

# The Influence of Individual Affective Factors on the Continuous Use of Mobile Apps

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**Abstract.** Mobile apps have attracted a substantial amount of attention in mobile commerce. Usage behavior of consumers is always an important issue in this research area. The objective of this study is to explore what factors will affect an individual's continuance intention to use mobile apps. We propose a research model that integrates the Task-Technology Fit (TTF) and Theory of Reasoned Action (TRA), which are augmented with concepts of affective factors. We conduct an online survey and the results show that a higher degree of TTF and VTF (Value-Technology Fit) resulted in a more positive attitude towards using the mobile app. SN and attitude had strong significant impacts on users' continuance intention to use the app. However, TTF and VTF had no significant effect on the continuance intention to use the app.

**Keywords:** Mobile apps · Task-Technology Fit · Value-Technology Fit · Subjective norm

## 1 Introduction

Recent years have seen an explosive growth in the number of mobile devices such as smart phones and tablets. There are hundreds of thousands of mobile apps out there for iOS and Android users. According to Gartner's report, it indicates that mobile apps revenues tipped to reach 26 billion dollars in 2013, and estimates that 103 billion mobile apps will be downloaded [20]. Gartner also predicts future trends in the market, claiming that by 2017, annual app downloads will reach 268.7 billion, and in-app purchases will generate 48 % of revenues. Due to the great potentials, users' behavior of mobile apps is always an important issue both in the research area and practical area.

To date, many theories and the antecedents of consumer adoption in mobile marketing have been discussed, such as theory of reasoned action, theory of planned behavior, task-technology fit, trust, flow, playfulness, decision-making, and perceived usefulness etc. Most previous literature focuses on treating new service/technology adoption as a rational decision based on the functional needs of an individual. In many cases, however, new service/technology adoption is not due to functional needs but affective reaction. Gartner points out that five simple attributes into mobile apps to

better engage our customers are as follows: recognize your customer, demonstrate that you value your relationship with your customer, create interactions that are inviting and fun, provide information sufficient for making a buy decision, and make payment easy. That is, mobile commerce apps should emphasize on the entire customer experience and satisfy their individual needs. Users with different motivations for adoption may lead to different outcome. In addition, we found there are few articles that can include functional factors and affective factors into consideration. Therefore, this study tries to understand what factors will affect an individual's continuance intention to use and whether different perceived value (functional value vs. mental value) will affect the continuance intention to use of the new app.

In this paper, we aim to investigate affective factors that may affect the continuance intention to use of mobile apps. In order to provide a solid theoretical basis for examining the use of mobile apps, this paper proposes a research model that integrates the Task-technology Fit (TTF) and Theory of Reasoned Action (TRA), which are augmented with concepts of affective factors. TTF and TRA have been used in many studies to predict and understand user intention to adopt new information systems. Hence, they are also appropriate for analyzing the continuance intention to use mobile apps. The purposes of this paper are specified as:

1. To investigate whether affective factors significantly impact a user's continuance intention to use mobile apps.
2. To evaluate whether the augmented technology adoption model can provide a better predictive power for the continuance intention to use mobile apps.

This paper proceeds as follows. Section 2 reviews related literature and describes our research framework. Section 3 outlines research method and instruments. Section 4 provides data analysis and results. Finally, Sect. 5 summarizes our findings and discusses potential implications.

## 2 Theory and Hypotheses

### 2.1 Fit

In recent years the fit concept has been widely predicted individual and organizational technology adoption and performance. Fit reveals different kinds of match in social science. For example, Task-Technology Fit (TTF) proposed by Goodhue and Thompson is more likely to have a positive impact on individual performance in organization and is used if the capabilities of the IT match the tasks that the user must perform [8–10, 24]. Fit-Appropriation Model (FAM) extended from TTF considers organizational context and argues a TTF is a necessary but not sufficient condition to improve performance. That is, TTF affects performance, but is moderated by appropriation [6]. Technology-Organization-Environment framework (TOE) identifies three aspects of an enterprise's context that influence the process by which it adopts and implements a technological innovation [23]. Fit-Viability Model (FVM) proposed by Liang and Wei [16] combines TTF with the general notion of organizational viability of information technology. Viability refers to the extent to which the organizational

environment is ready for the application. Fit refers to the extent to which the capabilities of IT meet the requirement of task. As mentioned above, besides TTF can both be used in the organizational and individual context, other theories are standing on organizational level.

