STUDIES ON USERS' AFFECTIVE EVALUATIONS OF MHEALTH MONITORING SERVICES: ANTECEDENTS, CONSEQUENCES, AND CONTINGENT EFFECTS

ZHANG XIAOFEI

PhD

The Hong Kong Polytechnic University

This programme is jointly offered by The Hong Kong Polytechnic University and Harbin Institute of Technology

2018

The Hong Kong Polytechnic University

Department of Logistics and Maritime Studies

Harbin Institute of Technology

School of Management

Studies on Users' Affective Evaluations of mHealth Monitoring Services: Antecedents, Consequences, and Contingent Effects

ZHANG Xiaofei

A thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy

December 2017

Certificate of Originality

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it reproduces no material previously published or written, nor material that has been accepted for the award of any other degree or diploma, except where due acknowledgement has been made in the text.

_____(Signed)

Zhang Xiaofei (Name of student)

Abstract

In healthcare, there is emerging use of mobile information and communication technologies to provide monitoring services for the elderly and patients with chronic diseases. However, there is low user engagement of mobile health (mHealth) monitoring services (MMSs) in China. This thesis will examine the low acceptance rate, low active use, and low continuous use of MMSs in the mHealth monitoring market from an affective perspective. The aims of the present research are to explain the low engagement of MMSs among patients with chronic diseases in China and elucidate inconsistent results in the affect literature. Three empirical studies were conducted to achieve the research objectives, as follows.

Study 1 focuses on the adoption stage and explains how potential users decide whether to adopt MMSs. Guided by the Affective Response Model and the taxonomy of affective constructs, this study explores how patients with chronic diseases develop affective evaluation (i.e., affective attitude) on using MMSs from perceived enjoyment and anxiety, which also subsequently contribute to their intention to adopt MMSs. Further, two contingent factors, namely, negative health emotion and health consciousness, are proposed to explain inconsistent results in the literature regarding the effects of perceived enjoyment and anxiety.

Study 2 focuses on the use stage and investigates how actual users make MMS use decisions. This study examines how MMS users (i.e., patients with chronic diseases) develop affective evaluation (i.e., emotional attachment) on using MMSs based on

their learned affective evaluations on the service components, which subsequently influence their MMS usage decisions. We draw on the affect transfer theory to explain how learned affective evaluations are transferred through both cognitive and misattribution routines and whether the transfer process is contingent on the health rationality of patients with chronic diseases.

Study 3 focuses on the post-use stage and inspects how actual users decide whether to continue MMS usage. This study proposes that users' previous affective evaluations (i.e., affective attitude at the adoption stage in Study 1 and emotional attachment at the use stage in Study 2) can influence continuous use through final affective evaluation (i.e., user satisfaction) at the post-use stage. To investigate the longitudinal relationships between affective factors, this study further argues that the effects of affective attitude and emotional attachment on user satisfaction are contingent on whether users' prior expectations are confirmed through using MMSs.

Based on a health program at a leading hospital in Beijing, we empirically test the three studies and the posited hypotheses on patients with chronic diseases. The results show that: 1) affective evaluations influence users' adoption intention, usage behavior, and continuous usage; 2) perceived enjoyment and anxiety significantly influence potential users' affective attitude and these relationships are contingent on patients' negative health emotion and health consciousness; 3) users' service-component satisfaction (i.e., device satisfaction and feedback satisfaction) can be transferred to their emotional attachment to using an MMS, and the transfer process is contingent on

their health rationality; and 4) users' affective attitude at the adoption stage and emotional attachment at the use stage significantly influence user satisfaction at the post-use stage, and these effects are contingent on user confirmation.

This thesis contributes knowledge to the existing literature by explaining the low engagement of mHealth services in the Chinese market from a purely affective perspective, unraveling the inconsistent results in the affect literature, and elucidating the unique decision-making processes of patients with chronic diseases. The findings of this thesis also provide some practical implications for MMS providers, patients with chronic diseases, and health professionals.

Keywords: mHealth Monitoring Services, Affective Evaluation, Affective Response, Adoption Intention, Use Behavior, Continuous Use, Patients with Chronic Diseases

Selected Publications of the Candidate

Publications Arising from the Thesis

1. **Xiaofei Zhang**, Xitong Guo, Joe Valacich, Yulin Fang, Kee-hung Lai, 2017. Exploring the Role of Enjoyment and Anxiety on Affective Responses to Utilitarian Mobile Services (under revision at *Journal* of *MIS*). (listed as A* journal in PolyU and HIT)

2. **Xiaofei Zhang**, Xitong Guo, Shuk Ying Ho, Kee-hung Lai, Doug Vogel. Understanding the Role of Emotional Attachment to mHealth Monitoring Service: An Affect Transfer Perspective (under review at *Journal of the Association for Information Systems*). (listed as A* journal in PolyU)

3. **Xiaofei Zhang**, Xitong Guo, Kee-hung Lai, Chunxiao Yin, Doug Vogel, 2017. The Role of Previous Affective Responses in the Continuance of mHealth Monitoring Services Usage: A Longitudinal Study (final preparation for journal submission, plan to submit to *Information & Management*). (listed as A journal in PolyU and HIT)

4. **Xiaofei Zhang**, Kee-hung Lai, Xitong Guo, 2017. Policy Analysis on China's mHealth Market. *Health Policy and Technology*, 6(4): 383-388 (SCI, IF: 1.167).

Learning Outcomes of Guided Studies in PolyU

1. **Xiaofei Zhang**, Xitong Guo, Yi Wu, Kee-hung Lai, Doug Vogel, 2017. Exploring the Inhibitors of Online Health Service Use Intention: A Status Quo Bias Perspective. *Information & Management*, 54(8): 987-997. (listed as A journal in PolyU and HIT)

2. **Xiaofei Zhang**, Xitong Guo, Kee-hung Lai, Chunxiao Yin, Fanbo Meng, 2017. From Offline Healthcare to Online Healthcare Service: The Role of Offline Healthcare Satisfaction and Habit. *Journal of Electronic Commerce Research*, 18(2): 138-154. (listed as C journal in PolyU)

3. **Xiaofei Zhang**, Xitong Guo, Kee-hung Lai, Yi Wu, 2016. How does Interactional Unfairness Matter for Patient-Doctor Relationship Quality in Online Health Consultation? The Contingencies of Professional Seniority and Disease Severity (under fourth-round review at *European Journal of Information Systems*. (listed as A journal in PolyU and HIT)

4. **Xiaofei Zhang**, Chunxiao Yin, Xitong Guo, Kee-hung Lai, Doug Vogel, 2017. Attitudinal Differences across Utilitarian Mobile Service Usage Behaviors: The Moderating Role of Decision Rationality (under review at *International Journal of Information Management*).

Acknowledgements

I would like to take this opportunity to express my greatest gratitude to the following important individuals. Without their guidance, support, and help, it would have been impossible for me to finish this thesis.

First, I would like to thank my supervisors, Prof. Kee-hung Lai at PolyU and Prof. Xitong Guo at HIT. During the four-year doctoral study, they supported me in my academic research, subject learning, and university life. Their invaluable guidance helped me to gain the ability to conduct research and publish academic papers. Their selfless support and suggestions helped me overcome many difficulties along the doctoral journey and gain research experience at three different universities. Without their help, I would not have gained any academic achievements or finished my thesis on time. Here, I express my sincere gratitude to my supervisors, Prof. Kee-hung Lai and Prof. Xitong Guo.

Second, I extend much gratitude to my co-authors of my research papers. On the doctoral journey, along with my chief supervisors, they also taught me how to conduct quality research and improve academic writing. They are Prof. Doug Vogel at Harbin Institute of Technology, Prof. Joe Valacich at The University of Arizona, Prof. Yulin Fang at The City University of Hong Kong, Prof. Bin Gu at Arizona State University, Prof. Shuk Ying Ho at Australian National University, Dr. Wei Chen at The University of Arizona, Dr. Yi Wu at Tianjin University, Dr. Yefei Yang at Beijing Jiaotong University, Dr. Chunxiao Yin at Southeast University, and among others. With their

help, I have learned different research methods and completed several research papers.

Third, I am very grateful to my friends and classmates in The Hong Kong Polytechnic University, Harbin Institute of Technology, and The University of Arizona. With their help, company, and emotional support, I enjoyed a colorful doctoral journey.

Fourth, I should also thank the research respondents from the users of the health monitoring program at the hospital. Their patient and continuous participation provided valuable data to finish this thesis. Also, I am very grateful to the hospital employees, especially Mr. Yuan, Mr. Li, and Mr. Zhang, for guidance and suggestions on data collection.

Finally, I want to give my sincere appreciation to my family for their support, understanding, and love. My parents always support my choices and encourage me in difficult times. My wife has maintained a long-distance relationship with me for about ten years, and she did not complain about my long study. Their support, understanding, and love have motivated me during the doctoral journey.

Table of Contents

List of Figures

List of Tables

List of Abbreviations

AATT	Affective Attitude
AI	Adoption Intention
ANXT	Anxiety
ARAL	Arousal
ARM	Affective Response Model
AVE	Average Variance Extracted
C.R.	Composite Reliability
CNF	Confirmation
CUS	Continuous Use
DVCS	Device Satisfaction
ECM	Expectation-Confirmation Model
ECT	Expectation-Confirmation Theory
eHealth	Electronic Health
EMAT	Emotional Attachment
EMR	Electronic Medical Records
FDBS	Feedback Satisfaction
HCI	Human-Computer Interaction
HCNS	Health Consciousness
HEMO	Negative health emotion
HRTN	Health Rationality

ICTs	Information and Communication Technologies
IS	Information Systems
mHealth	Mobile health
mICTs	Mobile Information and Communication Technologies
MMSs	Mobile Monitoring Services
PEN	Perceived Enjoyment
PLS	Partial Least Squares
PU	Perceived Usefulness
PVAL	Perceived Value
RCT	Rational Choice Theory
SAT	User Satisfaction
SEM	Structural Equation Model
TAM	Technology Acceptance Model
TRB	Theory of Rational Behavior
USFR	Frequency of Use
USIN	Intensity of Use
VLNC	Valance
WHO	Word Health Organization

Chapter 1 Introduction

This section explains the research background of the thesis. First, from the market perspective, three practical issues regarding low user engagement of mobile health (mHealth) diffusion are identified, namely, low acceptance rate, low active use, and low continuous use. Second, the theoretical lens of affective response is proposed to explain the low user engagement of mHealth monitoring services (MMSs). Along with the mixed findings of the three aspects of relationships in the affect literature, two research questions and four research objectives are proposed and addressed in this dissertation. Finally, the logic and structure of this dissertation are presented.

1.1 Research Background

In China, the aging population not only persists, but is expanding. More than 15% of the current population is aged 60 or above, with two-thirds of them older than 65 (NBSC 2015). Meanwhile, the number of patients suffering from chronic conditions, totaling more than 20% of the population, is also on the rise. Chronic diseases account for 85% of all deaths and for 70% of all medical expenses (NHFPC 2012). Such diseases cause huge medical burden in China. However, the number of physicians and nurses per thousand Chinese residents is 2.06 and 2.13 respectively, which is largely inadequate in contrast to that of the United States (NHFPC 2012, Xiaohui et al. 2014). The imbalance between supply and demand renders it difficult and expensive to receive medical consultation in China.

With hospitals struggling to fulfill medical demands, the use of information and

communication technologies (ICTs) to provide remote health services has become increasingly popular. The use of mobile ICTs (mICTs) in healthcare, commonly termed mHealth, is fast developing in the country. The Global Observatory for eHealth defined mHealth as "medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants, and other wireless devices." Many device providers, service providers, telecom operators, and platform providers have entered the mHealth market. Brookings Institution predicts that the size of the Chinese mHealth market will exceed 10 billion Yuan Renminbi (RMB) in 2017, which is only slightly smaller than that of the United States (Xiaohui et al. 2014).

Monitoring services are promising in the worldwide mHealth market in view of the rapidly aging population in developed countries, as well as the growing population with chronic diseases in the emerging mHealth market. MMSs provide health monitoring services to the end-users by three steps: (1) collecting daily monitoring data from the end-users using mobile devices and their Electronic Medical Record (EMR) data from hospital, (2) storing and analyzing these data on a system that is transparent to the end users, and (3) providing feedback or suggestions from the system or doctors to end-users based on the analysis (Agarwal and Lau 2010). Figure 1-1 shows the operation mode of the MMSs proposed by CAS and SIBE (2015). The prediction shows that this submarket may account for nearly two-thirds of the total mHealth market (PwC and GSMA 2012).

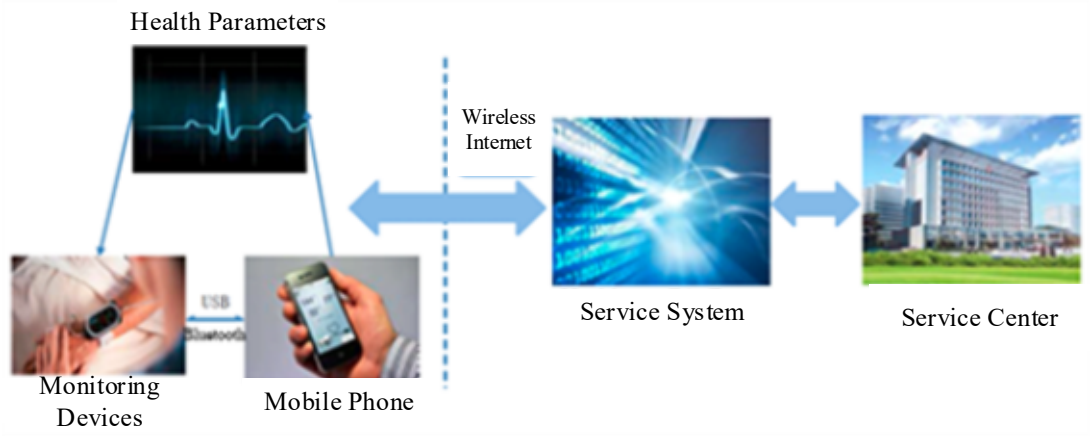

Figure 1-1 Operation Mode of mHealth Monitoring Services

In China, the mHealth monitoring market is also booming, with many companies and numerous investments being devoted to this submarket. For example, Ping An (Group) Company of China established its wholly owned subsidiary, Ping An Health, with registered capital of 350 million RMB to capture this promising market and provides daily monitoring services through mobile devices (PingAnHealth 2105). Chunyu Doctor, which was established in 2011, provides health information and consultation through mobile Internet and is one of the leading companies in this market with the hope of with more than 30,000,000 users and 100,000 physician partners (EnfoDesk 2014). Other companies provide MMSs for specific diseases, such as BSKCare, which delivers mobile monitoring services for patients with diabetes, and MUMU Health, which monitors the health conditions of patients with hypertension.

Even though the MMS market has broad prospects and is likely to be a vibrant healthcare market in the future, it is still in its infancy and presents many problems. According to market research of the Chinese Academy Sciences, the mHealth market has experienced low user engagement since 2013 (CAS and SIBE 2015). Their

research predicted that market recognition would increase in 2016 and 2017, but effective measures should be made in recent years to increase the user engagement of such services. However, as of the end of the 2016/2017 financial year, we still had not witnessed a significant increase in user engagement in this market.

More specifically, low user engagement of mHealth services has resulted in low acceptance rate, active use, and continuous use of MMSs. In China, there are 220 million elderly people, and 20% of the total population suffer from chronic diseases (TalkingData 2015). These individuals are in need of monitoring for their daily health and supposed to be users of such services. However, of the 90 million users of mHealth services, most are young (TalkingData 2015), so the intended users may not be accessing these services. Therefore, most potential users do not become actual users, and the *acceptance rate* of MMSs is still relatively low.

The Chunyu Doctor mHealth platform provides online health services for nearly 30,000,000 users, but only 900,000 are daily active users (EnfoDesk 2014). Similarly, even though patients with diabetes tend to exhibit high acceptance and active usage as this disease requires daily monitoring for treatment, BSKCare reports fewer than 10% active users (Ouyang 2014). This trend of low active usage is not restricted to China. Helander et al. (2014) studied the continuous use of a mobile app that provides a dietary self-monitoring service in English speaking populations and found that less 3% of users exhibited continuously use of the app in 2013. Therefore, it appears that most MMS adopters do not become active users, resulting in *low active use* and *low*

continuous use. Therefore, low user engagement is a common phenomenon in the MMS market.

Although the MMS submarket is predicted to account for nearly two-thirds of the mHealth market (PwC and GSMA 2012), However, in the mHealth market of China in2014, 64% of the investment was spent on health apps concerned with care information, drug information, and medical advice, rather than monitoring services. Therefore, low user engagement may hinder the development of MMSs and the mHealth market more broadly. Studying the low engagement of MMSs could help solve the problems in this submarket and make the submarket operate normally.

The previous research on technology diffusion has mainly been conducted in workplaces (Venkatesh and Brown 2001). However, MMSs are used in household or personal settings and related to personal health. So user behavior may largely be influenced by personal factors (i.e., affective factors) (Chapman and Coups 2006, Christensen et al. 1999). This thesis aims to explain user decision regarding MMSs from an affective perspective and the reasons are three-fold. (1) Cognitive factors and affective factors are two aspects of factors that determine human behavior. However, current research mainly focuses on the cognitive factors and has neglected the affective factors. (2) Knowledge about the usefulness and importance of services from a cognitive perspective may not transform the potential users into active users or from actual users to continuous users. Indeed, some previous research has concluded that affective factors present more of a barrier to preventive health behaviors (such as using

the MMSs) than cognitive factors (Ajzen and Timko 1986, Eves 1995, Lowe et al. 2002). (3) Affective factors are closely related to human health (Salovey et al. 2000). Thus, in user-MMS interaction, affective factors may play a more critical role than user-general-ICT interaction. Therefore, this thesis is developed to examine the possible reasons for the low user engagement of MMSs in China.

1.2 Theoretical Background

To examine the low user engagement of MMSs, this thesis studies user-MMS interaction (including potential and actual users of MMS) from an affective response perspective. Human behavior is determined by both cognitive and affective factors. Affective factors (e.g., emotion and mood) and physical health can, directly and indirectly, influence each other (Salovey et al. 2000). Affect also influences user behavior in human-ICT interaction (Zhang 2013). Therefore, affective factors may play a more significant role in user-MMS interaction than in the interactions between users and general-ICTs. However, the cognitive factors on human-ICT interaction have received the majority of research attention (Zhang 2013), while relatively less attention has been paid to the affective factors.

In part, the limited research on affective factors may be due to inconsistent and inconclusive results in numerous disciplines (Zhang 2013). Seeking to explain the inconsistent and inconclusive results and study the affective factors in the ICT context, Zhang (2013) developed a comprehensive Affective Response Model (ARM). The model defines three main categories of affective factors in human-ICT interaction: (1)

factors residing within a person, which are neither the result of nor are influenced by ICT-related stimuli; (2) factors residing within an ICT-related stimulus are aroused purely by the stimuli rather than the individual's interactions with it; and (3) factors residing between a person and an ICT-related stimulus concerning an individual's affective response to the ICT-related stimulus. The third category is the core affective response of human-ICT interaction, which can further be classified as induced affective state, process-based affective evaluation, outcome-based affective evaluation, and learned affective evaluation.

Zhang's (2013) model does help to explain the inconsistent effects of affective constructs to a certain extent induced by different definitions in different studies (name labeled as 'Type I Inconsistencies' herein). For instance, *attitude* has been defined as a cognitive evaluation, a process-based or outcome-based affective evaluation, and a satisfaction evaluation in different studies, thus leading to inconsistent results (Zhang 2013). This model provides a clear taxonomy of the affective factors in human-ICT interaction, which may reduce confusions surrounding construct definition and explain Type I Inconsistencies in the affect literature.

A literature review on the effects of affective factors found that there were many inconsistent or inclusive results in the Information Systems (IS) and Human-Computer Interaction (HCI) literature, even though the affective constructs were similarly defined. For example, negative affect was widely believed to have negative effects on positive evaluations, but many studies detected insignificant effects (AbuShanab et al.

2010, Compeau et al. 1999, John 2013, McKenna et al. 2013, Venkatesh et al. 2003). The case was similar regarding the effects of some positive affect (Constantiou et al. 2012, Huang et al. 2013, Venkatesh et al. 2002, Young Im and Hancer 2014). Table 1-1 presents a summary of inconsistent results and provides examples.

Table 1-1 Examples of the Inconsistent Results in the Affect Literature

Affective Category	**Affective Factors**	**Inconsistent Relationships**	**Literature**
Induced affective state	Anxiety	Anxiety->Behavioral Intention	(AbuShanab et al. 2010)
	Anxiety	Anxiety->Usage	(Compeau et al. 1999)
	Anxiety	Anxiety->Usage	(John 2013)
	Anxiety	Anxiety->Behavioral Intention	(McKenna et al. 2013)
	Anxiety	Anxiety->Behavioral Intention	(Venkatesh et al. 2003)
Process-based affective evaluation	Perceived Enjoyment	Perceived Enjoyment -> Use Intention	(Constantiou et al. 2012)
	Perceived Enjoyment	Perceived Enjoyment -> Behavioral Intention	(Huang et al. 2013)
	Perceived Enjoyment	Perceived Enjoyment -> Behavioral Intention to Use	(Venkatesh et al. 2002)
	Perceived Enjoyment	Perceived Enjoyment -> Attitude	(Young Im and Hancer 2014)
	Affect	Affect (pleasure) -> Trial Attitude	(Kim and Morris 2007)
Learned affective evaluation	Affective Attitude	Attitude toward a type of Object -> Attitude toward a Particular Object	(Ajzen and Fishbein 2005)
	Affective Attitude	Attitude toward the Advertisement -> Brand Attitude	(Machleit and Wilson 1988)
Previous affective evaluation	Affective Attitude	Prior Brand Attitude -> Brand Attitude	(Machleit and Wilson 1988)
	Prior Emotions	Prior Negative Emotion -> Loyalty; Prior Positive Emotion ->	(Lee et al. 2008)

		Loyalty	
	Trial Attitude	Trial Attitude -> Product Attitude	(Kim and Morris 2007)

Note: (1) If there is no 'process-based', the affective evaluation in this thesis refers to outcome-based affective evaluation.
(2) Learned affective evaluation refers to the outcome-based affective evaluations on other related objects.
(3) Previous affective evaluation refers to the prior outcome-based affective evaluations of the same object.

In Table 1-1, we can find that there are many inconsistent results (mainly insignificant effects) regarding different affective factors. These affective factors are defined by the same affective category as other studies according to the ARM. Therefore, these inconsistent results do not represent to the Type I Inconsistencies and cannot be directly explained by the ARM. We label these inconsistent results 'Type II Inconsistencies' in this thesis.

We attribute two reasons for Type II Inconsistencies. First, as can be concluded from Table 1-1, different outcomes of affective factors have been used in previous studies, such as behavior, behavioral intention, and other affective factors. Thus, different outcomes may lead to insignificant results. Second, according to contingency theory, the relationship between two variables can be contingent on the effectiveness of the independent variable in different environments (Tosi and Slocum 1984). Therefore, contingent factors may arouse insignificant effects of affective factors. With the aim to rationalize the low engagement of MMSs from an affective perspective, this thesis is further designed to explain Type II Inconsistencies according to the two reasons proposed above.

As Type II Inconsistencies have received little research attention and the reasons for these Inconsistencies are thus left under-explored, discerning the possible reasons and providing plausible explanations may not only enhance our understanding of the affective factors in human-ICT interaction, but may also contribute to the affect literature by explaining inconsistent results.

1.3 Research Questions and Objectives

1.3.1 Research Questions

Based on the ARM, this thesis focuses on users' affective responses to study the low user engagement of MMSs. According to the model, there are different affective categories in human-ICT interaction, among which outcome-based affective evaluation is the summative and global level evaluation beyond the interaction process (Zhang 2013). Outcome-based affective evaluations can manifest the overall impact of the affective response process on user decisions (Zhang 2013), which can be used as uniform outcomes of the affective responses to explain Type II Inconsistencies. Therefore, this thesis mainly studies how users develop affective evaluations of MMSs (i.e., antecedents) and how the affective evaluations influence user decisions (i.e., consequences) regarding adoption, active use, and continuous use. At different stages, different concrete affective constructs are used to manifest users' affective evaluations.

When developing overall affective evaluations of using MMSs, individuals may be influenced by earlier affective response in user-MMS interaction (P1, the relationships between induced affective stage or process-based affective evaluation

and outcome-based affective evaluation), affective evaluations of other related stimuli, such as service components (P2, the relationships between learned affective evaluations and overall affective evaluation), and previous affective evaluations of such services (P3, the relationships between previous affective evaluations and final affective evaluation) (Zhang 2013). Figure 1-2 shows the relationships between these affective factors and affective evaluations.

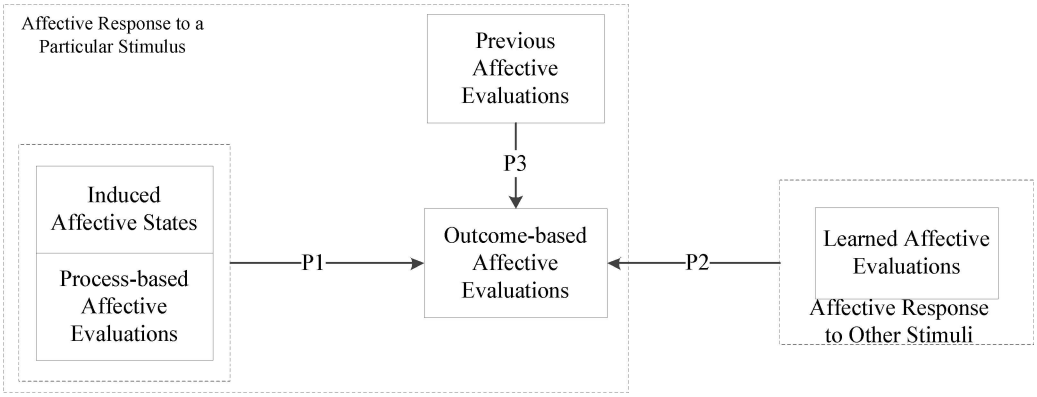

Figure 1-2 Three Aspects of Determinants of Affective Evaluations

Drawing on the three aspects of determinants of affective evaluations (Figure 1-2), this thesis designed three studies to explain Type II Inconsistencies related to each aspect. Further, according to the contingency theory, these inconsistencies may be due to the lack of understanding of the boundary conditions within which individuals perform their affective responses differently (Tosi and Slocum 1984). To understand Type II Inconsistencies further, this thesis investigates in *what situations* the effects of the three aspects of determinants of affective evaluations can be exerted differently to influence users' decisions regarding MMSs.

To identify the contingent factors that define the boundary conditions, this thesis

draws on patients with chronic diseases as our research participants. The reasons for this are two-fold. First, MMSs are especially suitable for patients with chronic diseases because these patients need to monitor their health indexes frequently (Motamarri et al. 2014). Therefore, many MMSs are designed for chronic diseases, and many MMSs providers treat patients with chronic diseases as their target users (Agarwal and Lau 2010). Second, chronic diseases are long-term diseases, which shapes the patients' decision-making processes unconsciously (Brock and Wartman 1990). The long-term effect of chronic diseases can induce the patients to have their own affective and decision-making characteristics, and thus may alter their affective responses to MMSs. Therefore, to identify the contingent factors, this thesis draws on patients with chronic diseases by arguing that their characteristics can be considered as boundary conditions of the affective response process.

By addressing the aforementioned gaps in the affect research, this thesis seeks to develop a theoretical framework to integrate the affective evaluation development process at three different stages and investigates the moderating roles of several contingent factors to explain Type II Inconsistencies. The research questions are:

RQ1: ***What are the affective factors that lead to the low engagement of MMSs among its potential and actual users?***

RQ2: ***What characteristics of patients with chronic diseases define the boundary conditions that influence their affective responses to the MMSs?***

1.3.2 Research Objectives

To address the research questions above, we set the objective of the present thesis to explain the low engagement of MMSs and the inconsistent results in the affect research. Following this overarching objective, four specific research objectives are proposed:

A. Identify the factors causing the low engagement of MMSs from an affective perspective among MMS potential and actual users, specifically, in patients with chronic diseases.

B. Empirically examine the relationships between induced affective state, process-based affective evaluation, and overall affective evaluation (P1 relationships) and the boundary conditions of these relationships.

C. Empirically examine the relationships between learned affective evaluations and overall affective evaluation (P2 relationships) and the boundary conditions of these relationships.

D. Empirically examine the relationships between previous affective evaluations and overall affective evaluation at the final stage (P3 relationships) and the boundary conditions of these relationships.

To achieve objective A, we develop three theory-based behavioral models for different use stages: adoption stage, use stage, and post-use stage. We then identified the main affective factors at each stage that lead to the low engagement of MMSs and study how these factors influence user behavior through overall affective evaluations. The three models illustrate how affective factors influence users' affective evaluations

of MMSs and how the evaluations relate to their usage behavior. Testing the relationships between affective factors and user behavior may also obtain knowledge on the role of affect in mHealth diffusion. In sum, by testing the three behavioral models to achieve objective A, the present thesis obtains a better understanding of the low engagement of MMSs from a purely affective perspective and extends the current knowledge on mHealth diffusion.

Study 1 focuses on the adoption stage and aims to achieve objective B. Induced affective state is a user's state of consciousness without being aware of future behavior toward the services (Csikszentmihalyi 1990). Process-based affective evaluation is formed when processing information about the future usage process of the services (Zhang 2013). Induced affective state and process-based affective evaluation are formed during the earlier response process before potential users develop affective evaluation at the adoption stage. Therefore, when developing an outcome-based affective evaluation regarding whether to adopt such services, the earlier stage of the response (i.e., induced affective state and process-based affective evaluation) can be the main factors influencing outcome-based affective evaluation.

Close consideration of empirical studies on the effects of induced affective state and process-based affective evaluation reveals many inconsistent results in the previous literature. These inconsistent results are not limited to Type I Inconsistencies. Indeed, studies that employ similar definitions of affective factors still show inconsistent results (i.e., Type II Inconsistencies) (AbuShanab et al. 2010, Compeau et

al. 1999, Constantiou et al. 2012, Huang et al. 2013, John 2013, McKenna et al. 2013, Venkatesh et al. 2003, Venkatesh et al. 2002, Young Im and Hancer 2014), and how these inconsistent results can be explained remains unclear. Therefore, Study 1 of this thesis focuses on the adoption stage and examines P1 relationships and the boundary conditions, and aims to explain the Type II Inconsistencies regarding the effects of induced affective state and process-based affective evaluation. In sum, by testing the behavioral model of Study 1 to achieve objective B, this thesis provides plausible explanations for some Type II Inconsistencies (related to induced affective state and process-based affective evaluation) and gains a better understanding of P1 relationships in the affect literature.

Study 2 focuses on the use stage and aims to achieve objective C. For learned affective evaluations, this thesis focuses on affective evaluations of the following components of MMSs—mobile devices and personalized feedback. Only after short-term use of the services could users understand the components of the services better and have affective evaluations of the service components. When developing affective evaluation of the entire monitoring services, their affective evaluations of the service components are important determinants (McKinney et al. 2002, Szymanski and Hise 2000). There is affect transfer phenomenon from MMS-components to MMS. However, few empirical studies have been conducted to study the phenomenon of affect transfer in the IS context, and there are also inconsistent results regarding the outcomes of the transfer process (Ajzen and Fishbein 2005). As the affect is transferred

and the outcomes are of the same affective category, these represent Type II Inconsistencies. Therefore, there is a need to explore the mechanism of affect transfer and explain the inconsistent results of the transfer process. Thus, Study 2 focuses on the use stage and examines P2 relationships and the boundary conditions, aimed at explaining Type II Inconsistencies regarding the effects of learned affective evaluations. In sum, by testing the behavioral model of Study 2 to achieve objective C, this thesis provides plausible explanations for some Type II Inconsistencies (related to learned affective evaluations) and gain a better understanding of the P2 relationships in the affect literature.

Study 3 focuses on the post-use stage and aims to achieve objective D. At the post-use stage, users eventually develop final affective evaluations of using MMSs. Their previous affective evaluations at the adoption and use stages can be stored in their memory for a long time (Ajzen and Timko 1986, Bamberg et al. 2003). These previous affective evaluations, as well as the cognitive evaluations of the MMSs, are the information available for the development of final-stage affective evaluations (Zhang 2013). Therefore, the final affective evaluations after long-term usage may be influenced by the affective evaluations made at earlier use stages (Cacioppo et al. 1999). However, for the effects of previous affect on future affective evaluations, the previous literature does not present to a consolidated conclusion that individuals would express a similar emotion to different extents when influenced by previous affective evaluations (Pemberton and Fox 2013), thus leading to Type II Inconsistencies

regarding the effects of previous affective evaluations on later evaluations. These inconsistent results have also received little attention in the previous literature. Thus, Study 3 focuses on the post-use stage and examines P3 relationships and the boundary conditions, aiming to explain Type II Inconsistencies regarding the effects of previous affective evaluations. In sum, by testing the behavioral model of Study 3 to achieve objective D, this study provides plausible explanations of some Type II Inconsistencies (related to previous affective evaluations) and gain a better understanding of the P3 relationships in the affect literature.

To sum up, this thesis established and empirically tests three theory-based behavioral models with a set of hypotheses for different MMS-use stages. Qualitative data were collected by interviews and focus groups to support the rationality of the models and explain the potential reasons for the unsupported hypotheses. In addition, quantitative data were collected by field surveys among patient with chronic diseases to test the proposed models and hypotheses. As the MMSs are especially suitable for patients with chronic diseases and most of the potential and actual users of MMSs have chronic diseases, this thesis limits the research population to patients with chronic diseases to define the boundary conditions. Figure 1-3 shows an overall picture of the studies in this thesis.

