Analyzing the Factors Influencing for Third-Party E-Commerce Payment with DEMATEL Based UTAUT2 Model

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Abstract. This study adopts latest TAM model—Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) to probe into the third-party e-commerce payment. Meanwhile, new technology system is highly professional and complicated, not all the respondents will be able to completely understand the technology system, mass samplings are difficult to obtain. In addition, the external variables of TAM may be not independent, that is, there is existing causal relationship which results in the wrong conclusion. This study adopt decision-making and trial evaluation laboratory (DEMATEL), it can effectively improve the above mentioned two deficiencies.

Introduction

Along with the development of the third-party e-commerce payment, the emergence of such new technology has become a major topic for organization to study factors that have influenced the people's adoption and acceptance to new technology as well as mutual influence. Technology Acceptance Model (TAM) is one of the most studied on behavioral intention to use new technology. Such as Morosan and Defranco (2016) [1] used UTAUT2 to examine consumers' intentions to use NFC mobile payments in hotels; Khan et al., (2017) [2] used UTAUT2 to Understand online banking adoption in a developing country.

Although many scholars have made contributions to this topic, the main research method of TAM is the empirical study method which uses the survey questionnaire method, process assumption test and model establishment by using statistical analysis on the questionnaires usually. However, certain new technology system is highly professional and complicated, not all the respondents will be able to completely understand the technology system, mass samplings are difficult to obtain. Meanwhile, the external variables of TAM may be not independent, that is, there is existing causal relationship which results in the wrong conclusion (Lee et al., 2010) [3]. Lots of scholars have applied TAM model with decision-making and trial evaluation laboratory (DEMATEL) method to reach the optimum explanatory ability [4-6]. But less study adopted the last TAM model‐ UTAUT2 model with DEMATEL to analyze so far.

Hence, this study adopts latest TAM model—Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) to probe into the third-party e-commerce payment. Secondly, this study adopt decision-making and trial evaluation laboratory (DEMATEL), which is an analysis technology for complex problem by applying expert's opinion to evaluate the causal relationship of variables. It can effectively improve the above mentioned two deficiencies.

UTAUT2 Model and DEMATEL Method

UTAUT2 Model. TAM model was developed by Davis (1989) [7], and it has already been updated by many scholar. Such as Venkatesh et al., (2003) [8] integrated Task - technology fit (TTF); Innovation diffusion theory (IDT); Theory of reasoned action (TRA); Theory of planned behavior (TPB); Motivational model (MM); Combined TAM and TPB (C-TAM-TPB); Model of PC utilization (MPCU) and Social cognitive theory (SCT) and proposed Unified Theory of Acceptance and Use of Technology (UTAUT). And then Venkatesh et al., (2012) [9] incorporated three constructs into UTAUT: Hedonic Motivation; Price Value and Habit to be UTAUT2 model. UTAUT2 model dropped Voluntariness from individual differences to make UTAUT applicable in the context of a voluntary behavior, and increase influence relationship of Facilitating Conditions toward BI. The seven core determinants that play a significant role as direct determinants of BI and Usage Behavior, meanwhile Usage Behavior will be affected by Facilitating Conditions and Habit. Similar to UTAUT, the effect of seven core determinants will respectively be affected by other adjustment variables of the three individual difference variables Age, Gender and Experience are theorized to moderate various UTAUT relationships, as follow Figure 1.
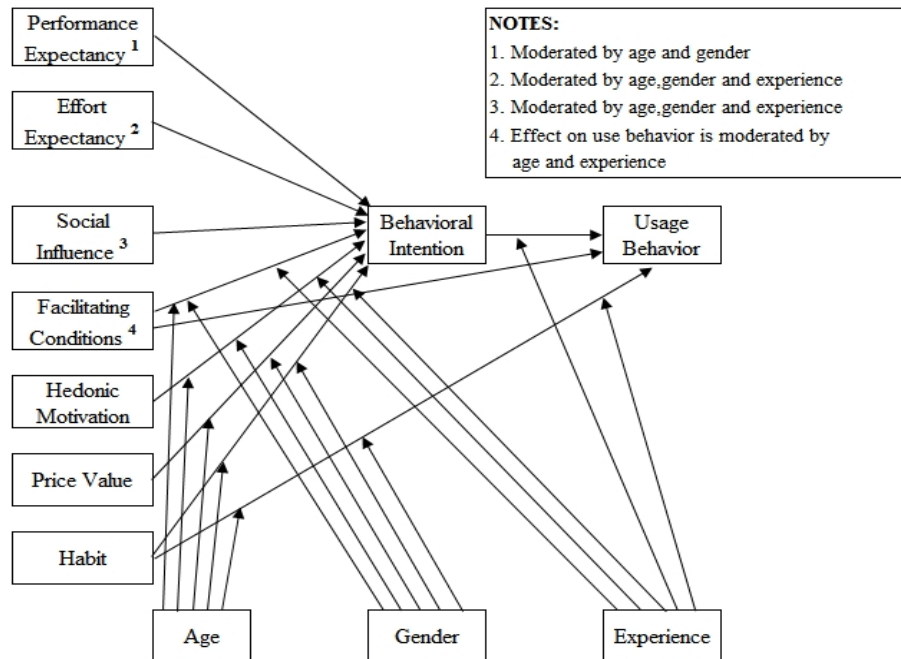

