Exploring Mobile Terminal Continuance Usage from Customer Value Perspective

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Abstract: With the large-scale growth of mobile terminal users, exploring their continuance use behavior attracts wide attention. However, there is insufficient research on user psychological states in different hierarchy models towards continuance use of a mobile terminal. This study advanced a mediation model of continuance use of a mobile terminal with a moderator based on expectation confirmation theory from the perspective of customer value dimension. Data were collected in China, and 311 samples were used to examine the hypotheses provided from the research model with the partial least squares structural equation modeling method. The empirical results indicate that perceived usefulness positively influences continuance use of a mobile terminal, and perceived usefulness positively influences satisfaction and in turn impacts on continuance use of a mobile terminal. Specially, there is a significant mediating effect of attitude loyalty between satisfaction and continuance use of a mobile terminal. Moreover, the results also verify that mobility negatively moderates the relationship between attitude loyalty and continuance use of a mobile terminal. Our findings suggest that user psychological states are in different levels to reflect mobile terminal user value during the process of continuance use of a mobile terminal. Moreover, our findings indicate the boundary condition in continuance use of a mobile terminal.

Keywords: continuance usage of a mobile terminal; perceived usefulness; satisfaction; attitude loyalty; mobility; customer value; expectation confirmation theory; mobile application

1. Introduction

A mobile terminal refers to a mobile information platform that can be installed for a variety of mobile applications (e.g., instant message Apps and mobile payment Apps) to process different things in an intelligent, integrated and convenient way, such as mobile phones, smart phones or new Android-based devices [1]. As more and more users frequently use mobile terminals worldwide, especially smart phones, using mobile terminals is becoming a popular method to deal with their things [2–4]. Data from Meeker (2017) show that the number of China mobile Internet users is above 7 hundred million in 2016, and the year-on-year growth of mobile Internet daily time spent is 30 percent [2]. Because mobile terminal users are the final users of mobile applications, their usage behavior has an important effect on the continuing development of mobile applications. Therefore, exploring the behavior of continuance usage of a mobile terminal (CUMT) has attracted wide attention. CUMT refers to the users' continued usage of mobile applications by a mobile terminal over long periods after adoption [5,6].

Lots of studies on continuance usage (CU), such as mobile payment services [7] and social networking services from smart phones [8], have confirmed that CU is important in successful information systems (IS) or mobile applications [5,7–10]. Among these studies, some studies support

the view that perceived usefulness (PU) depicting user belief is of primary relevance for the behavior or intention of CU [5,9,11–14]. In addition, Bhattacherjee (2001) [5] confirmed that PU and user satisfaction with IS use influence subsequent continuance decisions, and user satisfaction, in turn, is influenced by PU based on expectation confirmation theory (ECT). Satisfaction is used to depict user psychological or affective states in CU [12,13,15,16]. Although these studies have considered user belief and affective states describing user psychology toward CU, it is deficient to study user psychological states in different hierarchy models in the process of CU, which is beneficial to better understand the behavior of CU.

To divide the hierarchy of user psychological states in CU, the authors focus on the studies of customer value that is about how enterprises create value for customers to enhance the enterprise competitiveness in tough markets. Customer value is one of important topics in some fields, such as marketing, retailing and enterprise strategic management [17–21]. Previous works tended to clarify customer value by different dimensions, and deemed that different customer values depended on customer different psychological states [17,18]. In the mobile Internet context, larger-scale users are using mobile terminals instead of tradition methods to deal with their things [14,22,23], and different users might come into being different psychological states that can reflect different customer values in the process of CU. The authors believe that the relevant studies not only reveal user different psychological states toward the behavior of CUMT, but also help mobile application enterprises to identify mobile terminal user different values to create new value [5,17,19,24]. Therefore, the authors will explore user different psychological states toward CUMT from the customer value perspective.

To address this study, the authors focus on loyalty variables that relate to both satisfaction and CU. In existing studies, especially in the customer behavior and marketing, user satisfaction and loyalty were always linked closely. Most works took loyalty as a dependent variable to explore which factors determine loyalty to retain the customers or users, and verified that satisfaction significantly influenced loyalty [25–29]. In addition, some literature divided loyalty into attitude loyalty and behavior loyalty, and deemed that the former is prior to the latter. Attitude loyalty was used to depict the psychological meaning of loyalty, such as preference, intension of repurchasing or recommending to others [25,30]. According to the argument above, the authors think that attitude loyalty can be used to depict a psychological state to reflect a customer value dimension. Thus, the authors proposed the first research question.

> RQ1: Does attitude loyalty depict user psychological states toward the behavior of CUMT in some level of customer value?