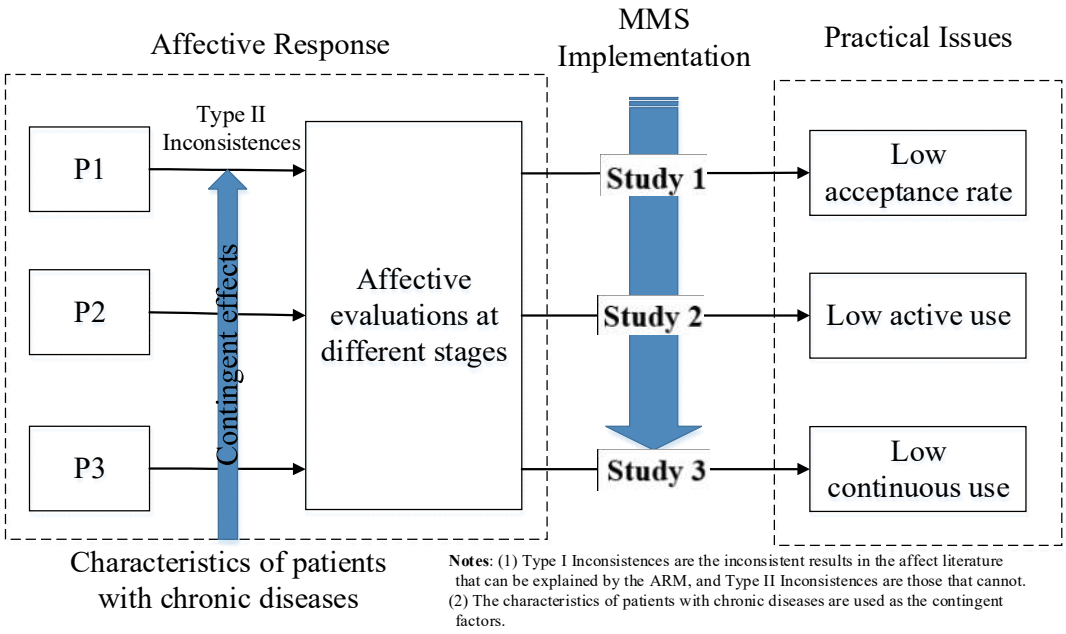

Figure 1-3 An Overall Picture of the Thesis

1.4 Significance of the Research

This research is based on a health program at a leading hospital in Beijing that provides MMSs to its patients. Three surveys with the same group of participants with chronic diseases were conducted to collect data to test the models and hypotheses. The theoretical implications of this research are four-fold.

First, we explore user-MMS interaction from a purely affective perspective. Affect is closely related to human health (Salovey et al. 2000); therefore, affective factors may play a more important role in user-MMS interaction than the interactions with general-ICTs. However, few studies have considered this issue from an affective perspective. This thesis mainly focuses on how users develop affective evaluations of using MMSs from different aspects of determinants (P1, P2, and P3). By doing so, the aim is to contribute to the user-MMS interaction research by examining how users perform affective responses in the service diffusion.

Second, this thesis extends the affect literature by explaining Type II Inconsistencies. Aiming to explain inconsistent results regarding the effects of affective factors, this research studies the boundary conditions under which the affective factors (i.e., induced affective state, process-based affective evaluation, learned affective evaluation, and previous affective evaluation) influence outcome-based affective evaluations differently. These extensions provide plausible explanations for the inconsistent results in the affect literature and enhance the generalization of the ARM.

Third, health factors are taken into consideration in mHealth diffusion research. Most behavioral studies on mHealth examine user behavior from a technology perspective and ignore the health-related factors. This thesis incorporates health-related factors, such as negative health emotion, health consciousness, and health rationality, into the affective response to MMSs, providing new insights into behavioral research regarding health services or e-services.

Finally, we explored the affective responses and user behavior regarding MMSs among patients with chronic diseases. This user group has an increasing population, but is largely neglected in the IS literature. By identifying the characteristics of these patients as the contingent factors in the affective responses and usage decision-making, we found that patients with chronic diseases have complicated decision-making processes regarding MMSs.

1.5 Dissertation Structure

The thesis consists of six subsequent sections.

Chapter 2 reviews the theoretical foundation of the research. First, a definition of MMSs and current research on this topic are reviewed. Then three theoretical perspectives are reviewed—innovation diffusion theory, ARM, and the characteristics of patients with chronic diseases. Finally, specific theories for each study are then reviewed.

Chapters 3-5 introduce the research model and hypotheses of each study. Each chapter follows a similar structure: (1) introduces the background and aims of the study, (2) justifies the rationale of the model and constructs, (3) presents the model, and (4) proposes the hypotheses.

Chapter 6 gives an overall review of the mixed-methodology. Specifically, the research context, measurement development, and data collection process are illustrated. Then details of the data analysis process and results of each study are presented. The key findings and specific implications of each study are also provided in this section.

Chapter 7 draws conclusions from the findings and evaluates whether the research objectives have been achieved by the three studies. Then, the academic implications, practical implications, and policy implications are outlined, as well as the limitations and future research directions. Finally, the last subsection concludes the whole thesis.

Chapter 2 Literature Review

This chapter reviews the relevant knowledge of this thesis. First, it introduces the current research on MMSs to identify gaps in the research. Second, it discusses the theories or theoretical frameworks used in this work, such as innovation diffusion theory, ARM, and characteristics of patients with chronic diseases. Further, the specific theories used in each study are reviewed, namely, affect transfer theory in Study 2 and the expectation-confirmation model (ECM) in Study 3. Finally, the last subsection concludes this chapter.

2.1 mHealth Monitoring Services

mHealth can be defined as the use of mICTs with the capability of managing and delivering health information between end users and health professionals to improve patient safety and quality of care (Kazemi et al. 2017). Because of the advantages of mobility, ubiquity, and portability of mobile ICTs, mHealth services can provide more personalized, continuous, and timely services than general electronic health (eHealth) (Akter et al. 2010). According to Phillips et al. (2010), mHealth includes three aspects of health services: services designed to improve processes dealing with disease monitoring, management, and treatment compliance; services designed to deliver treatments and health management programs; and services designed to improve healthcare procedures (e.g., remote appointments and notification).

mHealth services are a promising platform for chronic care as mobile technologies are suitable for these patients with chronic disease. mHealth leverages the

core values of mobile ICTs—mobility, ubiquity, and portability. It enables service providers (such as hospitals, health professionals, and other stakeholders) to deliver timely and personalized health services, particularly to patients who are located in a remote distance (Akter et al. 2010). The long-term nature of chronic diseases promotes the need for health services and leads to significant costs (Mirza et al. 2008). A possible solution to these problems is to empower patients to undertake self-health management (Radin 2006). In this context, MMSs are advantageous in the daily management of health and to provide regular health status updates (Mirza et al. 2008).

Further, mHealth may be particularly relevant to patients with chronic diseases because of the sheer number of patients. In the United States, as of 2012, about half of all adults (about 117 million people) lived with one or more chronic health conditions, and one in four adults lived with two or more chronic health conditions (Ward et al. 2014). In addition, the Word Health Organization (WHO) indicated that in China chronic diseases kill three million people annually (Reuters 2015). Thus, it is practically infeasible for physicians based at hospitals to closely monitor every patient's health needs (Bodenheimer et al. 2002). Further, as patients with long-term illnesses often want to play an active role in their health decision-making (Payton et al. 2011), MMSs are a potential solution to enable self-health management (Mirza et al. 2008).

MMSs are a revolutionary approach for supporting self-health management and medical decision-making for populations living in poor health conditions, particularly

for patients with long-term illnesses (Giamouzis et al. 2013). Indeed, patients with chronic diseases are a target user group of MMSs. These patients require daily monitoring of their health to ensure that their conditions remain stable.

MMSs provide health monitoring services for end-users in three steps: (1) collecting data—daily monitoring of the end users using mobile devices and their EMR data from hospital, (2) storing and analyzing data—from monitoring devices and hospital in a system that is transparent to the end user, and (3) providing personalized feedback and suggestions—from the system or doctors to the end user based on data analysis (Agarwal and Lau 2010).

Prior research has suggested that MMS usage for chronic healthcare leads to favorable clinical outcomes (Kelley et al. 2011, Shetty et al. 2011), streamlined clinical processes (Liew et al. 2009, Liu et al. 2011, Shetty et al. 2011), a reduction in medical expenses (Leong et al. 2006, Ostojic et al. 2005), strong compliant behavior of patients (Ostojic et al. 2005, Shetty et al. 2011), and health-related quality of life (Liu et al. 2011). However, as MMSs are a relatively new phenomenon, behavioral research in this context is still limited. The present thesis, therefore, reviewed behavioral studies in a broader context, mHealth. To review the related literature in accordance with the innovation diffusion theory, the thesis classifies the behavioral research on mHealth into three stages, adoption stage, use stage, and post-use stage. The related literature is shown in Table 2-1 and Table 2-2.

Table 2-1 Behavioral Research on mHealth Adoption

Stage	Literature	Topic	N.	Independent Variables	DV	Theory
Adoption	Zhang et al. (2017)	mobile health services	650	Self-efficacy, Response-efficacy, Perceived ease of use (PEOU), Perceived usefulness (PU)	Adoption Intention	TAM
	Okazaki et al. (2017)	MMS	968	Personal Innovativeness in ICT, Perceived value, Ubiquitous control, Compatibility, Physician scarcity	Usage Intention	
	O' Connor and O' Reilly (2016)	mobile health service	157	Technology trust, Resource availability, Self-efficacy, Time criticality, Habit, Task Behavior	mHealth Infusion	
	Faqih and Jaradat (2015)	mobile healthcare	366	Social influence, Trust, Security and Privacy, Cost, Perceived usefulness (PU), Perceived ease of use (PEOU)	Behavioral Intention	TAM
	Guo et al. (2015)	mHealth service	428	Perceived vulnerability, Perceived severity, Response efficiency, Self-efficiency, Attitude (ATT)	Adoption Intention	PMT
	Okazaki et al. (2015)	mHealth monitoring	495	Perceived value (PV), Social norms (SN), Perceived ease of use (PEOU), Information quality, Health outcome, Job relevancy	Adoption Intention	TRA
	Carter et al. (2015)	text-message base health intervention	120	Relative Advantage, Compatibility, Complexity, Privacy concerns, Risk beliefs.	Intention to use	IDT
	Ng et al. (2015)	health APP	414	Social norms(SN), Perceived usefulness (PU), Perceived ease of use (PEOU), Reject to change, Safety, Facilitating conditions (FC)	Adoption Intention	TAM/TRA
	Deng et al. (2014)	mHealth service	424	Perceived value (PV), Attitude (ATT), Perceived behavior control (PBC), Social norms (SN), age	Adoption Intention	TRA/elder

Stage	Literature	Topic	N.	Independent Variables	DV	Theory
	Zhang et al. (2014)	mHealth service	481	Attitude(ATT), Perceived behavior control(PBC), Social norms (SN)	Adoption Intention	TRB/Gender differences
	Guo et al. (2013)	mHealth service	204	Technology anxiety (TA), Reject to change, Perceived usefulness (PU), Perceived ease of use (PEOU)	Adoption Intention	TAM/elder
	Rai et al. (2013)	mHealth	1132	Individual difference, Healthcare usage, Social-economic status	Adoption Intention	
	Hung and Jen (2012)	mHealth based health management	170	Perceived usefulness (PU), Perceived ease of use (PEOU), Attitude (ATT)	Adoption Intention	TAM
	Yang and Wang (2012)	mHealth service for Asthma	700	Social norms(SN), Innovativeness(INN), Manager support(MS), Perceived usefulness (PU), Perceived ease of use (PEOU), Attitude (ATT)	Adoption Intention	TAM//TRB
	Deng et al. (2012)	mHealth service	336	Perceived available (PSA), Perceived ease of use (PEOU), Perceived usefulness, Attitude (ATT)	Adoption Intention	TAM
	Akter et al. (2011)	mHealth IS	216	Trustworthy, Consumer trust	Trust	TRB
	Cocosila and Archer (2010)	mHealth	52	Perceived overall risks (POR), Intrinsic motivation (IM), Extrinsic motivations (EM)	Adoption Intention	MT

Table 2-2 Behavioral Research on mHealth Usage

Stage	Literature	Topic	N.	Independent Variables		Theory
Usage behavior	Illiger et al. (2014)	mHealth technology	206	50% of respondents would like to use mobile devices to find doctors, 38% would like to find health information, 34% would like to communicate with doctors, 21% would like to manage their health data		
	Helander et al. (2014)	mHealth APP	189770	Only 2.58% of downloaders became active users, who can self-manage their health and get feedback actively.		
Post-Use	Wu et al. (2015)	mHealth system	125	Costs, Benefits, Social norms (SN), Description norm, Response efficiency, Self-efficiency	Compliance behavior intention/behavior	RCT/TRB
	Lowry et al. (2014)	mHealth system	125	Satisfaction on doctors, Communication barriers, Communication quality, Trust (TRST), Attitude (ATT), Social norms (SN), Response efficiency, Self-efficiency	Compliance behavior intention/behavior	TRB
	Akter et al. (2013)	mHealth	104	System quality, Interaction quality, Information quality, Service quality, Satisfaction(SAT)	Continuous use	SQ/ECT
	Akter et al. (2013)	mHealth service	225	Perceived ease of use (PEOU), Expectation Confirmation, Service quality, Trust (TRST), Satisfaction (SAT)	Continuous use	SQ/ECT
	Akter et al. (2013)	mHealth service	480	mHealth service quality, Satisfaction	Continuous use Intention/life quality	SQ/ECT

	Zhang et al. (2017)	mobile healthcare applications	273	Central behaviors, Peripheral cues, Trust, Perceived eHealth literacy, satisfaction	Continuance Intention	ELM/Trust
	Marakhimov and Joo (2017)	wearable devices for healthcare	260	Health concern, Health information concern, Privacy concern, Challenge appraisal, Threat appraisal, Problem-focused coping, Emotion-focused coping	Extended use	Coping theory

First, there are different research efforts on the cognitive and affective factors in the mHealth literature. From the review, it can be concluded that among the limited literature on mHealth, behavioral studies are mainly confined to a cognitive perspective. The effects of cognitive factors have been verified in both mHealth adoption and usage. In terms of adoption, previous studies have explored the role of trust (Faqih and Jaradat 2015, O' Connor and O' Reilly 2016), perceived risk (Carter et al. 2015, Cocosila and Archer 2010), intrinsic and extrinsic motivation (Cocosila and Archer 2010), perceived ease of use and usefulness (Guo et al. 2013, Sun et al. 2013), attitude (cognitive) (Guo et al. 2015), self-efficacy (Sun et al. 2013), and perceived value (Okazaki et al. 2017). For mHealth usage literature, the role of cost and benefit (Wu et al. 2015), trust (Akter et al. 2011, Lowry et al. 2014, Zhang et al. 2017), service quality (Akter et al. 2013, Akter et al. 2010), attitude (cognitive) (Lowry et al. 2014), and efficiency (Wu et al. 2015). For most of the models with all cognitive factors, only less than half of the variance of behavior intention was explained, indicating that a large portion has not been explained (Guo et al. 2015, Rai et al. 2013, Zhang et al. 2017).

For the cognitive factors in mHealth research, we can conclude that most common-used cognitive factors are introduced into the mHealth literature and their impacts have been well-explored. However, focusing on the cognitive factors induces the current literature has ignored the affective factors and led to some research models have weaker explanatory power.

Only a small number of studies have considered one or two affective factors. For example, to explain mHealth adoption, only perceived anxiety (Guo et al. 2013), perceived enjoyment (as intrinsic motivation) (Cocosila and Archer 2010), and privacy concerns (Carter et al. 2015) are incorporated into behavioral research. There are more

affective factors in the mHealth usage literature, such as perceived severity (Sun et al. 2013), health concern (Marakhimov and Joo 2017), privacy concern (Marakhimov and Joo 2017), and satisfaction (Akter et al. 2013, Akter et al. 2010). Even though these models include affective factors, the underlying mechanism is still based on cognitive process with more cognitive factors in the models.

For the affective factors in mHealth research, we can conclude that only a small portion of the current studies have incorporated affective factors to study mHealth diffusion. Although their significant effects in predicting user behavior have been verified, they only play a less important role in the model relative to the cognitive factors. Further, to the best of our knowledge, no current research has explored this issue from a pure affective perspective. Therefore, the role of affective factors in mHealth diffusion needs further research attention.

Second, prior studies have been relatively limited to users' behavioral intentions (not actual system usage), such as adoption intention (Akhter et al. 2014, Cocosila and Archer 2010, Guo et al. 2013, Sun et al. 2013, Wu et al. 2011, Zhang et al. 2017), use intention (Carter et al. 2015, Rai et al. 2013) and continuance intention (Akter et al. 2013, Akter et al. 2010). Only a few studies have investigated actual usage behavior, for instance, compliance (Lowry et al. 2014) and actual usage (Lim et al. 2011).

Third, the review indicates that most of the behavioral research has been conducted from a technology or service perspective, and few health-related factors have been incorporated. The previous research just adopted well-developed technology acceptance models, such as Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), and Protection Motivation Theory (PMT), to study user behavior regarding mHealth, rather than diverge from the traditional innovation diffusion perspective or consider any health-related factors. Therefore, much of the previous

research fails to elucidate the specific characteristics of user–MMS interaction or make significant contributions to mHealth-related behavioral research.

To enrich the previous behavioral research on mHealth, this thesis adopts a purely affective perspective and incorporates health-related factors to explore the low engagement of MMSs. Affective factors (e.g., emotion and mood) and physical health can directly and indirectly influence each other (Salovey et al. 2000). Patients with chronic diseases need daily healthcare. Thus, when facing MMSs, they would generate affective responses to using the services, such as being happy to know that the services fit their conditions, finding it enjoyable to use the services to self-manage their health, and being pleased about staying informed about their health. The impacts of such affective factors on preventive health behavior have been reported in previous studies (Ajzen and Timko 1986, Eves 1995, Lowe et al. 2002). They may also play an important role in patients' responses to mHealth services. To narrow the aforementioned gaps in the context of mHealth, this thesis aims to explore users' responses to MMSs from a purely affective perspective to enrich the behavioral knowledge of mHealth.

2.2 Innovation Diffusion Theory

Innovation diffusion theory, which is a well-known theory proposed by Rogers (2010) and widely used in IS research, is utilized to theoretically underpin this examination of the MMS diffusion process (Karahanna et al. 1999, Rogers 2010, Xue et al. 2011). The theory suggests that an innovation, such as a new technology, service, or idea, can be communicated through a certain process among individuals. Once individuals accept the innovation, the diffusion process is achieved. This theory can help us understand the user decision process in adoption, use, and continuous use of an innovation; that is, how and why individuals decide to adopt an innovation, how adopters decide to use the

innovation, and how users decide whether to continuously use it.

The innovation diffusion theory indicates that the innovation-decision process consists of five steps: (1) knowledge—awareness that the innovation exists and an initial understanding of how it works; (2) persuasion—forming a positive or negative attitude toward it; (3) decision—deciding to accept the innovation or reject it (we refer this stage as the 'adoption stage' in MMS diffusion); (4) implementation—putting the innovation into practice (we refer this stage as the 'use stage' in MMS diffusion); and (5) confirmation—evaluating the decision process and reversing the decision if needed (Rogers 2010) (we refer this stage as the 'post-use stage' in MMS diffusion). Figure 2-1 shows the innovation diffusion process.

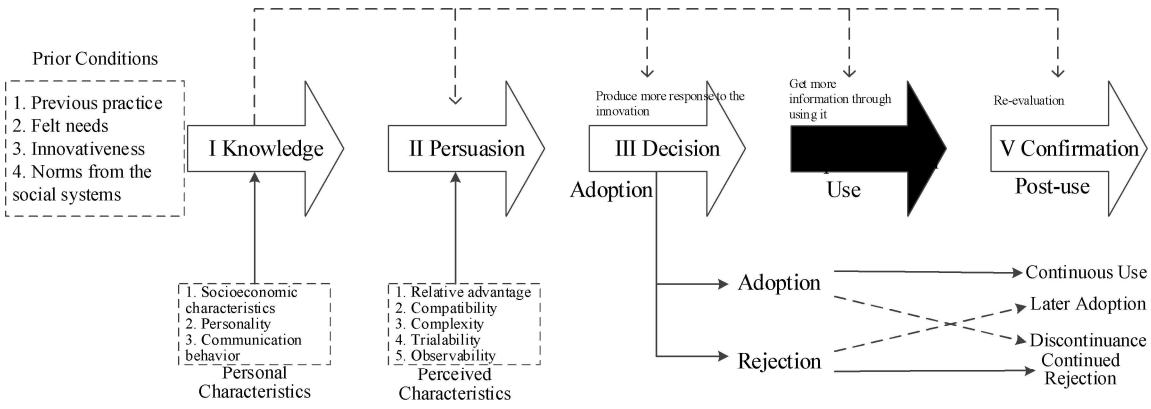

Figure 2-1 Innovation-Diffusion Process

To explore the low engagement of MMSs by potential and actual users, the thesis draws on the innovation diffusion theory to identify and examine users' decision process at different stages in MMS diffusion. Specifically, to study the low acceptance rate of potential users, Study 1 focuses on their decision process and examines how potential users make adoption decisions about MMSs at the adoption stage, that is, choosing whether to use such services or not. This decision is based on an overall evaluation of the services that the potential users formed in the persuasion process.

After becoming aware of the innovation, in this case of MMSs, the potential users would become psychologically involved with the innovation, and would form a favorable or unfavorable attitude (i.e., affective evaluation) toward the MMSs (Rogers 2010). Then, their evaluation would influence their adoption decision. Thus, Study 1 of this thesis explores how potential users form affective evaluations of MMSs and make adoption decisions.

To study the low active usage of MMSs by actual users, Study 2 focuses on the implementation process and examines how the users choose to use the services at the use stage. After the potential users decide to adopt the innovation, they put the services into usage and begin the implementation process. At this process, the users have to make decisions on how to use the services based their initial perceptions on whether the services are beneficial to their life, such as helping them deal with their health issues (Rogers 2010). If they believe the services can help them stay healthy and be informed about their health conditions, they may choose to actively use the services. Thus, Study 2 of this thesis investigates how the users' affective evaluations influence their usage of MMSs.

To study MMS users' low continuous usage, Study 3 focuses on the confirmation process and examines how users make continuous use decisions at the post-use stage. After they implement the decision to use the innovation, users may use MMSs for longer and secure further information (Rogers 2010). If the information from their usage confirms their evaluations at previous stages, they are more likely to make continuous usage decisions. Otherwise, they may choose to reject the innovation and make the decision to discontinue use. To explain the continuance behavior of MMS users, Study 3 of this thesis examines how users confirm or disconfirm their previous evaluations of the services and make continuance decisions based on their final

affective evaluations.

Thus, according to innovation diffusion theory, we can allocate the three problems reflecting low user engagement to a single MMS implementation process. Specifically, the low acceptance rate can be considered part of the decision-making process at the adoption stage. The low active use can be considered part of the implementation process at the use stage. The low continuous use can be considered part of the confirmation process at the post-use stage.

2.3 Affective Response Model

'Affect' is an umbrella term that reflects a fundamental characteristic of human beings (Lerouge et al. 2007) that influences personal perceptions and finally impacts on behavior. It encompasses emotions, mood, and feelings (Bagozzi et al. 1999, Russell 2003). Prior studies have shown that affect has effective explanatory power on individuals' cognition and behavior, and under certain circumstances even has more explanatory power than cognitive factors (Zhang 2013). As health information technologies are more closely associated with life quality and personal inner feelings, affect may play a more important role in the health-related behaviors than behavior related to general-ICTs (Van der Pligt et al. 1997). Thus, exploring the affective factors relevant to user-MMS interaction may be essential in understanding potential and actual users' behavior regarding MMSs.

Although affective factors have been widely studied in the IS and human-computer interaction (HCI) literature, compared with the plentiful studies on cognitive factors, affective factors have received inadequate research interest. This limited interest may be largely owing to the inconsistent and inconclusive results obtained in other disciplines (Zhang 2013). In an attempt to explain the inconsistent and inconclusive results associated with affective factors in the ICT context, Zhang

(2013) developed a comprehensive ARM. The model defines three main categories of affect in human-ICT interaction. Affect can reside within a person, which is neither result from nor influenced by any ICT-related stimuli. Affect residing within an ICT-related stimulus refers to affect aroused purely by the stimulus rather than the interaction with it. Affect residing between a person and an ICT-related stimulus concerns an individual's responses to the ICT stimulus. The taxonomy of affective constructs in human-ICT interaction is shown in Table 2-3 by Zhang (2013).

Table 2-3 The Affective Category of Human-ICT Interaction

<table>
<tr><th colspan="2">Residing Within a Person</th><th rowspan="2">Residing Within an ICT</th><th colspan="4">Residing Between a Person and an ICT (Affective Response)</th></tr>
<tr><th rowspan="2">Temporally Constrained (State)</th><th rowspan="2">Temporally Unconstrained (Disposition)</th><th colspan="3">Particularly ICT</th><th rowspan="3">General/ Learned ICT</th></tr>
<tr><th rowspan="2">Temporally Constrained (State)</th><th colspan="2">Temporally Unconstrained (Evaluation/Disposition)</th></tr>
<tr><td rowspan="3">Free-floating affective state</td><td rowspan="3">Affectivity</td><td rowspan="3">Affective characteristics</td><td rowspan="3">Induced affective state</td><td colspan="2">Particular ICT</td></tr>
<tr><td>Process-based</td><td>Outcome-based</td></tr>
<tr><td>Process-based affective evaluation</td><td>Outcome-based affective evaluation</td><td>Learned affective evaluation/ Disposition</td></tr>
</table>

Source: Zhang (2013).

As affect can reside within a person which is neither result from nor influenced by any ICT related stimulus (Zhang 2013), this affective category exists regardless of whether there is a stimulus. This category contains individual temperaments, personality of habitual preferences, affective traits (Compeau et al. 1999), and moods. According to the duration of the affective conditions, this category can be classified as temporally constrained affective state (i.e., free-floating affective state) and temporally unconstrained affective disposition, such as affectivity. The free-floating affective state is inside the person and not related to any contributing stimuli (Zhang 2013). A common free-floating affective state is mood. Affectivity is an individual's affective tendency and personal traits (Zhang 2013). It refers to the personal mode of how a person performs affective response to a stimulus. This mode, a person has when he/she

is interacting with an ICT, can influence one's affective response to the ICT. Thus, affectivity can directly shape the affective response to an ICT.

Affect residing within an ICT-related stimulus refers to affect aroused purely by the stimulus rather than the interaction with it (Zhang 2013). This affective category belongs to the attribute of the stimulus, its affective characteristics. This includes two main sub-dimensions—affective quality and affective cue. Affective quality is the inherent capacity of a stimulus to arouse affective changes in a person (Zhang 2013). Affective cue refers to the characteristics of the stimulus that can manifest the affective quality aroused by the stimulus (Zhang 2013). These affective characteristics of a stimulus are independent of the person, but can influence the interaction between the person and the ICT-related stimulus by determining the extent and direction of their affective response.

Affect residing between a person and an ICT-related stimulus concerns an individual's affective response to the stimulus. This category is the focal affect for human-ICT interaction research. When interacting with a particular ICT-related stimulus, it can be categorized as induced affective state (e.g., emotion and anxiety) and affective evaluation according to whether it is constrained by time. Induced affective state focuses on how the interaction influences the person's inner feelings, and affective evaluation refers to a person's appraisal of the affective quality of the ICT-related stimulus (Zhang 2013).

There are two categories of affective evaluation—outcome-based affective evaluation and process-based affective evaluation. Both of these categories concern affective appraisals about a particular ICT or conducting certain behavior toward a particular ICT. Process-based affective evaluation is a low-level appraisal that focuses on the response process, such as how the action is performed and how the goal is

achieved. Outcome-based affective evaluation is a high-level appraisal that focuses on the goal of the action or conducting behavior toward a particular ICT. As formed from careful appraisal and deep information processing, outcome-based affective evaluations are summative level evaluations and can conclude the affective response process (Zhang 2013). This thesis, therefore, adopts outcome-based affective evaluation to represent a person's overall affective evaluation in their affective response to MMSs.

When interacting with general ICT-related stimuli or other ICTs, a person would have learned affective evaluation and disposition (Zhang 2013). This learned affective response can be stored in the memory for a long time and influence subsequent affective responses as an affective tendency. For example, after a person has developed positive affective evaluations of general ICTs based on previous experience or knowledge, he or she may be more likely to form a similar evaluation when interacting with a new ICT-related stimulus.

The ARM was proposed to explain the inconsistent results of affective constructs in the existing literature. We will discuss the inconsistencies and affective factors in different stages in the following subsections.

2.3.1 Inconsistencies in the Affect Literature

Type I Inconsistencies

The ARM was developed to explain the inconsistent results in affect research. In recent decades, the IS and HCI literature has seen intensive interest in affective factors and broadened the area of affect research. The concepts of emotional design (Norman et al. 2003), emotional usability (Kim et al. 2003), affective reactions toward information technologies (Zhang and Li 2004), mood in IS-related behavior (Loiacono and Djamasbi 2010), anxiety and anger in information technology use (Beaudry and

Pinsonneault 2010, Yin et al. 2014), and among others, have been explored in previous studies.

However, at the same time, there exist many inconsistent results regarding the effects of affective factors. For example computer anxiety was found not related to computer usage (Compeau et al. 1999) and cognitive evaluations (Karahanna et al. 2002), affective response did not influence web usage (Cheung et al. 2000), perceived enjoyment had no effects on behavioral intention (Venkatesh et al. 2002) although it may have some effects on usage behavior (Teo et al. 1999), and affective attitude did not significantly influence system use (Yang and Yoo 2004).

One possible explanation for these counterintuitive results may be that the different definitions of the independent variables (i.e., affective factors) in different studies. For example, anxiety in some studies was defined as the affective tendency of the individual (Compeau et al. 1999, Karahanna et al. 2002), but in other studies, it was defined as an induced affective state (Hackbarth et al. 2003, Venkatesh et al. 2002). Further, affective attitude is generally defined as an outcome-based affective evaluation; however, Yang and Yoo (2004) defined it as one's negative or positive feelings.

The different definitions of the same affective factor may result in different effects in different contexts. To explain these inconsistent results, the ARM was proposed to provide a systematic reference map for the affective factors in human-ICT interaction (Zhang 2013). The model develops the taxonomy of the affective factors in the human-ICT interaction process and provides clear definitions of the affective constructs in different categories to guide future research and gain a better understanding of the ICT-related affective factors. By doing so, the ARM can, to a certain extent, help explain some of the existing inconsistent results in the affect

research, specifically, inconsistencies produced by the different definitions of one affective construct in different studies.

Type II Inconsistencies

Besides Type I Inconsistencies, there also exist many studies with inconsistent results of the effects of affective factors, in which the affective factors were similarly defined. For instance, as a commonly used construct, anxiety has been defined as a negative induced affective state in many studies, a considerable number of which have reported non-significant effects (AbuShanab et al. 2010, Compeau et al. 1999, John 2013, McKenna et al. 2013, Venkatesh et al. 2003). The same has been found in the effects of some positive process-based affective evaluations, such as perceived enjoyment (Constantiou et al. 2012, Huang et al. 2013, Venkatesh et al. 2002, Young Im and Hancer 2014). User satisfaction, defined as an outcome-based affective evaluation, has also been found to be not significantly related to continuous intention (Lee et al. 2010). These studies avoided the Type I Inconsistencies by having their affective constructs defined similarly according to the taxonomy of the ARM, thus cannot be directly explained by the model. These inconsistent results are defined as Type II Inconsistencies in this thesis.

One plausible explanation for Type II Inconsistencies may be that there is a gap between the affective factors and the dependent variables. Most studies use induced affective states or process-based affective evaluations to directly predict behavioral intentions and actual behavior, other than a conclusive affective evaluation. The direct effects of low-level affective factors may not be exerted beyond a conclusive or high-level affective evaluation. For instance, if an individual has high anxiety toward using a new ICT, but also has made positive overall affective evaluations of the ICT; then the effect of anxiety may be mediated by the overall positive affective evaluation

and cannot be exerted.

Another plausible explanation may be the boundary conditions under which the affective factor has different effects on its outcomes. According to the contingency theory, the relationship between two variables is contingent on the effectiveness of the independent variable in different environments (Tosi and Slocum 1984). Therefore, contingent factors may arouse the mixed effects of the affective factors, such as different affective conditions, different decision tendency, and different response process. For instance, contingent factors may arouse different effects of the affective factors among different research groups, different research contexts, or different research processes.

Thus, to examine low user engagement of MMSs and explain the Type II Inconsistencies, this thesis investigates how the different affective factors in user-MMS interaction influence behavioral decisions through affective evaluations under different boundary conditions.

2.3.2 Affective Factors at the Adoption Stage

Affective Attitude

Affective attitude refers to the overall affective evaluation of an individual's performance when he/she thinks about using the target system or service and evaluates the outcomes of conducting such behavior (Fishbein and Ajzen 1975). Affective attitude is a core construct that could influence actual usage behavior directly (Davis 1986) and predicts the usage behavior indirectly through behavioral intentions (Davis et al. 1989). However, research on the antecedents of affective attitude has mainly adopted a cognitive perspective; while other affective factors in the earlier response process can also influence one's affective attitude, but were largely neglected in the previous literature. Therefore, this thesis adopts affective

attitude to manifest outcome-based affective evaluation at the adoption stage and explores how potential users develop an affective attitude from an affective response perspective.

Perceived Enjoyment and Anxiety

According to Zhang (2013), the ARM provides ample explanations of the Type I Inconsistencies, whereas the Type II Inconsistencies are ignored and cannot be directly explained by the ARM (Zhang 2013). For instance, as commonly-used positive and negative affect residing between users and an ICT, the effects of perceived enjoyment (Constantiou et al. 2012, Huang et al. 2013, Venkatesh et al. 2002, Young Im and Hancer 2014) and anxiety (AbuShanab et al. 2010, Compeau et al. 1999, John 2013, McKenna et al. 2013, Venkatesh et al. 2003) are found insignificant in many studies, leading to the mixed findings in the HCI literature under-explained. At the same time, these Type II Inconsistencies lack research attention in the IS research.

