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Comparison for Acceptance of Mobile Payment Technology with Two Methods

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ABSTRACT. *This study was conducted to compare the UTAUT2 model and SEM technique against the UTAUT2 model and DEMATEL technique for mobile payment technology acceptance per their respective advantages and disadvantages. There are indeed notable differences between the two methods as revealed by the model constructed to analyze the influence of various factors. The SEM method can also be used for large-scale surveys of mobile payment users.*

KEYWORDS: *Technology acceptance model, Utaut2, Dematel*

1. Introduction

The emergence – and widespread influence – of new information technology (IT) is a very popular topic among modern researchers. The Technology Acceptance Model (TAM) is one of the most often-used models for assessing behavioral intentions toward IT. TAM is a theory of reasoned action first applied to user information system acceptance by Davis (1989) [1]. The original TAM theory has been modified and extended to new models such as TAM1, TAM2, UTAUT, TAM3, and UTAUT2. Many scholars have applied these models; for example, Morosan and Defranco (2016) [2] and Khan et al. (2017) [3].

Most of the extant research on TAM involves empirical studies. These studies all centered on Structure Equation Modeling (SEM), a technique for the analysis of latent variables and causal relations between latent constructs to verify theoretical models. Lee et al. (2010) [4] pointed out that traditional and amended TAM require some important assumptions. (1) Subjects must understand the information technology and have complete experience of use. (2) Most of the external variables of TAM are independent, that is, there is no existing causal relationship among them. (3) TAM only applies directly to public technology systems, and empirical techniques cannot be used to gather a large number of samples. Other researchers have adopted the Decision Making and Trial Evaluation Laboratory (DEMATEL, by Gabus and Fontela, 1973 [5]) method to analyze the causal relationship between

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TAM variables. Many scholars have applied these models; for example, Hwang et al, (2016) [6] and Hsien & Wu (2010) [7]).

In the present study, we used the acceptance of mobile payment technology as an example and applied the UTAUT2 model with SEM technique and UTAUT2 model with DEMATEL technique, respectively, to compare the differences in results between them. We assessed the advantages and disadvantages of the two methods and to draw several conclusions which may serve as a workable reference for future researchers.

2. Case Study

2.1 Utaut2 Model with Sem Technique

The China Construction Bank Mobile Bank app serves as the research object in this study. Nine main factors affecting structure and hypotheses of the UTAUT2 model are combined as shown in Fig. 1.

H1. Performance expectancy will positively influence the user's intention.

H2. Effort expectancy will positively influence the user's intention.

H3. Social influence will positively affect the user's intention.

H4. Facilitating conditions will positively influence the user's intention.

H5. Price value will positively influence the user's intention.

H6. Hedonic motivation will positively influence the user's intention.

H7. Habit will positively influence the user's intention.

H8. Facilitating conditions will positively influence user behavior.

H9. Habit will positively influence user behavior.

H10. Use intention will positively influence user behavior.

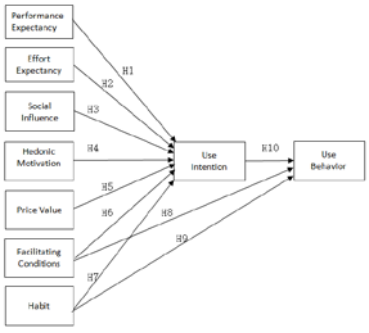

Fig.1 Hypothetical Model

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3. Sample and Procedures

Bank users who have experience using mobile payment technologies in China formed the sample for this study. Electronic questionnaires were distributed and a total of 313 valid questionnaires were collected. Among the respondents, 61.7% are women and 47.5% were aged between 20 and 30 years at the time of the study; 60.5% have a college degree and 90.7% use mobile payment at least once a day.

As mentioned above, we distributed questionnaires as the measurement instrument. We adopted all of the measurement items from established scales with sufficient validity and reliability. The respondents indicated their degree of agreement with items on a scale ranging from 1 (very strongly disagree) to 5 (very strongly agree).

Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, We used the the measures developed by Venkatesh et al. (2012) [8]; *Use Intention & Use Behavior,* We used the item measure developed by Sripalawat et al. (2011) [9].

4. Results

The results of the causal model (Fig. 2) revealed a good model fit: $\chi^2(403) = 1360.02$; RMSEA = .09; NFI = .98; NNFI = .98; CFI = .99; and IFI = 0.99. The standardized factor loadings were all acceptable and significant for the respective constructs. These results support the validity of the structure we constructed.