Figure 1. UTAUT2 Model

DEMATEL method. DEMATEL was developed by the Battelle memorial association of the Geneva research center (Fontela and Gabus, 1976) [10], it was aimed at studying the disjointed and antagonistic phenomena of world societies and searched for integrated solutions. In recent years, DEMATEL has been widely adopted because it is especially useful and practical for visualizing the structure of complicated causal relationships with matrices or digraphs, which portray the contextual relations between the elements of the system, where a numeral represents the strength of influence. Therefore, DEMATEL can convert the relationship between the effects and causes of criteria into an intelligible structural model of the system.

Therefore, DEMATEL can evaluate the interaction influence level among variables and it can visualize the complicated causal relationships among variables into a visible structural model to find the driving factors of the core problem in the complicated system, providing valuable insight for problem solving.

Case Study

In order to analyze the acceptance of third-party e-commerce payment, in this study, 6 managers and cadres of this industry as well as 8 users with rich experiences in third-party e-commerce payment from three different cities (Xiamen; Guangzhou and Shanghai) are invited for assessment. Total 30 experts made an assessment on the mutual influence of each variable in UTAUT2, and score them respectively according to the influence level from no influence (0) to high influence (3). DEMATEL was adopted to analyze the interaction influence between UTAUT2 variables.

Analysis result. According to the thirty experts, to focus on the third-party e-commerce payment for analyzing the interaction influence relationship between UTAUT2 variables, through the opinions of those 30 experts and specified into a certain scope, adopt the mean and establish a direct-relation matrix, as below:

$$
\begin{pmatrix}
0 & 0 & 0 & 1.36 & 1.25 & 1.18 & 1.32 & 1.28 & 1.87 & 1.56 & 1.43 & 0.77 \\
0 & 0 & 0 & 1.42 & 1.36 & 1.22 & 1.76 & 1.56 & 1.42 & 1.39 & 0.86 & 0.23 \\
0 & 0 & 0 & 1.92 & 2.12 & 1.18 & 1.12 & 1.37 & 0.65 & 1.56 & 1.56 & 1.43 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 2.08 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 2.11 & 0 \\
0 & 0 & 0 & 0.86 & 0 & 0 & 0 & 0.72 & 0 & 0.57 & 1.76 & 0.62 \\
0 & 0 & 0 & 0.96 & 0 & 0 & 0 & 0.77 & 0 & 0 & 1.82 & 1.56 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1..6792 & 1.77 & 0.62 \\
0 & 0 & 0 & 1.22 & 0 & 0 & 0 & 0.63 & 0 & 0.82 & 2.12 & 1.78 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0.53 & 0 & 0 & 1.65 & 1.44 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 2.27 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0
\end{pmatrix}
$$

Then, a normalized direct-relation matrix was adopted which using the biggest sum value of the row vector as the normalized basis and obtain λ value, 12.91, at the same time, and obtain normalized direct-relation matrix, N. And the direct/indirect-relation matrix, T can obtain as Table 1 as below.

Table 1.   Significant UTAUT2 direct/indirect-relation matrix, T.

$T_{CUT=0.8}$	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12
X1	0	0	0	1.713	1.250	1.180	1.320	1.590	1.870	1.813	3.024	2.054
X2	0	0	0	1.766	1.360	1.220	1.760	1.869	1.420	1.631	2.493	1.407
X3	0	0	0	2.143	2.120	1.180	1.120	1.606	0	1.737	3.128	2.532
X4	0	0	0	0	0	0	0	0	0	0	2.080	0
X5	0	0	0	0	0	0	0	0	0	0	2.110	0
X6	0	0	0	0.860	0	0	0	0	0	0	2.078	1.089
X7	0	0	0	0.960	0	0	0	0	0	0	1.186	1.986
X8	0	0	0	0	0	0	0	0	0	0	1.860	1.023
X9	0	0	0	1.220	0	0	0	0	0	0.855	2.517	2.350
X10	0	0	0	0	0	0	0	0	0	0	1.726	1.772
X11	0	0	0	0	0	0	0	0	0	0	0	2.270
X12	0	0	0	0	0	0	0	0	0	0	0	0

The DEMATEL analysis in third-party e-commerce payment model uses Price Value (X9) as the example: it can be seen from Table 1, Price Value (X9) will directly affect Performance Expectancy (X4), the affect level is 1.220; Price Value (X9) will directly affect Habit (X10), the affect level is 0.855; and Price Value (X9) will directly affect Behavioral Intention (X11), the affect level is 2.517; and Price Value (X9) will directly affect Usage Behavior (X12), the affect level is 2.350. The whole causal relationship and the interaction influence level are as Figure 2.