To address the previously mentioned research gaps, this research focuses on explaining the Type II Inconsistencies using the examples found in perceived enjoyment and anxiety. Perceived enjoyment is a process-based affective evaluation towards a certain behavior, which is a key affect in patients with chronic diseases as most of them are interested in the mHealth services (Edwards et al. 2014). It refers to the extent to which individuals can derive fun and enjoyment from using the health service through mobile devices. As a combination of health services and mICTs, the MMSs can have both utilitarian and hedonic features. Not only can it provide useful health services but also add self-fulfilled value to the patients with chronic diseases by giving them the impression that they can be informed of their health conditions and self-manage their health problems, which they badly need (Edwards et al. 2014). As this research is designed from an affective perspective, the hedonic features may play a

dominant role to influence outcome-based affective evaluation through intrinsic motivation (Van der Heijden 2004). Thus, we use perceived enjoyment to measure the positive effects from the earlier affective response process.

Anxiety, a negative emotion, is an induced affective state, which is a fairly common affect in users' interaction with ICT-based services (Meuter et al. 2003). In the case of chronic conditions and with emotional disorders, patients are more cautious about their health concerns (Bodenheimer et al. 2002) and are more anxiety-sensitive than healthy individuals (Van Beek and Griez 2003). Thus, when using health services delivered by mobile devices that are different from traditional face-to-face healthcare systems, the patients would feel anxiety about the risks and uncertainties in an online environment. The small operating and display platforms may result in more malfunctions and misconceptions, and the mobile ICTs may easily result in security and privacy issues (Yang and Forney 2013). Thus, anxiety can be a main negative affective state within patients performing evaluation when using the MMSs.

2.3.3 Affective Factors at the Use Stage

Emotional Attachment

The IS literature suggests that users develop affective responses to ICTs when interacting with them (Zhang 2013). Hazan and Zeifman (1999) posit that emotional attachment is an important affect in adults' lives, ensuring enduring relationships. We suggest patients who suffer from long-term illnesses will tend to seek physical or psychological support from their MMSs. As an outcome-based affective evaluation, emotional attachment refers to an emotional-laden bond between the user and a service (Thomson et al. 2005). It reflects the "feelings of connection, affection, love, and passion" in human interactions with an object and indicates a more consistent basis of the interaction (Thomson et al. 2005).

When suffering the stress from their chronic diseases, patients will tend to seek physical or psychological support from the MMSs by monitoring and being informed of their health status. Thus, during their interactions with the service, they will develop emotional attachments to using it (Hazan and Zeifman 1999). Furthermore, the long-term influence of the chronic diseases may arouse depression and anxiety, and these negative emotions will result in their affective attachments to using this service. In addition, emotional attachment can override the impacts of cognitive evaluation on service usage to make individuals more emotion-driven (Fan et al. 2014, Weber et al. 2004). Therefore, emotional attachment is a core affective evaluation in patients-MMS interactions and is likely to be a driver of users' subsequent usage behavior.

Individuals can develop emotional attachments to numerous objects, including branded goods (Thomson et al. 2005), pets (Hirschman 1994), places (Chow and Healey 2008, Hill and Stamey 1990), and human beings (Schultheiss and Blustein 1994). Prior research has considered emotional attachment to be an external stimulus and has not explored its determinants (Belaid and Temessek Behi 2011, Drigotas and Rusbult 1992, Fedorikhin et al. 2008, Thomson et al. 2005), or explained it from the perspective of a cognitive process (Kil-Soo et al. 2011, Lee et al. 2011, Vlachos 2012, Vlachos et al. 2010). The literature has explored the positive effects of emotional attachments on consumer loyalty (Belaid and Temessek Behi 2011, Vlachos 2012, Vlachos et al. 2010), behavioral commitment (Belaid and Temessek Behi 2011, Drigotas and Rusbult 1992), and behavioral intentions (Fedorikhin et al. 2008, Kil-Soo et al. 2011, Lee et al. 2011), although not in the context of mHealth.

The development of mICTs and their unique features have projected emotional attachments to mobile devices as a new research domain (Kolsaker and Drakatos 2009). Specific to mHealth, the personalized health advice of MMSs leads patients to develop

emotional attachments to them. Patients' emotional attachments to health resources have been verified to have positive effects on their compliance with their health procedures (Ciechanowski et al. 2001) and health outcomes (Ciechanowski et al. 2004). However, the effects of emotional attachment on actual behavior regarding an ICT, for example, actual usage, lack research investigation.

To narrow the research gap in the emotional attachment research, we drew on affect transfer theory to investigate the relationship between emotional attachment and MMS usage, as well as to explore the antecedents from an affective perspective. Study 2 of this thesis will adopt emotional attachment to measure the affective evaluation at use stage that links users' learned affective evaluations on the service components (component satisfactions) and usage behavior. Emotional attachment indicates users have a high commitment on the MMSs and have enduring psychological bonds with MMSs (McEwen 2005), and the high commitment and enduring bonds can lead to active usage of the services (Fedorikhin et al. 2008, Kil-Soo et al. 2011, Lee et al. 2011). As emotional attachment is developed to help users to create security feelings by satisfying their needs, this study proposes that component satisfactions can directly influence emotional attachment by satisfying their specific needs on using the service components and can also indirectly influence emotional attachment by satisfying overall needs of using the service through cognitive evaluation on the services. Therefore, this thesis proposes two routines to explain how learned affective evaluations influence emotional attachment and further investigates whether emotional attachment predicts use behavior.

2.3.4 Affective Factors at the Post-Use Stage

User satisfaction refers to users' affective feelings on the outcomes of using a service to achieve certain goals (Spreng et al. 1996). Satisfaction is developed in users'

affective interaction with the services after a long-term usage and is the key to retaining a long-term relationship between the users and the services. After using the services for a longer period, users will have an overall evaluation of the performance of the services. If this performance evaluation is higher than their previous expectations, they will perceive high satisfaction from using the services (Bhattacherjee 2001). Otherwise, they will be less satisfied or dissatisfied with using the services. User satisfaction is users' overall affective evaluation after having experience of using the services and determines whether they will proceed for continuous usage. Therefore, we propose user satisfaction to measure users' affective evaluations at the post-use stage to predict their continuous MMS usage.

The previous literature, especially in longitudinal studies, has largely neglected the relationships between different affective evaluations at different times in two aspects. First, some studies have explored the relationships between affective evaluations at the same stage, such as how user satisfaction influences affective attitude after using a website (Teo et al. 2003). The relationships over different times, such as between affective evaluations at different stages, have received little research attention. Second, in some literature, the relationships between two different affective evaluations vary in different situations. For example, one may have prior positive affective evaluations of a certain object but a different affective evaluation of the object when re-evaluating it (Kim and Morris 2007, Lee et al. 2008). This leads the Type II Inconsistencies regarding the effects of previous affective evaluations on new affective evaluation development.

To fill these gaps, Study 3 will examine the effects of previous affective evaluations on user satisfaction at the post-use stage to test the relationships over different times. The previous affective evaluations are manifested by affective attitude

at adoption stage and emotional attachment at use stage. Further, whether users confirm their expectations through using the MMSs is proposed as the contingent factor to explain the inconsistent relationships.

2.4 Characteristics of Patients with Chronic Diseases

Chronic diseases are long-term conditions and cannot be cured easily and instantly compared with acute diseases (Deng et al. 2013). Patients with chronic diseases face many challenges to managing their health in their daily life. They may feel more threats and losses when considering their health status and future life, which may give rise to more negative affect, such as anxiety and depression (Andenæs et al. 2006). Because of these long-term negative affect in their daily life, the interpretations of stimuli (Folkman 1984, Folkman et al. 1986) and affective responses to stimuli (Folkman et al. 1986, Lazarus 1991) by those suffering chronic illnesses may differ from healthy individuals or those with acute illnesses. To study the affective response process of patients interacting with MMSs, their affective state, affective tendency, and decision rationality are identified as the characteristics of this group, which can be included in the research models as the boundary conditions of the affective response.

Negative Health Emotion

Because chronic diseases are usually associated with substantial distress and functional limitations, patients have to deal with many changes in their daily life, such as feeling discomfort, losing potential chances, and facing financial constraints (Taylor and Aspinwall 1996). Recognizing that these changes are caused by chronic diseases and cannot be treated easily, they may generate negative emotions toward their health conditions. Although these negative emotions represent affect residing within a person regarding their health, when studying the affective response in their interacting with MMSs, they can be treated as affect residing within a person.

Health Consciousness

On the contrary, facing the new challenges associated with chronic diseases, chronically ill people are more likely to consider new ways to change their conditions (Jokela et al. 2014). Thus, patients with chronic diseases are more likely to avoid measures that may worsen their health and employ measures beneficial to their health (Stanton et al. 2007). Patients in this cohort have to self-manage their health every day, including what to eat, whether to exercise, and whether and how to comply with physicians' advance (Bodenheimer et al. 2002), therefore tend to have higher health consciousness than others. Health consciousness can be defined as a psychological disposition with regard to the tendency for self-awareness of health, personal responsibility for health as well as health motivation (Hong 2011). Thus, health consciousness can be a temperament example of affect residing within a person.

Health Rationality

Rationality refers to the extent to which individuals follow an explicit, systematic, and analytical approach when making decisions (Kandemir and Acur 2012). Individuals with a high sense of rationality are likely to make rational decisions based on their cognitive evaluations of all the alternatives (Scott and Bruce 1995). Conversely, individuals possessing a low sense of rationality are likely to rely more on spontaneous or intuitive approaches, rather than a cognitive approach (Scott and Bruce 1995). Accordingly, health rationality is defined as the extent to which individuals make rational decisions in relation to their health and health management.

Perhaps counter-intuitively, patients with chronic diseases tend to make less rational health decisions in their daily lives (Brock and Wartman 1990). Owing to the long-term negative influences of chronic diseases on their psychology, these patients often (1) have biases toward their present and near future, so that they cannot make

rational decisions about the cost and benefit related to their health status (Brock and Wartman 1990), and (2) request additional care to protect their health, which may not be necessary (Brock and Wartman 1990). Further, emotional distress resulting from the chronic disease may influence their cognitive evaluations by producing greater cost or risk perceptions in their decision-making (Smith et al. 1984). Thus, patients with chronic diseases are more likely to make less rational decisions in their health-related decision-making and possess a low sense of health rationality compared with the general population. This characteristic of patients with chronic diseases may influence their affective responses to MMSs, as well as the affect transfer process.

Therefore, this thesis draws on negative health emotion, health consciousness, and health rationality as proxies of the affective characteristics of patients with chronic diseases. Drawing on these characteristics to study the affective boundary conditions under which process-based affective evaluation, induced affective state, and learned affective evaluation exert their effects on affective evaluations, this thesis aims to provide insights to the affective response of this special cohort and offer plausible explanations to the Type II Inconsistencies.

2.5 Affect Transfer Theory

Affect transfer theory explains the phenomenon in which people's favorite attitudes toward a component of an object can facilitate the development of their attitude toward the object overall (Aaker and Keller 1990, Coulter 1998). This theory was first developed in the marketing literature to study people's favorite attitudes in a comparison between advertisements and brands (Machleit and Wilson 1988) and between two brands (Aaker and Keller 1990). The core construct, affect transfer, is defined as the process whereby individuals' pre-existing affect regarding an object is transferred to their affective responses to another closely related object (Shimp 1981).

In addition to the marketing literature (Aaker and Keller 1990, Kim et al. 1998, Marks and Olson 1981), this theory has also been applied in the psychology literature (Oikawa et al. 2011, Phillips 1971), but has thus far received limited research attention in the IS literature.

Different studies propose that the transfer routine can be cognitive or misattribution. The underlying routine in which an individual's affect regarding a component of an object is transferred to the object itself is unclear.

The Cognitive Routine

Affect transfer may rely on a cognitive routine and this routine may be conscious. For instance, an individual evaluates an unfamiliar object based on its similarities and the relations between its components (Aaker and Keller 1990, Machleit and Wilson 1988). The theoretical foundation underlying this postulation is that (1) one's cognition of an unfamiliar object is first developed based on one's affective responses to its components and the relations between them, and (2) cognition then induces the individual's affective response to the unfamiliar object (Brown and Stayman 1992). As this routine is processed through cognition efforts, we use perceived value to manifest cognitive routine the present thesis.

Perceived value in the context is used to manifest the cognitive routine, which refers to an overall evaluation based on a comparison between the benefits and costs of using MMSs for health management (Kahneman and Tversky 1979). The rationale is derived from rational choice theory, which posits that people are rational when making decisions and they compare benefits and costs to maximize outcomes (Paternoster and Pogarsky 2009). Perceived value measures net benefits in the comparison as an overall cognitive evaluation (Kim and Kankanhalli 2009). It has been used to measure the overall cognitive outcomes of conducting certain behaviors,

such as switching to a system (Kim and Kankanhalli 2009), making a purchase (Moliner et al. 2007), or using a service (McDougall and Levesque 2000). Therefore, Study 2 chose perceived value to measure cognitive routine, in which satisfaction of an MMS's components influences the overall affective evaluation of the MMS.

However, rational choice theory has been criticized for having limited capacity to explain behavior in low rationality conditions, for instance, when emotions are involved in decision-making (Mellers et al. 1998). Hence, perceived value has thus far been generally applied by previous research to study decision-making in which affective factors are not incorporated. In other words, perceived value has been used for (purely) cognitive decision-making (Kim and Kankanhalli 2009, Wang 2010), in which the influence of affective judgment has been largely overlooked. Based on the argument that perceived value manifests cognitive routine in affect transfer, Study 2 demonstrates that even for relationships between two affective factors, the rational decision lens still works. In so doing, we provide empirical evidence that rational choice theory can be used to explain the partial decision process in less rational decision-making.

Misattribution Routine

Some scholars have argued that the routine of affect transfer can be unconscious, that is to say, it does not necessarily provoke cognitive effort (Oikawa et al. 2011). This unconscious process is an affect misattribution routine that occurs when an individual is unable to separate his or her responses to the unfamiliar object and its components, whereby he or she misattributes the affective responses to components of the object (Payne et al. 2005). Thus far, the literature has not reached a consensus on which underlying routine is more appropriate to explain the affective transfer process, and this may explain why there are mixed findings on the outcomes of affect transfer

(Ajzen and Fishbein 2005, Machleit and Wilson 1988). For example, the affective attitude toward a component of an object may not be the same as the affective attitude toward the object (Reeve 2014).

Combined Routines in Affect Transfer

In the affect transfer from an object's components to the entire object, just as in the process of MMS components to MMS as a whole in this context, both aspects manifest relations and differences simultaneously. Thus, when forming affective responses to an unfamiliar object (i.e., the MMS) based on affective responses to its components (i.e., MMS components), users can only distinguish similarities and differences between these aspects to a certain extent. Therefore, when transferring affect from MMS components to the entire MMS in such situations, users may rely on cognitive and misattribution routines simultaneously.

To explore the two routines of affect transfer and explain the mixed findings regarding the outcomes of affect transfer, this thesis investigates the direct and indirect effects of previous affective evaluations (of MMS components) on the affective response to using MMSs. The indirect effects are exerted through a cognitive process. These two routines display differences in the analytical mode. Cognitive routine relies more on an analytical process and is more rational (Brown and Stayman 1992), while misattribution routine is an intuitive process and is less rational (Oikawa et al. 2011). Therefore, we anticipated that health rationality would moderate the combined effects of the two routines in their affect transfer when making MMS-usage decisions. Investigating the moderating role of health rationality in patients' affective responses to MMSs not only provides a better understanding of the decision-making process of this special group of patients, but also facilitates understanding of the mixed outcomes of affect transfer.

2.6 Expectation-Confirmation Model

The expectation-confirmation model of IS continuance (ECM) is based on the expectation-confirmation theory (ECT), which was developed by consumer behavior researchers to explore consumer satisfaction and post-purchase behavior in the service context (Swan and Trawick 1981). The ECT posits that consumers' pre-purchase expectations and confirmation perceptions on the purchase determine consumer satisfaction, which in turn predicts their re-purchase behavior (Oliver and DeSarbo 1988).

Following ECT, the ECM was proposed to explore how users make continuous use decisions of IS at the post-use stage (Bhattacherjee 2001). The model indicates that users' continuous usage of a technology or a service is determined by user satisfaction that further depends on users' usefulness and confirmation perceptions. Specifically, the model posits that confirmation can directly and indirectly (via perceived usefulness) influence user satisfaction, and perceived usefulness can influence both user satisfaction and continuance intention. The model has been used to explain user continuance behavior in a wide range of contexts, including online banking (Bhattacherjee 2001), IS implementation (Brown et al. 2008), Internet-based learning (Limayem and Cheung 2008), online services (Kang et al. 2009), mobile data services (Kim 2010), and paid mobile apps (Hsu and Lin 2015).

Compared with the ECT, the ECM focuses only on the post-use stage and ignores the adoption and use stages on the grounds that the confirmation and satisfaction perceptions can capture the effects of any perceptions or evaluations ta adoption and use stages (Bhattacherjee 2001). However, there is no empirical evidence supporting this argument. Further, the model adopts user satisfaction as the core construct to predict continuous behavior, but the antecedents of user satisfaction are all cognitive

factors, lacking an affective perspective. Therefore, to bridge the aforementioned gaps, this study incorporates affective evaluations at the adoption and use stages into the ECM to predict user satisfaction.

2.7 Summary

This section reviews the related theoretical fundamentals of this thesis, that is, MMSs, innovation diffusion theory, the ARM, as well as other related theories. After reviewing the behavioral research on mHealth services, two main research gaps were detected, namely, inadequate affective factors and few health-related factors were incorporated in previous research. Innovation diffusion theory provides a clear theoretical lens through which to locate the low user engagement problems, i.e. low acceptance rate, low active use, and low continuous use at three diffusion processes. These problems exist at the three different but successive processes in MMS diffusion.

Next, the ARM and affect literature were reviewed. According to the ARM, the different categories were introduced and Type I Inconsistencies were defined, including an illustration of how the ARM may explain these inconsistencies. Conversely, the reasons for Type II Inconsistencies remain unclear. From a theoretical perspective, we proposed plausible explanations for these inconsistencies and how to examine the explanations. Then, the affective characteristics of patients with chronic diseases were outlined.

In summary, four research gaps were identified in the previous literature as follows:

- Few behavioral studies have explored the affective factors that influence the diffusion of mHealth services.
- Few health-related factors have been incorporated into the previous behavioral research related to mHealth services.

- Type II Inconsistent results in affective research have not been sufficiently explained.
- Patients with chronic diseases have an increasing population and their own characteristics, however, this group has largely been neglected in the IS and HCI literature.

By addressing these gaps, the present thesis adds to the mHealth research by elucidating the effects of affective factors and health factors in diffusion of the innovation, to the affect literature by providing plausible explanations of under-explained inconsistent relationships, and the IS and HCI literature by exploring the behavior of a special user group, i.e., patients with chronic diseases.

Chapter 3 Exploring Potential Users' Affective Evaluation at the Adoption Stage

As mHealth services can provide continuous and timely health monitoring at the individual level (Kumar et al. 2013), MMSs may be particularly ideal for patients suffering from chronic diseases, who require regular medical attention (Phillips et al. 2010). For instance, according to a recent report by the WHO, chronic diseases account for 60% of all deaths worldwide (Pollettini et al. 2014). However, as the potential users (i.e., patients with chronic diseases) are not yet actual users of these services, and the acceptance rate of MMSs is relatively low. The potential users would be aware of the usefulness and importance of the monitoring services for their health in determining adoption of the services. However, knowledge about the usefulness and importance from a cognitive perspective does not necessarily translate into active usage behavior. To understand the currently low acceptance rate of MMSs, Study 1 was designed to explain adoption decision of potential users of MMSs from an affective perspective.

3.1 Introduction of Study 1

In the healthcare context, especially for people suffering from chronic diseases, using the mHealth services to monitor their health has the potential to provide great benefit, such as providing them with informational and emotional support. The rationale for this is that continuous health monitoring can keep such patients informed about their health conditions in a timely manner and reduce their negative emotions such as anxiety disorders (Liang and Xue 2013, Salovey et al. 2000). In hospitals, doctors are too busy to closely follow up on patients' health management of chronic diseases (Bodenheimer et al. 2002). Self-health management using mHealth on a daily basis may be a viable way of regularly monitoring chronic conditions. However, little is

known about how these patients, exhibiting specific behavioral characteristics, respond to MMSs and the role of such characteristics specific to their conditions in their responses.

In the mHealth market, even if MMSs are useful for many potential users or committed users, the proportion of actual users is relatively low (Park et al. 2014). In China, there are 220 million elderly people and 20% of the total population suffers from chronic diseases (TalkingData 2015). These individuals need daily monitoring of their health conditions and represent potential users of these services. However, there are only about 90 million users of mHealth services and most of them are young (TalkingData 2015). Therefore, most potential users are not yet actual users and the acceptance rate of such services is thus relatively low. Previous research has determined that affective evaluations may present more of a barrier to preventive health behavior than cognitive evaluations (Ajzen and Timko 1986, Eves 1995, Lowe et al. 2002). However, many previous studies have examined users' responses to mHealth services mainly from a cognitive perspective (Akter et al. 2011, Cocosila and Archer 2010, Guo et al. 2013, Lowry et al. 2014), and scant research attention has been paid to how users perform affective evaluations of mHealth services, especially MMSs.

In order to predict how patients affectively respond to MMSs, we investigate the determinants of affective attitude toward using MMSs, because attitude is the key predictor of human adoption intentions and actual adoption (Fishbein and Ajzen 1975). In the psychology literature, attitude has both cognitive and affective components based on whether the evaluating process stems from a cognitive or affective perspective (Bagozzi and Burnkrant 1979). Affective evaluation is automatically formed without any cognitive effort or conscious purpose and is stored in the human memory (Ajzen and Fishbein 2000, Ajzen and Timko 1986, Bamberg et al. 2003), and

can influence subsequent judgments on related stimuli (Ajzen and Fishbein 2000). Thus, affective attitude toward using MMSs, as an overall affective evaluation, may not only influence the potential users' adoption intention, but may also influence their usage behavior after adoption. For instance, once patients with chronic diseases form a positive affective evaluation of the outcome of using MMSs—such as enjoyable using the services for health self-management or pleasant to be informed about their own health status—this evaluation may indirectly influence their adoption behavior through a more positive benefits evaluation and directly influence their usage behavior leading to actual adoption. Therefore, affective attitude may be an important predictor of health-related behaviors (Ajzen and Timko 1986, Chan and Fishbein 1993, Payne et al. 2004). In the context of mHealth, it will help identify potential users as well as potential actual users. Here, this study uses affective attitude to measure potential users' (i.e., patients with chronic diseases) overall affective evaluation of MMSs and further explore its antecedents and outcomes, which have rarely been considered in the previous IS literature. Accordingly, our first research question is:

RQ1-1: *How do potential users develop affective attitude toward using MMSs, which further determines their adoption*?

To study the determinants of affective attitude toward using MMSs, we draw on an affective response process of patients with chronic diseases. Based on the taxonomy of affective constructs and the HCI literature, induced affective state is one's state of consciousness without being aware of future behavior (e.g., toward using a service) (Csikszentmihalyi 1990), and process-based affective evaluation is formed when processing information about the future usage of the service (Zhang 2013). Therefore, when forming an outcome-based affective evaluation regarding whether to adopt such services, affective response in the earlier process, such as induced affective state and

process-based affective evaluation, can be the main factors influencing their outcome-based affective evaluation (i.e., affective attitude).

This study thus explores the determinants of affective attitude from the affective factors that belong to induced affective state and process-based affective evaluation. Perceived enjoyment is a key intrinsic predictor of technology response and use (Brown and Venkatesh 2005). Potential users decide to use or purchase services based on two basic reasons: hedonic benefits and utilitarian benefits (Batra and Ahtola 1991). MMSs, as a new type of health service, can also provide hedonic benefits, such as hope and confidence, to arouse process-based affective evaluation when considering using such services (Fassnacht and Koese 2006). People with chronic conditions, who may suffer poor health for a long time, have great health needs and often difficulty accessing health care, so they may show interest in using new ICT-based health services, such as MMSs (Edwards et al. 2014).

On the other hand, as services in the mobile context differ from traditional and online channels in that mobile devices have small operational and display platforms, they may more easily induce security and privacy issues and cause technology anxiety for new users (Yang and Forney 2013). Further, patients with chronic diseases may be more cautious about their health (Bodenheimer et al. 2002), and using mobile devices for health services may provoke anxiety. In that regard, anxiety may be a key barrier in patients' responses to MMSs, so we use anxiety as an induced affective state to predict affective attitude, which leads to the second research question:

RQ1-2: *How do enjoyment and anxiety influence potential users' affective attitude toward using MMSs*?

Although perceived enjoyment and anxiety are presumed to have positive and negative effects on behavioral intention and overall evaluations, many studies report

insignificant results (AbuShanab et al. 2010, Compeau et al. 1999, Constantiou et al. 2012, Huang et al. 2013, John 2013, McKenna et al. 2013, Venkatesh et al. 2003, Venkatesh et al. 2002, Young Im and Hancer 2014). While the ARM helps to explain why some of the conflicting results occurred (i.e., inconsistent items and constructs), it is likely that other factors may cause at least some of these prior inconsistencies (i.e., failing to carefully set boundary conditions regarding where, when, and how affective factors play a significant role). Discerning the affective boundary conditions of affective response will not only enhance our understanding of the affective factors in human-ICT interaction at the adoption stage, but also contribute to the ARM by explaining the Type II Inconsistencies regarding the effects of induced affective state and process-based affective evaluation. This leads to the third research question:

RQ1-3: *Can the identification of boundary conditions explain the prior mixed findings in the affect literature*?

The objectives of this study are to investigate how potential users, that is, patients with chronic diseases, produce affective responses to MMSs and whether the affective boundary conditions arouse Type II Inconsistencies in affective responses. First, we identify patients with chronic diseases as our research respondents and examine their affective characteristics. Second, we investigate the effect of perceived enjoyment on affective attitude under different induced affective states (i.e., anxiety). Third, we investigate the effects of perceived enjoyment and anxiety on affective attitude under different affect bases, that is, the affective characteristics of patients with chronic diseases, i.e., negative health emotion and health consciousness.

This work contributes to the IS literature by demonstrating how affective evaluations are developed at the adoption stage in the context of MMSs. Specifically, our results provide plausible explanations for some of the mixed findings in the

existing literature. Additionally, this study extends the knowledge frontier of the ARM, exploring affective factors under different boundary conditions. Finally, by investigating the contingent role of the affective characteristics of patients with chronic diseases, our study provides insight into how patients with chronic diseases develop affective responses.

3.2 Research Model of Study 1

The research model guiding this study is shown in Figure 3-1. As many researchers have explored the direct effects of perceived enjoyment and anxiety on affective attitude and the effect of affective attitude on adoption intention, they were not hypothesized in this study. The first level relationship is between process-based affective evaluation (i.e., perceived enjoyment) and outcome-based affective evaluation (i.e., affective attitude), which are both temporally unconstrained affect residing within users and MMSs. The second level relationships focus on the direct effect of induced affective state (i.e., anxiety) on affective attitude and its moderating role on the relationship between perceived enjoyment and affective attitude. The third level relationships focus on the moderating role of affective factors residing within patients with chronic diseases (e.g. negative health emotion and health consciousness) on the effects of perceived enjoyment and anxiety on affective attitude. Affect residing purely within MMSs (i.e. arousal and valence) was modeled as control variables.

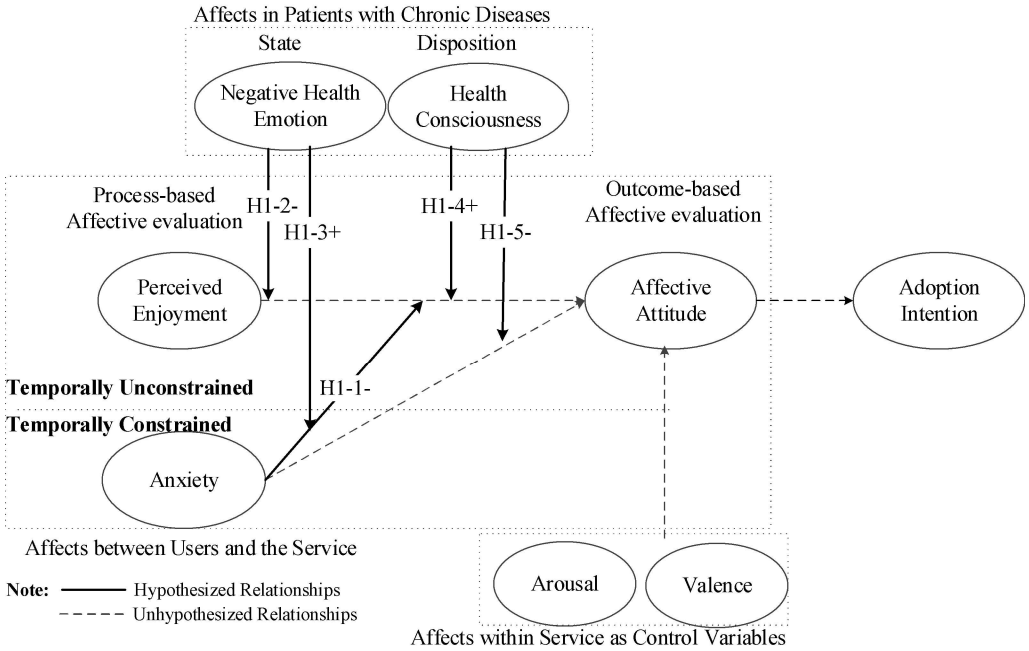

Figure 3-1 Research Model of Study 1

3.2.1 The Moderating Role of Anxiety

Anxiety is a negative emotion induced by one thinking about executing a certain behavior (Brown et al. 2004). Research on computer anxiety has found that people sometimes experience tension when exposed to new ICTs (Brown et al. 2004). Mobile ICTs, as an extension of general computer technologies, can render interactions relatively unclear in the mobile context, thus producing anxiety about using such services, which can be elevated in many mobile usage contexts (Yang and Forney 2013).

Further, faced with high degrees of anxiety when thinking about using a new technology, people generally experience negative self-evaluation (Ciarrochi and Forgas 1999) and low self-esteem (Spielberger and Gorsuch 1983). They may be more cautious about high-risk situations that they think are beyond their ability and tend to avoid such situations (Ciarrochi and Forgas 1999). Thus, when enjoyment in using MMSs is perceived, potential users with a high sense of anxiety will be more cautious and seek more information to systematically evaluate it. Therefore, the level of anxiety

will moderate the effect of enjoyment on affective attitude toward using MMSs. Thus, we hypothesize that:

H1-1: *Potential users' anxiety weakens the positive relationship between perceived enjoyment and affective attitude, such that perceived enjoyment positively influences attitude more strongly when anxiety is low*.

3.2.2 The Moderating Role of Negative Health Emotion

Patients' emotions are closely related to their health conditions and their illnesses can lead to negative emotions such as anxiety, worry, and depression (Anderson and Agarwal 2011, Trumbo et al. 2007). Negative emotions are produced to help people make approach–avoidance distinctions (Loewenstein et al. 2001, Zajonc 1998), and negative health emotion can lead patients with chronic diseases to focus more on taking measures to avoid health deterioration and improve health conditions (Anderson and Agarwal 2011). Therefore, their inner emotions on health would directly influence their decision-making in health matters.

Patients with chronic diseases have more negative emotions about their health conditions. Facing a possible solution (e.g. using MMSs) to a health-related problem, they are more likely to utilize their own inner feelings about their health concerns and needs to evaluate the solution (Loewenstein et al. 2001). On the other hand, their inner feelings can also influence their responses to new stimuli through information processing, which may then bias their decisions to align with their inner feelings (Clore 1992). For instance, when patients with chronic diseases have negative emotions about their health, their reliance on positive or negative affect aroused during the interactions with MMSs will be lessened. Thus, we hypothesize that:

H1-2: *Potential users' negative health emotion weakens the positive relationship between perceived enjoyment and affective attitude, such that perceived*

enjoyment positively influences attitude more strongly when negative emotion is low.

H1-3: *Potential users' negative health emotion weakens the negative relationship between anxiety and affective attitude, such that anxiety negatively influences attitude more strongly when negative emotion is low*.

3.2.3 The Moderating Role of Health Consciousness

With a high degree of health consciousness, patients with chronic diseases will have a tendency to focus their attention on their health and are more likely to devote themselves to a healthy lifestyle (Iversen and Kraft 2006). They will be more interested in the information related to health and more likely to engage in health actions, such as health promotion behaviors (Iversen and Kraft 2006) and health preventive behaviors (Jayanti and Burns 1998). Indeed, research has verified the significant role of health consciousness in predicting health attitudes and behaviors (Hong 2011).

Therefore, patients with chronic conditions with a high sense of health consciousness are more likely to take responsibility for their health and conduct more health-related behaviors. They are also more likely to gather more information on health-related issues and have more health-related experiences (Dutta-Bergman 2004). Thus, patients with chronic conditions are expected to possess greater ability to adopt new health-related behaviors (Hong 2011). With the ability to use the MMSs, they will be more likely to develop positive outcome-based affective evaluation when they perceive enjoyment on the usage because the ability can enable them to achieve the outcomes of usage. On the other side, they may not form positive affective evaluations of such services because of a lack of ability even though they perceive enjoyment of using the MMSs. This is because without the ability they cannot gain the outcomes of using the services, let alone perceive positive evaluation of the potential outcomes.

Thus, we hypothesize that:

H1-4: *Potential users' health consciousness strengthens the positive relationship between perceived enjoyment and affective attitude, such that perceived enjoyment positively influences attitude more strongly when health consciousness is high*.

With a high degree of health consciousness, patients with chronic diseases may undertake more health-related behaviors in their daily lives and may possess greater capacity to use new health services (Hong 2011). If they experience anxiety when considering the use of MMSs, the effect of the anxiety will be amplified because of their perceived ability toward health-related behavior. Therefore, a feeling of anxiety will result in a more negative affective evaluation when patients have a high degree of consciousness concerning their health. On the other hand, a high sense of health consciousness may lead to people taking more responsibility towards their health and tending to avoid taking measures that may worsen their health (Stanton et al. 2007). Feelings of anxiety about using MMSs will cause them to develop more negative outcome-based affective evaluations in order to avoid such behavior. Thus, we hypothesize that:

H1-5: *Potential users' health consciousness strengthens the negative relationship between anxiety and affective attitude, such that anxiety negatively influences attitude more strongly when health consciousness is high*.