Hypotheses tests, as shown in Fig. 2, performance expectancy, hedonic motivation, price value, facilitating conditions, and habit were found to be positively related to user intentions ($\beta = .11$, $p < .05$; $\beta = .09$, $p < .05$; $\beta = .19$, $p < .01$; $\beta = .21$, $p < .001$; $\beta = .38$, $p < .001$, respectively); however, we did not find any similar relationship for effort expectancy and social influence. Only H1, H4, H5, H6, and H7 were supported by our data. In addition, facilitating conditions, habit, and user intention were found to be positively related to user behavior ($\beta = .11$, $p < .05$; $\beta = .15$, $p < .05$; $\beta = .89$, $p < .001$, respectively) which supports H8, H9, and H10.

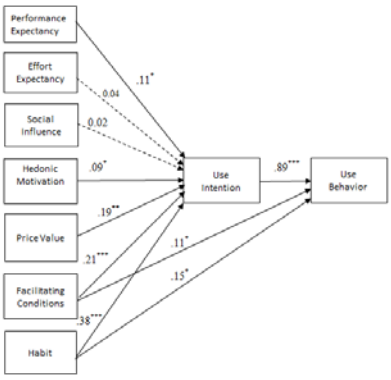

Fig.2 Sem Results of Influence Factors on Mobile Payment

4.1 Utaut2 Model with Dematel Technique

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The nine main factors affecting structure and codes in the UTAUT2 model are shown in Table 1.

Table 1 Factors and Code

Factors	Code		Factors	Code
Performance Expectancy	C1		Facilitating Conditions	C6
Effort Expectancy	C2		Habit	C7
Social Influence	C3		Use Intention	C8
Hedonic Motivation	C4		Use Behavior	C9
Price Value	C5			

We wrote questionnaires to compare the impact of each of the above factors. Six professors in the business management department, three professors in the information management department, and 30 mobile payment users were invited to fill out the questionnaire. A total of 39 sample views were collected and a direct relation matrix was compiled by the arithmetic average method as follows:

X	C1	C2	C3	C4	C5	C6	C7	C8	C9
C1	0	0.23	0	0	0	0	0.22	3.24	0.13
C2	2.37	0	0	1.33	0	0	0	3.45	0.17
C3	0.89	0	0	0	0	0	0.86	2.33	2.26
C4	0	1.21	0	0	0	0	2.45	3.02	0.12
C5	0.88	0	0	0	0	0	0.76	3.32	0.18
C6	0.76	1.15	0	0	0.12	0	0.45	2.78	0.17
C7	0	0	0	0	0.35	0	0	2.66	1.26
C8	0	0	0	0	0	0	0	0	3.37
C9	0	0	0	0	0	0	0	0	0

5. Dematel Analysis

After obtaining the initial direct relation matrix, we calculated the normalized base $\lambda = 1 / 7.22$. The direct relation matrix X was then multiplied by the normalized base λ value to obtain a normalized direct relation matrix N. The following inverse matrix was obtained after subtracting the direct relation matrix N from the identity matrix I:

$(1-N)^{-1}$	C1	C2	C3	C4	C5	C6	C7	C8	C9
C1	1.01	0.03	0	0.01	0	0	0.03	0.48	0.25
C2	0.36	1.04	0	0.19	0	0	0.02	0.75	0.37
C3	0.13	0.01	1	0	0.01	0	0.13	0.43	0.54
C4	0.17	0.17	0	1.03	0.02	0	0.08	0.59	0.32
C5	0.06	0.18	0	0.03	1.02	0	0.35	0.68	0.40
C6	0.12	0	0	0	0.01	1	0.11	0.56	0.31
C7	0	0.01	0	0	0.05	0	1.02	0.40	0.37
C8	0	0	0	0	0	0	0	1	0.47

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C9	0	0	0	0	0	0	0	0	1

Then, the complete relation matrix T was calculated as follows:

T	C1	C2	C3	C4	C5	C6	C7	C8	C9
C1	0.01	0.03	0	0.01	0	0	0.03	0.48	0.25
C2	0.36	0.04	0	0.19	0	0	0.02	0.75	0.37
C3	0.13	0.01	0	0	0.01	0	0.13	0.43	0.54
C4	0.17	0.17	0	0.03	0.02	0	0.08	0.59	0.32
C5	0.06	0.18	0	0.03	0.02	0	0.35	0.68	0.40
C6	0.12	0	0	0	0.01	0	0.11	0.56	0.31
C7	0	0.01	0	0	0.05	0	0.02	0.40	0.37
C8	0	0	0	0	0	0	0	0	0.47
C9	0	0	0	0	0	0	0	0	0

