

Explaining and Predicting Older Adult' Continuance Intention toward SNSs: An Extension of the Expectation–Confirmation Model

Wei Liu

School of Information Technology, Jiangxi Key Laboratory of Data and Knowledge Engineering, Institute of Information Resources Management, Jiangxi University of Finance & Economics, Nanchang 360013, P. R. China
Email: Lw0519@126.com

Abstract—Due to the rapid growth of social net services (SNSs), research into SNSs continuance has recently emerged as an important issue in information systems. This study develops an integrated model designed to predict older adults' continuance behavior toward SNSs based on the expectation-confirmation model (ECM), the task technology fit (TTF) and the theory of planned behavior (TPB). The hypothesized model is validated empirically using a sample collected from 232 older adults who had prior experience with SNSs and was tested against the proposed research model using structure equation modeling. Analysis results demonstrate that satisfaction has the most significant effect on older adults' continuance intention, followed by perceived usefulness and ttf. Furthermore, the two components of the TPB, subject norm and perceived behavioral control, also have a significant impact on SNSs continuance intention. Overall, this study provides evidence that an integrated model has a better explanatory power of older adults' SNSs continuance compared to either model considered alone.

Index Terms—SNS, older adults, continuance intention, adoption model

I. INTRODUCTION

Nowadays, older adults make up the fastest growing consumer segment of Internet users [1]. They are enhancing their independence by accessing online services such as banking, shopping, or healthcare management, and Social network services (SNSs) including recreation and communication.

SNSs can be defined as an individual web page which enables online human-relationship building by collecting useful information and sharing it with specific or unspecific people. Many researches have implied the expansion of the SNSs could enhance the quality of life of older adults. But many older adults discontinue using SNSs after initially accepting it, their intention to continue using such system is still very low. Although initial

acceptance of SNSs is an important first step toward achieving SNSs success, actual success still needs continued usage rather than on first-time use. Therefore, understanding the factors affecting older adults' intention to continue using SNSs will assist developers and vendors in designing popular contents and strategies that are more likely to increase the older adults' use of SNSs.

ECM is a rigorous model that predicts the key factors of IS continuance [2]. But, it employs only three variables to explain behavioral intention, namely satisfaction, confirmation, and post-adoption expectations. However, a older adult's behavioral intention toward adopting SNSs will also be affected by other factors, such as the opinions of important individuals (subjective norms) (Fishbein & Ajzen, 1975), and even if older adults have a strong intention to perform a behavior, they may feel that they lack the necessary resources and skills (perceived behavioral control) (Ajzen, 1991). The TPB theory can address this gap. Furthermore, the older adult's SNSs adoption is not only determined by their perception and attitudes toward the technology but also by a good task technology fit. A good task technology fit will promote older adults adoption of SNSs. In contrast, a poor task technology fit will decrease older adults' adoption intention. For example, although network service has many advantages such as ubiquity and immediacy, if users do not require these advantages, they will select traditional services rather than network services.

So, in this paper, we synthesize the expectation–confirmation model (ECM), the task technology fit (TTF) and theory of planned behavior (TPB) to explain older adults' intention to continue using SNSs.

Prior research has examined ECM, TTF, and TPB independently in explaining information technology usage. As we known, few studies have theoretically combined these three models. The primary contributions of this study are its examination of the integration of ECM, TTF and TPB in explaining the older adult's continuance usage intention of SNSs and an empirical evaluation of which factors are critical to affecting this intention. The findings from this paper may therefore help bridge the existing research gap between acceptance and continuance usage

of the older adults. The results of this work are expected to give practitioners an increased understanding of older adult's continuance intention, which can then be used as a guideline to devise more appropriate SNSs products for older adults.

The rest of the paper is organized as follows. Section 2 presents our research model and hypotheses, while Section 3 proposes the measurement method and scales. We present the research results in Section 4, followed by discussion in Section 5. Finally, the limits of this work are presented in Sections 6.