In this research, we focus on the study of individual continuance intention to use under the mobile commerce context. The satisfaction of Individual needs deriving from the unique features of mobile apps (such as customization, personalization, and social integration etc.) becomes more and more important. Therefore, TTF which is one of appropriate theories will be considered in our research. Although TTF effectively uses a user evaluation perspective to explain individual performance after information technology/service adoption, it neglects user's attitudes and intention in its model. To some extent, it is the concept of "cognitive fit", because whether task and technology fit for each other depends on individual's personal perception. If user perceived task and technology are fit for each other, it would affect user's intention of technology adoption. Meanwhile, if user perceive task and technology are fit for each other, it would also positive affect user's attitude toward technology usage. Therefore, factors affecting users' attitude and intention to use IT will be both considered in our theoretical model. In the use of mobile commerce context, the cognitive dimension, fit, measures the whether mobile app fits for the tasks that the individual needs to perform. Therefore, we propose our first two hypothesis.

Hypothesis 1: Task-Technology Fit positively affect user's attitude toward using mobile apps.

Hypothesis 2: Task-Technology Fit positively affect user's continuance intention to use mobile apps.

Most previous literature focuses on treating new service/technology adoption as a rational decision based on the functional needs of an individual. In many cases, however, new technology/service adoption is not due to functional needs but affective needs. That is, the other individual perception we concerned in this research. We have thought that a user who adopts a service was desire to gain a reward or avoid a negative outcome. However, we found an alternative behavior occur while people have other particular needs [11, 13, 15, 20]. For example, people are playing a game because they find it exciting, joining a charity event due to increase social status, and participating in a sport to gain a social identity [12]. It is called perceived intangible value. On the contrary, people are participating in a sport in order to win awards, and competing in a contest for winning a scholarship. This means perceived tangible value. Therefore, Value-Technology Fit is defined by this study as the extent that technology functionality matches perceived value of individual. If technology functionality and perceived value of individual fit for each other, it will affect individual attitude and intention to use new technology. Thus, the followings are our hypothesis.

Hypothesis 3: Value-Technology Fit positively affect user's attitude toward using mobile apps.

Hypothesis 4: Value-Technology Fit positively affect user's continuance intention to use mobile apps.

### 2.2 Theory of Reasoned Action

TRA was derived from social psychology and proposed by Ajzen and Fishbein [1, 7]. It is a models that have been used to interpret and predict the intention of technology use in the information systems area. The components of TRA are three general constructs: behavioral intention, attitude, and subjective norm. Behavioral intention measures a person’s relative strength of intention to perform a behavior. Attitude consists of beliefs about the consequences of performing the behavior multiplied by his or her evaluation of these consequences. Subjective norm (SN) refers to the social pressure exerted on an individual to perform or not perform a particular behavior [7]. Consequently, the social pressure causes the relevant behavior to become the individual’s normative beliefs with which he/she would comply. Motivation to comply refers to he/she wanting or being willing to comply with these beliefs. That is, a user may exhibit different motivations for complying with the opinions of relevant people on the adoption of mobile apps. This theory has been applied to study many information technology applications and is certainly appropriate for investigating the continuance intention to use mobile apps.

Hypothesis 5: Attitude toward mobile apps positively affect user’s continuance intention to use mobile apps.

Hypothesis 6: Subjective Norm positively affect user’s continuance intention to use mobile apps.

### 2.3 Research Model

To summarize, our theoretical model examines effects of (1) task-technology fit to user attitude, (2) task-technology fit to continuance intention to use, (3) vale-technology fit to user attitude, (4) value-technology fit to continuance intention to use, (5) user attitude to continuance intention to use, and (6) subjective norms to continuance intention of using mobile apps. Figure 1 shows the theoretical framework.

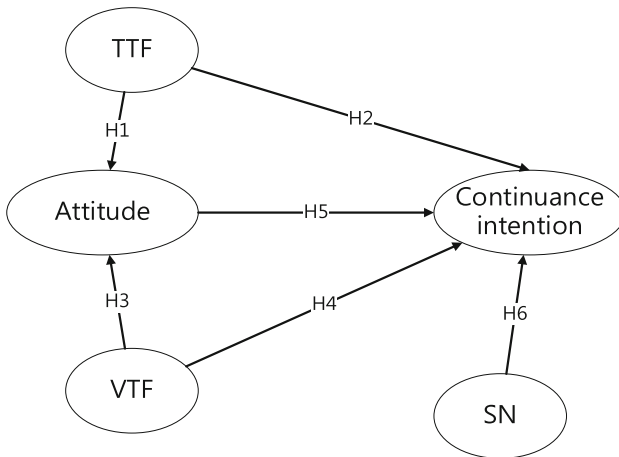


Fig. 1. Theoretical framework

### **3 Instrument Development and Research Methodology**

#### **3.1 Instrument Development**

Existing measures from previous studies were adapted with slight modifications to fit our context. The measures used five-point Likert scales. All measures are listed as follows (Table 1).

