore, we can assume that *Perceived risk* is an important determinant for behavioral intentions.

H5: *Competitors Influence* affects *Behavioral intentions* positively and *Perceived risk* affects *Behavioral intentions* negatively.

F. Behavioral Intention

We assume that *Behavioral intentions* are followed by User Behavior based on UTAUT model [9]. Obviously, it affects *User Behavior* positively.

H6: *Behavioral intentions* affects *Users' behaviors* positively.

IV. Experiment

A. Experimental design

In order to confirm the validity of the proposed model, a small experiment has been conducted. Comparison with the original UTAUT model, a feature of the proposed model is that *Social influence* is divided into to constructs, i.e. positive one (*Competitors Influence*) and negative one (*Perceived risk*). Thus, the purpose of this experiment is to investigate the effects of these two constructs on *Behavioral Intention*.

The procedure of the experiment is shown below:

1. Participants read the scenarios described below

Recently, many stores will introduce self-service systems, such as convenience stores. We want to ask you some questions about this. Now the facial recognition payment will be introduced into the self-service settlement system. Facial recognition payment does not require cash, cards or mobile phones. You only need to upload your facial information through a camera before the first payment, associate the facial information with a credit card account. Then you can complete the transaction by scanning your face during payment. It is faster than the cash payment and credit card payment.

For using facial recognition payment, an account with your face image is necessary. However, little information is available on this mechanism, and I don't know which features of the face are used to authenticate people. You are worried that your face image may leak on the Internet and others may use your face image without your acknowledgment.

TABLE II. QUESTIONNAIRE

1. Gender:(1-Female, 2-Male)

2. Age: (   )

3. Where are you from:
(1-Japan, 2-Thailand, 3-Taiwan, 4-China)

CI1. People who influence my behavior think that I should use facial recognition payment.

(*1 - Strongly disagree, 2 - Disagree, 3 - Neither Agree nor Disagree, 4 - Agree, 5 - Strongly Agree*)

CI2. People who are important to me think that I should use facial recognition payment.

(*1 - Strongly disagree, 2 - Disagree, 3 - Neither Agree nor Disagree, 4 - Agree, 5 - Strongly Agree*)

CI3. Other people think that they should use facial recognition payment.

(*1–Strongly disagree, 2–Disagree, 3–Neither Agree nor Disagree, 4 - Agree, 5–Strongly Agree*)

PR1. I wouldn't feel completely safe by providing personal information through the facial recognition payment system.

(*1–Strongly disagree, 2–Disagree, 3–Neither Agree nor Disagree, 4 - Agree, 5–Strongly Agree*)

PR2. I'm worried about the future use of facial recognition payment services, because other people might be able to access my data.

(*1–Strongly disagree, 2–Disagree, 3–Neither Agree nor Disagree, 4 - Agree, 5–Strongly Agree*)

PR3. I don't feel protected when sending confidential information via the facial recognition payment system.

(*1–Strongly disagree, 2–Disagree, 3–Neither Agree nor Disagree, 4 - Agree, 5–Strongly Agree*)

PR4. The likelihood that something wrong will happen with the facial recognition payment systems is high.

(*1–Strongly disagree, 2–Disagree, 3–Neither Agree nor Disagree, 4 - Agree, 5–Strongly Agree*)

Your decision is:

1. I will use the cash payment or credit card payment.

2. Comparing with the facial recognition payment, I prefer to use the cash payment or credit card payment.

3. Comparing with the cash payment or credit card payment, I prefer to using facial recognition payment.

4. I will use the facial recognition payment.

TABLE I. RESULTS

Questionnaire item	Correlation with *Behavioral intention*
CI1	0.737
CI2	0.797
CI3	0.750
PR1	-0.612
PR2	-0.562
PR3	-0.469
PR4	-0.753

B. *Results and discussion*

TABLE 2 shows results of the experiment. The numbers in the table show the correlations with the construct of *Behavioral intention*. As we can see from the table, all of the items which represent attitudes for *Competitors Influence* have significant positive correlations. All of the items which represent attitudes for *Perceived risk* have negative correlations, although they are not so significant.