II. RESEARCH MODEL AND HYPOTHESE

A. Expectation - Confirmation Model (ECM)

The ECM is widely used to explore user behavior in an IS post-adoption environment [2]. The ECM posits that an individual's intention to continue IS usage is dependent on three variables: the user's level of satisfaction with the IS, the extent of user's confirmation of expectations, and perceived usefulness. User satisfaction refers to an overall evaluation of an IS, which reflects an emotion-based response about the target IS [3]. Empirical evidence on IS continuance supports that user satisfaction is a major factor of IS continuance intention [2], [3]. So, we give the first hypotheses associated with older adult's satisfaction with SNSs usage.

H1: Older adult's satisfaction with SNSs usage positively affects their continued SNSs usage intention.

According the ECM, user's satisfaction with IS is determined by the user's confirmation of expectations and their perceived usefulness of IS. Older adults develop initial expectations about SNSs before using it. After the older adults actually use SNSs, they update their expectations of SNSs performance based on their direct experiences. When SNSs outperforms relative to their initial expectations, their post-adoption expectations are confirmed. Otherwise, their post-adoption expectations are disconfirmed. The level of confirmation and post adoption expectations affect the level of older adults' satisfaction about the IS. Moreover, the IS adoption literature has consistently found that perceived usefulness is the most important determinant of users' adoption intentions [2], [3]. Perceived usefulness is the user's beliefs about how useful a piece of technology is for achieving a certain goal. Where technology can be used to enhance job performance, perceived usefulness may play a significant role in encouraging adoption of new systems. As a result, the ECM posits users' perceived usefulness of IS has a positive effect on their intention to continue IS usage. Because SNSs is a kind of information technology on the Internet, we derived the following hypotheses from the ECM:

H2. Older adult's confirmation of expectations positively affects their satisfaction with SNSs.

H3. Older adult's perceived usefulness of SNSs positively affects their satisfaction with SNSs.

H4. Older adult's perceived usefulness of SNSs positively affects their continued SNSs usage intention.

H5. Older adult's confirmation of expectations positively affects their perceived usefulness of SNSs.

B. Task and Technology Fit (TTF)

As previously stated, one of our main proposition is that the task-technology fit model has considerable potential in explaining the users' continuance intention.

The Task Technology Fit (TTF) model argues that task characteristics and technology performance determine the task technology fit of IS, and individuals will adopt a technology based on the fit between the task requirements and technology characteristics [4]. So, a good task technology fit will promote older adults' adoption of SNSs. In contrast, a poor task technology fit will decrease older adults' adoption intention. For example, although social network service has many advantages such as ubiquity and immediacy, if users do not require these advantages, they will select traditional services rather than network services. Previous researches have suggested the importance of task technology fit on user IS adoption. Accordingly, in this model, we propose that the variable perceived task-technology fit will impact both perceived usefulness and the continuance intention.

Perceived usefulness is an indicator of the degree to which the use of an IS will enhance a user's job performance. In other words, there is no substantial difference between the concept of "performance impacts" in TTF theory and the concept of "perceived usefulness" in the ECM model [2], [4]. On the other hand, the more a technology meets specific work task characteristics, the higher is the probability that the technology will contribute to an attract continued usage [4]. So, we propose the next hypothesis:

H6. Perceived task-technology fit positively affects older adult's perceived usefulness of SNSs.

H7. Perceived task-technology fit positively affects older adult's continued SNSs usage intention.

C. Theory of Planned Behavior (TPB)

The theory of planned behavior (TPB) was developed based on the theory of reasoned action (TRA), which argues that both behavioral attitude and subjective norm affect behavioral intention, which in turn affects the actual behavior. TPB adds to TRA a third factor - perceived behavioral control - that affects behavioral intention and actual behavior [5]. Many studies have replicated and investigated these three constructs and found that they are valid in explaining individual intention to use various forms of IT [3].

In our model, we propose that both perceived behavioral control and subjective norm will impact the continuance intention. Subjective norm refers to "the perceived social pressure to perform or not to perform the behavior" [5]. In other words, subjective norm is related to the normative beliefs about the expectation from other people. Many older adults choose to use SNSs because their friends or relatives are the users of SNSs system, and they recommend it to them. Hence, we propose:

H8. Subjective norm positively affects older adult's continued SNSs usage intention.