#### **3.2 Measure and Data Collection**

The targets of this research are office workers in Taiwan. The voluntary users were invited to join the Project 2 weight-loss challenge. Each volunteer had to record his/her daily exercise and food via a health-related app, JustFit. JustFit is one of the most popular apps in Taiwan. It not only can help people to record daily food, exercise and mood easily, but also provide over 120,000 local food data. An online survey was conducted to gather data after using the app for three months (from 11 July to 31 October in 2014). Finally, a total of 278 volunteers (170 females and 108 males) were recruited. Their ages ranged from 31 to 45 years old (43.5 %). 70.2 % of the subject had at least a master degree, and 75.2 % of them were sitting at their desks for over 5 h per day. There were over 120 people (50.4 %) who think his/her body type is a little fat, and over 123 people (44.3 %) who don't satisfy their body (shown in Table 2).

### **4 Analysis of Results**

#### **4.1 Measurement Model**

A confirmatory factor analysis using the Partial Least Squares (PLS) was conducted to assess the validity and reliability of our data. Reliability and convergent validity of the factors were estimated by composite reliability and average variance extracted (AVE). The acceptable composite reliability value is suggested to exceed 0.7, and the AVE value to exceed 0.5. Discriminant validity verifies whether the squared correlation between a pair of latent variables is less than the AVE for each variable. As can be seen in Tables 3 and 4, all constructs satisfies the criteria, thus requiring no changes to the constructs.

#### **4.2 Structural Model**

The results show that the combined model can interpret user attitude toward mobile apps and users' continuance intention of mobile app. The model indicates that Task-Technology Fit and Value-Technology Fit can explain 46.5 % of the variance in attitude and the attitude along with subjective norm can explain 50.3 % of the variance in continuance intention. Attitude was affected by Task-Technology Fit and Value-Technology Fit, and continuance intention to use was affected by attitude and subjective norm. However, Task-Technology Fit and Value-Technology Fit had no

**Table 1.** Measures of constructs

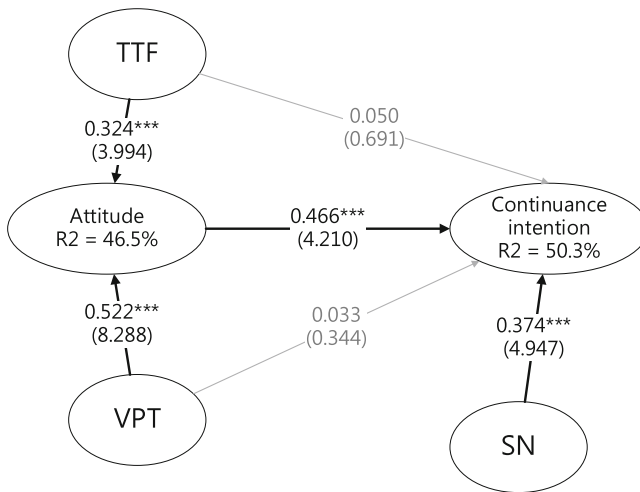
Construct	Items	References
Task-technology fit (TTF)	Information/Data needs	5, 10
	1. The APP provides me with up-to-date health information	
	2. The APP provides the consistency of information from a variety of information resources to me	
	3. The APP allows me to deliver, access and storage a large amount of information	
	4. The APP provides me with accurate health information	
	5. The APP allows me to quickly access health information	
	6. The APP provides me with understandable information	
	Ubiquitousness needs	
	7. The APP allows me to use on the move	
	8. The APP allows me to use in different place	
	9. The APP allows me to use at any time	
	EOU needs	
	10. Learning to use the APP is easy for me	
	11. It will be impossible to use the APP without the manual	
	12. It takes too much time to learn to use the APP	
	13. Using the APP requires a lot of mental effort	
Importance		
14. Information/Data needs is important to weight management		
15. Ubiquitousness needs is important to weight management		
16. EOU needs is important to weight management		
Value-technology fit (VTF)	Intangible value	14, 19
	1. I use the APP to improve personal exposure and visibility	
	2. I use the APP to increase the chance of interacting with others	
	3. I use the APP to obtain social identity	
	4. In sum up, using the APP can bring me an intangible value	
	Tangible value	
	5. I use the APP to control eating habits efficiently	
6. I use the APP to record exercise habits		
7. I use the APP to remind me to take care of my health		