3.3 Summary of Study 1

This study focuses on potential users' affective evaluation (i.e., affective attitude) of MMSs: the antecedents of the affective evaluation (P1), the effect of the evaluation on adoption intention, and whether the effects of process-based affective evaluation and induced affective state on affective attitude are different under different contingent

factors (affect residing within the potential users). The affective factors residing within the services (i.e., arouse and valence) are used as control variables. In sum, this study aims to explain the low acceptance rate of MMSs and the Type II Inconsistencies related to the effects of process-based affective evaluation and induced affective state.

Chapter 4 Exploring Users' Affective Evaluation at the Use Stage

The progressive development of mobile health (mHealth) in recent years has attracted significant practical and academic attention. However, most of its users have failed to become active users, and the potential reasons for this phenomenon remain indistinct. This study investigates how a special group of users of MMSs (i.e., patients with chronic diseases) develop emotional attachment to using the services from an affect transfer perspective, which in turn determines their MMS usage. In particular, drawing on the affective response process and affect transfer theory, this study hypothesizes that users' satisfaction with MMS components (i.e., devices and feedback) influences their emotional attachment to MMSs through both cognitive and misattribution routines and that the combined effects of the two routines are contingent on their health rationality. Therefore, to understand the low active use of MMSs, Study 2 is designed to explain the use decisions of MMS users from an affective perspective.

4.1 Introduction of Study 2

MMSs are particularly useful for assisting patients with long-term chronic diseases because their daily health conditions vary and they must follow healthcare procedures accordingly. Also, since MMSs recommend preventive measures to patients (Motamarri et al. 2014), they are believed to reduce the costs of the health sector substantially. Indeed, over the past decade, the industry has started to invest noticeably in MMSs. The worldwide market of MMSs will reach US$15 billion by the end of 2017, accounting for more than half of the total mHealth market (PwC and GSMA 2012, Xiaohui et al. 2014).

Despite the prosperity of the MMS market, active users make up only a small

percentage of its total users. For instance, BSKCare, a Chinese health company, provides a daily MMS for diabetic patients, who are anticipated to be highly engaged in the process since chronic diseases require daily monitoring. Disappointingly, however, a few months after patients start to use the services, more than 90 percent become inactive (Ouyang 2014). As another example, Chunyu Doctor in China—a leading mHealth company—provides MMSs for nearly 30 million patients, but of these only 900,000 (3 percent) are frequent users (EnfoDesk 2014). Notably, the poor response rate is a problem not only in China. In a study of patients' behavior regarding healthy eating interventions through mobile apps, Helander et al. (2014) provided a dietary self-monitoring service among the English-speaking population of various countries and found that less than 3 percent of about 190,000 app users remained active after a six-month period.

Since the core value of MMSs derives from their ability to provide effective monitoring of patients' health conditions and constant interactions between health professionals (e.g., physicians) and patients in spite of geographical distance (Aceti and Luppicini 2013), the patients' inactivity compromises the benefits of MMSs. This study aimed to examine the affective factors motivating patients with chronic diseases (in our case, chronic diseases) to use MMSs.

The literature on system usage behavior sheds little light on MMS usage by patients with chronic diseases because the literature is mainly confined to the cognitive view, such as the expectation-confirmation model (Bhattacherjee 2001, Soongeun et al. 2008) and the technology adoption perspective (Bhattacherjee 2001, Soongeun et al. 2008, Venkatesh et al. 2008). Using a cognitive view to predict user behavior somehow fails to explain actual usage behavior at the post-adoption stage, for example, frequency of use (Straub et al. 1995, Venkatesh et al. 2008). Also, in the mHealth

context, because of long-term illnesses, patients have a much stronger emotional need than do typical system users (Maunder and Hunter 2015). Thus, it is important to consider the role of affective factors that determine patients' usage behavior. Since a theoretical lens that explicitly identifies the role of affective factors in system use is lacking (Bagozzi 2007), this study sought to develop a model to predict affective responses of patients toward MMSs to predict user behavior.

Prior research suggests that during interaction with a service users may develop emotional attachment to using the service (Bowlby 2012, Thomson et al. 2005). Emotional attachment exerts enduring and stable impacts on user behavior (Carroll and Ahuvia 2006). Users who are affectively attached to a service, therefore, make a strong commitment to using it after adoption (Carroll and Ahuvia 2006). Some patients with chronic diseases may experience negative emotions caused by their long-term illnesses. Consequently, they develop emotional attachments to the services more easily, which relieves their illnesses by reducing fears and stresses (Maunder and Hunter 2015). Further, the features of the mobile context help patients feel they are interacting with the mobile devices, which also leads to emotional attachment (Kolsaker and Drakatos 2009). Therefore, emotional attachment may play a more significant role in patients' interaction with MMSs compared with a system in more typical technological contexts.

However, it is unclear what factors motivate users to form an emotional attachment to MMSs. Our study theorizes that MMSs are a combination of health services and mICTs; specifically, MMSs are made up of two components: the monitoring device and personalized monitoring feedback for patients' health. The IS literature suggests that users rely on their interaction process with system components to develop their perceptions and feelings about the entire system (Xu et al. 2013). Therefore, we anticipate that patients may first develop affective evaluations about the

monitoring device and the personalized monitoring feedback. Then, the affective evaluations of these two components can be transferred to the entire MMS, and consequently, patients develop emotional attachments to the service. We adopt an affect transfer lens to validate this anticipation. The affect transfer theory describes that a person's affect induced by object components can be transferred to the object (Kim et al. 1998, Marks and Olson 1981). Based on this theory, this study examines affect transfer in the context of MMSs and its role in patients' usage of MMSs. Our first research question was:

RQ2-1: *How do users' experiences with MMSs lead to emotional attachment, and subsequently, to their MMS usage?*

Further, to explain the underlying mechanisms of affect transfer, we proposed the two routines of affect transfer—cognitive and misattribution routines. Cognitive routine is based on cognitive evaluations, and so is considered rational (Bower 1981). In contrast, misattribution routine concerns misattributing affect derived from other objects, which is less rational and can manifest as direct relationships (Oikawa et al. 2011). This dissension renders the underlying mechanism of affect transfer under-explored and has resulted in mixed findings; for instance, one can transfer different or similar affect to a particular object from a certain type of similar objects (Ajzen and Fishbein 2005, Machleit and Wilson 1988). To uncover the mixed findings of affect transfer, we drew on contingency theory to identify health rationality as the boundary condition that determines the combined effects of cognitive and misattribution routines (Tosi and Slocum 1984). Health rationality plays a significant role in health decision-making because (1) patients with chronic diseases make less rational health decisions and possess a low sense of health rationality (Brock and Wartman 1990), and (2) cognitive routine is more rational while misattribution routine

is affective-oriented, thus the effects of the two routines can be contingent on their rationality. By examining the moderating role of health rationality, we sought to understand how patients with different characteristics form emotional attachment to MMS. Our second research question was:

RQ2-2: *To what extent is the transfer process contingent on the health rationality of the patients?*

To address these research questions, a theoretical model is developed and empirically tested by means of a field survey. This study contributes to the literature in several ways. To our knowledge, it is one of the earliest studies to have investigated the impact of affective responses on real patients' MMS usage. Further, our study explored the mechanisms of affect transfer explicitly in the context of mHealth. Finally, by investigating the moderating role of patients' characteristics (i.e., health rationality, in this case) in the transfer process, we provide plausible explanations for the mixed findings in the affect transfer literature, as well as the affect literature. Our findings should be of interest to academics and health practitioners as they continue to enhance mHealth applications.

4.2 Research Model of Study 2

To guide this study based on the theoretical foundation discussed previously, a research model is developed to examine the effect of emotional attachment on the MMS usage and its antecedents, and these are depicted in Figure 4-1.

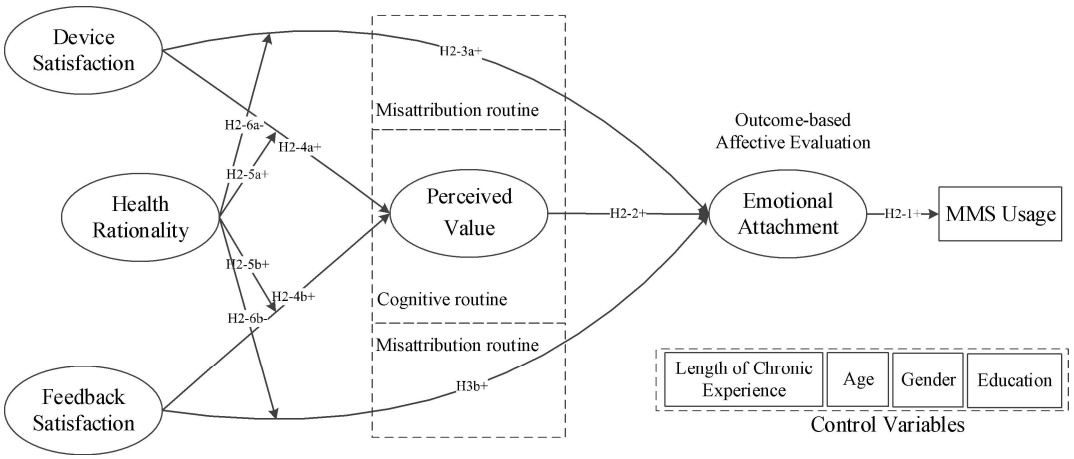

Figure 4-1 Research Model of Study 2

4.2.1 The Effect of Emotional Attachment

Emotional attachment reflects an affective bond between patients and the MMS (Thomson et al. 2005). In a general technological context, an individual with such an emotionally significant bond with a service generally perceives interactions with the service as differentiated and irreplaceable (Thomson 2006). The stronger the user's attachment to using the service, the more likely will the user be committed to maintaining interactions with it (Thomson et al. 2005). When patients experienced functional limitations and psychological stresses from their chronic diseases, they seek physical or psychological support from an emotionally attached object that is able to ease their problems. An MMS is one such object, and this leads to patients' frequent and extensive usage of such services to maintain their interactions with MMSs (Thomson et al. 2005). Therefore, we posited that emotional attachment to using the MMS should lead to a more active usage of the service. We hypothesized that:

H2-1: *Emotional attachment positively influences users' MMS usage.*

4.2.2 The Effect of Perceived Value

According to rational choice theory, perceived value captures the extent of perceived benefits (compared with costs incurred) that patients gain by using the MMS to manage

their chronic conditions (Kim and Kankanhalli 2009). A high-value perception means that the patients believe their interactions with the MMS are consistent with their expectations and meet the basic medical needs for their chronic diseases, which can provide them security feelings on their health condition. As a result, they develop a strong affective bond with the services because of the security feelings (Meyer et al. 1993, Thomson et al. 2005). Conversely, a low perceived value indicates that patients experience more costs than benefits from using the MMS and, accordingly, they may conclude that their interactions with this service are less consistent with their expectations and can barely meet their medical needs and induce security feelings on their health. Accordingly, they will develop a weak attachment to using the MMS. Consequently, we posited that a patient's value perception of using the MMS should lead to a strong emotional attachment to using it. Hence, we hypothesized that:

H2-2: *Perceived value positively influences users' emotional attachment to using an MMS.*

4.2.3 The Effects of MMS Components Satisfaction

Patients' emotional attachments are developed from their interactions with the MMS, more specifically, when they are using mobile devices and receiving personalized health feedback. We conceptualized the MMS components to consist of two parts: the device per se and the personalized feedback provided by the MMS. Satisfaction with the MMS components is a retrospective evaluation, which assesses the interaction process in previous stages. Emotional attachment is a more forward-moving evaluation capturing the strength of the relationship between patients and the MMS (Gustafsson et al. 2005). Retrospective evaluation provides a psychological basis for the forward-moving evaluation, that is, emotional attachment (Thomson et al. 2005).

Being satisfied with using the devices and receiving health feedback indicates that

patients have formed positive affective evaluations of the outcomes of their interactions with the devices and personalized feedback, and thereby have generated positive feelings such as pleasure, enjoyment, and fondness. Since the devices and personalized feedback are components of the MMS, patients may experience a limited ability to identify the sources of their positive feelings and misattribute them to the MMS to a certain extent (Payne et al. 2005). These positive feelings that are misattributed to the MMS alleviate negative feelings derived from the functional limitations and psychological stresses caused by their chronic diseases, and motivate patients to maintain and improve their interactions with the MMS (Vlachos et al. 2010). Hence, we hypothesized that device satisfaction and feedback satisfaction leads to an emotional attachment to MMSs:

H2-3a: *Device satisfaction positively influences users' emotional attachment to using MMSs*.

H2-3b: *Feedback satisfaction positively influences users' emotional attachment to using MMSs*.

Apart from the direct effects on emotional attachment of the device itself and personalized feedback satisfaction, this study also postulated the indirect effects of the device through a cognitive process that is mediated by perceived value. Such value represents a cognitive evaluation of the benefits and costs of using the MMS (Kim and Kankanhalli 2009). The effects of component satisfaction on overall affective evaluations have been verified by the IS success model (Wixom and Todd 2005, Xu et al. 2013). Device satisfaction represents a degree of positive feelings regarding the device, and when patients experience greater satisfaction, they consider that using it will be less costly (Wixom and Todd 2005). Feedback satisfaction implies the degree of positive feelings regarding the outcomes of receiving information from the MMS.

When patients feel more satisfied with such personalized feedback, they find the service beneficial for their health concerns (Wixom and Todd 2005). The benefit and cost perceptions on the device and feedback make up their overall cognitive evaluation of the service (Xu et al. 2013). The lower costs of using the device will decrease the overall costs of using the service and higher benefits from the health feedback will increase the overall benefits of using the service, all of which will increase users' cognitive value perception on the service. Therefore, we hypothesized that device and feedback satisfaction lead to a positive value perception of MMSs:

H2-4a: *Device satisfaction positively influences perceived value*.

H2-4b: *Feedback satisfaction positively influences perceived value*.

4.2.4 The Moderating Role of Health Rationality

We explore the moderating effects of health rationality on the relationships between MMS components and perceived value through the cognitive routine. Health rationality refers to the extent to which patients make rational cognition-based decisions. Patients with a high sense of rationality tend to rely more on their perceptions of benefits and costs when making health decisions (Scott and Bruce 1995). Thus, when forming affective responses to an MMS based on their interactions with MMS components, patients are more likely to use their affective responses to the components to assess their cognitive evaluation of using the MMS in the initial stage and subsequently form their affective evaluations of MMS usage, that is, their emotional attachment. Therefore, we hypothesized that device and feedback satisfaction exert stronger positive effects on perceived value when patients have a higher sense of health rationality:

H2-5a: *Health rationality strengthens the positive effects of device satisfaction on perceived value, such that the effects are stronger when users have a high sense of health rationality*.

H2-5b: *Health rationality strengthens the positive effects of feedback satisfaction on perceived value, such that the effects are stronger when users have a high sense of health rationality.*

Lastly, we examined the moderating effect of health rationality on the relationship between MMS components and emotional attachment through misattribution routine. Patients with a low sense of health rationality will rely more on spontaneous or intuitive approaches to make health decisions (Scott and Bruce 1995). Thus, when forming affective responses to using the MMS, they are more likely to rely spontaneously on their pre-existing affective evaluations related to the service and to directly misattribute their previous evaluations of MMS components to the MMS without making cognitive efforts (Payne et al. 2005). Therefore, patients displaying low health rationality are likely to rely more on their affective evaluations of MMS components to form their emotional attachments to using the MMS directly. We therefore hypothesized that:

H2-6a: *Health rationality weakens the positive effect of device satisfaction on emotional attachment, such that the effect is weaker when users have a high sense of health rationality*

H2-6b: *Health rationality weakens the positive effect of feedback satisfaction on emotional attachment, such that the effect is weaker when users have a high sense of health rationality*.

We surveyed patients with chronic diseases to collect data for testing the above hypotheses. In the data analysis, we included some patients' demography

characteristics as control variables because the patients' illnesses cause them to feel negative emotions regarding their health, which further induces emotional attachment to using the MMS.

4.3 Summary of Study 2

This study focuses on users' affective evaluation (i.e., emotional attachment) of MMSs at the use stage, including: the antecedents of affective evaluation (P2), the effect of evaluation on usage behavior, and whether the effects of learned affective evaluations on overall affective evaluation are contingent to patients' health rationality. In sum, this study aims to explain the low active use of MMSs and the Type II Inconsistencies regarding the effects of learned affective evaluations.

Chapter 5 Exploring Users' Affective Evaluation at the Post-Use Stage

MMSs are considered effective tools for managing chronic diseases, but in practice, many patients abandon continuous usage of such services. The reasons for this situation remain under-explored. Based on the ECM, this study explores the effects of users' previous affective evaluations on user satisfaction at the post-use stage, which subsequently influences their continuance decisions regarding MMSs. To further investigate the relationships between affective evaluations at different stages, this study draws on user confirmation as the contingent factor to explain the Type II Inconsistencies. Therefore, to understand the low continuous use of MMSs, Study 3 is designed to explain the continuance decisions of long-term MMS users from an affective perspective.

4.1 Introduction of Study 3

Adoption and short-term use are the initial steps of MMS diffusion, while the long-term value creation of such services depends on whether users make continuous usage (Bhattacherjee 2001). However, extant research indicates that many MMS users do not continuously use MMSs for the long term (EnfoDesk 2014). For instance, 85 patients with type 2 diabetes in Singapore decided to use an MMS that could monitor their food intake and physical activities, but more than 90% of them discontinued the usage after two months (Goh et al. 2015). Similarly, Helander et al. (2014) found that less than 3% of users of a dietary self-monitoring service continuously used the app after a six-month period. Thus, it is a fundamental issue for MMS practitioners to understand why users continue their usage of MMSs or not.

According to the ECT, users' affective evaluation is an important factor

determining continuous usage of a service after a long period of use (Oliver 1980). Further, user satisfaction comprises users' overall and final affective evaluations of a variety of service-related factors inducing continued usage of the services (Bhattacherjee 2001). Users with higher satisfaction with the service usage outcomes, apart from cognitive evaluations, are more likely to continue usage than those with lower satisfaction of the service usage (Davis et al. 1992). Therefore, we propose user satisfaction as a proxy for users' final affective evaluation as the main predictor of continuous usage of MMSs at the post-use stage.

Bhattacherjee (2001) proposes an ECM in the IS context based on the ECT. The model argues that post-use expectation (represented by perceived usefulness) and user satisfaction are the main predictors of IS continuance, and the satisfaction can capture the effects of previous interaction stage with the service. However, the mechanism for how the effects of the previous interaction stages are captured by user satisfaction has been left under-explored (Bhattacherjee 2001).

Further, in the affect literature, few studies have investigated how previous affective responses influence affective evaluations at a later stage, that is, the relationships between affective factors at different times. This limitation may be because many scholars believe that some emotions and moods are short-lived impressions rather than persistently influencing human behavior (Lindgaard et al. 2006). However, the affective factors generated from the interaction with a particular stimulus can be stored in the memory without cognitive effort (Ajzen and Timko 1986, Bamberg et al. 2003), which can subsequently influence future affective responses (Zhang 2013). Therefore, to investigate the relationships between affective factors at different times and to explain how the effects of the previous interaction stages are captured by user satisfaction, this study draws on users' previous affective evaluations

at the adoption and use stages to predict user satisfaction at the post-use stage. Accordingly, the first research question guiding Study 3 is:

RQ3-1: *Do users' previous affective evaluations of MMSs lead to final user satisfaction, and, subsequently, to their continuous MMS usage*?

From the affective perspective, this study investigates how users' previous affective evaluations influence their post-use satisfaction of MMS usage. Affective attitude and emotional attachment are the main affective evaluations at the adoption and use stages, respectively. This is because affective attitude can manifest potential users' affective evaluation before usage (Fishbein and Ajzen 1975) and emotional attachment can be used to reflect the affective interaction between the service and users during the use stage (Carroll and Ahuvia 2006). This study draws on these two previous affective evaluations to predict user satisfaction in the context of MMSs usage. By doing so, this study provides a novel approach to understanding how users derive satisfaction from using MMSs.

Previous positive or negative affective evaluations can influence further information processing and bias interpretations of the information, thus leading to similar evaluations (Wegener and Petty 2001). According to Wegener and Petty (2001) and innovation diffusion theory, the effects of previous affective evaluations on later evaluations and behaviors depend on whether the previous affective evaluations match previous expectations (Rogers 2010). Thus, the extent to which users derive satisfaction from their previous affective evaluations of using a service may be contingent on whether their expectations are confirmed by usage. Further, the previous studies concluded that users may have prior positive affective evaluations of a certain object but a different affective evaluation of the object when re-evaluating it (Kim and Morris 2007, Lee et al. 2008), leading to Type II Inconsistencies regarding

the effects of previous affective evaluation. Therefore, to provide a precise knowledge of the relationships between previous affective evaluations and user satisfaction, the second goal of Study 3 is to explore whether the effects of affective attitude at the adoption stage and emotional attachment at the use stage on user satisfaction are contingent on user confirmation. Thus, the second research question for this study is:

RQ3-2: *To what extent are the effects of affective attitude and emotional attachment on user satisfaction contingent on user confirmation?*

To address the aforementioned research questions, a theoretical model was developed based on the ECM and users' previous affective evaluations. The model was then tested with data collected from a three-wave survey among MMS users, specifically, patients with chronic diseases. This study makes several significant contributions to the literature. First, although user satisfaction has been a popular research topic, most previous studies were conducted from a cognitive perspective to explain how users develop satisfaction with MMSs. This study is one of the first to propose and empirically test the effects of previous affective evaluations on user satisfaction. Second, although the relationships between different affective factors have been well studied, few empirical studies have examined their relationships over different use stages remain scanty. Thus, the present research provides insight into the relationships between affective factors at different times. Third, by precisely investigating the contingent effects of user confirmation on MMSs usage, this research sheds light on the relative importance of previous affective responses in determining final user satisfaction. Finally, by incorporating previous affective responses in the ECM, the findings enhance the knowledge on the trade-off between affective expectation and confirmation in the mHealth context. Our findings can also be of interest to MMS providers to promote their services from an affective perspective.

5.2 Research Model of Study 3

To guide this study based on the theoretical foundations discussed previous chapters, a research model was developed to examine the effects of previous affective evaluations on user satisfaction and the contingent role of user confirmation. The model is depicted in Figure 5-1. As the ECM-related hypotheses have been widely examined in the previous literature, this study does not hypothesize them.

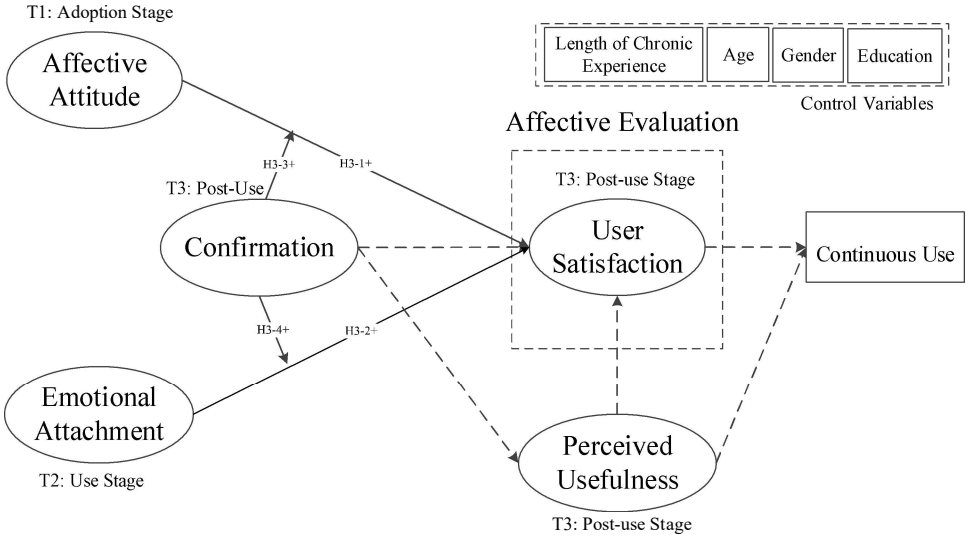

Figure 5-1 Research Model of Study 3

5.2.1 The Effects of Previous Affective Evaluations

Affective attitude at the adoption stage means that potential users of MMSs generate positive feelings about the potential outcomes of using such services (Fishbein and Ajzen 1975). Positive attitude developed before adopting a service has two-fold meanings: (1) potential users are interested in using the MMSs to manage their health, and (2) potential users have high expectations about the potential outcomes from using the services. If users develop interest prior to using a service, they may be intrinsically motivated to use it for enjoyment and fun rather than for performance (Thong et al. 2006). Thus, positive affective attitude at the adoption stage may be expected to lead to effective MMS usage after adoption. Further, highly effective usage is more likely to

lead to stronger positive outcomes from using the service, which may arouse stronger positive feelings at the post-use stage and increase overall user satisfaction. Hence, we propose that:

H3-1: *Affective attitude at the adoption stage is positively related to user satisfaction at the post-use stage.*

Emotional attachment at the use stage means that users develop an emotional bond with the service after initial usage (Thomson et al. 2005). With the emotional bond, the users will view their interactions with the MMSs from a long-term perspective and maintain their relationship with the service even if they have difficulties in using the service (Van Lange et al. 1997). Thus, the users will be affectively committed to using the service, and are more likely to invest time and effort in using the service and have greater patience with such service. Therefore, they are more likely to obtain stronger positive outcomes from the MMSs and experience greater satisfaction with the service at the post-use stage. On the other side, if users have low emotional attachment to using a service and are thus not committed to using it, they will be less likely to make effort in using it and may also have higher demands on its performance. Thus, they are likely to be less satisfied with using the service. Therefore, we hypothesize that:

H3-2: *Emotional attachment at the use stage is positively related to user satisfaction at the post-use stage.*

5.2.1 Moderating Role of User Confirmation

Confirmation refers to the match between the user's expectation of performance and perceived actual performance of using the MMSs (Oliver and DeSarbo 1988). Thus, user confirmation means that the perceived actual performance equals or exceeds performance expectations, while user disconfirmation denotes that the actual

performance fails to reach the expectations. Because confirmation indicates the magnitude between previous evaluations and actual performance, it may play a contingent role in the relationships between previous affective evaluations and user satisfaction at the post-use stage.

As noted, positive affective attitude at the adoption stage leads users to use the services effectively after adoption. While using an MMS, if previous expectations (i.e., affective attitude toward using the service) are confirmed, users may feel that their previous affective attitude towards using the service is confirmed. Accordingly, they will feel their time and effort in using the service have been well rewarded. These feelings may maintain their interest in using the service and thus they may obtain greater outcomes from usage (Thong et al. 2006). On the other side, if previous expectations are not confirmed, users will challenge their previous affective attitude and subsequently consider that the outcomes are not worthy of their investment in time and efforts. Subsequently, effective usage may be reduced, and poorer outcomes may be obtained from using the service. Thus, the relationship between affective attitude and user satisfaction will be weakened. Accordingly, we propose that:

H3-3: *Confirmation strengthens the positive relationship between affective attitude and user satisfaction*.

Emotional attachment at the use stage will induce users to be affectively committed to using the MMSs (Van Lange et al. 1997), which may commit their efforts to service usage with satisfaction. If previous expectations on the MMSs are confirmed after long-term usage, emotional attachment will induce a higher commitment at the post-use stage as users become increasingly confident in their emotional bond with the service (Vlachos et al. 2010). A higher commitment will induce greater effort in using the MMS and increase the overall outcome of using the service, and subsequently

increase satisfaction with the outcome of MMS usage. If previous expectations are not confirmed, even though users may be somewhat emotionally attached to using the service, they may be less affectively committed to the MMS because the outcomes do not meet their expectations. Lower affective commitment may weaken the positive relationship between emotional attachment and user satisfaction. We therefore propose that:

H3-4: *Confirmation strengthens the positive relationship between emotional attachment and user satisfaction*.

We surveyed long-term MMS users (i.e., patients with chronic diseases) to collect data for testing the above hypotheses. In the data analysis, we used several some demography characteristics of the patients as control variables, such as education, gender, and age. Further, the length of chronic diseases is further included as a control variable because the patients' illnesses may further their continuance decision on using the MMSs.

5.3 Summary of Study 3

Study 3 mainly focused on users' final affective evaluation on MMSs at the post-use stage, including the effects of previous affective evaluations on the conclusion stage evaluation (P3) (i.e., user satisfaction), and whether the effects are different under different use experiences. Specifically, this study explored the effects of affective attitude at the adoption stage and the emotional attachment at the use stage on user satisfaction at the post-use stage; further, user confirmation is proposed as the contingent factor on these effects. In summary, this study aims to explain the low continuance MMS usage and the Type II Inconsistencies related to the effects of previous affective evaluations.

Chapter 6 Methodology, Results, and Discussions

This chapter presents the methodology, results, and discussions of the thesis. First, the qualitative approach to verify the characteristics of patients with chronic diseases is introduced. Then, the research context and data collection procedures of the quantitative approach are introduced. Then detailed data analyses, model estimation results, and key findings of each study are provided. Finally, the last sub-section concludes this chapter.

6.1 Qualitative Approach

This thesis adopted a mixed methodology to test the theoretical model to increase the reliability of the results (Venkatesh et al. 2013). First, focus group interviews were conducted to confirm the characteristics of patients with chronic diseases. Next, three field surveys were conducted among patients with chronic diseases to collect quantitative data to test the research models.

The focus group is a useful qualitative research approach for exploratory studies (Calder 1977), and previous literature has demonstrated its effectiveness in the emerging mobile service context (Jarvenpaa and Lang 2005). As MMSs are still at an early developmental stage and have not been widely recognized by research scholars and practitioners, the focus group, therefore, is applicable for exploring potential users' responses to such services (Bloor 2001) and detecting the common characteristics of their responses to MMSs (Jarvenpaa and Lang 2005). The focus group approach was therefore adopted to verify the characteristics of patients with chronic diseases.

6.1.1 Participants of Focus Group

To improve the generalization of focus group results and ensure the proper discussion

process, we invited 26 respondents of different ages and divided them into four groups (Bryman 2012). Group 1 consisted of six students under 25 years of age from a university in northeast China. Group 2 included six junior employees aged 25 to 40. Eleven of the participants of Group 1 and Group 2 were healthy. Group 3 comprised seven senior employees aged 40 to 55. Five of them were suffering from chronic diseases, such as insomnia, hypertension, and calcium deficiency. Group 4 included seven retired elders aged 55 or above. They were aged 55 and above. Because of their advanced age, all Group 4 members had experienced or were experiencing chronic diseases. All participants had little prior experience with MMSs. Each of them received an incentive of about US $10 for participating in the focus group. Detailed information on the participants is presented in Table 6-1.

Table 6-1 Demographics of the Participants in the Focus Group

Group #	Number of Participants	Age	Gender	Health Condition
Group 1	6	< 25	3 males, 3 females	Healthy
Group 2	6	25-40	3 males, 3 females	One with chronic disease
Group 3	7	40-55	2 males, 5 females	Five with chronic diseases
Group 4	7	55+	2 males, 5 females	All with chronic diseases

6.1.2 Procedures of Focus Group Interviews

The four focus group interviews were conducted in parallel. Before the interviews, an introduction on MMSs and a semi-structured interview outline were prepared. The introduction was printed on a colored leaflet and explained how MMSs work and how they may benefit users. The outline interview included a warm-up section, an explanation of the interviews, a section on health conditions (i.e., current health conditions, health emotion, and health consciousness), an introduction to the service, and initial evaluation of the MMS (i.e., positive responses, negative responses, and

overall evaluation).

A moderator and several assistants were selected to conduct the focus group interviews. The moderator raised the topics according to the outline and guided the interview process. When needed, the moderator would ask follow-up questions to collect further information. The assistants made notes throughout the interview process and helped the moderator to accomplish all the aims listed in the outline. The interviews were recorded by audio and later transcribed for coding. Finally, the interviews of the four groups were coded using the guidelines presented by Creswell (2002).

6.1.3 Results of Focus Group Interviews

Six of the participants in Group 4 reported that they had a high sense of health consciousness. Five individuals in Group 4 had previously experienced long-term chronic problems, which had led caused them to realize the importance of physical health. The other two participants had observed their relatives' experiences with chronic diseases, and so they too were quite concerned about avoiding similar situations. Further, they spent much more time and efforts in their health and required more care than they needed. Consequently, since their retirement, all seven participants had spent considerable time on their health issues to reduce the impact of chronic diseases. They insisted on taking daily exercise, watching health programs on the TV, and taking health supplements, and various other measures. Two of the elderly participants responded as follows:

> Group 4 participant 1: "*I have congenital heart disease, i.e., a case of insufficient blood supply. I insist on treatment by taking healthy food and do not take medicine except in cases of emergencies. I must exercise in the morning and make my old husband exercise too. And now he does not take any medicine.*"

Group 4 participant 2: "*For a while, my legs gave me a lot of pain due to rheumatic arthritis. I even could not move down the stairs. Once I found that Tai Chi is good for my health, and I have practiced Tai Chi since 1995. Now I can walk freely. Moreover, since I have heard that the sea buckthorn fruit could prevent age-related illnesses. I now eat it every day*."

Because of the long-term influence of chronic diseases, the Group 4 participants found that it is impossible to entirely cure their diseases. Even though they had fought the chronic diseases for a long time and had achieved their goals to some extent, when talking about their diseases, they expressed concern and feelings of helplessness. Although they presented an overall positive attitude toward their lives, they generated negative emotions regarding their health conditions, for example:

Group 4 participant 1: "*The heart disease influenced my life a lot, as well as my children. I am now even a little tired of this illness.*"

Group 4 participant 2: "*There is no radical cure for rheumatic arthritis, so I have to carefully deal with it.*"

Group 4 participant 3: "*My two uncles and an aunt have hypertension, and my mother has heart diseases. The genetic cardiovascular disease in my family is very serious. When I was young, I did not realize the danger of this genetic disease, and was not very concerned about it, until my father died in 2006. Then my children and I worried a lot about my health. I have to pay a great deal of attention to my diet and living habits. The disease greatly affected my family.*"

Five of the seven participants in Group 3 suffered from chronic diseases, and showed a high sense of health consciousness. These five participants had experienced a decline in their health, but did not have much time for exercise because of their busy work schedules, indicating less rational in health decision-making. They

expressed concern about their current situation and worried about their future health conditions. One of the participants stated:

Group 3 participant 1: "*Due to hypoglycemia, I feel my health is getting from bad to worse. But as I spend considerable time on my work and family, I have hardly any time to deal with this problem. Thinking of the time when I am getting old, I am very concerned about my health.*"

Only one of the younger participants in Groups 1 and 2 was suffering from a chronic disease and, although he was aware of his illness, he was not overly concerned about it. He stated:

Group 2 participant: "*My health is poor. I suffer from a fatty liver disease and hypertension. I plan to deal with these problems by controlling my diet, but I cannot stick to it. Moreover, I also ignore my health problems*."