In addition, prior studies on customer value have also pointed out that the consumption context is an important factor in affecting customer value [17]. Under different consumption contexts, even if customer is the same one, he/she would form different psychological states which leads to different customer values [20]. Woodruff et al. (1997, 2002) suggested that customer value depended on specific consumption contexts [17,31]. In the mobile Internet context, the authors consider mobility as a context variable. Mobility refers to the degree of conveniently accessing the mobile Internet without restrictions of time and place [32]. Only mobile terminal users access the mobile Internet, they can use mobile applications to connect with others and handle affaires effectively, and interaction performance of mobile applications can be shown [22,33]. Because mobility is different in different areas, even in a city, mobility with different levels will form different usage contexts [34]. Therefore, the authors try to explore the moderating effect of mobility in the behavior of CUMT. The second research question was proposed as follows.

> RQ2: Does mobility have a moderating role in the behavior of CUMT?

To answer these questions, this study advances a research model to investigate the mechanism of CUMT based on ECT from the perspective of customer value. Our study contributes to the CU literature by advancing a CUMT model based on ECT from the customer value perspective, suggesting that user psychological states are in different levels during the process of CUMT. In addition, our study extends ECT literature by introducing attitude loyalty as a mediator into the research model based on ECT. The study supplements a psychological state toward the behavior of CUMT that relates to the social value dimension, enriching the ECT literature. Moreover, our study contributes to the knowledge of mobility by considering it as a moderator to explore the boundary condition in CUMT.

2. Theoretical Background and Hypotheses

2.1. Customer Value

In some academic and practice fields, such as marketing and retailing, value creation has been considered as a key to long-term success in competition [17,21,24], and delivering customer value runs through the whole consumption process. Customer value comes from customer psychological output, such as perception, preference, and appraising whether it meets customer needs. It is related to each of individual. For different customers with different needs and experiences, customer values are different [17,20]. These different values that customer has perceived mainly depend on customer's different decision levels. Existing studies usually elaborated the connotation of customer value with different value dimensions [10,17,18]. For example, Woodruff (1997) [17], who proposed a customer value hierarchy model that includes expectation value and actual produce value, suggested that customer value was the results of perception value for production in different levels, and it was linked with user different psychological states, such as customers' perception, preference and appraisal. Sweeney et al. (2001) [18] proposed four value dimensions from multiple items of consumer perceived value, that is, emotional value, social value, functional value (quality/performance) and functional value (price/value for money).

### 2.2. Mobile Terminal User Value Dimension

According to previous studies of customer value, especially Sweeney and Soutar's value dimensions [17–21], our study divides mobile terminal user value into three dimensions, namely, functional value, emotional value, and social value (seeing Table 1). The authors merge Sweeney and Soutar's two functional value dimensions that are mainly derived from perception of product into one to depict user perception of usefulness of mobile applications. The authors adopt their emotional value dimension that is described as "the utility derived from the feelings or affective states that a product generate" [18] (p. 211), emphasizing mobile terminal user experience based on the satisfaction result. In co-creation value studies, researchers have suggested that co-creation value comes from the creating results not only between customers and enterprises, but also between customers [19,24,35] and "value should be understood as value-in-social-context" [24] (p. 327). Therefore, the authors also adopt the social value dimension that is described as "the utility derived from the product's ability to enhance social self-concept" [18] (p. 211), reflecting user social self-concept or co-create value by user intension toward the behavior of CUMT or recommendation to others.

Table 1. Mobile terminal user value dimensions.

Original Dimension	Definition	New Dimension with a Corresponding Description in CU
Functional value (price/value for money)	"the utility derived from the product due to the reduction of its perceived short-term and long-term costs"	Functional value (PU is used to depict user perception of usefulness of mobile applications)
Functional value (performance/ quality)	"the utility derived from the perceived quality and expected performance of the product"	
Emotional value	"the utility derived from the feelings or affective states that a product generates"	Emotional value (satisfaction is used to depict affective states while users use mobile applications).
Social value (enhancement of social self-concept)	"the utility derived from the product's ability to enhance social self-concept"	Social value (attitude loyalty is used to depict user intention/preference of CU or recommending to others to embody value creation between users and social self-concept)

Note: Original dimensions and definitions are sourced from Sweeney and Soutar (2001) [18] (p. 211).

