Theoretical Development: Extending the Flow Theory with Variables from the UTAUT2 Model

Yuyang Zhao

NOVA Information Management School (NOVA IMS), Universidade Nova de Lisboa, Lisboa, Portugal

Fernando Bacao

NOVA Information Management School (NOVA IMS), Universidade Nova de Lisboa, Lisboa, Portugal

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Theoretical development: extending the flow theory with variables from the UTAUT2 model

Yuyang Zhao*
NOVA Information Management School (NOVA IMS)
Universidade Nova de Lisboa
Campus de Campolide, 1070-312 Lisboa, Portugal
d2015046@novaims.unl.pt

Fernando Bacao
NOVA Information Management School (NOVA IMS)
Universidade Nova de Lisboa
Campus de Campolide, 1070-312 Lisboa, Portugal
bacao@novaims.unl.pt

***Abstract*—According to the dramatic development of innovative information technology in worldwide ranges, business climate has changed from traditional commerce to virtual commerce in recent two decades. It is important to synthetically understand customers' adoption intention of new technology for better business management and strategy involved with information technology. Thus, this study extends the Flow theory by integrating variables from the revised Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model and satisfaction to propose a theoretical development for investigating the factors determining customers' behavioral intention on adopting new information technology. In addition, the proposed theoretical development contributes the relevant researches on systematical understanding customers' adoption intention determined from technological perceptions to mental cognition. Moreover, the proposed framework and measurement method can be applied as reference for relevant researchers and stakeholders to investigate customers' behaviors for further research and future business management and strategy.**

Keywords- Theoretical development; Flow theory; Unified Theory of Acceptance and Use of Technology 2 (UTAUT2); adoption intention.

I. INTRODUCTION

With the significant development of information technology, the global business climate has changed dramatically from traditional social commerce to online commerce towards to mobile commerce in recent two decades. Such as, mobile payment technology has been widely adopted in various industries [1][2][3]; catering service has transformed from traditional eat in to online-to-offline order and delivery service [4]; traditional brick-and-mortar shopping has developed to online shopping towards live-streaming shopping [5]. Customer's consumption habit has changed by increasingly interacting with information technology [4]. Thus, investigating the antecedents determining users' adoption intention of information technology is becoming increasingly important for relevant business stakeholders to extend market and manage business strategy. A variety of prior literatures have investigated the factors influencing customers' intention of using information technology in various contexts [1][2][4][5]. However, previous studies unilaterally analyzed users' adoption intention from technological perceptions or mental expectations respectively [5][6]. Moreover, several studies involved perceived flow into adoption models as a mediating variable to illustrate customers' mental cognition to connect the perceptions and behavioral intention [7][8]. Therefore, the current study aims to develop the Flow theory by integrating the variables from the revised Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model as technological perceptions [6], in turn formulating customers' mental cognition and concentration (including flow and satisfaction) [9][10], towards determining adoption intention. The proposed model is applied for investigating customers' behavior from perceptive determinants to affective engagement towards intentional reaction on new information technology adoption.

In addition, in order to comprehensively understand users' adoption intention, the following sections are addressed in this study to develop the theoretical framework: section 2 includes reviewing of theoretical background; section 3 and section 4 contains hypotheses and model development; section 5 proposes a future research demonstration; section 6 demonstrates the conclusion and contributions.

II. THEORETICAL BACKGROUND

A. *Flow theory*

Csikszentmihalyi (1975) initially proposed the Flow theory for explaining the special mental state of people. Flow reflects the level of concentration engaged in a certain activity, which influenced by a loss of self-awareness, internal enjoyment, human-machine, and self-reinforcement to filter out other unrelated perceptions [9]. When users apply a specific information technology, the flow state represents their holistic feeling of total involvement and immersive experience, which is influenced by the perceptions of technology features and senser of interacting with machine [7]. Meanwhile, flow is validated significantly formulates users' engagement of using information technology in different contexts, e.g. mobile payment system [11][12], live streaming application [8]. Furthermore, flow theory has been modified in prior literatures by incorporating with different theoretical frameworks to investigate information technology adoption from users' dimension. Such as, integrating with IS success model to investigate customers' usage intention of mobile payment [11]; combining with TAM to explain users' adoption intention of online games [13]; coordinating with stimulus-organism-response framework to examine consumers' purchase intention of mobile payment [7]. Wherein, flow plays as