Discussion. This study probes into the analysis result of DEMATEL, most of influence relationship related to UTAUT2 are in conformity. First, focus on the original variables which four core

determinants and three regulated variables from UTAUT2 for discussion. The four core determinants include Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions. Most of causal relationships relate to UTAUT2 are in conformity. Performance Expectancy (X4); Effort Expectancy (X5); Social Influence (X6) and Facilitating Conditions (X7) have significant affect to BI. Usage Behavior (X12) have significant affected by Facilitating Conditions (X7) and BI. However, the results also found Usage Behavior (X12) have significant affected by Social Influence (X6). Hence, organization should enlarge advertising effect and expand the social influence. Three regulated variables include Age; Gender and Experience. Performance Expectancy (X4); Effort Expectancy (X5) and Social Influence (X6) all were affected directly by Age (X1); Gender (X2) and Experience (X3), and Performance Expectancy (X4) was affected directly by both of Age (X1) and Gender (X2). However, the results also found Performance Expectancy (X4) have significant affected by Experience (X3).
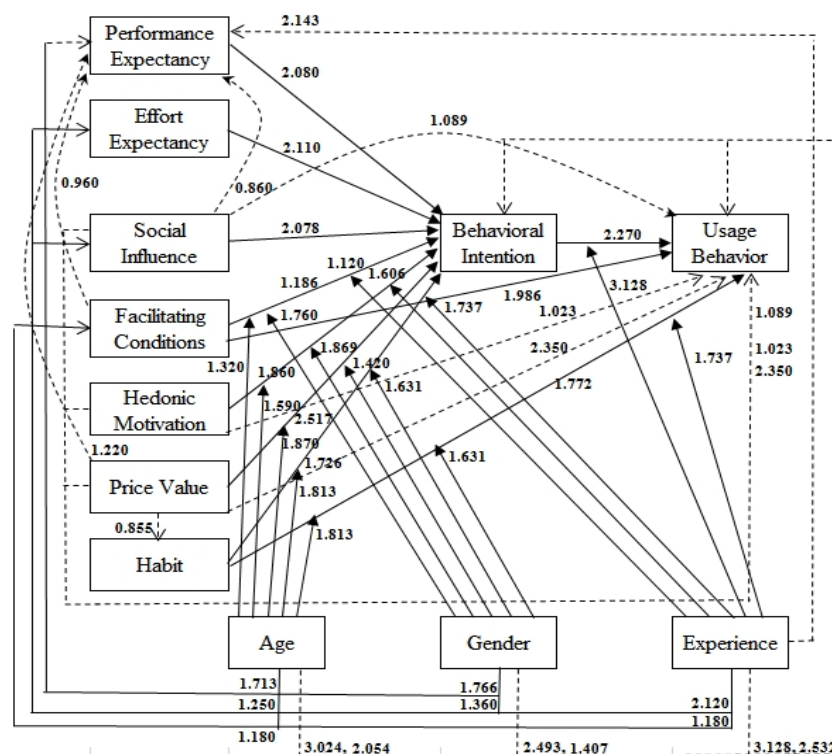

Figure 2.   UTAUT2 established by DEMATEL

In addition, the extra causal relationship was found. BI has significant affected by Hedonic Motivation (X8); Price Value (X9) and Habit (X10). And Usage Behavior (X12) has significant affected by Habit (X10) and BI. But the result also found Usage Behavior (X12) will be affected directly by Hedonic Motivation (X8) and Price Value (X9). Hence, organization should pay more effect on product design; user interface; funny and people's perceived benefits of the applications between the monetary costs for using. In addition, Price Value (X9) also directly affects Performance Expectancy (X4) and Habit (X10). That is to say, essential interactive relationship existed, hence, when adopting traditional statistics empirical approach, more attention should be made to the influence of seven variables on BI.

Conclusion

The study found that adopting DEMATEL in the UTAUT2 have most part of consistent results with conventional study, include both Age (X1) and Gender (X2) directly affect Performance

Expectancy (X4); Effort Expectancy (X5); Social Influence (X6); Facilitating Conditions (X7); Motivation (X8); Price Value (X9) and Habit (X10). Experience (X3) directly affects Expectancy (X5); Social Influence (X6); Facilitating Conditions (X7); Motivation (X8) and Habit (X10). BI is affected directly by Performance Expectancy (X4); Effort Expectancy (X5); Social Influence (X6); Facilitating Conditions (X7); Motivation (X8); Price Value (X9) and Habit (X10). And Usage Behavior (X12) is affected directly by Facilitating Conditions (X7); Habit (X10) and BI.

However there is partial different with conventional study method. BI and Usage Behavior will be affected directly by Age (X1); Gender (X2) and Experience (X3). At same time, Experience (X3) will directly affect Performance Expectancy (X4). Usage Behavior (X12) also will be affected by Social Influence (X6); Hedonic Motivation (X8) and Price Value (X9). In addition, Performance Expectancy (X4) will be affected by Social Influence (X6); Facilitating Conditions (X7) and Price Value (X9), at same time, Price Value (X9) also will affect Habit (X10). Base on this method, it can provide organization with clearer management and improvement target and direction.

Besides, due to the fact that only 8 experienced users from 3 cities respectively and 6 experts of the industry are invited in this study, it is lack of representative and professional degree. Therefore, increasing the number of experts and area coverage will be the research direction in the future.

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