Accordingly, the authors advance a research model of CUMT with a moderator based on ECT from mobile terminal user value dimensions. In this model, our study forms three paths, namely, PU-CUMT, PU-satisfaction-CUMT and PU-satisfaction-loyalty-CUMT, to reflect mobile terminal user different values and explore the usage context. In addition, considering that control variables (e.g., age and gender) might have impacts on CUMT, the authors also introduce control variables into this research model. Figure 1 shows the research model. And then, the authors discuss the hypotheses proposed in the research model.
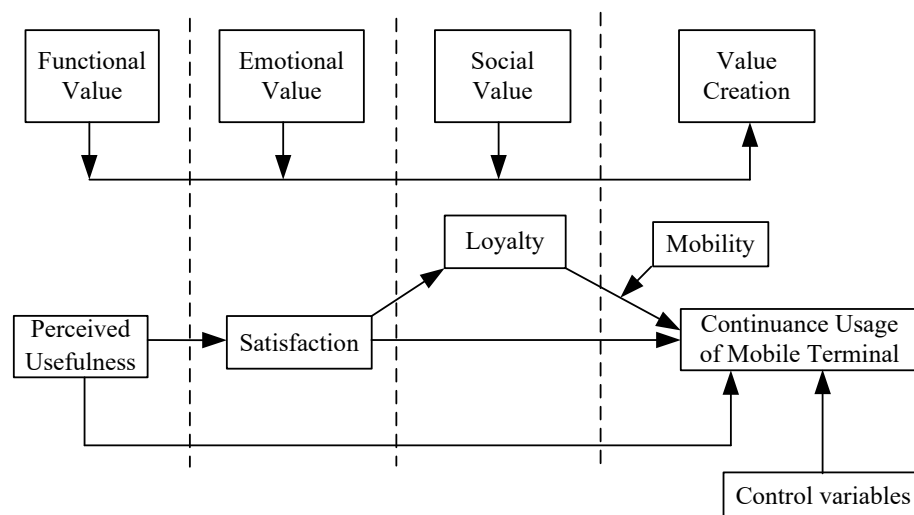
Figure 1. Research model.

2.3. IS Continuance and ECT

In accordance with the viewpoint of Bhattacherjee (2001), that is, "long-term viability of an IS and its eventual success depend on its continued use rather than first-time use" [5] (pp. 351–352), the studies of IS CU have been obtained wide attention in different contexts, such as traditional Internet, and the mobile Internet. Extensive studies are focusing on CU of IS from different theory perspectives [5,6,11–14]. Some studies explored CU based on rational action theory, such as technology acceptance model (TAM) and its extension [36,37], other works considered habit as a key factor in

investigating CU from the unconsciousness perspectives [36,38], and other CU research was conducted based on ECT [39,40].

Among these dominating theories on CU studies, ECT is the prominent theory to explain IS continuance, which integrates "confirmation and user satisfaction constructs within our current understanding of IS use" and suggests "users' continuance intention is determined by their satisfaction with IS use and perceived usefulness of continued IS use. User satisfaction, in turn, is influenced by their confirmation of expectation from prior IS use and perceived usefulness" [5] (p. 351). This study also pointed out that "satisfaction is viewed as the key to building and retaining a loyal base of long-term consumers" [5] (p. 353), underscoring a psychological or affective state and revealing "the salient motivations underlying IS users' intention to continue using an IS" [5] (p. 352).

2.4. The Roles of PU and Satisfaction

According to ECT and mobile terminal user value dimensions, the authors consider PU depicting user perception of usefulness of mobile applications to reflect functional value and satisfaction depicting user affect toward mobile applications to reflect emotional value in the process of CUMT. In this study, PU is defined as user's perception of the benefits of using mobile applications installed in a mobile terminal [5]. Satisfaction is operationally defined as the degree of user affect while using mobile applications by a mobile terminal [5,41].

In the mobile Internet context, PU is still crucial for users to constantly use mobile application via mobile terminals [23,42]. Because the screen size of mobile terminals is usually small, especially smart phones, information displayed in the screen is limited, and mobile applications usually show the information with small pieces of text, few pictures, and simple navigation [43]. Compared with traditional web pages on the Internet, mobile applications should more effectively attract the user's attention to arouse the user's behavior of CUMT in a limited visual space [44]. When perceiving the usefulness of mobile applications, users will handle a variety of things with them to meet their needs, such as communicating with friends, focusing on the news or friends, shopping, booking, paying bill, navigating, and ordering taxis [1]. In their spare time, users will also entertain themselves by playing games, reading books, watching videos, and listening to music with mobile applications [45]. Hence, as users increasingly perceive the usefulness of mobile applications, they will enhance the behavior of CUMT.

At present, mobile application is a marketing platform for mobile Internet enterprises, providing a good method for users to obtain information, communicate, or deal with affairs (e.g., functionality, integration and intelligence) [43,44]. When users perceive the usefulness and advantage of mobile applications, user satisfaction will easily emerge [26,27,46,47]. As user satisfaction increases, satisfaction will encourage users to use mobile applications constantly. Some literature deemed that PU influences satisfaction, and in turn, satisfaction is relevant of continuance behavior [5,6,48]. For example, Bhattacherjee (2001) suggested "users' continuance intention is determined by their satisfaction with IS use and perceived usefulness of continued IS use. User satisfaction, in turn, is influenced by their confirmation of expectation from prior IS use and perceived usefulness" [5] (p. 351).