Perceived behavioral control refers to “people’s perception of ease or difficulty in performing the behavior of interest”. It is associated with beliefs about the presence of control factors that may facilitate or hinder the performance of the behavior in question (Liao, Chen, et al., 2007). In this case, although SNSs can enhance the older adult’s independence and some other benefits, they still need to have the basic Internet skills to use it. Thus, we posit that:

H9. Perceived behavioral control positively affects older adult’s continued SNSs usage intention.

III. RESEARCH METHODOLOGY

A. Instrument Development

We used a questionnaire survey to test our theoretical model. Each item corresponding to the constructs was measured using a seven-point Likert scale, with answer choices ranging from “disagree strongly” (1) to “agree strongly” (7). The survey items for the constructs were adapted from pre-validated ECM, TTF and TPB studies. The question measurements were reworded to fit the older adults and SNSs environment. The scale items for perceived usefulness was adapted from Davis [6], subjective norm and perceived behavioral control were adapted from Taylor and Todd [7]. In addition, the items measuring task and technology fit were adapted from Lin and Huang (2008), and the continuance intention, satisfaction, confirmation were adapted from Bhattacharjee [2]. The survey items are listed in Appendix A.

Before conducting the survey, the survey measurements were reviewed by five IS experts to identify problems in the wording, content, and to remedy any ambiguities in the questions. After several modifications of the items based on the suggestions from these IS experts, the modified questionnaire was pilot-tested on 67 older adults. The results of the pilot test were evaluated by using Cranach’s reliability and factor analysis. The reliability coefficient was first calculated for the items of each construct, and the standard lower bound for Cranach’s alpha set at 0.7 (Anderson & Gerbing, 1988). A factor analysis was then performed to examine whether the items produced the anticipated number of factors and whether the individual items were loaded on their appropriate factors. All items had high loadings on their related factors and low cross-loadings on other factors, showing good convergent and discriminate validities.

B. Subjects and Data Collection

Empirical data was collected via a paper-based survey from two communities in Shang Hai located in eastern China. A total of 232 older adults aged 50-65 years participated in this study. All participants reported using the SNSs or internet services at least once a week. The participants had an average of 16.5 years of education. A majority of the participants were men (69%).

Each participant was given a survey booklet or a link to complete the survey online. Participants were told, “This study is designed to understand more about how older

adults feel about social networking websites.” If participants were not currently users of SNSs, but had internet experience, they were instructed to “answer based on their thoughts about SNSs, rather than their experience using them.” Each survey began with a table presenting basic information about SNSs, as well as specific information about some popular social networking platforms. To encourage participation, participants were given some gifts, funds provided by the author.

IV. RESULTS

In analyzing the collected data, we followed the two-step approach of SEM, which is closest in spirit to Byoungsoo Kim [3]. First, a confirmatory factor analysis (CFA) was used to measure convergent and discriminant validity. Then, we examined the structural model to investigate the strength and direction of the relationships among the theoretical constructs.

TABLE I. SUMMARY OF FIT INDICES

Fit indices	Recommended value	Measure model	Structural model
χ^2/df	≤ 5	2.61	2.37
RMSA	≤ 0.08	0.058	0.062
CFI	≥ 0.90	0.96	0.97
NNFI	≥ 0.90	0.95	0.65
SRMR	≤ 0.10	0.054	0.087