From the results, we can say that social influences can be divided into two groups base on effects for *Behavioral intention*. The fact supports the basic idea of the proposed model.

V. Conclusion

In this paper, a model for representing the relationships between merchandisers' mental factors and behaviors on using mobile payments is proposed. The model is designed based on the original UTAUT model. The construct of *Social influence* in UTAUT model is divided into two constructs, i.e. *Competitors Influence* and *Perceived Risk*.

In order to investigate the validity of the model, a simple experiment has been conducted. As the result, the two constructs, i.e. *Competitors influence* and *Perceived risk*, have different directions effects on the construct of *Behavioral Intention*. The fact shows that the design concept of the proposed model is acceptable.

To construct concrete models of merchandisers' mental factors for choosing payment method, enough data have to be obtained from many merchandisers. The authors are preparing the investigations. Based on the results, six hypotheses shown in section III, i.e. H1 – H6, will be confirmed.

Acknowledgment

References

[1] K. Yahiro, "Economic effects of Market Stalls, Report of the 4th workshop of the future of symbiosis with market stalls (Japanese)," 2011.

[2] R. de Sena Abrahão, S. N. Moriguchi, and D. F. Andrade, "Intention of adoption of mobile payment: An analysis in the light

carefully:

2. Participants asked the questionnaire shown in TABLE 1.

3. Analyzed the results by means of SEM method.

The item CI1, CI2 and CI3 are for asking attitudes for *Competitors influence* and PR1, PR2, PR3 and PR4 are for asking attitudes for *Perceived risk*. Answers of "Your decision is" corresponding to construct of *Behavioral intention* in the proposed model.

The participants were 22 students. They are belonging to a engineering course of Japanese university (mean age:25.00, SD:3.15).

of the Unified Theory of Acceptance and Use of Technology (UTAUT)," *RAI Rev. Adm. e Inovação*, vol. 13, no. 3, pp. 221–230, 2016.

[3]   Q. Min, S. Ji, and G. Qu, "Mobile commerce user acceptance study in China: a revised UTAUT model," *Tsinghua Sci. Technol.*, vol. 13, no. 3, pp. 257–264, 2008.

[4]   C.-S. Yu, "Factors affecting individuals to adopt mobile banking: Empirical evidence from the UTAUT model," *J. Electron. Commer. Res.*, vol. 13, no. 2, p. 104, 2012.

[5]   Corporate Public Relations Division of HAKUHODO, "News: survey of mobile payment for daiy life (Japanese)," 2019.

[6]   I. Ajzen, "From intentions to actions: A theory of planned behavior," in *Action control*, J. K. Beckmann, Ed. Springer, 1985, pp. 11–39.

[7]   F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Q.*, pp. 319–340, 1989.

[8]   I. Ajzen and M. Fishbein, "Attitude-behavior relations: A theoretical analysis and review of empirical research.," *Psychol. Bull.*, vol. 84, no. 5, p. 888, 1977.

[9]   V. Venkatesh, M. G. Morris, G. B. Davis, and F. D. Davis, "User acceptance of information technology: Toward a unified view," *MIS Q.*, pp. 425–478, 2003.

[10] P. A. Rosen, "Effect of Personal Innovativeness on Technology Acceptance and Use," Oklahoma State University, 2005.

[11] M. G. MORRIS and V. VENKATESH, "AGE DIFFERENCES IN TECHNOLOGY ADOPTION DECISIONS: IMPLICATIONS FOR A CHANGING WORK FORCE," *Pers. Psychol.*, vol. 53, no. 2, pp. 375–403, 2000.

[12] J. Park, S. Yang, and X. Lehto, "Adoption of mobile technologies for Chinese consumers.," *J. Electron. Commer. Res.*, vol. 8, no. 3, 2007.

[13] H. L. Minton and F. W. Schneider, *Differential psychology*. Prospect Heights, Ill.: Waveland Press, Inc., 1985.