2.5. The Role of Loyalty

Most works usually took loyalty as an important topic to explore how to retain the customers or users [25–29,49]. Some literature also divided loyalty into attitude loyalty and behavior loyalty. Repeat behavior, such repurchase and CU, was always considered as user behavior loyalty, and attitude loyalty was used to depict the psychological meaning of loyalty [25,30,48]. According to mobile terminal user value dimensions above, the authors consider attitude loyalty to reflect social value in the process of CUMT. In this study, attitude loyalty is used to depict the psychological meaning of loyalty towards CUMT, such as preference, intension or recommending to others [25,30].

In existing studies, especially in the customer behavior and marketing, user satisfaction and loyalty were usually linked closely [25–29]. Bhattacherjee (2001) have pointed out that "satisfaction is viewed as the key to building and retaining a loyal base of long-term consumers" [5] (p. 353). Prior studies have confirmed this point that satisfaction significantly influences loyalty [25–29]. Moreover, some literature has confirmed that PU influences satisfaction, and in turn influences loyalty intention [26–28]. For example, Zhou and Lu examined mobile instant messaging user loyalty [28]. In the mobile Internet context, mobile applications provide these good performances, such as practicality, convenience, intelligence, and advancement. As users perceive the usefulness of mobile applications, users will accumulate their emotion to promote satisfaction for CUMT. Based on cumulatively satisfying CUMT, preference and intention toward CUMT has developed [26–28]. As a result, as a level of satisfaction with mobile applications increases, user attitude loyalty increases, and in turn, the behavior of CUMT increases. Therefore, the authors proposed the following hypothesis.

Hypothesis 1. *Satisfaction influences CUMT through attitude loyalty.*

2.6. The Moderating Role of Mobility

With the wide coverage of the mobile Internet, users can easily access the mobile Internet by a variety of ways, for example, high-speed Wi-Fi services are freely provided in many places [50], so that users can connect with others over space and time [32,51,52]. Prior studies have shown that mobility impacts the use intention or actual CU of mobile applications [33,53,54], and also impacts satisfaction or customer experience [33,53,55]. However, because of the different coverage degrees of mobility in different areas, under different levels of mobility, the effect of user' psychological states on CUMT might be different.

According to environment–behavior relationship theory, under an uncertainty environment, individual's emotion will be aroused to lead to his/her specific explorative behavior, while under a stable environment, individual's emotion is not aroused easily and the behavior is unconscious [56,57]. In the mobile Internet context, under a low level of mobility, users cannot easily access the mobile Internet to use mobile applications through mobile terminals all times. In this condition, user's internal psychological states increase. As attitude loyalty established in the past increases, the behavior of CUMT increases. Therefore, the effect of attitude loyalty on CUMT is stronger under a low level of mobility than that under a high level of mobility. Based on H1, the authors proposed the following hypothesis.

Hypothesis 2. *Mobility negatively moderates the relationship between attitude loyalty and CUMT.*

3. Methods

3.1. Questionnaire Design and Data Collection

The research model includes five variables: CUMT, PU, satisfaction, attitude loyalty and mobility. The measures of PU, satisfaction and CUMT were mainly adapted from Bhattacherjee (2001) [5] and included 4 items each. Attitude loyalty was mainly adapted from Bayraktar et al. (2012) [58] and Chang (2015) [59] and included 4 items. Mobility was mainly adapted from Nikou and Bouwman (2014) [32] and included 3 items. Since demographic profiles of user might influence CUMT, for instance, the young constantly use mobile terminals more than the elder, and some users use mobile terminals more frequently or for a long time, the authors selected the four control variables: gender, age, frequency of daily use, and total time of daily use based on the previous studies [60–62]. The initial questionnaire was carefully reviewed to ensure content validity. Then, a pre-survey among fifty college students was carried out and the scale was further modified (see Appendix A, Table A1). All items were measured on a 5-point Likert scale (i.e., strongly disagree, disagree, neutral, agree and strongly agree).

The data were randomly collected in China with online and offline methods. The online questionnaires were collected with the Internet sample pool, and the offline questionnaires were collected randomly in some places (e.g., college and community). At last, 405 questionnaires were received. After excluding an invalid questionnaire, the authors finally obtained 311 data. The effective rate is 76.8%. The demographic analysis is shown in Table 2.

Table 2. Demographics analysis (The number of sample = 311).

Demographics Variables	Frequency of Daily Use	Percentage (%)
Gender		
Male	169	54.3
Female	142	45.7
Age		
<20	26	8.3
20–29	162	52.1
30–39	101	32.5
≥40	22	7.1
Education level		
Senior middle school and below	24	7.7
Junior college	40	12.9
Undergraduate	217	69.8
Postgraduate and above	30	9.6
Frequency of daily use (times)		
<10	57	18.3
10–20	94	30.2
20–30	83	26.7
30–40	28	9.0
40–50	16	5.2
≥50	33	10.6
Total time of daily use		
<30 minutes	24	7.8
1–2 hours	90	28.9
2–3 hours	76	24.4
3–4 hours	43	13.8
≥4 hours	78	25.1

3.2. Data Analysis Technique

Partial Least Squares (PLS) is suitable to examine a complex model including direct effects, indirect effects and moderating effects [63–66], and is robust for a small sample size [63,64,67]. Hence, the authors selected the PLS method to examine the current research model.