mediating variable, reflects users' perceptions of technological features and in turn determines users' mental cognition and emotion, towards formulates psychological reaction or actual behavior, such as adoption intention, continuance usage [11][12]][8][7]. Accordingly, this study defines flow, as the mental cognition and affection state of customers engrossed in using information technology that not easily be disturbed by the outside world, contains the mediating effect that responding users' technological perceptions, reflecting users 'mental cognition towards determines users' adoption intention.

B. Unified Theory of Acceptance and Use of Technology 2

UTAUT2 is a reflecting social cognition theory, which designed by Venkatesh, Thong and Xu (2012) as advance version of UTAUT to predict users' adoption intention of information technology [6]. Moreover, the UTAUT2 model can be revised by extending or subtracting variables to appropriately analysis users' adoption intention of information technology in particular situation, such as, excluding price value and adding privacy to investigate mobile payment adoption [14], adding culture moderators to predict mobile banking adoption [15], Moreover, the UTAUT2 model has been revised by integrating with other theoretical models to comprehensively analyze the antecedents of information technology adoption. Such as, integrating with Diffusion of Innovation models to investigate mobile payment adoption [3]; cooperating with Expectancy Confirmation Model and Task-Technology fit model to explain food delivery apps adoption [4]. Therefore, the majority of users' technological perceptions can be reflected by the variables of the UTAUT2 model, as the extension of Flow theory with synthetical determinants, to formulate users' adoption intention of information technology.

III. HYPOTHESES DEVELOPMENT

A. Independent variables from UTAUT2

1) Performance expectancy (PE)

PE refers as users' perceived usefulness when using a particular technology, which can improve their performance in a certain activity [6]. When service provided from relevant information technology meets users' expectation, they will tend to adopt it, which has been verified in various contexts, like mobile banking [17], mobile payment [18] and mobile internet [6]. Thus, PE formulates customers' mental cognition with a positive attitude of utilizablility. Hossain and Zhou (2018) validated that when customers feel a particular technology can increase their efficiency of a certain activity, they will feel more engaged in using that technology [7]. Moreover, satisfaction, as an affective expectation, is partially conceptualized that users are satisfied with the performance of the service provided by the information technology [19]. Therefore, PE significantly determines customers' satisfaction when they want to adopt a new technology [17][19]. Consequently, two hypotheses are formulated as followed:

H1: Effect of PE positively affects flow on information technology adoption.

H2: Effect of PE positively affects satisfaction on information technology adoption.

2) Effort expectancy (EE)

The definition of EE is the degree of users' perceived easiness when they participate in a particular information technology usage [6]. When users' perception of technology with understandable interface, operatable system, and accessible service, they will formulate a positive attitude to use the new information technology. Which means, users' psychological cognition is formulated by perceived easiness of the relevant technology, which can be summarized that customers' perceived flow is positively influence by EE [7][13]. Moreover, EE also been proved has positive influence on PE, when users tend to adopt new information technology [18][17]. In addition, satisfaction as further cognitive reflection, also been confirmed by Marinković, Đorđević and Kalinić (2020) that significantly influenced by perceived easiness of usage [19]. Which means, when users feel the new technology is easy to operate, their mental requirements will be easier to meet. The effects of EE are concluded in following hypotheses:

H3: Effect of EE positively affects flow on information technology adoption.

H4: Effect of EE positively affects PE on information technology adoption.

H5: Effect of EE positively affects satisfaction on information technology adoption.