(Continued)

**Table 1.** (Continued)

	8. In sum up, using the APP can bring me an tangible value	
Social Norm (SN)	1. My partners/close friends support me to use the APP	7
	2. Generally speaking, how much do you care what your partners/close friends think you should do?	
	3. My boss/my parents support me to use the APP	
	4. Generally speaking, how much do you care what your boss/your parents think you should do?	
	5. My colleagues/my classmates support me to use the APP	
	6. Generally speaking, how much do you care what your colleagues/your classmates think you should do?	
Attitude (ATT)	1. Using the APP to manage weight is a good idea	7
	2. Using the APP to manage weight is a wise idea	
	3. Using the APP to manage weight is a pleasant idea	
Continuance intention to use (CI)	1. For me, it is worth using the APP	5
	2. I will continue using the APP in the future	

significant influence on the continuance intention to use mobile app. Therefore, hypotheses 1 to 6 are partially supported. That is, the integrated model can predict 50.3 % of the continuance intention to use mobile app (Fig. 2).



\*p<0.05; \*\*p<0.01; \*\*\*p<0.001

**Fig. 2.** Path analyses of mobile app

**Table 2.** Demographic characteristics of participants

Characteristics	Item	Frequency	Percent
Gender	Female	170	61.2
	Male	108	35.8
Age	16–30 years	64	23
	31–45 years	121	43.5
	46–60 years	73	26.3
	61–75 years	20	7.2
Education	High school	13	4.7
	College	70	25.2
	Master	184	66.2
	Upper Master	11	4
Sitting time	3–4 h	29	10.4
	4–5 h	40	14.4
	Upper 5 h	209	75.2
Body type	Thin	9	3.2
	A little thin	42	15.1
	Fit	87	31.3
	A little fat	120	43.2
	Fat	20	7.2
Do you satisfy your body	Very dissatisfied	26	9.4
	Dissatisfied	97	34.9
	Neutral	58	20.9
	Satisfied	57	20.5
	Very satisfied	40	14.4

**Table 3.** Reliability, convergent validity

	AVE	Composite reliability	R Square	Cronbach’s alpha
Attitude	0.8461	0.9428	0.4650	0.9087
Continuance use	0.8813	0.9369	0.5029	0.8653
Task-technology fit	0.5659	0.9437		0.9345
Value-technology fit	0.5161	0.8945		0.8645
Subjective norm	0.5779	0.8913		0.8559

**Table 4.** Discriminant validity

	Attitude	Continuance use	TTF	VPT	SN
Attitude	0.9198				
Continuance use	0.6024	0.9388			
TTF	0.4594	0.3639	0.7523		
VTF	0.6068	0.4026	0.2594	0.7184	
SN	0.2506	0.5099	0.2438	0.1992	0.7602



## 5 Conclusion

Mobile devices such as mobile phones and tablets have become a part of human life. The mobile apps market seems have the feeling of a gold rush. Juniper Research claimed that 80 billion mobile apps will be downloaded in 2013, rising to 160 billion by 2017, but only around 5 % of apps will be paid by 2017 [21]. That is why many researchers attempted to investigate the issue of factors affecting users' adoption behavior. Given that the adoption of mobile app is purpose-sensitive, this paper aims to analyze user's continuance usage of mobile apps by providing an integrated TTF and TRA model and augmented the model with affective factors. Using a health-related mobile app as example, our specific goal is to examine to what extent our model can explain the continuance usage of mobile apps. After the empirical study and data analysis, we have obtained the following findings.

TTF and VTF both had significant impact on attitude towards using the mobile app. However, the coefficients of variation of VTF is higher than TTF's. It indicates that people had more positive attitudes toward using a new technology while their affective needs were satisfied [20]. SN and attitude had strong significant impacts on users' continuance intention to use the app. However, TTF and VTF had no significant effect on the continuance intention to use the app. The further analysis, we found most of people are not satisfied with their bodies even they have a standard body shape. Any app which could help them to manage and control their weight is viewed as a good app. It will increase users' positive attitude toward the app. Furthermore, some of people who use the lose-weight app are trying to connect with others, or gaining a sense of identity. They expect to have more confidence via increasing opportunities of communication with other people. This implies that a good app should not only provide the right technical services, but also satisfy the mental needs. Besides, those people who care about other people's opinions, especially colleagues and friends, are more willing to continue using the app. The research findings have suggestions for the mobile apps and future research studies.