4. Results

4.1. Measurement Model

The results of construct reliability with PLS are shown in Table 3, indicating a satisfying reliability [68]. All composite reliabilities (CRs) are over 0.80, all average variance extracted (AVE) values are above 0.60, and all Cronbach's alpha values are greater than 0.70. As shown in Table 4, all items' factor loadings are larger than 0.7 in relevant factors, indicating a good convergent validity [68]. In Table 5, a good discriminant validity is also observed, in which each of the square root values of AVE is greater than the correlation coefficient in the corresponding row and column [68].

Table 3. Results of reliability.

Variables	Items	Cronbach's α	AVE	CR
Continuance Usage of a Mobile Terminal	4	0.88	0.74	0.92
Perceived Usefulness	4	0.81	0.64	0.88
Satisfaction	4	0.87	0.72	0.91
Attitude Loyalty	4	0.84	0.68	0.89
Mobility	3	0.82	0.73	0.89

Notes: AVE = average variance extracted, CR = composite reliability.

Table 4. Loadings and cross-loadings.

	CUMT	PU	SAT	LOY	MOB
CUMT1	**0.89**	0.55	0.47	0.54	0.35
CUMT2	**0.86**	0.48	0.40	0.44	0.35
CUMT3	**0.86**	0.47	0.38	0.45	0.37
CUMT4	**0.82**	0.56	0.50	0.50	0.35
PU1	0.43	**0.79**	0.43	0.40	0.24
PU2	0.40	**0.75**	0.40	0.27	0.18
PU3	0.54	**0.78**	0.40	0.37	0.27
PU4	0.55	**0.88**	0.52	0.45	0.34
SAT1	0.45	0.45	**0.85**	0.45	0.40
SAT2	0.48	0.48	**0.83**	0.52	0.37
SAT3	0.43	0.46	**0.89**	0.48	0.39
SAT4	0.38	0.47	**0.84**	0.42	0.35
LOY1	0.58	0.45	0.52	**0.87**	0.48
LOY2	0.35	0.34	0.43	**0.77**	0.42
LOY3	0.40	0.35	0.44	**0.83**	0.36
LOY4	0.50	0.40	0.41	**0.82**	0.44
MOB1	0.42	0.33	0.41	0.47	**0.89**
MOB2	0.27	0.19	0.31	0.37	**0.83**
MOB3	0.35	0.29	0.41	0.47	**0.85**

Notes: CUMT = continuance usage of a mobile terminal, PU = perceived usefulness, SAT = satisfaction, LOY = attitude loyalty, MOB = mobility, the bold numbers reflect the item loadings on the respective constructs.

Table 5. Results of discriminant validity.

	Gender	Age	Times	Total	CUMT	PU	SAT	LOY	MOB
Gender	NA								
Age	0.02	NA							
Times	0.08	0.00	NA						
Total	−0.04	−0.02	0.50	NA					
CUMT	0.12	0.06	0.10	0.13	0.86				
PU	0.10	0.03	0.10	0.01	0.60	0.80			
SAT	0.06	0.11	−0.01	−0.03	0.51	0.55	0.85		
LOY	0.14	0.05	0.08	0.07	0.57	0.47	0.55	0.82	
MOB	0.12	0.14	0.06	0.02	0.42	0.33	0.44	0.52	0.85

Notes: CUMT = continuance usage of a mobile terminal, PU = perceived usefulness, SAT = satisfaction, LOY = attitude loyalty, MOB = mobility; diagonal elements are the square root values of AVE; the correlation coefficients are in the corresponding row or column cells.

4.2. Structural Model for the Base Model

The PLS results for the base model are shown in Figure 2 and Table 6. As Davis and Golicic suggested (2010) [68], "Significance statistics were produced by bootstrapping 1000 subsamples of the data" (p. 65). The results show that PU positively influences CUMT and satisfaction (for CUMT: $\beta = 0.39$, t = 6.81, $p < 0.001$; for satisfaction: $\beta = 0.55$, t = 12.08, $p < 0.001$). Path coefficient c' between satisfaction and CUMT is positive and significant ($\beta = 0.14$, t =2.00, p < 0.05), and both path coefficient a between satisfaction and attitude loyalty and path coefficient b between attitude loyalty and CUMT