3) Social influence (SI)

The definition of SI in technology adoption is "the degree to which an individual perceives that significant others believe he or she should use the new system" [6]. SI considerably explains users' adoption intention of information technology [14], which can be summarized that the recommendation and support from relevant important people can decrease the uncertainty and anxiety of using a new information technology, when users are not familiar with it yet [17]. Moreover, users' mental state of flow can be formulated by users' social recommendation and interaction [20]. Thus, SI formulates users' attitude of accepting a new information technology, and accelerates users' engagement, towards influences users' satisfaction [8][13]. Therefore, this paper proposes that SI significantly affects users' flow and satisfaction from the influence of important relevant people, which shown in following hypotheses.

H6: Effect of SI positively affects flow on information technology adoption.

H7: Effect of SI positively affects satisfaction on information technology adoption.

4) Hedonic motivation (HM).

Based on concept of UTAUT2, HM is proposed as the degree of customers' apperceptive pleasure or joy when using an information technology [6]. HM significantly formulates mental perception of relevant information technology, which indicates that users will emerge higher

acceptance attitude towards impacting positive adoption intention, once they acquire higher entertainment value of LSC [8]. This result is confirmed in various information technology adoption literatures, such as mobile banking [15], mobile payment [17][14], mobile shopping apps [16]. Meanwhile, when users assume using an information technology can bring them pleasant and enjoyable feeling by interacting with machine, they will acquire higher level of engagement [5]. Thus, HM represents customers' enjoyment, concentration and curiosity positively formulates users' metal state of flow [8]. Moreover, HM is one of antecedents of customers' mental expectation, which in turn formulates users' satisfaction when they tend to adopt a new information technology [21]. Chen and Lin (2018) confirmed that entertainment and enjoyment play a considerable role on explaining users' satisfaction [8]. Therefore, according to previous literatures, the following hypotheses are addressed:

H8: Effect of HM positively affects flow on information technology adoption.

H9: Effect of HM positively affects flow on information technology adoption.

B. Mediating variables

1) Flow

Flow describes a state of users' mental cognition and affection that fully concentrating on participating into a particular technology or activity [9]. When customers are engaged in using information technology, if the relevant technology can fill their perceived enjoyment, relaxation and pleasure, they will totally immerse into the interacting with machine and difficultly been disturbed by the outside irrelevant things [2]. Thus, flow is considered as a temporarily experience of unawareness shapes a positive attitude of engagement for customers, which in turn influence their behavioral intention of adoption. Accordingly, flow directly contributes a significant influence on adoption intention of information technology [11]. Furthermore, flow establishes customers' satisfaction in turn affecting their adoption intention [8][11]. Customers will feel more satisfied with the service quality and information quality when they are immersed into a certain technology [12]. Thus, the influences of flow on satisfaction and behavioral intention can be summarized in following hypotheses:

H10: Effect of flow positively affects satisfaction on information technology adoption.

H11: Effect of flow positively affects behavioral intention on information technology adoption.

2) Satisfaction

Satisfaction refers as a customers' general psychological cognition that believing a certain technology can bring them a positive operating experience to meet their multi-dimensional expectations [8][10]. Satisfaction is positively impacted by engagement of using information technology [5]. Thus, this study assumes satisfaction, as mediating variable, reflects users' technological perceptions and experience of engagement, in turn formulates users' adoption intention of information technology, which is in corresponding with prior technology adoption literatures in online purchase intention [10], mobile payment adoption [21][20], live streaming adoption [8]. Accordingly, it can be demonstrated that satisfaction reflects customers' technological perceptions and mental engagement towards formulates customers' behavioral intention of adopting information technology, which generalizing the follow hypothesis:

H12: Effect of satisfaction positively affects behavioral intention on information technology adoption.