6. Influence Degree Analysis

According to the architecture of UTAUT2, the degree of influence among various factors can be obtained from the complete relation matrix T. In this study, to simplify the analysis, we set the α-cut to 0.195; the influence of C3 on C8 accounted for 11.05% of all C8 (C1 to C7). Thus, the influence of C3 on C9 was estimated to be 0.54- 0.47×11.05%=0.49. We built a complete framework accordingly for the factors of consumer willingness to use the target mobile payment app as shown in Fig. 3.

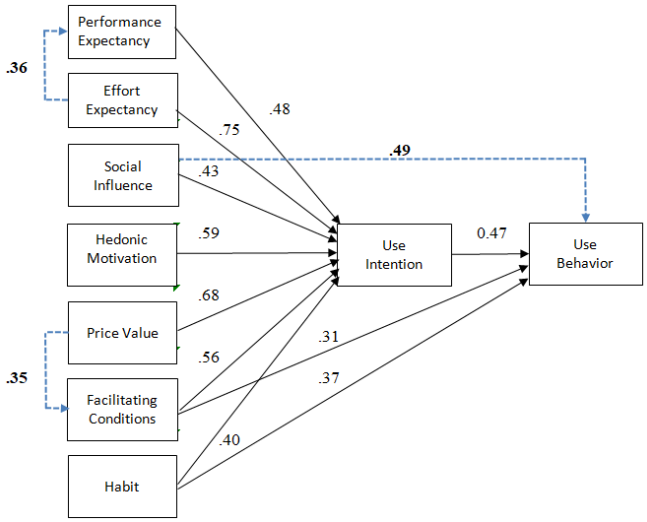

Fig.3 Dematel Results of Influence Factors on Mobile Payment

7. Discussion

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Our SEM analysis results can be summarized as follows:

(1)Performance expectancy, hedonic motivation, price value, facilitating conditions, and habit significantly affect use intention. The facilitating conditions factor has the greatest degree of impact followed by price value. Effort expectancy and social influence have no significant impact on use intention.

(2)Facilitating conditions have a significant direct impact on use behavior, but habit does not.

(3)Use intention has a significant impact on use behavior.

Conversely, DEMATEL analysis revealed the following:

(1)Performance expectancy, effort expectancy, social influence, hedonic motivation, price value, facilitating conditions, and habit have an impact on use intention. Effort expectancy has the greatest impact, followed by price value.

(2)Both facilitating conditions and habit have a direct influence on use behavior; habit has a greater impact between the two.

(3)The DEMATEL method revealed three additional influence relationships between the factors: effort expectancy impacting performance expectancy, price value influencing facilitating conditions, and social impact affecting use behavior.

The two methods, in short, revealed quite different results. The main difference lies in the SEM analysis. Effort expectancy and social influence have no significant impact on use intention, possibly because most users are very familiar with the use of mobile Internet products and are very clear about the outcomes of mobile payment. Effort expectation is thus simply no longer a factor in willingness to use. Many banks have promoted mobile payment technology to the point that represents a “spontaneous use” phenomenon; the impact of social influence on usage intentions is not significant. a few of the experts we surveyed have relatively little familiarity with mobile banking, so they provided different answers than regular mobile banking users.

The three additional influence relationships we observed between factors support a significant relationship between effort expectancy and performance expectancy. Users seem to be concerned about the extent of simplicity or difficulty in using mobile payment. This concern not only impacts their use intention, but also their perception of functional utilities (performance expectancy).

Our empirical results also provide credible proof of the causal path between price value and facilitating conditions. Price value is of particular interest in the user as he or she forms a perception of facilitating conditions. In other words, the user is more likely to engage with the facilities, resources, and skills required using the mobile payment technology when the benefits and utilities perceived in using mobile payment relative to the financial cost paid of such systems are enhanced.

8. Conclusion

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Per our comparative analysis of the results, the advantages of both methods may be exploited in future study; the accuracy of said results could be further enhanced as well. DEMATEL can be utilized to determine the influence structure between factors and build a model based on the data provided by several key experts. The SEM method can be used for large-scale surveys of general users.

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