are positive and significant (β = 0.55, t = 11.31, *p* < 0.001; β = 0.29, t = 5.19, *p* < 0.01). The authors can found that both indirect effect a × b and direct effect c′ are significantly different from zero. The 95% confidence interval and bias-corrected confidence interval (see Table 7) also show that the mediation effects are significant [69]. Therefore, H1 is supported, that is, the effect of satisfaction on CUMT is partially mediated through attitude loyalty. In addition, total time has a positive impact on CUMT (β = 0.12, t = 2.56, *p* < 0.05), and other control variables, such as gender, age and times, are observed to be insignificant. The model explained 49.0% the variance in CUMT, that is, R^2 is 0.49.
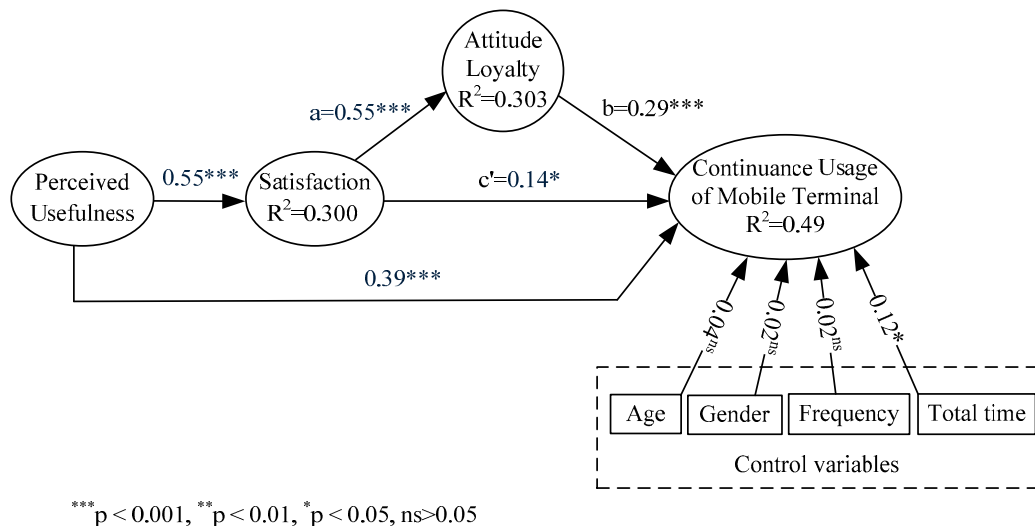

Figure 2. Base model of CUMT.

Table 6. PLS results for the base mode.

Path	β(Parameter Estimate)	Significance	
		t-Statistic	*p*-Value
Perceived usefulness → CUMT	0.39	6.81	<0.001
Perceived usefulness → Satisfaction	0.55	12.08	<0.001
Satisfaction → CUMT	0.14	2.00	<0.05
Satisfaction → Attitude Loyalty	0.55	11.31	<0.001
Satisfaction → CUMT (Total effect)	0.30	4.78	<0.001
Attitude Loyalty → CUMT	0.29	5.19	<0.001
Age → CUMT	0.02	0.42	>0.05
Gender → CUMT	0.04	0.97	>0.05
Times → CUMT	0.02	0.42	>0.05
Total time → CUMT	0.12	2.56	<0.05

Notes: CUMT = continuance usage of a mobile terminal.

Table 7. Results of testing mediation effects of base mode.

Mediation Effect	Point Estimate	Confidence Intervals (Percentile 95%)	Confidence Intervals (Bias-Corrected)
Total effect c	0.301	(0.184, 0.398) *	(0.191, 0.405) *
indirect effect a × b	0.162	(0.111, 0.223) *	(0.108, 0.220) *
direct effect c′	0.140	(0.013, 0.244) *	(0.024, 0.254) *

Notes: * a significant effect at 0.05.

4.3. Structural Model for the Full Model

A moderator of mobility was considered in the full model, and the PLS results are shown in Figure 3 and Table 8. A significant negative influence of mobility on the relationship between attitude loyalty and CUMT is observed (β = −0.12, t =2.71, *p* < 0.01). The R^2 value of CUMT increases from 0.49

in the base model to 0.51 in the full model. The effect size f^2 is 0.04 (see Table 9), which is between 0.02 and 0.15, indicating a small moderating effect that cannot be neglected. Therefore, H2 is supposed. The authors depict a moderating role mode of mobility (see Figure 4). Figure 4 shows that attitude loyalty influences CUMT stronger under a low level of mobility than under a high level of mobility. Evidence further supports H2.
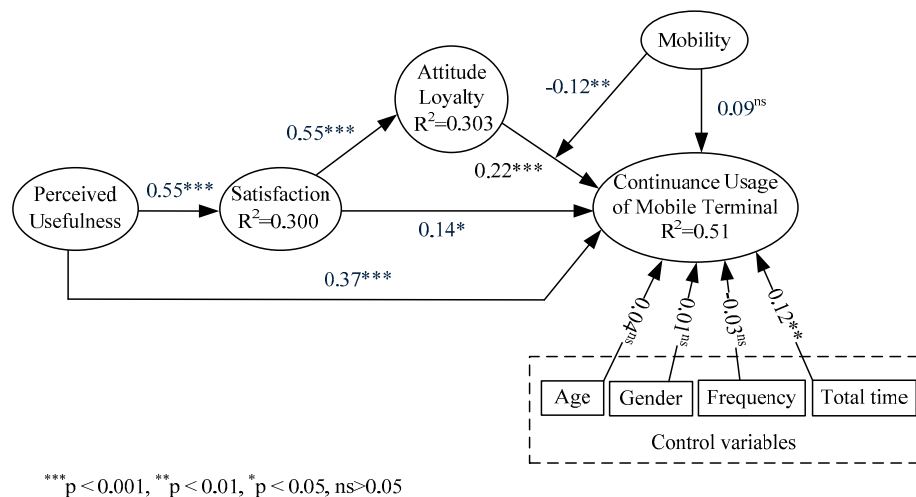