IV. THEORETICAL MODEL DEVELOPMENT

Based on the above literature review and hypotheses development, the Flow theory is theoretically developed by integrating four variables (performance expectancy, effort expectancy, social influence and hedonic motivation) from the revised UTAUT2 model, as independent variables to measure customers' technological perceptions. Meanwhile, facilitating condition, habit and price value are considered to be excluded in the proposed model. Because of these variables require incorporating with actual adoption situation of a specific information technology and sufficient usage experience respectively [4][15]. Moreover, the mediating variables is extended with flow and satisfaction to represent customers' engagement and mental cognitions, which reflecting users' technological perceptions [8][10][20]. Furthermore, customers' behavioral intention is assumed as mental reaction, which influenced by their mental process of adopting information technology [6]. Specifically, according to the research objectives, the theoretical framework is developed based on the relevant studies with demanded measurement constructs by extending the boundaries of flow theory with the revised UTAUT2 model to complementarily investigate external and internal antecedents determining customers' adoption intention of information technology. The proposed theoretical model is demonstrated in figure 1, with relevant causal relations of above-mentioned hypotheses and postscript of abbreviations. Moreover, all measurement items are defined based on the relevant hypotheses and be modified to adapt the proposed research model and present in table I with relevant references.

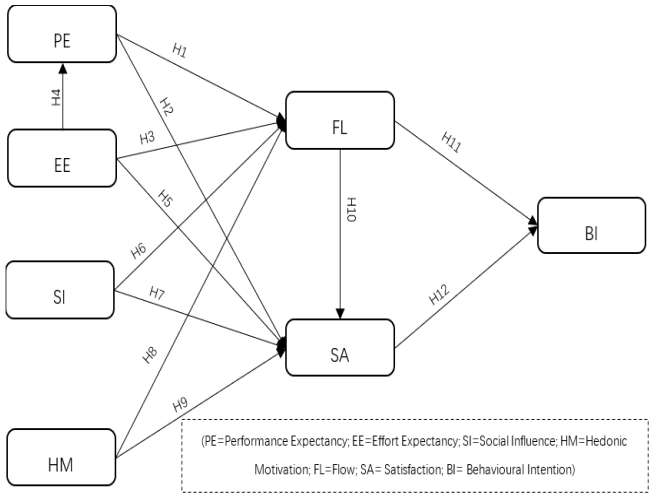

Figure 1. Research Model

TABLE I. MEASUREMENT CONSTRUCTS, ITEMS AND RELEVANT REFERENCES

Construct	Items	References
Performance expectancy (PE)	PE1: I feel information technology is a useful. PE2: Using information technology makes my life easier. PE3: Using information technology makes me more efficient dealing things. PE4: Using information technology bring me more convenience.	[6]
Effort expectancy (EE)	EE1: It is easy to learning how to use information technology. EE2: Following all the functions of information technology is easy. EE3: It is easy to become skillful of using information technology. EE4: I feel it is clear and comprehensible to interact with information technology.	[6]
Social influence (SI)	SI1: People who are important to me (e.g., family members, close friends, and colleagues) recommend me using information technology. SI2: People who are important to me think the information technology is valuable. SI3: People who are important to me think using information technology is a good idea to involved in daily life. SI4: People who are important to me support me to use information technology.	[6]
Hedonic motivation (HM)	HM1: Using information technology is entertaining. HM2: Using information technology relaxes me. HM3: Using information technology gives me pleasure. HM4: Using information technology get me excited. HM5: I enjoy using information technology.	[5] [6]
Flow (FL)	FL1: I am totally focused when using information technology FL2: When using information technology, I do not realize how time passes. FL3: Using information technology gives me a short-time escape from the real world. FL4: I can forget my troubles when using information technology. FL5: Using information technology makes me forget the work I should do sometime.	[5] [8] [12]
Satisfaction (SA)	SA1: Using information technology make my daily life better. SA2: Using relevant information technology can meets my basic requirement. SA3: Using information technology makes me very happy and satisfied. SA4: I am intent to using information technology in various aspects in my daily life.	[8] [10] [20] [21]
Behavioral intention (BI)	BI1: I have an open-mind to use information technology. BI2: Given the opportunity, I will use information technology. BI3: I am willing to use information technology in the future.	[6] [8]