A. Measurement Model

A CFA was conducted to test the measurement model. This study assessed model fit in terms of four different indices: root mean square error approximation (RMSEA), comparative fit index (CFI), non-normed fit index (NNFI), and standardized root mean square residual (SRMR). The four fit indices are recommended based on their relative stability and insensitivity to sample size [3]. As shown in Table I, all recommended fit indices were within the recommended level, representing a good model fit. This study calculated convergent validity, reliability, and discriminate validity of the measurement scales [3]. First, to assess convergent reliability, this study checked item loadings. Convergent validity can be satisfied if item loadings are 0.60 or higher [3]. The lowest loading of this study was 0.754, confirming the convergent validity. Second, the CR and AVE values were calculated to check reliability. The reliability was acceptable if the CR value was 0.70 or higher and the AVE value was 0.50 or higher. As shown in Table II, all factors met both criteria for acceptable reliability. Lastly, the assessment of discriminate validity was conducted by comparing the shared variances between factors with the AVE of the individual factors. Table III gives the inter-construct correlations and the square roots of the AVEs. This table shows that the square root of the AVE was higher than their shared variances. The results confirmed the discriminate validity of the model constructs.

B. Structural Model and Hypothesis Testing

The nine hypotheses presented above were tested collectively using the structural equation modeling (SEM) approach, also tested using LISREL 8.5. As shown in

Table I, the same set of fit indices was used to test the fit of the structural model. All the indices suggested a fairly good fit. The results of the SEM are presented in Fig. 1.

In this study, user satisfaction was found to play a significant role in older adults' SNSs continuance intention. Consistent with our expectations, continuance intention was found to be significantly related to perceived usefulness. Therefore, H1 and H4 are accepted. Also, perceived usefulness was found to have a significant effect on older adults' satisfaction, H3 is accepted too. The effects of confirmation of expectations on perceived usefulness and user satisfaction are all confirmed. Therefore, H2 and H5 are supported. Perceived task-technology fit positively affects the perceived usefulness and also is positively associated with SNSs continuance intention. Hence, H6 and H7 are also accepted. The effect of Social norm and perceived behavioral control on continuance intention are confirmed, H8 and H9 are accepted too.

TABLE II. SCALE RELIABILITIES

Construct	Item	Mean	Standard deviation	Loading	CR	AVE
Continuance intention	CI1	3.84	1.53	0.856	0.87	0.7864
	CI2	3.38	1.53	0.845		
	CI3	3.69	1.59	0.857		
User satisfaction	US1	3.64	3.57	0.845	0.94	0.8316
	US2	3.69	3.71	0.902		
	US3	3.61	3.49	0.914		
	US4	3.78	3.67	0.863		
Perceived usefulness	PU1	4.12	1.74	0.851	0.93	0.7287
	PU2	4.33	1.92	0.871		
	PU3	3.69	1.53	0.815		
Confirmation	CM1	3.51	1.28	0.754	0.85	0.5841
	CM2	3.32	1.24	0.835		
	CM3	3.21	1.31	0.792		
Task and Technology Fit	TTF1	3.71	1.22	0.864	0.91	0.7312
	TTF2	3.84	1.19	0.858		
	TTF3	3.89	1.51	0.849		
Subjective norm	SN1	2.97	1.31	0.823	0.89	0.7421
	SN2	3.12	1.29	0.836		
	SN3	2.89	1.25	0.845		
Perceived behavior control	PBC1	4.87	1.31	0.847	0.92	0.7813
	PBC2	4.93	1.48	0.905		
	PBC3	4.79	1.52	0.877		

TABLE III. CORRELATION MATRIX AND DISCRIMINANT ASSESSMENT

	1	2	3	4	5	6	7
1.Continuance intention	0.718						
2.User satisfaction	0.335	0.728					
3.Perceived usefulness	0.327	0.622	0.735				
4.Confirmation	0.309	0.501	0.537	0.722			
5.Task and Technology Fit	0.148	0.169	0.319	0.375	0.716		
6.Subjective norm	0.284	0.52	0.607	0.546	0.293	0.769	
7.Perceived behavior control	0.029	0.289	0.291	0.298	0.238	0.371	0.743