***p < 0.001, **p < 0.01, *p < 0.05, ns>0.05

Figure 3. Full model of CUMT.

Table 8. PLS results for the full model.

Path	Parameter Estimate	Significance	
		t-Statistic	**p-Value**
Perceived usefulness → CUMT	0.37	6.50	<0.001
Perceived usefulness → Satisfaction	0.55	12.32	<0.001
Satisfaction → CUMT	0.14	2.09	<0.05
Satisfaction → Attitude Loyalty	0.55	11.27	<0.001
Attitude Loyalty → CUMT	0.22	3.93	<0.001
Mobility → CUMT	0.09	1.60	>0.05
Mobility* Satisfaction → CUMT	−0.12	2.71	<0.01
Age → CUMT	0.04	0.20	>0.05
Gender → CUMT	0.02	0.93	>0.05
Times → CUMT	0.02	0.59	>0.05
Total time → CUMT	0.12	2.60	<0.01

Notes: CUMT = continuance usage of a mobile terminal.

Table 9. Interaction effects test.

	R^2	**f-Statistics**
Base model	0.49	0.04
Full model (with a moderator)	0.51	

Notes: the value of f-statistics = [R^2 (full model) – R^2 (base model)] / [1 – R^2 (base model)].
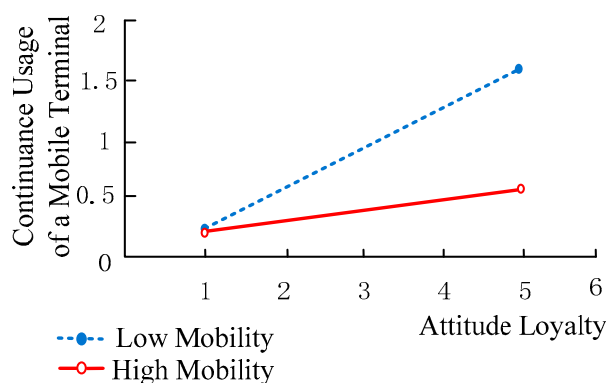
Figure 4. Moderating effect.

5. Discussion

The goal of this study is to investigate the mechanism of CUMT based on ECT from the perspective of customer value. The authors obtain three main results as follows. First, the results show that there are significant effects on the relationships between PU and CUMT, between PU and satisfaction, as well as between satisfaction and CUMT. These findings are consistent with previous studies, supporting the point that PU in functional value dimension and satisfaction in emotion value dimension play major roles in the process of CUMT. Second, the results confirm that attitude loyalty partially mediates the relationship between satisfaction and CUMT. This finding suggests that attitude loyalty can reflect user psychological states in the social value dimension. The findings further indicate that PU, satisfaction and attitude loyalty can depict user psychological states to reflect mobile terminal user different values. The results support H1, answering the research question 1. Third, the results confirm that mobility negatively moderates the relationship between attitude loyalty and CUMT, validating that mobility that can form different usage environments influences the relationship between user psychology and behavior of CUMT. The results support H2, and answer the research question 2.

5.1. Theoretical Contributions

Our study makes three major theoretical contributions. First, this study contributes to the CU literature by developing a research model of CUMT based on ECT from mobile terminal user value dimensions. Prior studies have indicated that PU influences satisfaction, and in turn influences CU [5,7,8]. There are, no doubt, important insights that explore the behavior of CU. However, insufficient researches focus on user psychological states toward CUMT from the customer value perspective. This study divides mobile terminal user value into three dimensions including functional value, emotion value and social value dimensions based on previous customer value studies [17–21,35]. According to the new value dimension, the authors advance a research model based on ECT with three variables, namely, PU, satisfaction and attitude loyalty, and form three paths to reflect the different user values. Our study suggests that mobile terminal users have different psychological states that relate to different user values in the process of CUMT, and proposes a new insight to understand the behavior of CUMT.

Second, our study extends ECT by taking attitude loyalty as a mediator to the research model based on ECT. Although previous research on satisfaction and loyalty has been widely carried out, there is a lack of considering attitude loyalty as a psychological state based on ECT in social value dimension [25–28,59]. Our study introduces attitude loyalty into the research model as a mediator and empirically validates that satisfaction partially influences CUMT through attitude loyalty, revealing attitude loyalty can reflect social value in the process of CUMT and extending the ECT literature.