V. FUTURE RESEARCH

The future research of this study will consist data collection, data analysis and discussion sections to verify the proposed theoretical model and explain the factors influencing user's adoption intention of information technology. Online questionnaire survey will be applied for data collection. Specifically, the questionnaire will be designed with two sections. The first sections will involve close-ended questions for respondents' demographic data, including users' sexuality, age range, educational background and experience of using information technology. The second section will be developed by implementing constructs and items for structural equation modelling based on previous hypotheses to explain performance expectancy, effort expectancy, social influence, hedonic motivation, flow, satisfaction and behavioral intention. The relevant items from table I will be measured by seven-point Likert scale (from strongly disagree = "1" to strongly agree = "7") with 29 measurement items as indicators. Afterwards, after removing the data with missing values, the valid data will be evaluated by Kolmogorov–Smirnov test for non-response bias [22] and Exploratory Factor Analysis (EFA) will be applied by SPSS to evaluate common method bias in the dataset [23].

Furthermore, covariance based structural equation model will be applied by using SPSS and AMOS through the two-step approach to evaluate measurement model and structural model [24]. Specifically, in measurement model, this paper will apply SPSS to implement EFA to exam the construct reliability (Cronbach's alpha > 0.7). Meanwhile, Confirmatory Factor Analysis in AMOS will be applied to assess the convergent validity (factor loading >0.7; Composite Reliability >0.7; Average variance extracted (AVE) >0.5) and discriminant validity (square root of AVE should be greater than all correlations between any other pair of constructs) to verify the quality of measurement model. Moreover, the model-fit will be assessed by the ratio of chi-square to degrees-of-freedom, comparative fit index, goodness of fit index, adjusted goodness-of-fit index, normalized fit index, Tucker-Lewis index, and root mean square error of approximation. Afterwards, structural model

will be examined by AMOS with maximum likelihood estimation method and boot-strapping technique. Specifically, R^2 values of endogenous variables and path coefficients of internal structure will be assessed to illustrate the explanatory power of structural model and test the hypotheses.

In addition, based on the results of data analysis, discussion section will evaluate the factors affecting adoption intention of information technology to verify the quality of theoretical development and provide relevant theoretical and practical contributions based on the specific information technology.

VI. CONCLUSION AND CONTRIBUTIONS

A theoretical development is proposed in this research by extending Flow theory with the revised UTAUT2 model to explain users' behavioral intention of adopting information technology. The proposed model fills the gap of traditional Flow theory only focusing on users' mental perceptions by integrating variables from UTAUT2. Moreover, extension of mediating variables, flow and satisfaction, reflects users' metal cognition and engagement, which conjointly explains users' adoption intention of information technology progressively. Specifically, this study proposes users' psychological processes, FL and SA, are influenced by their perceived technological perceptions, PE, EE, SI and HM. Accordingly, this study proposed a comprehensive model to contribute a complementary research idea for explaining factors determining users' adoption intention of various information technology.

Furthermore, corresponding the sharp development of information technology involved in various business industries, the factors affecting customers' adoption intention of information technology has attracted increasingly attention by research and relevant business stakeholders. Consequently, this study contributes a theoretical foundation to critically analysis customers' mental process determined by technological perceptions. Moreover, the current study extends the Flow theory with the revised UTAUT2's variables and satisfaction to fill the gap of Flow theory insufficiently explains users' technological perceptions. Furthermore, this study also contributes an overview of the methodology process and measurement process to assess the proposed theoretical framework, which is encourage future study to modify and apply in different information technology adoption based on the specific situations. In addition, the proposed research model and measurement method can be applied as a reference for relevant business stakeholders to analyze the customers' adoption intention for better understanding users' behaviors and establishing appropriate business strategy.

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Fernando Bacao	bacao@novaims.unl.pt	Assoc. Prof.	Data Science Machine Learning Remote Sensing Information Systems (Business Informatics).	https://www.novaims.unl.pt/fbacao/default.asp

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