One potential limitation of this research surrounds the size of the sample collected. Also, the convenient sampling used to solicit respondents for the survey may not be as perfect as random sampling. Another measurement limitation is that only two affective effects were investigated in this study. Other affective factors may affect users' intentions and future research could usefully identify and explore the effects of these factors.

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## References

1. Ajzen, I., Fishbein, M.: *Understanding Attitudes and Predicting Social Behavior*. Prentice-Hall, Englewood Cliffs (1980)
2. Bohlen, J.M.: The adoption and diffusion of ideas in agriculture. In: Copp, James H. (ed.) *Our Changing Rural Society: Perspectives and Trends*, pp. 265–287. Iowa State University Press, Ames (1964)

3. Bohlen, J.M.: Research needed on adoption models. In: *Diffusion Research Needs*. Columbia: Missouri Agricultural Experiment Station, North Central Regional Research Bulletin, vol. 186, pp. 15–21 (1968)
4. Clarke, I.: Emerging value propositions for M-Commerce. *J. Bus. Strat.* **18**(2), 133–147 (2001)
5. Davis, F.D.: Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Q.* **13**(3), 319–342 (1989)
6. Dennis, A.R., Wixom, B.H., Vandenberg, R.J.: Understanding fit and appropriation effects in group support systems via meta-analysis. *MIS Q.* **25**(2), 167–193 (2001)
7. Fishbein, M., Ajzen, I.: *Belief, Attitude, Intentions and Behavior: An Introduction to Theory and Research*. Addison-Wesley, MA (1975)
8. Goodhue, D.L.: Understanding user evaluations of information systems. *Manage. Sci.* **41**(12), 1827–1844 (1995)
9. Goodhue, D.L.: Development and measurement validity of a task-technology fit instrument for user evaluations of information systems. *Decis. Sci.* **29**(1), 105–138 (1998)
10. Goodhue, D.L., Thompson, R.L.: Task-technology fit and individual performance. *MIS Q.* **19**(2), 213–236 (1995)
11. Govers, P.C.M.: *Product Personality*. Unpublished doctoral dissertation, University of Delft, Delft (2004)
12. Gotzsch, J.: *Managing product expressions: Identifying conditions and methods for the creation of meaningful consumer home products*. Unpublished doctoral dissertation, Brunel University, London (2003)
13. Kandinsky, W.: *Concerning the Spiritual in Art*. Online Distributed Proofreaders. Retrieved from Project Gutenberg, Oxford (1977)
14. Klonglan, G.E., Coward, E.W.: The concept of symbolic adoption: a suggested interpretation. *Rural Sociol.* **35**(1), 77–83 (1970)
15. Kreitler, H., Kreitler, S.: *Psychology of the Arts*. Duke University Press, Durham (1972)
16. Liang, T.P., Wei, C.P.: Introduction to the special issue: a framework for mobile commerce applications. *Int. J. Electron. Commer.* **8**(3), 7–17 (2004)
17. Lin Y.L., Liang, T.P., Ho, S.C., Yeh, Y.H.: The impact of situation influences on the intention to use mobile value-added services. In: Paper Presented at the 6th Workshop on e-Business (WeB2007), Montreal, 9 December 2007
18. Penny, G.: *Use Mobile Apps to Provide Customer Value, and Revenue Will Follow*. Gartner (2014)
19. Rogers, E.M.: A communication research approach to the diffusion of innovations. In: *Diffusion Research Needs*, Columbia: Missouri Agricultural Experiment Station, North Central Regional Research Bulletin, vol. 186, pp. 27–30 (1968)
20. Shiau, W.L., Liou, T.R.: Understanding the effects of consumer's value technology fit on a mobile shopping website: the case of Rakuten Ichiba. In: *Pacific Asia Conference on Information Systems (PACIS 2014)*
21. Stuart, D.: Mobile apps revenues tipped to reach \$26bn in 2013. *the guardian* (2013). <http://www.theguardian.com/technology/appsblog/2013/sep/19/gartner-mobile-apps-revenues-report>
22. Sian, R.: Over 160 Billion Consumer Apps to be Downloaded in 2017, Driven by Free-To-Play Games. Juniper Research (2013). <http://www.juniperresearch.com/viewpress-release.php?pr=383>
23. Tornatzky, L.G., Fleischer, M.: *The Processes of Technological Innovation*. Lexington Books, Lexington (1990)
24. Wang, W.T., Wang, B., Wei, Y.T.: Examining the impacts of website complexities on user satisfaction based on the task-technology fit model: an experimental research using an eye-tracking device. In: *Pacific Asia Conference on Information Systems (PACIS 2014)*