Third, our study enriches knowledge of mobility by considering mobility as a moderator in the research model. In accordance with early studies that confirmed the role of mobility in the Internet or

mobile Internet [33,40,53,54], the authors believe that mobility is an importance variable to explore user psychology and behavior of CUMT. However, early studies ignored the boundary condition role of mobility. Our study introduces mobility as a moderator to explore its effect on the relationship between user attitude loyalty and CUMT. The results empirically verified that mobility negatively moderates this relationship. Our finding reveals that mobility is an important boundary condition in the process of CUMT, broadening the understanding of mobility in CU. This study has a theoretical contribution to mobility research in the mobile Internet context.

5.2. Practical Implications

This study has three implications for mobile application enterprises. First, mobile application enterprises should consider user value in different hierarchy models to grasp how user value is created in the whole usage process, and provide more value for users than other competitive enterprises in different value dimensions, such as functional value, emotion value, and social value dimensions, to enhance user CU behavior. Mobile application enterprises should remain to improve the usefulness of mobile applications to encourage user perception in function value aspects. For example, mobile application enterprises can push out a new revision with new functions to meet user' more needs.

Second, mobile application enterprises should focus on user satisfaction to promote user' emotional value [1,70,71] and encourage user preference and intention to improve user' social value. Mobile applications enterprises should pay more attention to cultivating user satisfaction and attitude loyalty by providing more powerful functions or personalized services. For example, mobile applications can provide personal web pages to reserve reading records or search links, give some recommendations according to the user's preference, and set sorting or managing data function. Moreover, both user satisfaction and loyalty play important roles in the process of PU influencing CUMT. Developing user satisfaction and loyalty can generate long-term value for mobile application enterprises. Therefore, enterprises should establish user relationship management systems with user's portrayal by a big data technology to meet user' satisfaction and create long-term loyalty.

Third, mobile application enterprises should take into account the usage context of mobile terminal to provide more convenient ways for mobile terminal users. For example, they should encourage the entity stores to provide free Wi-Fi or launch more beneficial Internet traffic packages while users use mobile applications. For example, after completing a route with online car-hailing service (e.g., Didi car-hailing Apps), user will obtain free 30 or 50 megabytes of data traffic that encourages user to use this mobile application service again. Meanwhile, mobile application enterprises should frequently reward the high loyalty users to ensure the CUMT with low mobility. In addition, mobile application enterprises should also provide a simple version of mobile application for users to meet the low mobility.

5.3. Limitations

There are several limitations in this study. First, although the authors selected three constructs, namely, PU, satisfaction, and attitude loyalty based on ECT, to reflect mobile terminal user value, there are also other constructs (e.g., perceived ease of use and perceived advantage) that can reflect user value in some dimensions. Therefore, in the future study, the authors will consider other constructs to conduct the study based on a new theory. Second, excepting for mobility, there are other constructs that can depict the usage context (e.g., place, working or not). In different scenes, the psychological state and behavior of CUMT might be different. Therefore, a new boundary conditional can be considered in further studies. Third, although the data can be conducted to examine the current research model, the data seem to be small in the big data age. In future studies, the authors will conduct the study with a big sample to enhance the generality.

Author Contributions: Conceptualization, A.L.; methodology, X.Y. and F.G.; collected data, X.Y. and A.L.; writing of original draft preparation, A.L.; writing of review and revise, A.L. and F.G.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Table A1. Measurement scales.

Construct	Source	Items
Continuance Usage of a Mobile Terminal	[5]	I often use a mobile terminal to access the Internet. I use a mobile terminal to access the Internet many times a day. I always spend some time on a mobile terminal to access the Internet every day. I have been using a mobile terminal to access the Internet for a period of time.
Perceived Usefulness	[5]	I think it is helpful for me to use a mobile terminal to access the Internet. I think I can easily address the things in work and life by using a mobile terminal to access the Internet. I think I can more effectively contact others and search for information by using a mobile terminal to access the Internet. I think it is useful for me to use a mobile terminal to access the Internet.
Satisfaction	[5]	Generally, I feel that using a mobile terminal is satisfactory. Generally, I feel that I am willing to use a mobile terminal. Generally, I feel that using a mobile terminal is enjoyable. Generally, I feel that using a mobile terminal can meet my needs.
Attitude Loyalty	[58,59]	In the future, I will continue to use a mobile terminal to access the Internet. I would recommend using mobile terminals to access the Internet to relatives, friends and others. I will talk to others about using mobile terminals to access the Internet. If necessary, I would choose to use a mobile terminal to access the Internet.
Mobility	[32]	I can use mobile terminals to access the Internet from many places, regardless of time. I can use mobile terminals to access the Internet without being limited by time and space. If necessary, I can conveniently use mobile terminals to access the Internet.

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