The participants (two from Group 3, five from Group 2, and six from Group 1) were not suffering from and had not experienced chronic diseases; and they did not show a high sense of health consciousness or negative emotion about their health. Further, for the participants with chronic diseases, either they cared too much of their health or did not do anything for their health, rendering a low level of health rationality.

Therefore, from the results of the focus group interviews, it can be concluded that participants who are suffering or have suffered from chronic diseases generally show higher levels of health consciousness, feel more negative emotions regarding their health, and possess a low level of health rationality than those who do not. These affective and decision characteristics residing within the patients are likely to influence their affective responses to the MMSs, which were tested by surveys in the next section.

6.2 Research Context

The research context of this thesis is the mHealth monitoring campaign provided by a leading hospital in Beijing. The hospital was built in 1958 and has more than 2100 employees, of which about 700 are physicians. In December 2015, the hospital launched a health management program to deliver a monitoring service through mobile devices named “Health Management Cloud Platform”. Through this program, the hospital can provide MMSs to the patients with chronic diseases.

The service provided by the hospital is a typical MMS. The service delivering process is as follows: (1) users use mobile monitoring devices, such as blood pressure monitors, glucometers, and cardiotachometers, to monitor and record their daily health indexes in the app; (2) the health campaign of the hospital then collects these daily health indexes through the app, and analyzes them with their health examination data; (3) the health professionals in the program provide health feedback to the users through the mobile app, including disease warning, health suggestions, and health education; and (4) users can self-manage their health according to the feedback, consult physicians remotely, and make an appointments. Figure 6-1 shows the data collection process of the service and Figure 6-2 shows examples of health feedback from the service.

Figure 6-1 Health Data Collection Process of the mHealth Monitoring Service

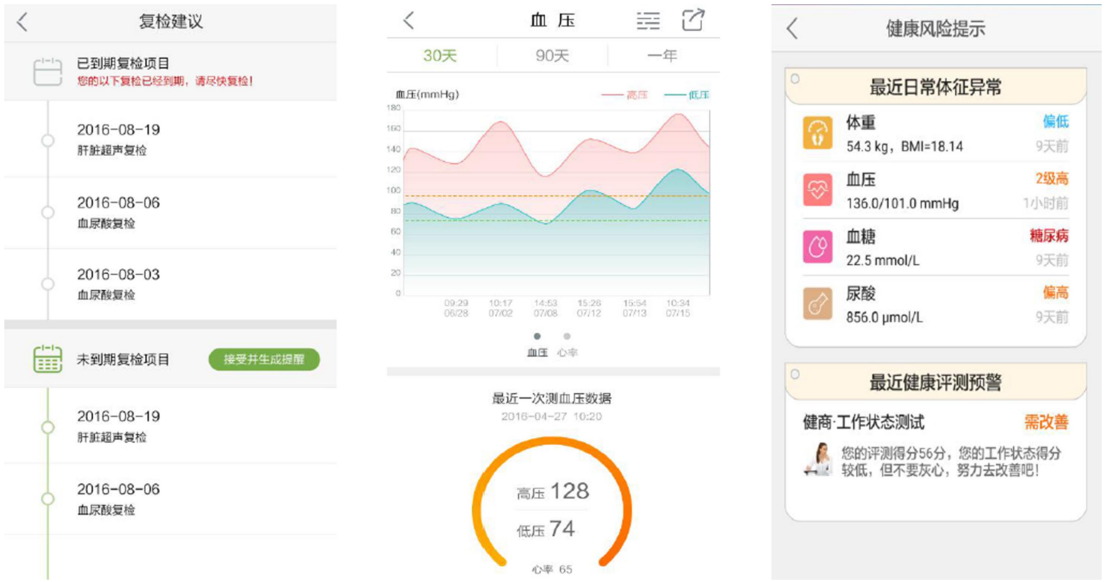

Figure 6-2 Health Feedback from the mHealth Monitoring Service

6.3 Data Collection Procedures

The respondents of the thesis are the users of the service who are suffering chronic diseases. A large company bought this service for their employees at the price of 500 RMB per year. The company planned to use the hospital's mHealth services to launch a health-awareness campaign for its employees, and so, it subscribed to the mHealth services offered by the Beijing hospital. With this subscription, employees could use their mobile devices to monitor their health indexes, such as exercise, blood pressure, and blood glucose readings, and upload them through the mobile app. The doctors of the hospital providing the services could retrieve the employees' indexes and analyze them, and whenever necessary, provide health advice and warnings to the employees. Before the company launched this mHealth campaign to all employees, as a pilot study, the company selected about 500 employees with chronic diseases to subscribe to this service. Further, based on the company's request, the hospital developed an enhanced module specifically for chronic disease management for the company.

Along the follow-up surveys of the mHealth program, the present thesis undertook surveys of the 500 pilot participants (or employees), conducting three surveys at different stages of the service implementation process (i.e., adoption stage, use stage, and post-use stage). Specifically, to test the research models, we conducted field surveys according to the timeline suggested by Venkatesh (2000), i.e., just after the introduction of the MMS to the employees, one month after service implementation, and three months after service implementation.

The first survey was conducted one week before the implementation of the program to test Study 1. During the first survey, the participants knew about the service, but had not started to use it. In this survey, we tested their use intention of the service, affective responses to using the service (i.e., valance, arousal, anxiety, perceived enjoyment, and affective attitude), affective state residing them (negative health mood and health consciousness), adoption intention and their general demographic information. At this stage, a total of 351 valid respondents have been collected after removing the incomplete questionnaires and those employees did not have chronic disease.

The second survey of the same user group was conducted one month after they started using the service. Before the survey, we randomly selected seven users and interviewed them to check whether they had obtained a basic understanding of the usage of the service. Results indicated that six of the users were aware of the costs and benefits of using the service, while the remaining one did not use the service after adoption and had a very limited understanding of the usage of the service. The survey was then sent to the sample population to measure affective evaluations of the device and feedback components, perceptions of gains and costs, emotional attachment to using the service, and rationality of health decision-making. We sent the survey

through the app of the service to those who had completed the first survey and who had started to use the service. In total, 262 users finished the second survey (a response rate of 74.6%), and 228 valid responses were collected.

MMS usage was measured by participants' usage experiences recorded in the system log. The prior research proposes three dimensions of usage, namely, duration, frequency, and intensity (Venkatesh et al. 2008). In our context, *duration* refers to how long the individuals used the service over a given time period, *frequency* refers to how many times individuals had used the MMS over the previous month, while *intensity* indicates how many features of the MMS they had used over the previous month. Duration was less appropriate in this study, because once the users had measured their indexes, the indexes were automatically uploaded to the system and the data collection/monitoring step was short and instantaneous. Therefore, we used frequency and intensity to operationalize MMS usage.

The third survey was conducted after three to four months (i.e., two to three months after the second survey) to measure users' long-term evaluations of the service. Two to three months after usage users were considered to have decided whether to continuously use the service, signaling the post-use stage (Kim and Malhotra 2005). To further confirm that the users had made their continuance decision, we checked their usage records in the service system and found the more than half of the 228 respondents (134) who had completed the second-wave survey. We randomly selected two continuous users and two discontinuous users for interview. Through the app, we sent an online survey to the 94 continuous users and a short phone message to the 134 discontinuous users (including the link to the survey). In total, 207 valid responses were received at this stage.

The third survey measured user satisfaction, user confirmation, and perceived

usefulness at the post-use stage. MMS continuance was measured as a binary variable based on usage records in the system to minimize common method bias—1 for continuous use and 0 for discontinuous use.

As most of the theoretical constructs have been well established in the literature, we adopted previous measures of these constructs and adapted them according to the affective categories. Appendices A–C show the measures used each study. Appendix D shows the Chinese versions of the three surveys.

Figure 6-3 shows the data collection procedures at the three stages based on the MMS program. Table 6-2 shows the demographic characteristics of the participants in the three studies.

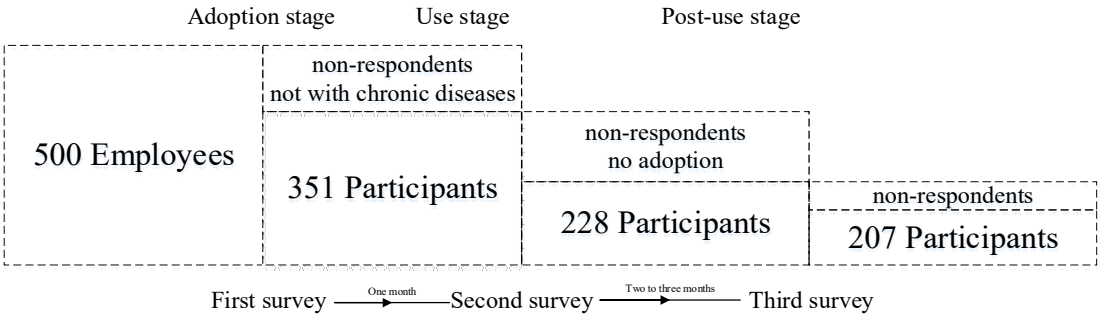

Figure 6-3 Data Collection Procedure

Table 6-2 Demographic Characteristics of the Participants

Characteristics		**First Survey**	**Second Survey**	**Third Survey**
Total Participants		351	228	207
Gender	Male	228	118	108
	Female	123	110	99
Age	30 or younger	16	10	10
	31-40	57	40	36
	41-50	180	112	96
	51-60	117	65	65
	61 or elder	1	1	0
Education	Middle school or lower	23	20	20
	Bachelor's Degree	311	202	185
	Master's degree or higher	177	6	4

6.4 Methodology and Discussion of Study 1

6.4.1 Participants in Study 1

As Study 1 focused on patients with chronic diseases, we selected the research participants who had or claimed to have chronic diseases as our survey sample. The first survey was conducted during the employees' annual physical examination in the hospital. Before their examinations, the doctors introduced the MMSs to them, and the questionnaire was sent to them after the introduction. An incentive of 10 RMB (about US$1.5) was offered to those who finished the survey. We did not limit the participants to patients with chronic diseases and, rather, posed a question to measure their chronic conditions to improve the reliability of their responses. In total, 500 questionnaires were sent out, and 351 valid responses (i.e., a response rate of 70.2%) were obtained after excluding incomplete responses and respondents who did not have chronic diseases. Detailed information of the measures is shown in Appendix A.

The most frequent chronic diseases suffered by participants were chronic gastritis (160), hypertension (79), rheumatic arthritis (66), cardiovascular and cerebrovascular diseases (42), and diabetes (30). 65.0% of the participants were males. The majority of participants were aged 41 to 50 years (51.3 %), and 117 of them were aged 51 to 60 years. Only 20.7% were under 40 years of age. The majority of them had attended college (88.6%), while 17 are postgraduates.

6.4.2 Measurement Model of Study 1

Validity and Reliability

We first tested the reliability and validity of the constructs. The theoretical model was tested by partial least squares (PLS) for two reasons: (1) it is a component-based structural equation modeling tool and suitable for path analyses with latent constructs (Chin et al. 2003); and (2) it is suitable for complex models with complicated

moderating effects (Chin et al. 2003, Wetzels et al. 2009). The results are shown in Table 6-3 and Table 6-4.

Table 6-3 Loadings and Cross-Loadings of Study 1

	AATT	AI	ANXT	ARSL	HCON	HEMO	PEN	VLNC
AATT1	**0.962**	0.532	-0.270	0.557	0.512	-0.271	0.675	0.597
AATT2	**0.980**	0.591	-0.226	0.575	0.507	-0.225	0.708	0.626
AATT3	**0.970**	0.557	-0.231	0.594	0.492	-0.228	0.669	0.617
AI1	0.568	**0.933**	-0.322	0.552	0.500	-0.228	0.570	0.582
AI2	0.551	**0.952**	-0.276	0.517	0.495	-0.270	0.555	0.587
AI3	0.687	**0.936**	-0.244	0.527	0.475	-0.237	0.569	0.562
ANXT1	-0.267	-0.330	**0.923**	-0.255	-0.125	0.435	-0.122	-0.309
ANXT2	-0.171	-0.194	**0.917**	-0.217	-0.078	0.465	-0.106	-0.251
ANXT3	-0.240	-0.256	**0.947**	-0.233	-0.137	0.444	-0.168	-0.274
ANXT4	-0.232	-0.302	**0.935**	-0.163	-0.107	0.370	-0.155	-0.241
ARSL1	0.553	0.536	-0.239	**0.926**	0.401	-0.146	0.499	0.786
ARSL2	0.565	0.513	-0.196	**0.927**	0.399	-0.120	0.574	0.764
ARSL3	0.431	0.435	-0.248	**0.854**	0.295	-0.130	0.422	0.685
ARSL4	0.587	0.562	-0.183	**0.930**	0.453	-0.076	0.571	0.769
HCON1	0.521	0.521	-0.065	0.435	**0.886**	-0.107	0.460	0.487
HCON2	0.510	0.494	-0.072	0.405	**0.946**	-0.157	0.433	0.465
HCON3	0.421	0.422	-0.141	0.332	**0.910**	-0.208	0.361	0.393
HCON4	0.368	0.395	-0.190	0.345	**0.809**	-0.124	0.324	0.386
HNEM1	-0.208	-0.245	0.437	-0.113	-0.135	**0.919**	-0.123	-0.199
HNEM2	-0.239	-0.248	0.405	-0.139	-0.156	**0.949**	-0.140	-0.247
HNEM3	0.029	-0.022	0.317	0.097	0.001	**0.809**	0.027	0.036
HNEM4	-0.225	-0.219	0.447	-0.081	-0.158	**0.931**	-0.116	-0.167
PEN1	0.661	0.549	-0.132	0.547	0.398	-0.104	**0.970**	0.586
PEN2	0.679	0.600	-0.146	0.561	0.445	-0.126	**0.978**	0.601
PEN3	0.716	0.603	-0.159	0.564	0.470	-0.178	**0.972**	0.615
VLNC1	0.576	0.563	-0.270	0.760	0.406	-0.197	0.556	**0.934**
VLNC2	0.585	0.552	-0.292	0.774	0.452	-0.268	0.561	**0.955**
VLNC3	0.595	0.576	-0.271	0.799	0.466	-0.228	0.609	**0.959**
VLNC4	0.617	0.588	-0.269	0.789	0.526	-0.208	0.598	**0.944**

Note: AATT = Affective Attitude; AI = Adoption Intention; ANXT = Anxiety; ARSL = Arousal; HCNS = Health Consciousness; HEMO = Negative Health Emotion; PEN= Perceived Enjoyment; VLNC=Valance

Table 6-4 Correlation Matrix of Study 1

	AVE	**C.R.**	**AATT**	**AI**	**ANXT**	**ARSL**	**HCNS**	**HEMO**	**PEN**	**VLNC**
AATT	0.942	0.980	**0.971**							
AI	0.884	0.958	0.818	**0.940**						
ANXT	0.866	0.963	-0.250	-0.298	**0.931**					
ARSL	0.828	0.951	0.593	0.566	-0.234	**0.910**				
HCNS	0.791	0.938	0.519	0.521	-0.123	0.431	**0.889**			
HEMO	0.746	0.920	-0.249	-0.261	0.458	-0.127	-0.166	**0.864**		
PEN	0.948	0.982	0.705	0.601	-0.150	0.573	0.450	-0.141	**0.973**	
VLNC	0.887	0.975	0.632	0.614	-0.292	0.827	0.491	-0.228	0.618	**0.942**

Note: AVE = Average Variance Extracted; C.R. = Composite Reliability; the values in bold on the diagonal are the square roots of AVEs.

Composite reliabilities of the eight constructs exceeded 0.920, significantly above 0.707, indicating composite reliability. Most of the loadings of items were above 0.800, which were largely above the suggested threshold of 0.600 (Barclay et al. 1995, Chin 1998, Jiang and Benbasat 2007), indicating convergent validity (Chin 1998). Moreover, the factor loadings of each construct were much greater than the cross-loadings on other constructs, and correlations of any two constructs were much smaller than their square root of the AVE (average variance explained), indicating discriminant validity (Chin 1998).

Common Method Bias

As survey data were collected from single participants using a single method, common method bias might threaten the validity of the results (Podsakoff et al. 2003). In this study, common method bias was tested by Harman's (1967) single factor approach. Following this approach, we found that the first unrotated factor only explained 30.4% of the covariance of the main constructs in the model, which is lower smaller than the ideal threshold. Thus, the results indicate that common method bias would have little effect in this study.

6.4.3 Structural Model of Study 1

We adopted hierarchical regression analysis to test the structural model. The effects of control variables were first examined, after which the independent variables were incorporated to test the direct effects of perceived enjoyment and anxiety. Next, the hypotheses were tested in the third stage. Table 6-5 shows the results of the testing of the structural model.

Table 6-5 Structural Model Results of Study 1

Dependent Variable: Adoption Intention	
Independent Variable	
Affective Attitude	0.818***
R^2	.669

Dependent Variable: Affective attitude	Model 1	Model 2	Model 3	Model 4	Model 5
Stage 1 Control Variable					
Arousal	.222**	.126*	.117*	.129**	.129*
Valance	.448***	.193**	.159**	.174**	.132*
Stage 2 Independent Variable					
Perceived Enjoyment		.500***	.578***	.473***	.413***
Anxiety		-.089**	-.226***	-.054	-.161**
Stage 3 Moderating Effect					
ANXT*PEN			-.263***		
HEMO*PEN				-.135*	
HEMO*ANXT				.023	
HCNS*PEN					.007
HCNS*ANXT					-.170**
R^2	.415	.571	.618	.595	.621
ΔR^2		.156	.047	.024	.050

Note: * $p < 0.050$; ** $p < 0.010$; *** $p < 0.001$.

The results showed that the model with independent variables explained 57.1% of the variance of affective attitude. The effect of perceived enjoyment on affective attitude was positive and significant ($\beta = 0.500$, $t = 7.854$, $p < 0.001$) and the effect of anxiety on affective attitude was negatively significant ($\beta = -0.089$, $t = 2.552$, $p < 0.010$). The moderating effect of anxiety on the effect of perceived enjoyment was negative and significant ($\beta = -0.263$, $t = 3.973$, $p < 0.001$), thus supporting H1-1. The moderating effect of negative health emotion on the effect of perceived enjoyment was negative and significant ($\beta = -0.135$, $t = 2.120$, $p < 0.050$), thus supporting H1-2. The moderating effect of health consciousness on the effect of anxiety was negative and significant ($\beta = -0.170$, $t = 2.821$, $p < 0.010$), thus supporting H1-5. The moderating role of negative health emotion on the effect of anxiety ($\beta = 0.023$, $t = 0.659$, $p > 0.050$) and the moderating role of health consciousness on the effect of perceived enjoyment ($\beta = 0.007$, $t = 0.186$, $p > 0.050$) were not significant. Thus, H1-1, H1-2, and H1-5 were supported, while H1-3 and H1-4 were not.

Further testing of H1-1, H1-2, and H1-5 was conducted using the procedures

proposed by Aiken et al. (1991) to examine the moderating effects. The results are shown in Figures 6-4, 6-5, and 6-6. As shown in Figure 6-4, with a high level of anxiety (line 2), affective attitude increases less rapidly than when anxiety is low (line 1), indicating that high anxiety will negate the positive effect of perceived enjoyment. As shown in Figure 6-5, with a high level of negative health emotion (line 2), affective attitude increases less rapidly than when negative emotion is low (line 1), indicating that more negative health emotion will negate the positive effects of perceived enjoyment. As shown in Figure 6-6, affective attitude decreases only when health consciousness is high (line 2), and at a low level of health consciousness, affective attitude does not decrease regardless of the level of anxiety. These results provide further evidence to support H1-1, H1-2, and H1-5.

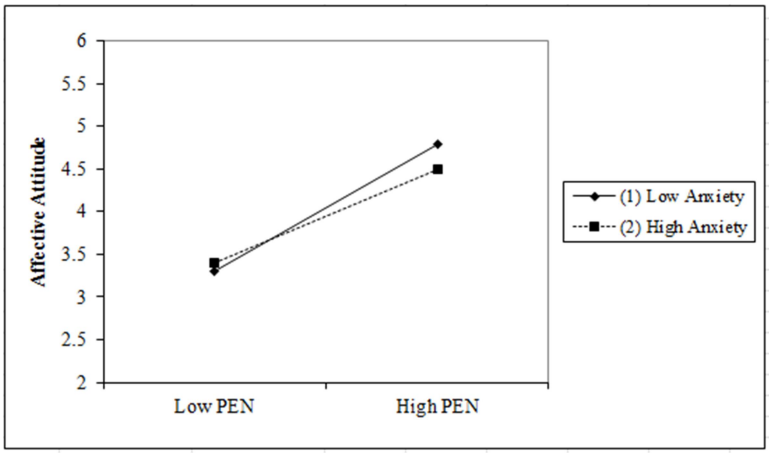

Figure 6-4 The Moderating Effect of Anxiety on the Effect of Perceived Enjoyment (PEN)

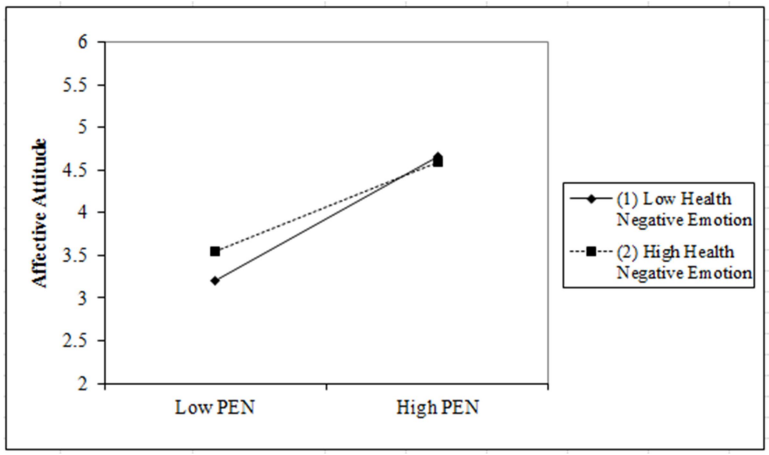

Figure 6-5 The Moderating Effect of Negative health emotion on the Effect of Perceived Enjoyment (PEN)

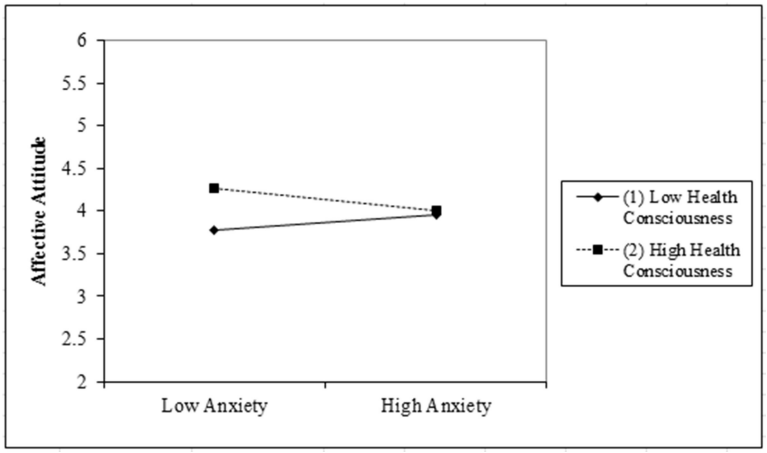

Figure 6-6 The Moderating Effect of Health Consciousness on the Effect of Anxiety

6.4.4 Discussion and Implications of Study 1

Key Findings

This study aimed to explain the Type II Inconsistencies in the P1 relationships by examining the affective boundary conditions (i.e., induced affective state and the affective characteristics of patients with chronic diseases) under which process-based affective evaluation (i.e., perceived enjoyment) and induced affective state (i.e., anxiety) exert their effects on outcome-based affective evaluation (i.e., affective attitude) differently. Specifically, the moderating role of anxiety on the effect of perceived enjoyment and the moderating role of negative health emotion and health

consciousness on the effects of perceived enjoyment and anxiety were investigated among patients with chronic diseases in the MMS context. Focus group interviews were conducted to verify the affective characteristics of patients with chronic diseases, and a field survey was conducted to empirically test the theoretical model. In doing so, this study concludes three aspects of key findings.

First, patients with chronic diseases have their specific affective responses to MMSs as the affect resulting from the diseases can influence their affective responses to the services. Owning to the long-term influence of chronic diseases, most of them generally perform in a negative affective state (i.e., negative emotions) regarding their health. When considering about their health conditions, they would feel sad, upset, or worried. Conversely, the sufferers of chronic diseases may have positive affective dispositions (i.e., a high sense of consciousness), more concern about their health and a greater desire to adopt new health measures than the general population. Their unique affective responses to their health, which are not directly related to their affective responses to the MMSs, can be the affect residing within a person that can influence their affective responses to the services.

By proposing and testing the moderating effects of negative health emotion and health consciousness on the effects of the induced affective state and process-based affective evaluation, this study found that the affective characteristics of patients with chronic diseases play a crucial moderating role in their affective responses to health services. Further, their affective characteristics can also be used to explain the inconsistent relationships between the affective constructs in previous literature.

Second, in the present study, the relationship between perceived enjoyment and affective attitude was negatively moderated by anxiety and negative health emotion. The negative moderating effect of anxiety suggests that, when there is high anxiety

about using a new ICT-based service, the effects of perceived enjoyment on potential users' affective attitude will be weakened, indicating that the positive effects of process-based affective evaluation on outcome-based affective evaluation will be negated by the negative induced affective state in the affective responses. The moderating effect of negative health emotion suggests that when negative emotion exists, the effects of perceived enjoyment on the individual's affective attitude will be weakened. This indicates that the positive effects of process-based affective evaluation on outcome-based affective evaluation will be negated by the negative affective state, which is beyond the affective responses to the service. The moderating role of anxiety and negative health emotion helps to explain why perceived enjoyment would result in a less positive affective attitude in some situations and the inconsistent results regarding the relationships between perceived enjoyment and its outcomes.

The proposed moderating role of health consciousness on the relationship between perceived enjoyment and affective attitude was found to be non-significant. The reason for this insignificant result could possibly be that health consciousness, as a temporally unconstrained disposition (a mode of affective response (Clark et al. 1994)) could influence the overall affective response to the service, which influences the users' process- and outcome-based affective evaluation simultaneously.

Third, the relationship between anxiety and affective attitude was found to be negatively moderated by health consciousness. The direct effect of anxiety was negatively significant, and the interaction between anxiety and health consciousness was also significant. The negative moderating effect of health consciousness suggests that when there is a high sense of health consciousness in their daily life, the effect of anxiety on an individual's affective attitude will be strengthened, indicating that the

negative effects of the negative induced affective state on outcome-based affective evaluation will be magnified by the positive affective disposition that beyond the affective responses to the service. The moderating role of health consciousness helps to explain why anxiety would result in a less negative affective attitude in some situations and cause the inconsistent results of the relationships between anxiety and its outcomes.

The proposed moderating role of negative health emotion on the relationship between anxiety and affective attitude was found to be insignificant. The reason may possibly be that even though negative health emotion and anxiety are from different affective categories, both of them are affective states. Therefore, the affective state beyond the affective response process to the service (i.e., negative health emotion) could be closely related to the users' induced affective state (i.e., anxiety) in the response.

Theoretical Implications

This study presents several theoretical implications. First, it explores the affective responses of the potential users to the MMSs, i.e., patients with chronic diseases. This special group is a growing segment of the population, but has been largely neglected in the IS literature. Because of their illnesses, patients with chronic diseases have special needs from health services and show different affective responses to health-related ICTs or services. Their unique affective responses to their health conditions, which are not directly related to their affective responses to the MMSs, can be the affect residing within a person that influence their affective responses to the services, which renders their responses more complicated than others. Thus, exploring the affective response of patients with chronic diseases will present fresh insight into affective research in user-ICT interaction and advance the current knowledge on the

decision-making of this specific group.

Second, with the aim to rationalize Type II Inconsistencies regarding the effects of affective factors, this study explored the affective boundary conditions under which affective factors exert their effects on affective evaluation differently. This examination was designed to help explain the mixed findings in previous affect literature that cannot be directly explained by considering the category of affective constructs. We limited our research respondents to patients with chronic diseases. Then, we tested the effects of perceived enjoyment on affective attitude under different induced affective states, specifically anxiety. Finally, we tested the effects of perceived enjoyment and anxiety on affective attitude regarding different affective characteristics of patients with chronic diseases, i.e. negative health emotion and health consciousness.

This study found that the induced affective state (i.e., anxiety) and free-floating affective state (i.e., negative health emotion) negatively moderates the relationship between process-based affective evaluation (i.e., perceived enjoyment) and outcome-based affective evaluation (i.e., affective attitude). The results also indicated that affective disposition residing in a person (i.e., health consciousness) negatively moderates the relationship between the induced affective state (i.e., anxiety) and outcome-based affective evaluation (i.e., affective attitude). This finding provides a better understanding of how process-based affective evaluation and the induced affective state influence outcome-based affective evaluation by specifying the affective boundary conditions. Consequently, this study provides a plausible explanation of the inconsistent results of the relationships between different affective constructs. Therefore, this study not only improves understanding of the Type II Inconsistencies in affective responses to a certain extent, but also provides suggestions

for future studies on affective response research, specifically, taking into account affective boundary conditions.

Finally, the moderating role of the affective characteristics of patients with chronic diseases (i.e., negative health emotion and health consciousness) provides insight into how patients with chronic diseases form affective responses to ICT-based health services. As a consequence of the long-term influences, sufferers of chronic diseases generate negative emotions and a high sense of consciousness about their health. Their affective characteristics play a moderating role when they form affective responses to new health-related behaviors. This finding suggests that patients with chronic diseases may have a special but more complicated affective response process. The results of this study also suggest that affect research should pay specific attention to the affective characteristics of the targeted research group.

Practical Implications

This study provides practical implications for both MMS providers and patients with chronic diseases. First, service providers need to be aware of the negative effects of the affective characteristics of potential or actual users with chronic diseases. Even though their negative health emotion and health consciousness could induce them to use the services, these characteristics can also play a negative moderating role in their affective responses to the services. Second, service providers should take measures to reduce the negative effects of these characteristics, such as reducing users' anxiety and increasing their enjoyment through service design and training. Finally, service providers should also increase potential or actual users' service engagement through a cognitive process rather than employing affective factors. For instance, service providers could promote the benefits of the service to their consumers to increase their cognitive evaluations of the service.

This study can help to recognize the unconscious effects of the affective characteristics of patients with chronic diseases. These patients may be aware that the long-term influence of their chronic diseases may motivate them into taking positive health measures. However, the long-term influence can also cause them to unconsciously produce negative evaluations of certain measures. Only by recognizing the unconscious effects of their affective characteristics may users with chronic diseases be able to make more rational health decisions across their lifetime.

6.5 Results and Discussion of Study 2

6.5.1 Participants in Study 2

The data of Study 2 were collected through a follow-up survey of the health program. The second survey was conducted about one month after the company's employees adopted the MMS. We sent an online survey to the 313 employees who participated in the first survey and had adopted and begun using the service through the mHealth app. Detailed information of the measures is shown in Appendix B. An incentive of 10 RMB (about US$1.5) was offered to those who finished the survey.

A total of 262 MMS users completed the survey (i.e., with a 74.9% response rate). We collected 228 valid respondents, and 34 were excluded because of incomplete responses. Of the 228 valid responses, 118 respondents were males, with 18.9% of the respondents being in their thirties, while 51.3% were in their forties, and 29.8% were in their fifties. The majority of the respondents had obtained a college degree (94.8%), while six had obtained a master degree or higher. We compared demographic characteristics between respondents and non-respondents with regard to age, education, gender, and use experience, and found no significant differences between the two groups, indicating minimal threat from non-response bias.

6.5.2 Measurement Model of Study 2

Validity and Reliability

The measurement model was first tested using Smart PLS to ensure the validity and reliability of the measurement items. The results are presented in Table 6-6 and Table 6-7.

Table 6-6 Loadings and Cross-Loadings of Study 2

	DVCS	EMAT	FDBS	HRTN	PVAL	USFR	USIN
DVCS1	**0.917**	0.469	0.488	0.533	0.461	0.348	0.566
DVCS2	**0.942**	0.477	0.495	0.506	0.428	0.246	0.507
DVCS3	**0.922**	0.464	0.461	0.449	0.490	0.230	0.491
EMAT1	0.274	**0.784**	0.298	0.239	0.236	0.243	0.546
EMAT2	0.532	**0.895**	0.498	0.240	0.468	0.270	0.533
EMAT3	0.353	**0.849**	0.353	0.244	0.292	0.267	0.547
EMAT4	0.501	**0.883**	0.471	0.261	0.500	0.290	0.601
FDBS1	0.496	0.441	**0.926**	0.601	0.580	0.321	0.502
FDBS2	0.465	0.460	**0.930**	0.551	0.574	0.271	0.513
FDBS3	0.486	0.461	**0.927**	0.573	0.596	0.232	0.470
HRTN1	0.382	0.259	0.389	**0.676**	0.369	0.203	0.326
HRTN2	0.395	0.211	0.458	**0.753**	0.397	0.117	0.317
HRTN3	0.414	0.207	0.468	**0.821**	0.408	0.155	0.310
HRTN4	0.453	0.239	0.549	**0.789**	0.447	0.115	0.326
HRTN5	0.414	0.184	0.509	**0.805**	0.409	0.093	0.249
PVAL1	0.553	0.410	0.691	0.481	**0.891**	0.233	0.534
PVAL2	0.449	0.395	0.627	0.463	**0.889**	0.105	0.507
PVAL3	0.503	0.433	0.659	0.478	**0.910**	0.209	0.499
USFR	0.298	0.314	0.296	0.177	0.206	**1.000**	0.398
USIN	0.563	0.598	0.533	0.398	0.573	0.398	**1.000**

Note: DVCS= Device Satisfaction, EMAT=Emotional Attachment, FDBS=Feedback Satisfaction, HRTN= Health Rationality, PVAL=Perceived Value, USFR= Frequency of Use, USIN= Intensity of Use

Table 6-7 Correlations and Discriminant Validity of Study 2

	Cronbach's Alpha	Composite Reliability	AVE	DVCS	EMAT	FDBS	HRTN	PVAL	USFR	USIN
DVCS	0.918	0.948	0.859	**0.927**						
EMAT	0.878	0.915	0.730	0.506	**0.854**					
FDBS	0.919	0.949	0.861	0.543	0.489	**0.928**				
HRTN	0.827	0.879	0.594	0.537	0.287	0.619	**0.771**			
PVAL	0.878	0.925	0.804	0.485	0.459	0.636	0.529	**0.897**		
USFR	1.000	1.000	1.000	0.298	0.314	0.296	0.177	0.206	**1.000**	
USIN	1.000	1.000	1.000	0.563	0.598	0.533	0.398	0.573	0.398	**1.000**

Note: AVE=Averaged Variance Extracted; the diagonally arranged bold numbers are the square roots of AVEs.