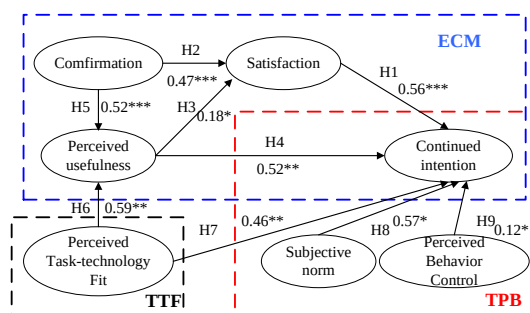


Figure 1. Research model and analysis results

V. CONCLUSION

We have examined the effects of satisfaction, perceived usefulness, confirmation, perceived task-technology,

subjective norm, and perceived behavioral control on the older adults' adoption and continuance intention of SNSs. The results of the study show that satisfaction is the strongest predictor of older adults' continuance intention, followed by perceived usefulness, confirmation, perceived task-technology, subjective norm, and perceived behavioral control. The satisfaction-intention link has previously been validated in consumer behavior research under the product and service contexts [2]. Further, satisfaction may be the key to explaining why the older adults discontinue using SNSs after their initial acceptance. Because satisfaction was the strongest predictor of continuance intention relative to the other predictors, older adults dissatisfied with SNSs may stop using it, despite having positive perceptions with regard to other elements.

In some previous TAM-based studies of IS acceptance, perceived usefulness was a stronger predictor of acceptance intention than other predictors. But, in this study, perceived usefulness was identified as a secondary determinant of continuance intention. Older adults' pre-acceptance attitude is formed potentially through some second-hand information from others people, the media, advertising or other sources. These influence sources may be biased, and hence older adults' attitude potentially may be inaccurate, unrealistic, and uncertain. In contrast, post-acceptance satisfaction is grounded in users' first-hand experience, and is therefore more realistic, unbiased, and less susceptible to change. The above result implies that perceived usefulness is more closely related to acceptance intention, while satisfaction plays a more important role for continuance intention. Therefore, in order to increase the older adults' adoption and continued usage of SNSs, the practitioners should inform new (potential) users of the potential benefits of SNSs use, and educate old (continued) users on how to use SNSs effectively so as to maximize their confirmation and satisfaction.

While all the ECM variables are significant in this study, they implicitly assume that behavior is volitional. However, older adults face several new constraints and barriers different from those of young people, such as relatively low familiarity with network technology, the degradation of the physical, sensory, and cognitive capabilities (perceived behavioral control), and influence of the opinions of other important persons (subjective norms). These issues call for the inclusion of TPB in the SNSs adoption model, and both subjective norm and perceived behavioral control are verified as having a significant influence on continuance intention. This finding implies that when older adults find that people around them have adopted SNSs services, they will be more willing to use it. So, as the results of some researches [2], [3], SNSs providers may use positive word-of-mouth strategy to enhance the older adults' awareness of the SNSs and promote its benefits, and they also may need to consider how to bring all those existing older adults users positive experience to remain their future acceptance, rather than rely on mass media only.

While in some related published reports, practitioners has mainly been to focus on IT-centric variables with, e.g.,

user satisfaction and perceived usefulness as the key to continued usage [4], [8], Goodhue and Thompson's theory of task-technology fit states that the perceived task-technology fit is work-centric variable and for an IS to have positive impact, it must be a good fit for the tasks it supports [4], [8].

In this study, we have demonstrated the importance of "task-technology fit" in explaining older adults' SNSs continuance intentions. The results obtained in this study suggest that perceived task-technology fit as work-centric variables can be just as important in determining the older adults' intention to continue using SNSs. So, the above findings imply that SNSs practitioners should not only focus on older adult's user satisfaction and perceived usefulness, but also take the older adult's perceived task-technology fit into consideration when to motivate the older adult users for continued use of SNSs.

VI. LIMITATION

This study has several limitations. First, the work was conducted using a short-term snapshot of older adults' behavior, and additional research efforts with longitudinal studies would give a clearer picture of how the older adults and the relationships among variables change over time. Second, the use of cross-sectional survey data has limitations. Because of the time limited, the validity of the numerical example should be further researched and improved yet. Third, while this study synthesizes three theoretical perspectives to propose a new model to explain and predict older adults' continuance intention to use SNSs, other external factors may also be important in understanding older adults' continuance intention to use SNSs.