[14] D. T. Hall and R. Mansfield, "Relationships of age and seniority with career variables of engineers and scientists.," *J. Appl. Psychol.*, vol. 60, no. 2, p. 201, 1975.

[15] C. Martins, T. Oliveira, and A. Popovič, "Understanding the Internet banking adoption: A unified theory of acceptance and use of technology and perceived risk application," *Int. J. Inf. Manage.*, vol. 34, pp. 1–13, 2014.

[16] N. D. Oye, N. A.Iahad, and N. Ab.Rahim, "The history of UTAUT model and its impact on ICT acceptance and usage by academicians," *Educ. Inf. Technol.*, vol. 19, no. 1, pp. 251–270, Mar. 2014.

[17] V. Venkatesh and M. G. Morris, "Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior," *MIS Q.*, pp. 115–139, 2000.

[18] K. Arning and M. Ziefle, "Understanding age differences in PDA acceptance and performance," *Comput. Human Behav.*, vol. 23, no. 6, pp. 2904–2927, 2007.

[19] A. Chadwick-Dias, M. McNulty, and T. Tullis, "Web Usability and Age: How Design Changes Can Improve Performance," *SIGCAPH Comput. Phys. Handicap.*, no. 73--74, pp. 30–37, Jun. 2002.

[20] S. AlAwadhi and A. Morris, "The Use of the UTAUT Model in the Adoption of E-Government Services in Kuwait," in *Proceedings of the 41st Annual Hawaii International Conference on System Sciences (HICSS 2008)*, 2008, p. 219.

[21] F. Bergeron, S. Rivard, and L. De Serre, "Investigating the support role of the information center," *MIS Q.*, pp. 247–260, 1990.

[22] L. Zhang, J. Zhu, and Q. Liu, "A meta-analysis of mobile commerce adoption and the moderating effect of culture," *Comput. Human Behav.*, vol. 28, no. 5, pp. 1902–1911, 2012.

[23] B. C. Richard, "An analysis of fraud on the Internet," *Internet Res.*, vol. 9, no. 5, pp. 348–360, 1999.

[24] S. J. Tan, "Strategies for reducing consumers' risk aversion in Internet shopping," *J. Consum. Mark.*, vol. 16, no. 2, pp. 163–180, 1999.

[25] J. M. Cortina, "What is coefficient alpha? An examination of theory and applications.," *J. Appl. Psychol.*, vol. 78, no. 1, p. 98, 1993.

[26] D. F. Cox and H. U. G. S. of Business Administration, *Risk taking and information handling in consumer behavior*. Division of Research, Graduate School of Business Administration, Harvard University, 1967.

[27] N. Oly Ndubisi and Q. Sinti, "Consumer attitudes, system's characteristics and internet banking adoption in Malaysia," *Manag. Res. News*, vol. 29, no. 1/2, pp. 16–27, 2006.

[28] P. Gerrard, J. Barton Cunningham, and J. F. Devlin, "Why consumers are not using internet banking: a qualitative study," *J. Serv. Mark.*, vol. 20, no. 3, pp. 160–168, 2006.

[29] D. Filson, "The Impact of E-Commerce Strategies on Firm Value: Lessons from Amazon. com and its Early Competitors," 2003.

About Authors:

Hidetsugu Suto is a professor at College of Information and Systems, Muroran Institute of Technology, Japan. He has received his PhD degree in informatics from Kyoto University, Japan. He is a member of The Society of Instrument and Control Engineers (SICE), The Japan Society of Kansei Engineering (JSKE), and The Japanese Society for Artificial Intelligence (JSAI).

Xue Song she is a master course student of Department of Information Electronics Engineering, Muroran Institute of Technology, Japan. She has received her degree form Hebei University, China. She is interested in the current situation of "Cashless Payments" in Japan, and analyzing relationships between users' mental factors and behaviors on choosing payment methods.

Dr. Jiunn-Woei Lian is an associate professor at Department of Information Management, National Taichung University of Science and Technology, Taiwan. He received his PhD degree in Department of Information Management from the National Central University, Taiwan. His research interests include electronic commerce, electronic business, service science, and ICT applications.