The composite reliability of each construct was above 0.870, significantly greater

than the threshold of 0.700, while the average variances extracted (AVEs) were significantly greater than 0.500, indicating good construct reliability (Fornell and Larcker 1981). Each construct had item loadings higher than 0.700, suggesting convergent validity (Chin 1998). All item loadings of each construct were much greater than the cross-loadings on other constructs, and the correlations between any two constructs were smaller than the square root of their AVEs, thus indicating discriminant validity (Chin 1998).

Common Method Bias

This study used a second data source, that is, the system log, to measure the dependent variable (i.e. MMS usage) to reduce the common method bias. Then Harman's (1967) single factor approach was further adopted to test the common method bias among the constructs measured by survey. Following this approach, the first unrotated factor was found to explain only 39.33% of the covariance of the main constructs in the model, which is lower than the ideal threshold. The result indicates that common method bias would have little effect in this study.

6.5.3 Structural Model of Study 2

We tested the structural model in three stages. First, the basic model without perceived value and health rationality was tested. The results show that emotional attachment positively influences frequency of use ($\beta = 0.145$, $t = 2.037$, $p < 0.010$) and intensity of use ($\beta = 0.763$, $t = 17.568$, $p < 0.001$), thereby supporting H2-1. Device satisfaction ($\beta = 0.226$, $t = 2.673$, $p < 0.001$) and feedback satisfaction ($\beta = 0.138$, $t = 2.018$, $p < 0.010$) both significantly influence emotional attachment, hence supporting H2-3a and H2-3b. The R^2 values of emotional attachment, frequency of use, and intensity of use are explained by 42.1%, 14.6%, and 65.8%, respectively.

Second, the model with the inclusion of perceived value was tested. Device

satisfaction positively influences emotional attachment (β = 0.238, t = 2.196, p < 0.050), while feedback satisfaction does not (β = 0.142, t = 1.538, p > 0.100). Further, we found device satisfaction (β = 0.567, t = 8.590, p < 0.001) and feedback satisfaction (β = 0.258, t = 3.817, p < 0.001) also positively influence perceived value. Therefore, H2-4a and H2-4b are supported. Perceived value positively influences emotional attachment (β = 0.118, t = 1.697, p < 0.100), thus, H2-2 is supported. The R^2 values of perceived value and emotional attachment are explained by 63.5% and 42.1%, respectively.

When incorporating perceived value into the structural model, the paths from device satisfaction and feedback satisfaction to emotional attachment became less significant (β = 0.238, p < 0.050 and β = 0.142, p > 0.100). We further tested the mediation effects of perceived value using the Sobel test (Sobel 1982). The results indicate that perceived value significantly mediates the effects of device satisfaction (t = 2.179, p < 0.050) and the effects of feedback satisfaction (t = 3.123, p < 0.010). Therefore, perceived value partially mediates the effects of device satisfaction and feedback satisfaction on emotional attachment, indicating that service-component satisfaction both directly and indirectly influences overall affective evaluation regarding the use of MMSs.

Third, the full model with moderating effects was tested. The results are shown in Figure 6-7.

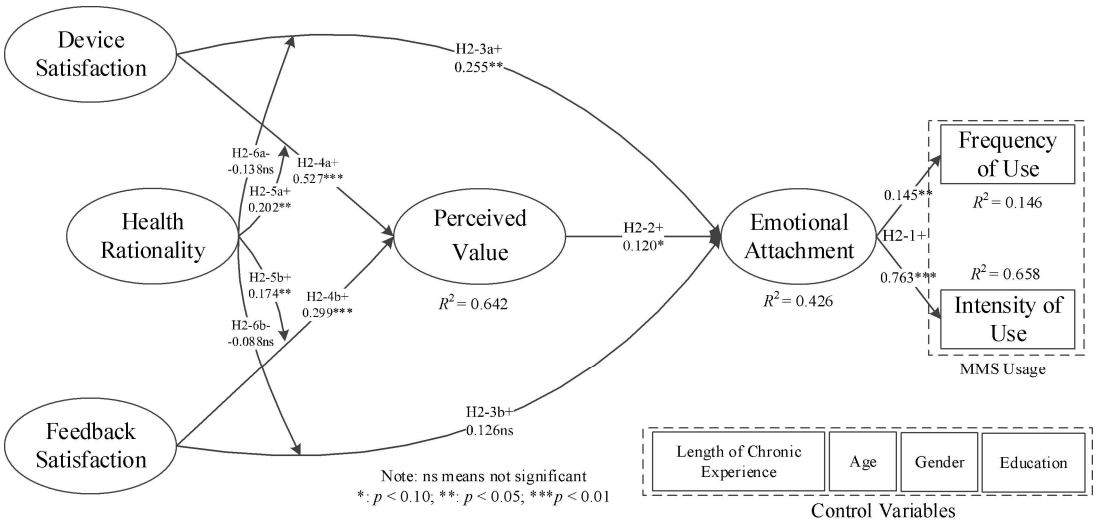

Figure 6-7 Results of the Full Model of Study 2

Figure 6-7 shows that health rationality positively moderates the effects of device satisfaction (β = 0.202, t = 2.016, p < 0.050) and feedback satisfaction (β = 0.174, t = 1.982, p < 0.050) on perceived value. Hence, H2-5a and H2-5b are supported. However, the moderating effects on the effects of device satisfaction (β = −0.138, t = 1.381, p > 0.100) and feedback satisfaction (β = −0.088, t = 0.851, p > 0.100) on emotional attachment are both negative, but non-significant. Thus, H2-6a and H2-6b are not supported.

To further test the moderating effects (H2-5a and H2-5b), we examine the moderations using the procedures by Aiken et al. (1991). The results are shown in Figures 6-8 and 6-9. As shown in Figure 6-8, at a high level of rationality (dot line), perceived value increases more rapidly than when rationality is low (solid line), indicating that high level of health rationality strengthens the positive effect of device satisfaction. As shown in Figure 6-9, at a high level of rationality (dot line), perceived value also increases more rapidly than when rationality is low (solid line), indicating that high level of health rationality strengthens the positive effect of feedback satisfaction. These results provide further evidence to support H2-5a and H2-5b.

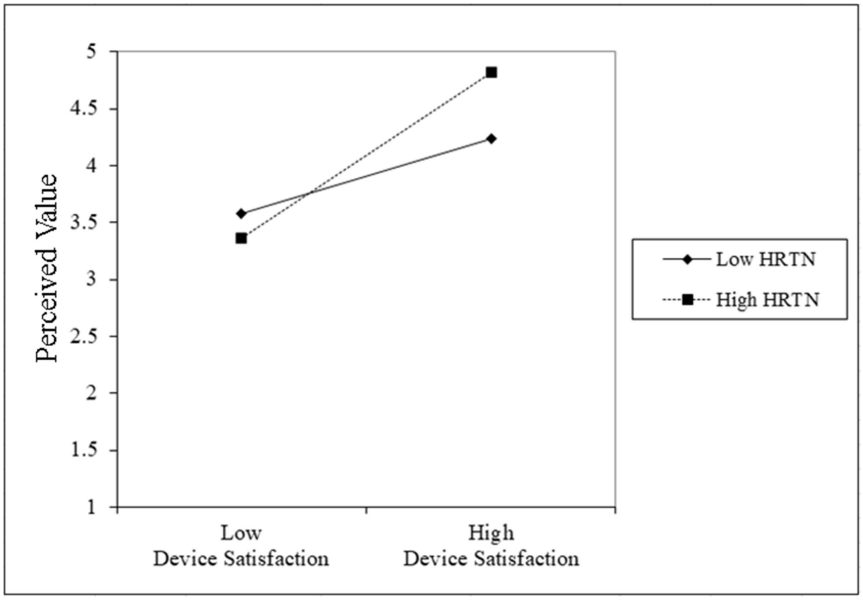

Figure 6-8 The Moderating Effect of Health Rationality on the Effect of Device Satisfaction

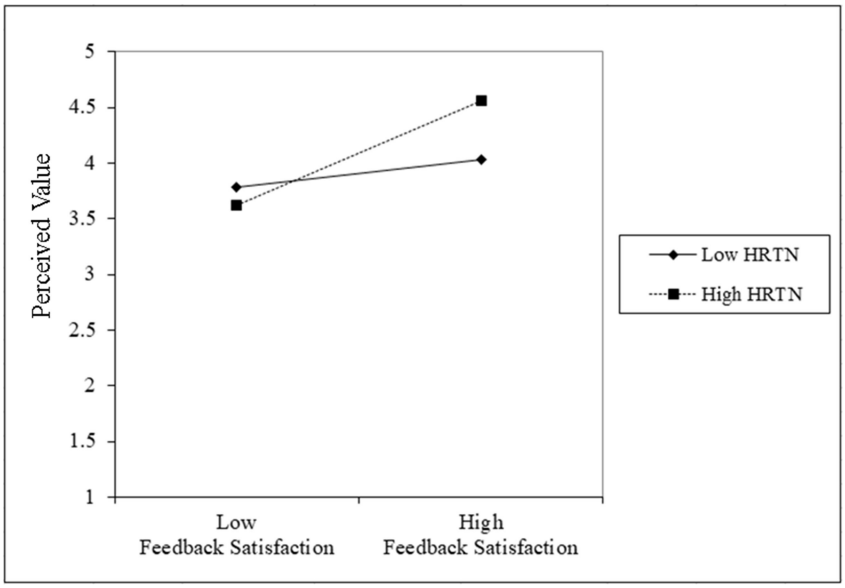

Figure 6-9 The Moderating Effect of Health Rationality on the Effect of Feedback Satisfaction

6.5.4 Discussion and Implications of Study 2

Key Findings

In this study, we investigated how actual MMS users, i.e., patients with chronic diseases, develop emotional attachments to using MMSs based on their affective responses to two MMS components, that is, monitoring device and personalized

feedback. An affect transfer lens was adopted to capture the transfer of affect from MMS components to the entire MMS through cognitive and affective routines. We theorized that the moderating role of health rationality on the above relationships and health rationality sets the boundary condition of the two transfer routines.

Three aspects of our study comprise the key findings. First, users' emotional attachment to using an MMS can induce more active usage. In using MMS for monitoring their chronic diseases, patients will develop an affective bond with it to obtain physical or psychological support. This emotion-laden bond further nurtures their commitment to using the service, which results in their active use of the MMS.

Second, user satisfaction with service components, directly and indirectly, influences their overall affective evaluation of using the MMS. Our findings suggest (and have empirically proven) that device satisfaction and feedback satisfaction can directly and indirectly (i.e., through perceived value) transfer users' emotional attachment to MMS usage. When they perceive satisfaction with the device or personalized feedback, they are more likely to make a positive affective evaluation of their service usage, for example, in developing emotional attachments.

Finally, patients' reliance on service-component affective evaluations in the course of making an overall affective evaluation of using a service is contingent on their decision rationality. Our study finds that health rationality positively moderates the effects of device satisfaction and feedback satisfaction on perceived value. However, the proposed negative moderating roles of the direct effects of device satisfaction and feedback satisfaction on emotional attachment are not supported. The insignificant results of H2-6a and H2-6b indicate that whether making a rational or less rational decision, there is no difference in a user's reliance on a misattribution routine to transfer the learned affective evaluations to the new affective evaluation. One

possible reason for this is that the misattribution routine in an affect transfer is attributable to one's lack of ability to distinguish the causes of the affect (Payne et al. 2005). In this situation, regardless of a rational or less rational decision, users will misattribute their affect when evaluating a service.

Theoretical Implications

This study also provides several theoretical implications. First, this study reveals the strongly significant relationships between affective responses to components and overall affective responses. The findings indicate that patients' learned affective evaluations of service components can directly and indirectly influence their overall affective evaluations of using the MMS, which further promotes their usage behavior. Our study provides a novel approach for investigating affective evaluation regarding the use of MMSs. The ICT-based design of emerging services makes human interactions with such services more complicated. It, therefore, became essential to explore users' affective responses to using such services according to their interactions with the core components of the services. In doing so, our study provides insights into the underlying mechanisms of how affective responses to service components can influence affective responses to the entire service.

Second, this study contributes to the affect transfer literature by revealing the underlying mechanisms of affect transfer and proposing a plausible explanation for the mixed findings thus far. Although affect transfer has been widely studied, there is no consensus about the underlying mechanisms of how affect is transferred, and there are conflicting outcomes regarding the transfer process. This study explored the transfer process from a balanced perspective of cognitive routine and misattribution routine, proposing that the combined effects are contingent on decision rationality. Faced with diverse levels of decision rationality, patients rely on their cognitive processes

differently during affect transfer, which can result in different outcomes of the transfer process. Accordingly, this study sheds light on the underlying mechanisms of how affect is transferred explicitly and provides a plausible explanation for the mixed findings of the affect transfer literature.

Third, the findings provide new insights into MMS use in the innovation diffusion literature. Although system usage has been an important research topic in recent decades, most of the literature has adopted a cognitive perspective by examining the confirmation between expectations and outcomes in predicting post-adoption behavioral intentions. In contrast, our study investigated the influence of affective responses on the prediction of actual usage in the mHealth context. Consistent with previous propositions in the affective response literature (Zhang 2013), our findings demonstrate the significant role of affective responses in service diffusion, especially in predicting actual usage behavior at the post-adoption stage.

Fourth, by exploring the contingency role of health rationality, this study contributes to the current knowledge of human decision-making processes. The research on rational choice theory argues that this theory cannot be generalized when emotions exist, and further frameworks are called for to "make connections with research on emotions and cognition" (Mellers et al. 1998). We propose that affect can be transferred through a cognitive routine (i.e., manifested as a rational decision-making process) and patients' reliance on this routine is contingent on their health rationality. This study not only drew on health rationality as a bridge between affective responses and the cognition process but also gained knowledge of decision-making styles in the existence of both cognition and emotions.

Finally, by investigating the moderating role of a decision characteristic of patients with chronic diseases—health rationality—on the affect transfer process, this

study provides insights into how actual MMS users, that is to say, patients with chronic diseases, respond to such services. Patients with chronic illnesses are a growing population, but their health concerns have been largely neglected in the previous literature. They have special but more complicated affective responses to using health services because of the long-term influences of chronic illness. Our study not only sheds light on how patients with chronic diseases respond affectively to using health services by revealing their usage behavior but also indicates how the long-term battle with their illnesses shapes their health decision-making.

Practical Implications

This study highlights some practical implications for MMS providers, health professionals, and patients. First, service providers need to evaluate the designs of core components of their services. Users' satisfaction perceptions of the service components encourage them to form positive evaluations of MMS usage and to use the services more actively. In contrast, unfavorable perceptions may deter active usage. Thus, service providers are encouraged to devote attention to every core component of their services. Second, as emotional attachment to using a service can influence active usage, service providers are advised to adopt measures to increase the emotional bond between users and their services. Providers can motivate users to treat the MMS as an essential part of their daily lives, especially in the case of patients with chronic diseases.

Service users need to be aware of the misattribution process in their evaluation of their services. This is because they sometimes simply misattribute their evaluations of the service components to the service, which may produce less rational decisions. We cite, for instance, that users may be favorably influenced by a service carrier with a well-designed portal and fail to understand whether such a service can fully meet their

needs. Therefore, users should notice their misattributions and focus more on whether they can benefit from using health services to make more rational health decisions.

This study also provides some suggestions for the health professionals. Our survey revealed that patients exhibit various levels of health rationality when making health decisions, and health rationality may influence their responses to the health services and treatments. To increase the effectiveness of the health services and treatments, health professionals should observe the patients' health rationality based on their interactions with patients, for example, whether they rely on analytical approaches to make health decisions. If the patients have a high sense of health rationality, health professionals can emphasize the benefits of the services and treatments to increase patient compliance. Otherwise, health professionals can increase their positive affective evaluations of the services and treatments or arouse their health anxiety about non-compliance.

6.6 Results and Discussion of Study 3

6.6.1 Participants in Study 3

To test the model of Study 3, we conducted the third survey. This survey was conducted about two to three months after the second survey (i.e., three to four months after adoption), considered sufficient time for users to decide whether they would continuously use the service or not, and thus was considered the post-use stage (Kim and Malhotra 2005). Through the mHealth app, we sent the third survey to the 228 employees who participated in the second survey. Detailed information on the measures is provided in Appendix C. An incentive of 20 RMB (about US$3.0) was offered to those who finished the survey.

In total, 207 respondents provided valid responses to the third survey (i.e., with a response rate of 90.8%). Among them, 108 were male, making up 52.2% of the total

respondents. About half of them were aged from 41 to 50 years old (46.4%), 65 were in their fifties (31.4%), and the other respondents (22.2%) were younger. The majority of them had a bachelor degree or above (91.3%). We then compared the age, education, and gender characteristics of the respondents and non-respondents of the first survey, as well as those who responded to the second survey but not the second survey. There were no significant differences between these three groups, which indicate that non-response bias had little influence on our dataset.

The measures of most constructs in Study 3 were adopted from previous studies and adapted to our research context, including affective attitude (measured in Study 1), emotional attachment (measured in Study 2), user satisfaction, confirmation, and perceived usefulness (measured in the third survey), were adopted from previous studies and adapted to our research context. Detailed information of the measures is provided in Appendix C. MMS continuance was measured as a binary variable based on their usage records in the system (i.e., whether they continuously used the service in the last month) to minimize common method bias: 1 for continuous use and 0 for discontinuous use.

6.6.2 Measurement Model of Study 3

Validity and Reliability

The measurement model and structural model were tested using the PLS method with SmartPLS. First, the validity and reliability of the measurement model were investigated. Tables 6-8 and 6-9 show the results.

Table 6-8 Loadings and Cross-Loadings of Study 3

	AATT	**CNF**	**EMAT**	**PU**	**SAT**	**CUS**
AATT1	**0.976**	0.620	0.548	0.599	0.609	0.284
AATT2	**0.982**	0.627	0.564	0.613	0.612	0.279
AATT3	**0.974**	0.622	0.554	0.603	0.609	0.254
CNF2	0.608	**0.935**	0.508	0.441	0.464	0.368
CNF3	0.600	**0.956**	0.522	0.409	0.483	0.372

CNF4	0.615	**0.967**	0.500	0.501	0.477	0.359
EMAT1	0.532	0.524	**0.801**	0.416	0.486	0.328
EMAT2	0.557	0.534	**0.894**	0.421	0.504	0.306
EMAT3	0.559	0.530	**0.851**	0.423	0.511	0.303
EMAT4	0.513	0.644	**0.873**	0.415	0.500	0.303
PU1	0.550	0.478	0.439	**0.926**	0.555	0.389
PU2	0.605	0.448	0.406	**0.918**	0.584	0.352
PU3	0.580	0.422	0.415	**0.916**	0.564	0.387
PU4	0.570	0.424	0.486	**0.916**	0.558	0.385
SAT1	0.603	0.402	0.588	0.541	**0.966**	0.405
SAT2	0.601	0.488	0.500	0.474	**0.973**	0.387
SAT3	0.613	0.481	0.486	0.477	**0.971**	0.403
CUS	0.279	0.385	0.325	0.389	0.411	**1.000**

Note: AATT = Affective Attitude, CNF = Confirmation, EMAT = Emotional Attachment, PU = Perceived Usefulness, SAT = User Satisfaction, CUS = Continuous Use.

Table 6-9 Correlations and Discriminant Validity of Study 3

	Cronbachs Alpha	**AVE**	**Composite Reliability**	**AATT**	**CNF**	**EMAT**	**PU**	**SAT**	**CUS**
AATT	0.877	0.955	0.945	**0.977**					
CNF	0.949	0.908	0.967	0.638	**0.953**				
EMAT	0.880	0.731	0.915	0.568	0.645	**0.855**			
PU	0.880	0.944	0.885	0.519	0.758	0.435	**0.972**		
SAT	0.869	0.941	0.879	0.624	0.518	0.516	0.791	**0.970**	
CUS	1.000	1.000	1.000	0.279	0.385	0.325	0.389	0.411	**1.000**

Note: AVE = Averaged Variance Extracted; the diagonally arranged bold numbers are the square roots of AVEs.

The AVE of each construct was greater than the threshold of 0.500, and the composite reliability of each construct was larger than 0.880. These results indicate good reliability of the measurement model (Fornell and Larcker 1981). The loadings of each construct on itself were greater than 0.800, indicating the convergent validity of the measurement model (Chin 1998). The item loadings of each construct on itself were larger than the cross-loadings on other constructs, and, further, the correlations between any two constructs were not greater than the square roots of the related AVEs. These indicate the discriminant validity of the measurement model (Chin 1998). Indeed, all the results from the measurement model verified the reliability and validity of the construct measures.

Common Method Bias

This study used a second data source (i.e., users' use experience in the system records) to measure the dependent variable (i.e., continuous use) to reduce the common method bias. Then Harman's (1967) single factor approach was further adopted to test the common method bias of the variables measured in the surveys. Following this approach, the first unrotated factor was found to explain only 31.21% of the covariance of the main constructs in the model, which is lower than the ideal threshold. The results indicated that common method bias would have little impact in this study.

6.6.3 Structural Model of Study 3

The structural model was tested in two stages. First, the baseline model without the moderator was tested to verify the relationships between affective evaluations at different stages. The results show that the relationship between affective attitude and user satisfaction was not significant ($\beta = 0.006$, $t = 0.321$, $p > 0.050$). Thus, H3-1 was not supported. While the relationship between emotional attachment and user satisfaction was positive and significant ($\beta = 0.184$, $t = 3.247$, $p < 0.001$), supporting H3-2 that emotional attachment at the use stage positively influences the user satisfaction at post-use stage.

Next, the full model with moderating effects was tested. Figure 6-10 shows the results.

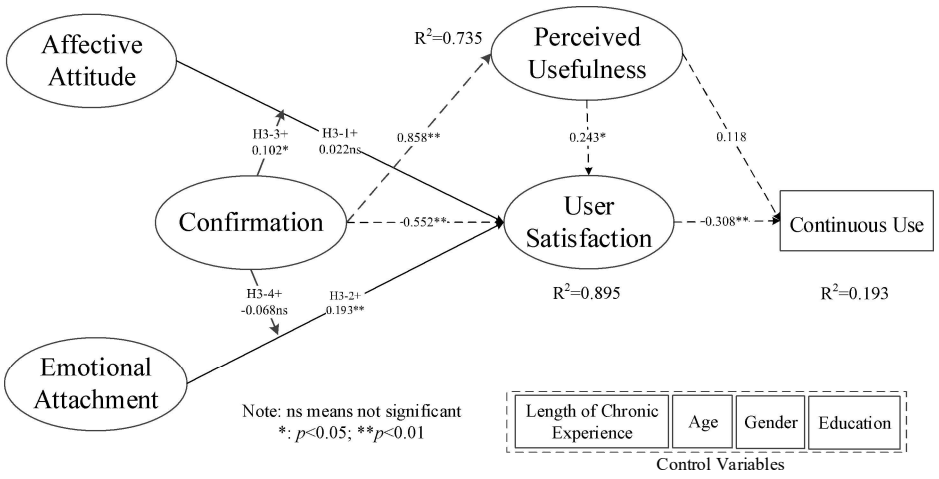

Figure 6-10 Results of Full Model Estimation of Study 3

From Figure 6-10, we can find that the moderating role of confirmation on the relationship between affective attitude and user satisfaction was positively significant ($\beta = 0.102$, $t = 1.996$, $p < 0.050$); however, its moderating role on the relationship between emotional attachment and user satisfaction was not significant ($\beta = -0.068$, $t = 1.61$, $p > .050$). Therefore, H3-3 was supported while H3-4 was not supported. With confirmation and perceived usefulness, affective attitude and emotional attachment explained 89.5% of the variance of user satisfaction. User satisfaction, perceived usefulness, and the control variables explained 19.3% of the variance of continuous use. The low explained variances of continuous use are understandable because we measured it as actual use behavior. There is a gap between users' perceptions and actual usage that positive evaluations can arouse behavioral intentions but intentions may not relate to actual use (Limayem and Hirt 2003, Venkatesh et al. 2003).

As the relationship between affective attitude and user satisfaction was not significant, and the moderating role of confirmation on this relationship was significant, to further investigate the underlying reason, we conducted a post-hoc analysis. We first divided the respondents into two groups, high confirmation (102) versus low confirmation (105) according to the confirmation perceptions on using the MMS. Then,

we ran the baseline model separately. Table 6-10 shows the results.

Table 6-10 Results of the Post-Hoc Analysis of Study 3

Relationships	High Confirmation	Low Confirmation
Affective Attitude -> User Satisfaction	0.067*	-0.015(ns)
Emotional Attachment -> User Satisfaction	0.239**	0.182**

Note: *$p < 0.05$; **$p < 0.01$; ns refers not significant.

From the post-hoc analysis, we found that the relationship between affective attitude and user satisfaction was positive and significant for those users with high confirmation perceptions. For those with low confirmation perceptions, this relationship was negative and insignificant. Therefore, the positive effect of affective attitude on user satisfaction is present when users have high confirmation from using the service. Further, the relationship between emotional attachment and user satisfaction was stronger in the high confirmation group than the low confirmation group.

6.6.4 Discussion and Implications of Study 3

Key Findings

This study explored how previous affective evaluations influence user satisfaction and further determine their continuous usage of MMSs. By doing so, it discovered three aspects of key findings. First, users' affective attitude toward using MMSs at the adoption stage can influence their user satisfaction at the post-use stage only if their expectations on using the services are confirmed. In developing positive affective attitude toward further usage of MMSs at the adoption stage, users may make more effort in using the services and obtain more benefits from usage. However, affective attitude may induce users to develop a high satisfaction perception at the post-use stage only when the benefits confirm their previous expectations of using the services.

Second, users' emotional attachment to using MMSs at the use stage positively

influences their satisfaction at the post-use stage. When users are emotionally attached to the service, they may treat it as part of their life and have fewer demands and greater patience when using it, and so may derive higher satisfaction perceptions on the outcomes of using such services for health management. Emotional attachment may also induce development of high satisfaction perceptions at the post-use stage.

Finally, user confirmation plays a contingent role in the relationships between affective evaluations at different stages. We proposed and have empirically proven that users' previous affective evaluations induce them to develop high satisfaction when their usage of MMSs was confirmed. Even though the moderating effect on the relationship between emotional attachment and user satisfaction was not significant, we further found that this relationship was stronger when user confirmation was high. One possible reason for the insignificant moderating effect may be that emotional attachment and user satisfaction were both developed, in this case after adoption of the service. User confirmation measures the extent to which the outcomes of using the services confirm their expectations before usage. Therefore, confirmation plays a relatively weaker role in the relationships between affective evaluations after usage.

Theoretical Implications

Study 3 also provides several aspects of theoretical implications. First, this study is one of the first studied to empirically explore the relationships between previous affective evaluations and user satisfaction. Although user satisfaction has been a popular research topic in the recent literature, most previous studies on its determinants have been conducted from a cognitive perspective. As an overall affective evaluation of using MMSs at the post-use stage, users can also derive satisfaction from their previous affective interactions with the services. By testing how previous affective evaluations influence continuous usage through user satisfaction, this study provides a

new rationale for user satisfaction development from an affective perspective.

Second, this study proposes a new approach to exploring the relationships between different affective factors. Although the relationships between different affective factors have been well studied, few prior empirical studies have tested these relationships at different time points. Based on the ECM, this study proposed and empirically tested how affective attitude at the adoption stage and emotional attachment at the use stage influence user satisfaction at post-use stage. By doing so, this study discovered how users' affective evaluations of using MMSs change over with time. Thus, this study provides new insight into the relationships between affective factors at different times and about how affective factors at different stages are related.

Third, by precisely investigating the contingent effects of user confirmation, this study sheds light on the relative importance of previous affective evaluations in determining user satisfaction. By testing the moderating effects of confirmation on the relationships between previous affective evaluations and user satisfaction, this study found that the relationships between different affective factors at different times are contingent on whether users' previous expectations are confirmed. This finding can improve the understanding of the mixed findings in the affect literature, specifically, that the different relationships between affective factors can be attributed to users' different user experiences.

Finally, this study also contributes to the ECM and IS continuance literature by incorporating previous use stages into the expectation-confirmation model. When exploring how users develop satisfaction on using a service or make continuance decisions, previous studies have largely neglected the influence of the adoption and use stages, especially the affective factors in these stages. The incorporation of previous

affective evaluations into the ECM to study MMSs continuance can provide an overview of how users' previous affective responses shape their continuous usage at the post-use stage. Our findings also enhance the knowledge of the trade-off between previous affective evaluations and cognitive confirmation in the e-service context by testing the contingent role of confirmation. Therefore, this study provides a more comprehensive understanding of the ECM and the decision processes regarding service continuance.

Practical Implications

This work also provides two aspects of practical implications. First, MMS providers should pay more attention to users' affective evaluations at different stages. The affective evaluations will not only induce users to adopt, use, and continuously use the services directly, but also may determine their overall satisfaction. Providers should think of ways to induce users to generate positive affective evaluations, such as providing small gifts or emotional support.

Second, as user confirmation plays such an important role in determining user satisfaction, MMSs providers should find ways to increase users' confirmation perceptions. They can first realize users' expectations of using the MMS, and when designing or providing the services, providers should do their best to confirm these expectations. On the other hand, providers should also promote user confirmation based on the existing services. For instance, they may show users what has been achieved during their use of the service, such as how their health has improved.

6.7 Summary

This chapter describes how the data for each study were collected, the data analysis process, and the results. Study 1 examined the effect of affective attitude on adoption intention, the P1 relationships, and the contingent factors of the affective

characteristics of patients with chronic diseases. The results supported moderating role of anxiety on the relationship between perceived enjoyment and affective attitude, the moderating role of negative health emotion on the relationship between perceived enjoyment and affective attitude, the moderating role of health consciousness on the relationship between anxiety and affective attitude were supported. This study indicates that potential users' affective response determines their affective attitude and further influences their adoption intention.

Study 2 explored the effects of service-component satisfaction on user behavior, the P2 relationships, and the contingent factors of the health rationality of patients with chronic diseases. The results show that users' learned affective evaluations of service components can be transferred to their evaluations of using the service, i.e., emotional attachment. The transfer process can be both cognitive and misattribution routines, and the cognitive routine is contingent on users' health rationality. This study revealed that actual users' learned affective evaluations of service components can be transferred to the entire service, which subsequently influences their usage behavior.

Study 3 investigated the effects of previous affective evaluations on continuous use, the P3 relationships, and the contingent factors of user confirmation. The results show that users' affective attitude at the adoption stage and emotional attachment at the use stage can influence user satisfaction at the post-use stage. The relationships between affective evaluations at different times are contingent on the extent to which the usage confirms users' expectations. Study 3 showed that users' previous affective evaluations at earlier stages can influence user satisfaction, which subsequently determines their continuous use of MMSs.

Chapter 7 Conclusion

This chapter first concludes the findings of chapters 3, 4, 5, and 6. Then, based on the findings, the achievements of the research objectives of the thesis are analyzed. Subsequently, the overall theoretical implications, practical implications, policy implications, limitations, and future research directions are presented subsequently. Finally, the last subsection concludes this chapter, as well as the whole thesis.

7.1 Summary of Study Findings

7.1.1 Role of Affective Evaluations on User Behavior

Study 1 examined the effect of affective evaluation at the adoption stage (i.e., affective attitude) on potential users' adoption intention of MMS. Study 2 examined the effect of affective evaluation at the use stage (i.e., emotional attachment) on actual users' MMS usage. Study 3 examined the effect of affective evaluation at the post-use stage, user satisfaction, on users' continuous usage of the MMS. We found that affective attitude positively influenced potential users' adoption intention, emotional attachment positively influenced actual users' MMS usage, and user satisfaction positively influenced actual users' continuous usage. Thus, all of three studies showed that affective evaluations play a significant role in determining users' behaviors regarding MMSs at different diffusion stages.

This findings verify the previous proposition that affective factors play a significant role in human-ICT interaction. It is clear that using MMSs is beneficial for the health management of patients with chronic diseases. However, even so, these patients do not have high user engagement of MMSs, resulting in low acceptance rate, low active use, and low continuous use. The findings of this thesis reveal that besides cognitive evaluations, affective evaluations can also induce adoption, active use, and

continuous use of MMSs. By doing so, this thesis provides a new approach for MMS practitioners to promote their MMSs and potentially improve improving potential and actual users' affective feelings on using such services.

7.1.2 P1 Relationships and Contingent Effects

Regarding the effects of process-based affective evaluation and induced affective state on outcome-based affective evaluation, Study 1 explored the effects of perceived enjoyment and anxiety on affective attitude at the adoption stage. The study finds that the effect of perceived enjoyment on affective evaluation is positive and significant, while the effect of anxiety is negatively significant. However, the previous literature indicates that there are many Type II Inconsistencies regarding the effects of such affective factors.

The relationship between perceived enjoyment and affective attitude is negatively moderated by anxiety and negative health emotion. The negative moderating effects of anxiety and negative health emotion suggest that when high anxiety and negative emotion on using health services are formed, the effect of perceived enjoyment on users' affective evaluations will be weakened. Therefore, it can be concluded that the positive effect of process-based affective evaluation on outcome-based affective evaluation can be contingent on users' negative affective state.