APPENDIX A. LIST OF MODEL CONSTRUCTS AND ITEMS

Continuance Intention Adapted from Bhattacherjee (2001)

- I will keep using the SNSs as regularly as I do now
- I will frequently use the SNSs in the future
- I will strongly recommend that others use it

User Satisfaction Adapted from Bhattacherjee (2001)

- How do you feel about your over experience with SNSs?
- 1. Very dissatisfied/Very satisfied.
- 2. Very displeased/Very Pleased.
- 3. Very frustrated/Very Contented.
- 4. Absolutely terrible/Absolutely delighted.

I am pleased with the experience of using SNSs

My decision to use SNSs was a wise one

Perceived Usefulness Adapted from Davis (1989).

I find SNSs can help me contact with other people effectively

I find SNSs can help me give more useful information quickly

I find SNSs can help me perform many things more conveniently

Confirmation Adapted from Bhattacherjee (2001).

My experience with using the SNSs was better than I expected

The service level provided by the SNSs was better than I expected

Overall, most of my expectations from using SNSs were confirmed.

Perceived Behavioral Control Adapted from Taylor and Todd (1995)

I would be able to use SNSs.

Using SNSs is entirely within my control.

I have the resources and the knowledge and ability to make to use of SNSs.

Subjective Norm Adapted from Taylor and Todd (1995)

People important to me support my use of SNSs

People who influence me think that I should use SNSs

People whose opinions I value prefer that I should use SNSs

Task Technology fit (TTF) Adapted from Lin and Huang (2008)).

In helping get more useful information tasks, the functions of SNSs are enough.

In helping contact my friends and some young relations tasks, the functions of SNSs are appropriate.

In general, the functions of SNSs fully meet my enjoyment and improve qualities of life needs.

ACKNOWLEDGMENT

This research was supported by the National Social Science Foundation of China under Grant 13BTQ059 and Technology Foundation of Jiangxi Provincial Department of Education under Grant GJJ12730 and GJJ12267.

REFERENCES

- [1] Y. G. Ji, "Older adults in an aging society and social computing: A research agenda," *INTL. Journal of Human-Computer Interaction*, vol. 26, no. 11-12, pp. 1122-1146, 2010.
- [2] A. Bhattacherjee, "Understanding information systems continuance: An expectation-confirmation model," *MIS Quarterly*, vol. 25, no. 3, pp. 351-370, 2001.
- [3] B. Kim, "An empirical investigation of mobile data service continuance: Incorporating the theory of planned behavior into the expectation-confirmation model," *Expert Systems with Applications*, vol. 37, pp. 7033-7039, 2010.
- [4] D. L. Goodhue and R. L. Thompson, "Task-technology fit and individual performance," *MIS Quarterly*, vol. 19, no. 2, pp. 213-236, 1995.
- [5] I. Ajzen, "The theory of planned behavior," *Organizational Behavior and Human Decision Processes*, vol. 50, no. 2, pp. 179-211, 1991.
- [6] F. D. Davis, R. P. Bagozzi, and P. R. Warshaw, "Extrinsic and intrinsic motivation to use computers in the workplace," *Journal of Applied Social Psychology*, vol. 22, no. 14, pp. 1111-1132, 1992.
- [7] S. Taylor and P. A. Todd, "Assessing IT usage: The role of prior experience," *MIS Quarterly*, vol. 19, no. 4, pp. 561-570, 1995.
- [8] T. J. Larsen, "The role of task-technology fit as users' motivation to continue information system use," *Computers in Human Behavior*, vol. 25, pp. 778-784, 2009.



Wei Liu was born in ShangHai china, in May 1971. He received his PhD in management information systems from School of Economics & Management, BeiHang University, China, in 2007. His current research interests include social network services, mobile commerce and adoption behavior. He is an IS associate professor and Institute of Information Resources Management Faculty Fellow at School of Information Technology, Jiangxi University of Finance & Economics, China.