The relationship between anxiety and affective attitude was negatively moderated by health consciousness. The moderating effect of health consciousness indicates that when levels of health consciousness are high, the effect of anxiety on users' affective evaluations will be strengthened. Therefore, it can be concluded that the effect of induced affective state on outcome-based affective evaluation can be contingent on users' affective disposition.

From the results regarding the P1 relationships in Study 1, we can conclude that affective factors residing with users can be the contingent factors influencing the effects of perceived enjoyment and anxiety, which can also arouse the mixed findings regarding such affective factors. Thus, some Type II Inconsistencies related to the P1 relationships can be explained to a certain extent.

7.1.3 P2 Relationships and Contingent Effects

Regarding the P2 relationships, Study 2 mainly explored the relationships between learned component-based satisfaction and emotional attachment to the entire service. Focused on the use stage, this study investigated how learned affective evaluations (i.e., device satisfaction and feedback satisfaction) influence users' affective evaluation regarding MMSs (i.e., emotional attachment).

User satisfaction of service components can directly influence their overall affective evaluation of using the service. Our research suggests (and has empirically proven) that device satisfaction and feedback satisfaction positively impact users' emotional attachment to MMS usage. On the other hand, user satisfaction on service components also indirectly influences their overall affective evaluation of using the MMS through a cognitive process. Study 2 adopted perceived value to manifest the cognitive decision process and observed that perceived value partially mediates the effects of device satisfaction and service satisfaction on emotional attachment. This finding demonstrates that users' learned affective evaluations of MMS components can, directly and indirectly, influence their overall affective responses to MMSs.

Further, the effect of service-component affective evaluation on overall affective evaluation is contingent on users' decision rationality. Study 2 found that health rationality positively moderates the effects of device satisfaction and feedback satisfaction on perceived value. The positive moderating effects indicate that, when

patients possess a high level of health rationality, they will rely more on cognitive processes to transfer their affective evaluation from the service components to the overall service.

From the results regarding the P2 relationships in Study 2, we can conclude that learned affective evaluations can directly and indirectly influence affective evaluation at later stages, and the influences can be contingent on users' decision-making rationality. The contingent role of health rationality indicates that under different situations users will rely on different routines to determine their overall affective evaluation, which can arouse mixed findings of such affective factors. Therefore, some Type II Inconsistencies regarding the P2 relationships can be attributed to users' decision-making characteristics.

7.1.4 P3 Relationships and Contingent Effects

Regarding the P3 relationship, Study 3 mainly investigated the longitudinal relationships between affective evaluations at different stages. Focused on the three stages of MMS implementation, this study explored how affective evaluation at the adoption stage (i.e., affective attitude) and affective evaluation at the use stage (i.e., emotional attachment) influence user satisfaction on using MMSs at the post-use stage.

The results show that affective attitude can only influence user satisfaction when users perceive high confirmation from using the services. Also, user confirmation positively moderates the relationship between affective attitude and user satisfaction. Further, we found that emotional attachment positively influences user satisfaction, and this effect is stronger when user confirmation is high. Therefore, it can be concluded that users' previous affective evaluations can significantly influence their final affective evaluation, which subsequently influences their continuous use of

MMSs at later stages.

From the results regarding the P3 relationships in Study 3, we can conclude that previous affective evaluations can influence final affective evaluation at the post-use stage, and such longitudinal relationships are contingent on whether users' previous expectations are confirmed during the use process. The contingent role of user confirmation shows that with different user experiences, users' reliance on their previous affective evaluations may be different. Therefore, some Type II Inconsistencies regarding the P3 relationships can be explained by users' different experiences between the different time points.

7.1.5 Affective Antecedents of Affective Evaluations in mHealth Diffusion

From the findings of the three studies, we can conclude how users develop affective evaluations on MMSs in four aspects.

First, affective factors in the earlier interaction process with the service can influence their affective evaluation. Study 1 finds that perceived enjoyment as a process-based affective evaluation can positively influence their affective evaluation and anxiety as a negative affective state can negatively influence their affective evaluation. These findings indicate that once users started their interaction with the service, their affective factors at the beginning can play a critical role in determining their use behavior.

Second, affective factors induced by the service components can influence their affective evaluation. Study 2 concludes that feedback satisfaction and device satisfaction during using the service can influence users' emotional attachment to the service. These findings show that when the service has different components, users' affective response to each component can influence their overall evaluation on using the service, which can further determine their use behavior.

Third, affective factors from the previous interaction stages can influence their affective evaluation at subsequent stages. Study 3 verifies that users' affective attitude at adoption stage and emotional attachment at use stage can influence their final user satisfaction. These findings reveal that users' affective responses at different times can also play a role when they developing affective evaluation at later stages, which means affective factors at different times can be relevant.

Finally, the characteristics of users and service play an important contingent role in users' affect-based decision-making. Study 1 shows that patients inner feelings on their health (as their affective characteristics) can moderate their affective response process at adoption process. Study 2 finds users' decision rationality (as their cognitive characteristics) can moderate the effects of affective response to service components on their overall affective evaluation. Study 3 finds user confirmation (as the characteristics of the service) can moderate the longitudinal relationships between affective factors at different times. These findings elucidate that the affective response process and the user-service interaction can be contingent on the characteristics of users and service.

Table 7-1 shows the four aspects of findings. Based on this, it can be concluded every affective factor and every characteristic matter in users' affect-based decision-making.

Table 7-1 An Overall Picture of the Research Findings

Affective Antecedents	**Classifications**	**Contingent Factors**	**Affective Evaluation**	**Use Behavior**
Process-based Affective Evaluation	Earlier Interaction Process	Affective Characteristics	Affective Attitude	Adoption
Induced Affective State				
Learned Affective Evaluation	Service Components	Decision Characteristics	Emotional Attachment	Use Behavior
Previous Affective Evaluations	Previous Stage	Service Characteristics	User Satisfaction	Continuous Use

7.2 Evaluation of the Achievement of Research Objectives

After collating the findings of the studies, we then evaluated whether the research objectives had been achieved by our three empirical studies. In the Introduction section (i.e., Chapter 1), this thesis proposed four research objectives. Table 7-1 summarizes the research objectives and how the objectives are achieved by the empirical findings. The findings of the three studies support the effects of affective evaluations on user behavior at different stages, the determinants of affective evaluations, and the related contingent factors.

Table 7-2 Evaluation of the Achievements of Research Objectives

#	**Research Objective**	**Achievement of Objectives**
A	Identify the factors causing the low engagement of MMSs from an affective perspective among potential and actual MMS users (i.e., patients with chronic diseases).	Based on the ARM, affective evaluations are proposed as the conprehensive appraisal from the affective perspective to explain users' behavior related to MMSs at different stages. Accordingly, affective attitude, emotional attachment, and user satisfaction were proposed as proxies of affective evaluations at adoption stage, use stage, and post-use stage, respectively. Three studies tested and verified that affective attitude, emotional attachment, and user satisfaction positively influence adoption intention, usage behavior, and continuous use, respectively.
B	Empirically examine the relationships between induced affective state, process-based	In Study 1, we empirically tested the P1 relationships and the boundary conditions among potential MMS users

	affective evaluation, and overall affective evaluation (P1 relationships) and the boundary conditions of these relationships.	before adoption. Study 1 adopted perceived enjoyment and anxiety to manifest process-based affective evaluation and induced affective state that determine affective attitude. Further, negative health emotion and health consciousness were identified as the boundary conditions that moderating the effects of perceived enjoyment and anxiety on affective attitude. The results show that perceived enjoyment positively influences affective attitude, while anxiety is a negative infleunce; and the effects of perceived enjoyment and anxiety are contingent on negative health emotion and health consciousness.
C	Empirically examine the relationships between learned affective evaluations and overall affective evaluation (P2 relationships) and the boundary conditions of these relationships.	In Study 2, we empirically tested the P2 relationships and the boundary conditions among actual MMS users at the use stage. Study 2 drew on service-component satisfaction as learned affective evaluation and used emotional attachment to measure affective evaluation at use stage. Health rationality was proposed as the boundary condition. The results show that device and feedback satisfaction directly and indirectly (as a cognitive routine manifested by perceived value) influences emotional attachment and the indirect influence is moderated by

		health rationality.
D	Empirically examine the relationships between previous affective evaluations and overall affective evaluation (P3 relationships) and the boundary conditions of these relationships.	In Study 3, we empirically tested the P3 relationships and the boundary condition among MMS actual users at the post-use stage. Study 3 exploited affective attitude at the adoption stage and emotional attachment at the use stage as previous affective evaluations that determine user satisfaction at the post-use stage. User confirmation was used as the boundary condition that moderating the relationships. The results show that affective attitude and emotional attachment influence user satisfaction at later stages and the effects can be moderated by user confirmation during MMS usage.

7.3 Overall Theoretical and Practical Implications

7.3.1 Theoretical Implications

In achieving the research objectives, this thesis proposes four aspects of theoretical implications. First, the findings of this thesis provide new insights into user behaviors regarding MMSs in the innovation diffusion literature. Although system adoption, usage, and continuance constitute been an important research topic in the field of IS, most previous studies have adopted a cognitive perspective by examining the role of confirmation between expectation and outcome in predicting users' behavioral intentions. In contrast, the studies in this thesis investigated the impacts of affective evaluations on adoption, actual use, and continuous use in the mHealth context. Consistent with previous propositions that affective factors have considerable

explanatory power (Zhang 2013), the findings demonstrate the significant role of affective factors in service diffusion, especially in the contexts where cognitive evaluations do not work effectively and user engagement is low, such as MMSs.

Second, with the aim of explaining Type II Inconsistencies in the affect literature, we studied the boundary conditions under which affective constructs exert different effects on affective evaluation. To help explain the mixed findings in the previous affect literature, we first limited our research sample to patients with chronic diseases. Specifically, in Study 1, we tested the effect of perceived enjoyment on affective attitude under different induced affective states, specifically anxiety, and the effect of perceived enjoyment and anxiety on affective attitude under different affective characteristics of patients with chronic diseases (i.e., negative health emotion and health consciousness). In Study 2, we examined the effects of learned affective evaluations (i.e., device satisfaction and feedback satisfaction) on the overall affective evaluation of using MMS under the different characteristic of patients with chronic diseases, (i.e., health rationality). Study 3 examined the effects of previous affective evaluations, namely, affective attitude at the adoption stage and emotional attachment at the use stage, on final affective evaluation under different levels of user confirmation.

With these efforts, this thesis provides plausible explanations for the inconsistent results of the relationships between different affective factors. In future studies of the outcomes of affective factors, (1) a uniform dependent variable (i.e., affective evaluation) should be considered, and (2) the boundary conditions under which the effects of affective factors are exerted should be taken into account. Therefore, the present thesis not only helps us understand Type II Inconsistencies in affective response research, to a certain extent, but also provides new insight to further affect

research to take the boundary conditions of the affective response into consideration.

Third, the present thesis extends the mHealth research, as well as e-service research, by incorporating the specific characteristics of such services into behavioral research. As previously mentioned in the literature review section, most behavioral studies on mHealth have considered only the cognitive perspective and treated services as a technology. The close relationship between affective factors and health behaviors and the characteristics of the patients have largely been neglected. Therefore, this thesis was designed to explore the MMS users' behavior from an affective perspective and incorporate the characteristics of patients with chronic diseases, including negative health emotion, health consciousness, and health rationality. Detecting the characteristics of the targeted users and examining the role of such characteristics may provide profound insights into user behavior regarding a specific service. By doing so, we can not only gain a better understanding of how users make decisions regarding a special service, but also prompt future affective research to consider the characteristics of targeted research groups and research contexts.

Finally, we explored the affective responses to MMS among patients with chronic diseases. This specific group has an increasing population, but has largely been neglected in the IS and HCI literature. Because of the long-term nature of their diseases, patients with chronic diseases have particular needs regarding health services and complicated affective responses to health-related ICTs or services. The contingent roles of the characteristics of patients with chronic diseases (i.e., negative health emotion, health consciousness, and health rationality) provide insight into how patients with chronic diseases perform affective responses to ICT-based health services differently.

By testing their characteristics, this thesis responds to the call by Liang et al. (2017), who encouraged greater focus on the minority groups in IS research and remarked that "we need future research to understand how people with other types of disability are likely to face different challenges and have different characteristics that influence their use." Thus, the findings of the present thesis suggest that patients with chronic diseases may have a special but a more complicated affective response process. This thesis not only sheds light on how patients with chronic diseases affectively respond to using health services by revealing user behavior at different stages, but also indicates how the long-term battle with such illnesses shapes patients' decision-making regarding their health.

7.3.2 Practical Implications

This thesis also provides some practical implications for MMS practitioners, potential and actual users, and health professionals.

First, service practitioners need to be aware of the significant role of affective factors in determining user engagement of MMSs. There is currently low user engagement of MMSs, which has led to a low adoption rate, low active use, and low continuous use of such services. The findings in this thesis show that users' affective evaluations at different stages can promote users to adopt, actively use, and continuously use MMSs. Thus, it would be beneficial for service providers to encourage potential and actual users to develop positive affective evaluations of MMSs. Providers could increase the positive feelings of potential users about the service, such as enjoyment in using a new service for their health and pride in self-managing their own health. At the use stage, providers could bring attention to the core components of the service to increase users' overall affective evaluation. For example, service providers could design features and provide personalized feedback to generate more

positive affective evaluations by users. Further, service providers could promote users' specific affective evaluations. For instance, to increase active usage, service providers could take measures to increase the emotional bond between users and their service.

Second, as patients with chronic diseases are the targeted users of MMSs and they have particular responses to the services, service providers should pay close attention to this group. Their negative health emotion and health consciousness play an indirect negative role when developing affective attitude, and their low health rationality induces them to make less rational decisions when evaluating services and making decisions about use. These characteristics cause potential and actual users to generate lower overall affective evaluations of using the services. Thus, when promoting their services, providers should pay attention to these factors to reduce the negative influences of chronic diseases or other related factors.

Third, MMS users, especially the patients with chronic diseases, need to notice the effects of their health conditions on their evaluations of using health services. In the context of patients with chronic diseases, this thesis found that the affect resulting from their health and special health-related decision-making do influence their affective evaluation of using health services, which subsequently induces less rational decision-making. Therefore, users should notice the influences of their characteristics in health decision-making and rely more on cognitive efforts to evaluate health services and make rational health decisions.

Finally, this thesis provides insights for health professionals. The findings of this thesis indicate that patients rely on their health-related emotions and have a low rationality in health decision-making. Health professionals can utilize these findings to increase healthcare outcome and patient compliance. On one hand, if the benefits of using a particular health service or treatment are clear, health professionals can

encourage patients to make rational decisions and reduce the influences of their emotions. Conversely, if the benefits of using a health service or treatment are unclear for the patients, health professionals can try to arouse their negative emotions, such as concern and anxiety about their health, to induce them to be more compliant to the treatments.

7.3.3 Policy Implications

By explaining the low user engagement of MMSs from an affective perspective, this thesis also provides some implications for the policymakers.

First, the governments are advised to develop regulatory policies and standards for market governance. In China, the government sectors hold a positive attitude toward the development of mHealth, especially MMSs for the elderly and patients with chronic diseases (Yin et al. 2014). However, there are no national policies delineating mHealth services, which may increase the concerns of potential or actual MMS users. Therefore, regulatory policies on mHealth are recommended to govern the market, such as definitions of MMSs, the scope of these services, privacy protection, and responsibility sharing. With explicit policy support, concern and uncertainty may be reduced in potential and actual users, which may lead to more positive affective evaluations.

Second, governments should encourage health professionals to participate in MMSs to improve dissemination of health knowledge and increase the medical value of the services. Further, MMSs could streamline monitoring, which could vastly reduce expenses of chronic diseases across the patient population. However, as MMS-related work is not as lucrative as hospital work for doctors, governments may need to incentivize doctors' participations in the MMS market. With health professionals in the ecosystem of MMSs, potential and actual users may perceive

more value in the services and thus may be more interested in using them.

Finally, governments could use MMSs to broadly distribute general patient education programs. As our results show that patients' negative health emotion and low health rationality play a negative contingent role in their affective response to MMSs, health education programs, especially for the elderly and patients with chronic diseases, may increase user engagement. For instance, governments could help patients realize the value of monitoring services for their health and potentially increase user engagement and usage of MMSs.

7.4 Limitations and Future Research

This thesis is not without limitations. First, according to Zhang (2013), there are three categories of affect in human-ICT interaction and we have studied only several of them. Although we considered affect residing within MMSs as control variables (i.e., valance and arousal in Study 1), they may also play a significant role in the affective response process. Further, for outcome-based affective evaluation, process-based affective evaluation, and induced affective state, there are other affective factors that can be studied.

Second, to label the Type II Inconsistencies in the affective response research, we have only presented samples related to perceived enjoyment, anxiety, and some affective evaluations. There may be other inconsistencies related to other affective constructs or other types of inconsistencies in the affect literature.

Third, to explain the Type II Inconsistencies regarding affective evaluations, this thesis drew on negative health emotion, health consciousness, and health rationality as the main characteristics of patients with chronic diseases to be the potential contingent factors. Other contingent factors, such as emotion regulation capability and users' inside affectability, can also help to explain such inconsistencies.

Fourth, due to the limited time and efforts, this thesis used whether users continuously used the service as a binary variable to measure continuous use at the post-use stage. There may be different dimensions of continuous use in the service context, such as continuous use of different features of the service. A more intensive measure of continuous use can gain to the post-use literature.

Finally, this thesis explored the affective responses to MMSs of a particular group, that is, patients with chronic diseases, using focus groups and field surveys conducted in the Chinese context. Thus, there may be cultural differences and health issue differences that threaten the external validity of our findings.

In the light of our limitations, future research could (1) investigate and explain the other Type II Inconsistencies and other types of inconsistencies in the affect literature, (2) consider other explanations for the inconsistencies in the affect literature, (3) use a more specific measure of use behavior, and (4) explore the relationships between affective factors among different groups (patients with other types of diseases or healthy people) in difference research contexts to enrich affective response research.

7.5 Concluding Remarks

Using mICTs in healthcare to increase health outcomes and improve unbalanced health resource distribution is a popular topic, and has received increasing academic and practical attention. However, as a submarket of mHealth, MMSs receive low user engagement and suffer from low adoption rate, low active use, and low continuous use issues. This thesis was therefore designed to explain the low user engagement of such services from an affective perspective. Three studies were conducted to explain how MMS users, specifically patients with chronic diseases, make different use decisions at the adoption, use, and post-use stages. This thesis provided valuable explanations for

user behavior regarding MMSs from an affective perspective, as well as explanations for the inconsistent results in the affect literature.

Theoretically, we proposed affective evaluations as the overall affective appraisal that determines user behavior. Drawing on the ARM, we proposed three types of affective factors influencing users' affective evaluations. Further, a review of the affect literature indicated that there are many Type II Inconsistencies left under-explored and unexplained. Therefore, four research objectives were proposed to guide exploration of the consequences of affective evaluations in MMS diffusion (i.e., adoption, use, and contingent use), the antecedents of affective evaluations (i.e., process-based affective-evaluation, induced affective state, learned affective evaluation, and previous affective evaluation), and contingent factors (i.e., negative health emotion, health consciousness, health rationality, and user confirmation).

The four research objectives were subsequently achieved. First, the affective evaluations on users' behavior toward MMS at three stages were found in the three studies. Then, at the adoption stage, the P1 relationships (the effects of process-based affective evaluation and induced affective stage on affective attitude) and the moderating effects of negative health emotion and health consciousness on these effects were verified. Next, at the use stage, the P2 relationships (the effects of learned affective evaluations on emotional attachment) and the moderating effects of health rationality on these effects were explored. Finally, at the post-use stage, the P3 relationships (the effects of previous affective evaluations on final user satisfaction) and the moderating effects of user confirmation were investigated.

In sum, by investigating the antecedents, consequences, and contingent effects of affective evaluation, the present thesis provides plausible explanations for the low user engagement of MMSs from an affective perspective and the Type II Inconsistencies in

the affect literature. Specifically, this thesis provides new insight into user behavior regarding MMSs in the innovation diffusion literature, gains to explain the Type II Inconsistencies in the affect literature, extends behavioral research in the mHealth and e-service context, and explains the specific affective responses of patients with chronic diseases. Practically, our findings provide suggestions for MMS practitioners on how best to promote the usage of MMSs, for mHealth users on how to make rational health decisions, and for health professionals on how to improve health outcomes by guiding patients in health-related decision-making.

We believe that the findings of this thesis can benefit researchers and practitioners to understand the role of affective factors in user behavior regarding health services and also address the low user engagement issues. We hope this thesis can trigger some researchers to conduct further investigation into affective responses regarding health services and human-ICT interaction.

Appendix A

Measurement of Study 1

Adoption Intention (Johnston and Warkentin 2010)

I intend to use mHealth monitoring services in the next 3 months

I predict I will use mHealth monitoring services software in the next 3 months

I plan to use mHealth monitoring services in the next 3 months

Affective Attitude (Kim 2009, Yang and Yoo 2004)

I like the idea of using mHealth monitoring services

Using mHealth monitoring services would be pleasurable

Using mHealth monitoring services would make me feel positive

Perceived Enjoyment (Venkatesh et al. 2003)

I find using the monitoring services would be enjoyable.

The actual process of using the monitoring services would be pleasant.

I will have fun using the mHealth monitoring services.

Anxiety (Thatcher and Perrewe 2002)

I feel apprehensive about using mHealth monitoring devices.

It scares me to think that I could cause the mHealth monitoring devices to harm my health by wrong operations.

I hesitate to use mHealth monitoring devices for fear of making mistakes that I cannot correct.

Using mHealth monitoring devices are somewhat intimidating to me.

Health Consciousness (Mai and Hoffmann 2012)

I reflect about my health a lot.

I am very self-conscious about my health.

I am constantly examining my health.

Negative Health Emotion (Bowman et al. 2006)

I have an intense loathing for my present state of health.

At present, I feel extreme dread about my health.

I feel very deep sorrow because of my health.

Health problems are tiresome to me.

Valence (Mehrabian and Russell 1974)

Happy----Unhappy

Pleased----Annoyed

Satisfied----unsatisfied

Contented----Melancholic

Hopeful----Despairing

Arousal (Mehrabian and Russell 1974)

Stimulated----Relaxed

Excited----Calm

Jittery----Dull

Wide awake----Sleepy

Appendix B

Measurement of Study 2

Emotional Attachment (Thomson et al. 2005)

I feel affectionate when thinking about using the monitoring service.

I feel a connection when using the monitoring service.

I feel passionate about using the monitoring service.

I would feel attached to the monitoring service.

Perceived Value (Kim and Kankanhalli 2009)

Considering the time and effort needed, the new way of protecting my health with the MMS service is worthwhile.

Considering the loss that I have previously incurred, the new way of protecting my health with the MMS is of good value

Considering the hassle that I may have to experience otherwise, the new way of protecting my health with the MMS service is beneficial to me.

Device Satisfaction (Xu et al. 2013)

All things considered, I am very satisfied with the use of the mobile device for the monitoring service.

Generally, I am very satisfied with my interactions with the mobile device for the monitoring service.

Using the mobile device for the monitoring service is very satisfying.

Feedback Satisfaction (Xu et al. 2013)

Generally, the feedback I got from the monitoring service was very satisfying for managing my health.

I am very satisfied with the feedback I received from the monitoring service to manage my health.

The monitoring service provides very satisfactory feedback for me in managing my health.

Health Rationality (Kaufmann et al. 2012)

My decision processes regarding my health issues are mostly analytical.

I look extensively for information in order to make a health-related decision.

Quantitative analyses are important for me in making a health-related decision.

The entire selection of health choices is very effective for focusing on important information.

I extensively analyze relevant information before making a health-related decision.

Appendix C

Measurement of Study 3

Affective Attitude (Kim 2009, Yang and Yoo 2004)

I like the idea of using mHealth monitoring services

Using mHealth monitoring services would be pleasurable

Using mHealth monitoring services would make me feel positive

Emotional Attachment (Thomson et al. 2005)

I feel affectionate when thinking about using the monitoring service.

I feel a connection when using the monitoring service.

I feel passionate about using the monitoring service.

I would feel attached to the monitoring service.

User Satisfaction (Xu et al. 2013)

All things considered, I am very satisfied with using the monitoring service.

Overall, my interaction with the monitoring service was very satisfying.

Using the monitoring service was very satisfying for my health.

Perceived Usefulness (Venkatesh et al. 2003)

Using the monitoring service improved my health management.

Using the monitoring service made it easier to manage my health.

Using the monitoring service enhanced my effectiveness in managing my health.

I found the monitoring service useful in my health management.

User Confirmation (Bhattacherjee 2001)

My experience with using the monitoring service was better than what I expected.

The monitoring service was better than what I expected.

Overall, most of my expectations from using the monitoring service were confirmed.

Appendix D

Questionnaire of Study 1

航天中心医院健康管理服务调查问卷Ⅰ

尊敬的先生/女士：

您好！我们是**航天中心医院**和**哈尔滨工业大学**联合项目的研究人员，欢迎您参与本次关于航天中心医院健康管理服务项目的调研。

非常感谢您能抽出宝贵的时间完来成这份问卷。

本次调查是为了**更好的改善该项服务**，考查您对该健康管理服务项目的态度，您的回答将帮助我们进一步认识和了解该服务。同时我们承诺：您提供的全部信息将**完全保密**。

本次调查不是测验，答案**没有对错**之分，请您尽**最大的努力**，根据您对问题的**真实想法和理解**作答，选择您认为对的选项。

该健康管理服务项目主要由航天中心医院通过**慈云健康手机客户端**提供，主要的功能有：

1、**咨询医生**：7×14小时×365天提供在线咨询医生服务。

2、**查询报告**：体检报告、化验单在线查询，历年结果趋势对比，既准确又便捷

3、**在线预约**：在线预约门诊、检查和体检，免去排队等候烦恼

4、**健康随访**：检后健康问题，专人跟踪提醒，不用再怕被遗忘

5、**健康记录**：运动、血压、血糖等健康数据上传至平台，形成连续健康档案

6、**健康计划**：为健康行为制定计划，系统到时自动提醒，有计划更高效

7、**健康教育**：丰富的健康资讯，在线观看专家直播讲座，有图像有真相

请您根据上述介绍，回答下列问题。

该服务介绍对您的***刺激程度***，分别在对应的词前面划对勾“√”						
□非常兴奋	□兴奋	□有点兴奋	□中立	□有点失望	□失望	□非常失望
□非常激动	□激动	□有点激动	□中立	□有点平静	□平静	□非常平静
□非常清醒	□清醒	□有点清醒	□中立	□有点不感兴趣	□不感兴趣	□非常不感兴趣
□非常好奇	□好奇	□有点好奇	□中立	□有点不好奇	□不好奇	□非常不好奇

您接触到该服务时的***情感感受***，分别在对应的词前面划对勾“√”						
□非常高兴	□高兴	□有点高兴	□中立	□有点不高兴	□不高兴	□非常不高兴
□非常满意	□满意	□有点满意	□中立	□有点忧虑	□忧虑	□非常忧虑
□非常愉悦	□愉悦	□有点愉悦	□中立	□有点烦恼	□烦恼	□非常烦恼
□非常满足	□满足	□有点满足	□中立	□有点不满足	□不满足	□非常不满足
□非常期待	□期待	□有点期待	□中立	□有点失望	□失望	□非常失望

下面问题想了解您对该服务看法	非常不同意	不同意	有点不同意	中立	有点同意	同意	非常同意
我拥有较高的意愿***采纳该服务***	1	2	3	4	5	6	7
我希望学习***使用该服务***	1	2	3	4	5	6	7
我***计划采纳该服务***来管理我自己的健康	1	2	3	4	5	6	7
我***喜欢使用***该服务	1	2	3	4	5	6	7
使用该服务会让我***觉得非常好***	1	2	3	4	5	6	7
使用该服务会让我觉得***很积极***	1	2	3	4	5	6	7
我对于使用该服务***感到不安***	1	2	3	4	5	6	7
我害怕在使用该服务时因错误操作***损害健康***	1	2	3	4	5	6	7
担心会犯无法更正的错误，对使用该服务***感到犹豫***	1	2	3	4	5	6	7
使用该服务让我感觉***有一点担忧***	1	2	3	4	5	6	7
我感觉使用该服务将会是***令人愉悦的***	1	2	3	4	5	6	7
使用该服务的过程将会是***愉快的***	1	2	3	4	5	6	7
我将会在使用该服务的过程中***获得乐趣***	1	2	3	4	5	6	7

下列问题涉及到您对自己健康的想法：

	非常不同意	不同意	有点不同意	中立	有点同意	同意	非常同意
我总是***反省自身健康***	1	2	3	4	5	6	7
我关注自身健康的***意识很强***	1	2	3	4	5	6	7
我通常留意***自身健康***	1	2	3	4	5	6	7
我***时常检查***身体状况	1	2	3	4	5	6	7
我的健康状况是***令人为难的***	1	2	3	4	5	6	7
我的健康状况***让我很生气***	1	2	3	4	5	6	7
我***很担心***自己的健康状况	1	2	3	4	5	6	7
我的健康状况是***令人讨厌的***	1	2	3	4	5	6	7

您的基本信息：

性别:	□ 男	□ 女				
年龄:	□ ≤20	□21-30	□ 31-40	□ 41-50	□ 51-60	□大于60
学历:	□ 小学	□ 中学	□ 大专	□ 大学	□ 研究生	□以上
手机使用经历：	□<2年	□2-4年	□4-6年	□6-8年	□8-10年	□>10年
每年生病次数：	□<2次	□2-3次	□4-6次	□7-10次	□>10	
您患有哪些慢性疾病：						

问卷完毕，

所有得到的资料绝对保密。

再次感谢阁下完成本问卷！

Questionnaire of Study 2

航天中心医院健康管理服务调查问卷 II

尊敬的用户：

您好！我们是**航天中心医院**和**哈尔滨工业大学**联合项目的研究人员，非常感谢您参加第一次调研，欢迎您参与本次调研。完成此次问卷，我们将给您**10元话费**奖励，充值到您注册的手机。

本次调查是为了**更好地改善该项服务**，考查您对该健康管理服务的态度，仅仅占用您**10分钟内的时间**。同时我们承诺：您提供的全部信息将**完全保密**。

本次调查不是测验，答案**没有对错**之分，请您尽**最大的努力**，根据您对问题的**真实想法和理解**作答，选择您认为对的选项。

下面问题想了解您对该服务看法

	非常不同意	不同意	有点不同意	中立	有点同意	同意	非常同意
当想到使用该监测服务时，我**充满了情感**	1	2	3	4	5	6	7
我和该监测服务建立起了**情感联系**	1	2	3	4	5	6	7
我在使用该监测服务时感受到了**激情**	1	2	3	4	5	6	7
我已经**依赖上**使用该监测服务	1	2	3	4	5	6	7
考虑到使用该服务花费的时间和经历，我觉得这种健康管理方式**是值得的**	1	2	3	4	5	6	7
考虑到使用该服务可能带来的损失，我觉得这种健康管理方式是**有价值的**	1	2	3	4	5	6	7
考虑到使用该服务带来的麻烦，我觉得这种健康管理方式对我**有利的**	1	2	3	4	5	6	7
综合考虑，我对使用的监测设备是**满意的**	1	2	3	4	5	6	7
我和移动监测设备的交互是**令人满意的**	1	2	3	4	5	6	7
总的来说，使用该监测设备以获得健康监测服务是**让我满意的**	1	2	3	4	5	6	7
综合考虑，我对从监测服务中收到的反馈**是满意的**	1	2	3	4	5	6	7
我对用监测服务提供的反馈来管理健康**是满意的**	1	2	3	4	5	6	7
总的来说，使用该监测服务提供了令人**满意的反馈信息**	1	2	3	4	5	6	7

下面问题想了解您对自己健康决策过程的看法

	非常不同意	不同意	有点不同意	中立	有点同意	同意	非常同意
我健康相关的决策过程都是**经过分析的**	1	2	3	4	5	6	7
为进行健康决策，我会搜寻**广泛的信息**	1	2	3	4	5	6	7
定量分析对进行健康相关决策非常重要	1	2	3	4	5	6	7
重要信息对健康决策选择过程是非常重要的	1	2	3	4	5	6	7
我在进行健康决策前，会**广泛地分析**各种信息	1	2	3	4	5	6	7

您的基本信息：

性别:	□ 男	□ 女				
年龄:	□ ≤20	□21-30	□ 31-40	□ 41-50	□ 51-60	□大于60
学历:	□ 小学	□ 中学	□ 大专	□ 大学	□ 研究生	□以上
患慢性病时长	□<2年	□2-4年	□4-6年	□6-8年	□8-10年	□>10年
每年生病次数：	□<2次	□2-3次	□4-6次	□7-10次	□>10	

问卷完毕，

所有得到的资料绝对保密。

再次感谢阁下完成本问卷！

Questionnaire of Study 3

航天中心医院健康管理服务调查问卷 III

尊敬的用户：

您好！我们是**航天中心医院**和**哈尔滨工业大学**联合项目的研究人员，非常感谢您参加前期调研，欢迎您参与本项目最后一次调研。完成此次问卷，我们将给您**20元话费**奖励，充值到您注册手机。

本次调查是为了**更好地改善该项服务**，考查您对该健康管理服务项目的满意度，仅仅占用您**6分钟以内的时间**。同时我们承诺：您提供的全部信息将**完全保密**。

本次调查不是测验，答案**没有对错**之分，请您尽**最大的努力**，根据您对问题的**真实想法和理解**作答，选择您认为对的选项。

下面问题想了解您对继续使用该服务的看法

	非常不同意	不同意	有点不同意	中立	有点同意	同意	非常同意
总的来说，我对使用该服务**非常满意**	1	2	3	4	5	6	7
总体来说，我和该服务的交互是**令人满意的**	1	2	3	4	5	6	7
使用该监测服务**满足了**我的健康需求	1	2	3	4	5	6	7
使用该监测服务**提高了**我的健康管理水平	1	2	3	4	5	6	7
使用该监测服务使我的健康管理**更加容易**	1	2	3	4	5	6	7
使用该监测服务**提高了**我的健康管理成效	1	2	3	4	5	6	7
我觉得该监测服务**有利于**我的健康管理	1	2	3	4	5	6	7
我使用该监测服务的经历比**预期的要好**	1	2	3	4	5	6	7
该监测服务的经历比**我预想的要好**	1	2	3	4	5	6	7
总的来说，我使用该服务的期望都**得到了确认**	1	2	3	4	5	6	7

您的基本信息：

性别:	□ 男	□ 女				
年龄:	□ ≤20	□21-30	□ 31-40	□ 41-50	□ 51-60	□大于60
学历:	□ 小学	□ 中学	□ 大专	□ 大学	□ 研究生	□以上
患慢性病时长	□<2年	□2-4年	□4-6年	□6-8年	□8-10年	□>10年
每年生病次数：	□<2次	□2-3次	□4-6次	□7-10次	□>10	

问卷完毕，

所有得到的资料绝对保密。

再次感谢阁下完成本问卷！

References

Aaker DA, Keller KL (1990) Consumer evaluations of brand extensions. *The Journal of Marketing*. 54(1)**:**27-41.

AbuShanab E, Pearson JM, Setterstrom AJ (2010) Internet banking and customers' acceptance in Jordan: the unified model's perspective. *Communications of the Association for Information Systems*. 26(1)**:**493-452.

Aceti V, Luppicini R (2013) *Exploring the Effect of mHealth Technologies on Communication and Information Sharing in a Pediatric Critical Care Unit* (Medical Information Science Reference, Hershey PA).

Agarwal S, Lau CT (2010) Remote health monitoring using mobile phones and Web services. *Telemedicine and e-Health*. 16(5)**:**603-607.

Aiken LS, West SG, Reno RR (1991) *Multiple regression: Testing and interpreting interactions* (Sage, Newbury Park, London).

Ajzen I, Fishbein M (2000) Attitudes and the attitude-behavior relation: Reasoned and automatic processes. *European Review of Social Psychology*. 11(1)**:**1-33.

Ajzen I, Fishbein M (2005) The influence of attitudes on behavior. *The Handbook of Attitudes*. 5**:**173-221.

Ajzen I, Fishbein M (2005) *The influence of attitudes on behavior* (Lawrence Erlbaum Associates, Mahwah, NJ).

Ajzen I, Timko C (1986) Correspondence between health attitudes and behavior. *Basic and Applied Social Psychology*. 7(4)**:**259-276.

Akhter M, Kumar V, Kumar U (2014) Predicting mobile health adoption behaviour: A demand side perspective. *Journal of Customer Behaviour*. 13(3)**:**187-205.

Akter S, D'Ambra J, Ray P (2011) Trustworthiness in mHealth information services: an assessment of a hierarchical model with mediating and moderating effects

using partial least squares (PLS). *Journal of the American Society for Information Science and Technology*. 62(1)**:**100-116.

Akter S, D'Ambra J, Ray P, Hani U (2013) Modelling the impact of mHealth service quality on satisfaction, continuance and quality of life. *Behaviour & Information Technology*. 32(12)**:**1225-1241.

Akter S, D'Ambra J, Ray P (2010) Service quality of mHealth platforms: development and validation of a hierarchical model using PLS. *Electronic Markets*. 20(3-4)**:**209-227.

Akter S, D'Ambra J, Ray P (2013) Development and validation of an instrument to measure user perceived service quality of mHealth. *Information & Management*. 50(4)**:**181-195.

Akter S, Ray P, D'Ambra J (2013) Continuance of mHealth services at the bottom of the pyramid: the roles of service quality and trust. *Electronic Markets*. 23(1)**:**29-47.

Andenæs R, Kalfoss MH, Wahl AK (2006) Coping and psychological distress in hospitalized patients with chronic obstructive pulmonary disease. *Heart & Lung: The Journal of Acute and Critical Care*. 35(1)**:**46-57.

Anderson CL, Agarwal R (2011) The digitization of healthcare: boundary risks, emotion, and consumer willingness to disclose personal health information. *Information Systems Research*. 22(3)**:**469-490.

Bagozzi RP (2007) The Legacy of the Technology Acceptance Model and a Proposal for a Paradigm Shift. *Journal of the Association for Information Systems*. 8(4)**:**244-254.

Bagozzi RP, Burnkrant RE (1979) Attitude organization and the attitude–behavior relationship. *Journal of Personality and Social Psychology*. 37(6)**:**913-926.

Bagozzi RP, Gopinath M, Nyer PU (1999) The role of emotions in marketing. *Journal of the Academy of Marketing Science*. 27(2)**:**184-206.

Bamberg S, Ajzen I, Schmidt P (2003) Choice of travel mode in the theory of planned behavior: The roles of past behavior, habit, and reasoned action. *Basic and Applied Social Psychology*. 25(3)**:**175-187.

Barclay D, Higgins C, Thompson R (1995) The partial least squares (PLS) approach to causal modeling: Personal computer adoption and use as an illustration. *Technology Studies*. 2(2)**:**285-309.

Batra R, Ahtola OT (1991) Measuring the hedonic and utilitarian sources of consumer attitudes. *Marketing Letters*. 2(2)**:**159-170.

Beaudry A, Pinsonneault A (2010) The other side of acceptance: Studying the direct and indirect effects of emotions on information technology use. *MIS Quarterly*. 34(4)**:**689-A683.

Belaid S, Temessek Behi A (2011) The role of attachment in building consumer-brand relationships: an empirical investigation in the utilitarian consumption context. *Journal of Product & Brand Management*. 20(1)**:**37-47.

Bhattacherjee A (2001) An empirical analysis of the antecedents of electronic commerce service continuance. *Decision Support Systems*. 32(2)**:**201-214.

Bhattacherjee A (2001) Understanding Information Systems Continuance: An Expectation-Confirmation Model. *MIS Quarterly*. 25(3)**:**351-370.

Bloor M (2001) *Focus groups in social research* (Sage, London).

Bodenheimer T, Wagner EH, Grumbach K (2002) Improving primary care for patients with chronic illness: the chronic care model, Part 2. *JAMA*. 288(15)**:**1909-1914.

Bower GH (1981) Mood and memory. *American psychologist*. 36(2)**:**129.

Bowlby J (2012) *The making and breaking of affectional bonds* (Routledge, New York,

US).

Bowman G, Watson R, Trotman-Beasty A (2006) Primary emotions in patients after myocardial infarction. *Journal of Advanced Nursing*. 53(6)**:**636-645.

Brock DW, Wartman SA (1990) When competent patients make irrational choices. *New England Journal of Medicine*. 322(22)**:**1595-1599.

Brown SA, Fuller RM, Vician C (2004) Who's afraid of the virtual world? Anxiety and computer-mediated communication. *Journal of the Association for Information Systems*. 5(2)**:**79-107.

Brown SA, Venkatesh V (2005) Model of adoption of technology in households: A baseline model test and extension incorporating household life cycle. *MIS Quarterly*. 29(3)**:**399-426.

Brown SA, Venkatesh V, Kuruzovich J, Massey AP (2008) Expectation confirmation: An examination of three competing models. *Organizational Behavior and Human Decision Processes*. 105(1)**:**52-66.

Brown SP, Stayman DM (1992) Antecedents and consequences of attitude toward the ad: A meta-analysis. *Journal of Consumer Research*. 19(1)**:**34-51.

Bryman A (2012) *Social research methods* (Oxford University Press, New York).

Cacioppo JT, Gardner WL, Berntson GG (1999) The affect system has parallel and integrative processing components: Form follows function. *Journal of personality and Social Psychology*. 76(5)**:**839-855.

Calder BJ (1977) Focus groups and the nature of qualitative marketing research. *Journal of Marketing Research*. 14(2)**:**353-364.

Carroll BA, Ahuvia AC (2006) Some antecedents and outcomes of brand love. *Marketing Letters*. 17(2)**:**79-89.

Carter L, Corneille M, Hall-Byers NM, Clark T, Younge SN (2015) Exploring user

acceptance of a text-message base health intervention among young African Americans. *AIS Transactions on Human-Computer Interaction*. 7(3)**:**110-124.

CAS, SIBE (2015) *Resear Report on mHealth Technologies and Market inside and outside China*. The Chinese Academy of Sciences Suzhou Institute of Biomedical Engineering.

Chan DKS, Fishbein M (1993) Determinants of College Women's Intentions to Tell Their Partners to Use Condoms1. *Journal of Applied Social Psychology*. 23(18)**:**1455-1470.

Chapman GB, Coups EJ (2006) Emotions and preventive health behavior: worry, regret, and influenza vaccination. *Health Psychology*. 25(1)**:**82-90.

Cheung W, Chang MK, Lai VS (2000) Prediction of Internet and World Wide Web usage at work: a test of an extended Triandis model. *Decision Support Systems*. 30(1)**:**83-100.

Chin WW (1998) The partial least squares approach to structural equation modeling. *Modern Methods for Business Research*. 295(2)**:**295-336.

Chin WW, Marcolin BL, Newsted PR (2003) A partial least squares latent variable modeling approach for measuring interaction effects: Results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study. *Information Systems Research*. 14(2)**:**189-217.

Chow K, Healey M (2008) Place attachment and place identity: First-year undergraduates making the transition from home to university. *Journal of Environmental Psychology*. 28(4)**:**362-372.

Christensen AJ, Moran PJ, Wiebe JS (1999) Assessment of irrational health beliefs: relation to health practices and medical regimen adherence. *Health Psychology*. 18(2)**:**169-176.

Ciarrochi JV, Forgas JP (1999) On being tense yet tolerant: The paradoxical effects of trait anxiety and aversive mood on intergroup judgments. *Group Dynamics: Theory, Research, and Practice*. 3(3)**:**227.

Ciechanowski P, Katon WJ, Russo JE, Walker EA (2001) The patient-provider relationship: attachment theory and adherence to treatment in diabetes. *American Journal of Psychiatry*. 158(1)**:**29-35.

Ciechanowski P, Russo J, Katon W, Von Korff M, Ludman E, Lin E, Simon G, Bush T (2004) Influence of patient attachment style on self-care and outcomes in diabetes. *Psychosomatic Medicine*. 66(5)**:**720-728.

Clark LA, Watson D, Mineka S (1994) Temperament, personality, and the mood and anxiety disorders. *Journal of Abnormal Psychology*. 103(1)**:**103-116.

Clore GL (1992) *Cognitive phenomenology: Feelings and the construction of judgment* (Erlbaum, Hillsdale, NJ).

Cocosila M, Archer N (2010) Adoption of mobile ICT for health promotion: an empirical investigation. *Electronic Markets*. 20(3-4)**:**241-250.

Compeau D, Higgins CA, Huff S (1999) Social Cognitive Theory and Individual Reactions to Computing Technology: A Longitudinal Study. *MIS Quarterly*. 23(2)**:**145-158.

Constantiou I, Legarth MF, Olsen KB (2012) What are users' intentions towards real money trading in massively multiplayer online games? *Electronic Markets*. 22(2)**:**105-115.

Coulter KS (1998) The Effects of Affective Responses to Media Context on Advertising Evaluations. *Journal of Advertising*. 27(4)**:**41-51.

Creswell JW (2002) *Educational research: Planning, conducting, and evaluating quantitative* (Prentice Hall, Columbus, OH).

Csikszentmihalyi M (1990) *Flow: The psychology of optimal experience* (Harper Perennial New York).

Davis FD (1986) *A technology acceptance model for empirically testing new end-user information systems: Theory and results*. Massachusetts Institute of Technology.

Davis FD, Bagozzi RP, Warshaw PR (1989) User acceptance of computer technology: a comparison of two theoretical models. *Management Science*. 35(8)**:**982-1003.

Davis FD, Bagozzi RP, Warshaw PR (1992) Extrinsic and intrinsic motivation to use computers in the workplace1. *Journal of applied social psychology*. 22(14)**:**1111-1132.

Deng X, Khuntia J, Ghosh K (2013) *Psychological Empowerment of Patients with Chronic Diseases: The Role of Digital Integration*. Milan.

Deng Z, Mo X, Liu S (2014) Comparison of the middle-aged and older users' adoption of mobile health services in China. *International journal of medical informatics*. 83(3)**:**210-224.

Deng Z, Zhang L, Zhang J (2012) Applying Technology Acceptance Model to Explore the Determinants of Mobile Health Service: From the Perspective of Public User.

Drigotas SM, Rusbult CE (1992) Should I stay or should I go? A dependence model of breakups. *Journal of Personality and Social Psychology*. 62(1)**:**62-87.

Dutta-Bergman MJ (2004) An alternative approach to social capital: Exploring the linkage between health consciousness and community participation. *Health Communication*. 16(4)**:**393-409.

Edwards L, Thomas C, Gregory A, Yardley L, O'Cathain A, Montgomery AA,

Salisbury C (2014) Are people with chronic diseases interested in using telehealth? A cross-sectional postal survey. *Journal of Medical Internet Research*. 16(5)**:**e123.

EnfoDesk (2014) *Chinese mHealth market research report*. Beijing, China.

Eves FF (1995) *Lay representations of exercise and health: the importance of feelings* (University of Alicante, Alicante, Spain).

Fan H, Lederman R, Smith SP, Chang S (2014) How Trust Is Formed in Online Health Communities: A Process Perspective. *Communications of the Association for Information Systems*. 34(1)**:**531-560.

Faqih KM, Jaradat M-IR (2015) Mobile healthcare adoption among patients in a developing country environment: Exploring the influence of age and gender differences. *International Business Research*. 8(9)**:**142-174.

Fassnacht M, Koese I (2006) Quality of electronic services conceptualizing and testing a hierarchical model. *Journal of Service Research*. 9(1)**:**19-37.

Fedorikhin A, Park CW, Thomson M (2008) Beyond fit and attitude: The effect of emotional attachment on consumer responses to brand extensions. *Journal of Consumer Psychology*. 18(4)**:**281-291.

Fishbein M, Ajzen I (1975) *Belief, attitude, intention and behavior: An introduction to theory and research* (Addison Wesley, Reading, MA).

Folkman S (1984) *Stress, appraisal, and coping* (Springer Publishing Company LLC, New York).

Folkman S, Lazarus RS, Dunkel-Schetter C, DeLongis A, Gruen RJ (1986) Dynamics of a stressful encounter: cognitive appraisal, coping, and encounter outcomes. *Journal of Personality and Social Psychology*. 50(5)**:**992-1003.

Folkman S, Lazarus RS, Gruen RJ, DeLongis A (1986) Appraisal, coping, health status,

and psychological symptoms. *Journal of Personality and Social Psychology*. 50(3)**:**571-570.

Fornell C, Larcker DF (1981) Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*. 18(1)**:**39-50.

Giamouzis G, Mastrogiannis D, Koutrakis K, Karayannis G, Parisis C, Rountas C, Adreanides E, Dafoulas GE, Stafylas PC, Skoularigis J (2013) Telemonitoring in chronic heart failure: a systematic review. *Cardiology Research and Practice*. 17(5)**:**e150.

Goh G, Tan NC, Malhotra R, Padmanabhan U, Barbier S, Allen Jr JC, Østbye T (2015) Short-Term Trajectories of Use of a Caloric-Monitoring Mobile Phone App Among Patients With Type 2 Diabetes Mellitus in a Primary Care Setting. *Journal of Medical Internet Research*. 17(2)**:**e33.

Guo X, Han X, Zhang X, Dang Y, Chen C (2015) Investigating m-Health Acceptance from a Protection Motivation Theory Perspective: Gender and Age Differences. *Telemedicine and e-Health*. 21(8)**:**661-669.

Guo X, Sun Y, Wang N, Peng Z, Yan Z (2013) The dark side of elderly acceptance of preventive mobile health services in China. *Electronic Markets*. 23(1)**:**49-61.

Gustafsson A, Johnson MD, Roos I (2005) The effects of customer satisfaction, relationship commitment dimensions, and triggers on customer retention. *Journal of Marketing*. 69(4)**:**210-218.

Hackbarth G, Grover V, Mun YY (2003) Computer playfulness and anxiety: positive and negative mediators of the system experience effect on perceived ease of use. *Information & Management*. 40(3)**:**221-232.

Harman HH (1967) *Modern factor analysis* (University of Chicago Press, Chicago, US).

Hazan C, Zeifman D (1999) *Pair bonds as attachments: Evaluating the evidence* (Guilford, New York).

Helander E, Kaipainen K, Korhonen I, Wansink B (2014) Factors related to sustained use of a free mobile app for dietary self-monitoring with photography and peer feedback: retrospective cohort study. *Journal of Medical Internet Research*. 16(4)**:**e109.

Hill RP, Stamey M (1990) The homeless in America: An examination of possessions and consumption behaviors. *Journal of Consumer Research*. 17(3)**:**303-321.

Hirschman EC (1994) Consumers and their animal companions. *Journal of Consumer Research*. 20**:**616-632.

Hong H (2011) An extension of the extended parallel process model (EPPM) in television health news: the influence of health consciousness on individual message processing and acceptance. *Health Communication*. 26(4)**:**343-353.

Hsu C-L, Lin JC-C (2015) What drives purchase intention for paid mobile apps? – An expectation confirmation model with perceived value. *Electronic Commerce Research and Applications*. 14(1)**:**46-57.

Huang Y-C, Backman SJ, Backman KF, Moore D (2013) Exploring user acceptance of 3D virtual worlds in travel and tourism marketing. *Tourism Management*. 36(Supplement C)**:**490-501.

Huang Y-C, Backman SJ, Backman KF, Moore D (2013) Exploring user acceptance of 3D virtual worlds in travel and tourism marketing. *Tourism Management*. 36**:**490-501.

Hung M-C, Jen W-Y (2012) The adoption of mobile health management services: An empirical study. *Journal of medical systems*. 36(3)**:**1381-1388.

Illiger K, Hupka M, von Jan U, Wichelhaus D, Albrecht U-V (2014) Mobile

Technologies: Expectancy, Usage, and Acceptance of Clinical Staff and Patients at a University Medical Center. *JMIR mHealth and uHealth*. 2(4).

Iversen AC, Kraft P (2006) Does socio-economic status and health consciousness influence how women respond to health related messages in media? *Health Education Research*. 21(5)**:**601-610.

Jarvenpaa SL, Lang KR (2005) Managing the paradoxes of mobile technology. *Information Systems Management*. 22(4)**:**7-23.

Jayanti RK, Burns AC (1998) The antecedents of preventive health care behavior: An empirical study. *Journal of the Academy of Marketing Science*. 26(1)**:**6-15.

Jiang Z, Benbasat I (2007) Research Note-Investigating the Influence of the Functional Mechanisms of Online Product Presentations. *Information Systems Research*. 18(4)**:**454-470.

John SP (2013) Influence of computer self-efficacy on information technology adoption. *International Journal of Information Technology*. 19(1)**:**1-13.

Johnston AC, Warkentin M (2010) Fear appeals and information security behaviors: an empirical study. *MIS Quarterly*. 34(3)**:**549-566.

Jokela M, Hakulinen C, Singh-Manoux A, Kivimäki M (2014) Personality change associated with chronic diseases: pooled analysis of four prospective cohort studies. *Psychological Medicine*. 44(12)**:**2629-2640.

Kahneman D, Tversky A (1979) Prospect theory: An analysis of decision under risk. *Econometrica: Journal of the Econometric Society*. 47(2)**:**263-291.

Kandemir D, Acur N (2012) Examining proactive strategic decision-making flexibility in new product development. *Journal of Product Innovation Management*. 29(4)**:**608-622.

Kang YS, Hong S, Lee H (2009) Exploring continued online service usage behavior:

The roles of self-image congruity and regret. *Computers in Human Behavior*. 25(1)**:**111-122.

Karahanna E, Ahuja M, Srite M, Galvin J (2002) Individual differences and relative advantage: the case of GSS. *Decision Support Systems*. 32(4)**:**327-341.

Karahanna E, Straub DW, Chervany NL (1999) Information technology adoption across time: a cross-sectional comparison of pre-adoption and post-adoption beliefs. *MIS Quarterly*. 23(2)**:**183-213.

Kaufmann L, Kreft S, Ehrgott M, Reimann F (2012) Rationality in supplier selection decisions: The effect of the buyer's national task environment. *Journal of Purchasing and Supply Management*. 18(2)**:**76-91.

Kazemi DM, Borsari B, Levine MJ, Li S, Lamberson KA, Matta LA (2017) A Systematic Review of the mHealth Interventions to Prevent Alcohol and Substance Abuse. *Journal of Health Communication*. 22(5)**:**413-432.

Kelley H, Chiasson M, Downey A, Pacaud D (2011) The clinical impact of eHealth on the self-management of diabetes: a double adoption perspective. *Journal of the Association for Information Systems*. 12(3)**:**208-234.

Kil-Soo S, Hongki K, Eung Kyo S (2011) What if your avatar looks like you? Dual-congruity perspectives for avatar use. *MIS Quarterly*. 35(3)**:**711-729.

Kim B (2010) An empirical investigation of mobile data service continuance: Incorporating the theory of planned behavior into the expectation–confirmation model. *Expert systems with applications*. 37(10)**:**7033-7039.

Kim H-W, Kankanhalli A (2009) Investigating user resistance to information systems implementation: A status quo bias perspective. *MIS Quarterly*. 33(3)**:**567-582.

Kim J, Lee J, Choi D (2003) Designing emotionally evocative homepages: an empirical study of the quantitative relations between design factors and

emotional dimensions. *International Journal of Human-Computer Studies*. 59(6)**:**899-940.

Kim J, Lim J-S, Bhargava M (1998) The role of affect in attitude formation: A classical conditioning approach. *Journal of the Academy of Marketing Science*. 26(2)**:**143-152.

Kim J, Morris JD (2007) The power of affective response and cognitive structure in product-trial attitude formation. *Journal of Advertising*. 36(1)**:**95-106.

Kim SS (2009) The integrative framework of technology use: an extension and test. *MIS Quarterly*. 33(3)**:**513-537.

Kim SS, Malhotra NK (2005) A longitudinal model of continued IS use: An integrative view of four mechanisms underlying postadoption phenomena. *Management Science*. 51(5)**:**741-755.

Kolsaker A, Drakatos N (2009) Mobile advertising: The influence of emotional attachment to mobile devices on consumer receptiveness. *Journal of Marketing Communications*. 15(4)**:**267-280.

Kumar S, Nilsen WJ, Abernethy A, Atienza A, Patrick K, Pavel M, Riley WT, Shar A, Spring B, Spruijt-Metz D (2013) Mobile health technology evaluation: the mHealth evidence workshop. *American Journal of Preventive Medicine*. 45(2)**:**228-236.

Lazarus RS (1991) Cognition and motivation in emotion. *American Psychologist*. 46(4)**:**352-367.

Lee G, Lee J, Sanford C (2010) An Exploratory Study on Maximizing Tendency and Continuance Intention of Web Sites. *Asia Pacific Journal of Information Systems*. 20(3)**:**73-90.

Lee HJ, Lee D-H, Taylor CR, Lee J-H (2011) Do online brand communities help build

and maintain relationships with consumers? A network theory approach. *Journal of Brand Management*. 19(3)**:**213-227.

Lee Y-K, Lee C-K, Lee S-K, Babin BJ (2008) Festivalscapes and patrons' emotions, satisfaction, and loyalty. *Journal of Business Research*. 61(1)**:**56-64.

Leong KC, Chen WS, Leong KW, Mastura I, Mimi O, Sheikh MA, Zailinawati AH, Ng CJ, Phua KL, Teng CL (2006) The use of text messaging to improve attendance in primary care: a randomized controlled trial. *Family Practice*. 23(6)**:**699-705.

Lerouge C, Mantzana V, Wilson EV (2007) Healthcare information systems research, revelations and visions. *European Journal of Information Systems*. 16(6)**:**669-671.

Liang H, Xue Y (2013) *Online Health Information Use by Disabled People: the Moderating Role of Disability*. Milan.

Liang H, Xue Y, Zhang Z (2017) Understanding Online Health Information Use: The Case of People with Physical Disabilities. *Journal of the Association for Information Systems*. 18(6)**:**433.

Liew S-M, Tong SF, Lee VKM, Ng CJ, Leong KC, Teng CL (2009) Text messaging reminders to reduce non-attendance in chronic disease follow-up: a clinical trial. *British Journal of General Practice*. 59(569)**:**916-920.

Lim S, Xue L, Yen CC, Chang L, Chan HC, Tai BC, Duh HBL, Choolani M (2011) A study on Singaporean women's acceptance of using mobile phones to seek health information. *International Journal of Medical Informatics*. 80(12)**:**189-202.

Limayem M, Cheung CM (2008) Understanding information systems continuance: The case of Internet-based learning technologies. *Information & Management*. 45(4)**:**227-232.

Limayem M, Hirt SG (2003) Force of habit and information systems usage: Theory and initial validation. *Journal of the Association for Information Systems*. 4(1)**:**3.

Lindgaard G, Fernandes G, Dudek C, Brown J (2006) Attention web designers: You have 50 milliseconds to make a good first impression! *Behaviour & Information Technology*. 25(2)**:**115-126.

Liu W-T, Huang C-D, Wang C-H, Lee K-Y, Lin S-M, Kuo H-P (2011) A mobile telephone-based interactive self-care system improves asthma control. *European Respiratory Journal*. 37(2)**:**310-317.

Loewenstein GF, Weber EU, Hsee CK, Welch N (2001) Risk as feelings. *Psychological Bulletin*. 127(2)**:**267-286.

Loiacono E, Djamasbi S (2010) Moods and their relevance to systems usage models within organizations: an extended framework. *AIS Transactions on Human-Computer Interaction*. 2(2)**:**55-72.

Lowe R, Eves F, Carroll D (2002) The influence of affective and instrumental beliefs on exercise intentions and behavior: A longitudinal analysis. *Journal of Applied Social Psychology*. 32(6)**:**1241-1252.

Lowry PB, Zhang D, Wu D (2014) *Understanding Patients' Compliance Behavior in a Mobile Healthcare System: The Role of Trust and Planned Behavior*. Auckland, New Zealand.

Lowry PB, Zhang D, Wu D (2014) *Understanding Patients' Compliance Behavior in a Mobile Healthcare System: The Role of Trust and Planned Behavior*.

Machleit KA, Wilson RD (1988) Emotional feelings and attitude toward the advertisement: The roles of brand familarity and repetition. *Journal of Advertising*. 17(3)**:**27-35.

Mai R, Hoffmann S (2012) Taste lovers versus nutrition fact seekers: how health

consciousness and self-efficacy determine the way consumers choose food products. *Journal of Consumer Behaviour*. 11(4)**:**316-328.

Marakhimov A, Joo J (2017) Consumer adaptation and infusion of wearable devices for healthcare. *Computers in Human Behavior*. 76(C)**:**135-148.

Marks LJ, Olson JC (1981) Toward a cognitive structure conceptualization of product familiarity. *Advances in Consumer Research*. 8(1)**:**145-150.

Maunder R, Hunter J (2015) *Love, fear, and health: how our attachments to others shape health and health care* (University of Toronto Press, Toronto).

McDougall GH, Levesque T (2000) Customer satisfaction with services: putting perceived value into the equation. *Journal of Services Marketing*. 14(5)**:**392-410.

McEwen WJ (2005) *Married to the brand: Why consumers bond with some brands for life* (Gallup Press, Princeton, NJ).

McKenna B, Tuunanen T, Gardner L (2013) Consumers' adoption of information services. *Information & Management*. 50(5)**:**248-257.

McKinney V, Yoon K, Zahedi FM (2002) The measurement of web-customer satisfaction: An expectation and disconfirmation approach. *Information Systems Research*. 13(3)**:**296-315.

Mehrabian A, Russell JA (1974) The basic emotional impact of environments. *Perceptual and Motor Skills*. 38(1)**:**283-301.

Mellers BA, Schwartz A, Cooke AD (1998) Judgment and decision making. *Annual Review of Psychology*. 49(1)**:**447-477.

Meuter ML, Ostrom AL, Bitner MJ, Roundtree R (2003) The influence of technology anxiety on consumer use and experiences with self-service technologies. *Journal of Business Research*. 56(11)**:**899-906.

Meyer JP, Allen NJ, Smith CA (1993) Commitment to organizations and occupations: Extension and test of a three-component conceptualization. *Journal of Applied Psychology*. 78(4)**:**538-551.

Mirza F, Norris T, Stockdale R (2008) Mobile technologies and the holistic management of chronic diseases. *Health Informatics Journal*. 14(4)**:**309-321.

Moliner MA, Sánchez J, Rodríguez RM, Callarisa L (2007) Perceived relationship quality and post-purchase perceived value: An integrative framework. *European Journal of Marketing*. 41(11/12)**:**1392-1422.

Motamarri S, Akter S, Ray P, Tseng C-L (2014) Distinguishing "mHealth" from Other Healthcare Services in a Developing Country: A Study from the Service Quality Perspective. *Communications of the Association for Information Systems*. 34(1)**:**669-692.

NBSC (2015) *National Economic and Social Development Statistics Bulletin*. National Bureau of Statistics of China, Beijing, China.

Ng S-N, Matanjun D, D'Souza U, Alfred R (2015) Understanding Pharmacists' Intention to Use Medical Apps. *electronic Journal of Health Informatics*. 9(1)**:**7.

NHFPC (2012) *Chinese chronic disease prevention planning (2012-2015)*. National Health and Family Planning Comminssion of the People's Republic of China, Beijing, China.

Norman DA, Ortony A, Russell DM (2003) Affect and machine design: Lessons for the development of autonomous machines. *IBM Systems Journal*. 42(1)**:**38-44.

O' Connor Y, O' Reilly P (2016) Examining the infusion of mobile technology by healthcare practitioners in a hospital setting. *Information Systems Frontiers*. forthcoming**:**1-21.

Oikawa M, Aarts H, Oikawa H (2011) There is a fire burning in my heart: The role of causal attribution in affect transfer. *Cognition and emotion*. 25(1)**:**156-163.

Okazaki S, Blas SS, Castañeda JA (2015) PHYSICIANS'ADOPTION OF MOBILE HEALTH MONITORING SYSTEMS IN SPAIN: COMPETING MODELS AND IMPACT OF PRIOR EXPERIENCE. *Journal of Electronic Commerce Research*. 16(3)**:**194-217.

Okazaki S, Castañeda JA, Sanz S, Mukherji P (2017) Physicians' motivations to use mobile health monitoring: a cross-country comparison. *Behaviour & Information Technology*. 36(1)**:**21-32.

Oliver RL (1980) A cognitive model of the antecedents and consequences of satisfaction decisions. *Journal of Marketing Research*. 17(4)**:**460-469.

Oliver RL, DeSarbo WS (1988) Response determinants in satisfaction judgments. *Journal of Consumer Research*. 14(4)**:**495-507.

Ostojic V, Cvoriscec B, Ostojic SB, Reznikoff D, Stipic-Markovic A, Tudjman Z (2005) Improving asthma control through telemedicine: a study of short-message service. *Telemedicine Journal & e-Health*. 11(1)**:**28-35.

Ouyang J (2014) *Diabetes Mellitus: Precise Management of Severe Vertical*. Shenzhen, China.

Park J-Y, Lee G, Shin S-Y, Kim JH, Han H-W, Kwon T-W, Kim WS, Lee JH (2014) Lessons learned from the development of health applications in a tertiary hospital. *Telemedicine and e-Health*. 20(3)**:**215-222.

Paternoster R, Pogarsky G (2009) Rational choice, agency and thoughtfully reflective decision making: The short and long-term consequences of making good choices. *Journal of Quantitative Criminology*. 25(2)**:**103-127.

Payne BK, Cheng CM, Govorun O, Stewart BD (2005) An inkblot for attitudes: affect

misattribution as implicit measurement. *Journal of personality and social psychology*. 89(3)**:**277.

Payne N, Jones F, Harris PR (2004) The role of perceived need within the theory of planned behaviour: A comparison of exercise and healthy eating. *British Journal of Health Psychology*. 9(4)**:**489-504.

Payton FC, Pare G, Le Rouge CM, Reddy M (2011) Health care IT: Process, people, patients and interdisciplinary considerations. *Journal of the Association for Information Systems*. 12(2)**:**1-13.

Pemberton K, Fox JR (2013) The experience and management of emotions on an inpatient setting for people with anorexia nervosa: A qualitative study. *Clinical Psychology & Psychotherapy*. 20(3)**:**226-238.

Phillips G, Felix L, Galli L, Patel V, Edwards P (2010) The effectiveness of M-health technologies for improving health and health services: a systematic review protocol. *BMC Research Notes*. 3(1)**:**250.

Phillips W (1971) Does familiarity affect transfer from an iconic to a short-term memory? *Perception & Psychophysics*. 10(3)**:**153-157.

PingAnHealth. 2105. Introduction of Ping An Health Cloud Company Limited, 2016, University.

Podsakoff PM, MacKenzie SB, Lee J-Y, Podsakoff NP (2003) Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology*. 88(5)**:**879-903.

Pollettini JT, Baranauskas JA, Ruiz ES, Pimentel MG, Macedo AA (2014) Surveillance for the prevention of chronic diseases through information association. *BMC Medical Genomics*. 7(1)**:**7-17.

PwC, GSMA (2012) *Touching lives through mobile health: Assessment of the global*

market opportunity. Pricewaterhouse Coopers

Groupe Speciale Mobile Association, India

Radin P (2006) “To me, it's my life”: medical communication, trust, and activism in cyberspace. *Social Science & Medicine*. 62(3)**:**591-601.

Rai A, Chen L, Pye J, Baird A (2013) Understanding determinants of consumer mobile health usage intentions, assimilation, and channel preferences. *Journal of Medical Internet Research*. 15(8)**:**e149.

Rai A, Chen L, Pye J, Baird A (2013) Understanding determinants of consumer mobile health usage intentions, assimilation, and channel preferences. *Journal of medical Internet research*. 15(8).

Reeve J (2014) *Understanding motivation and emotion* (John Wiley & Sons Inc, New York).

Reuters. 2015. WHO says chronic diseases kill 3 million annually in China, University.

Rogers EM (2010) *Diffusion of innovations* (Simon and Schuster, New York).

Russell JA (2003) Core affect and the psychological construction of emotion. *Psychological Review*. 110(1)**:**145.

Salovey P, Rothman AJ, Detweiler JB, Steward WT (2000) Emotional states and physical health. *American Psychologist*. 55(1)**:**110-121.

Schultheiss DP, Blustein DL (1994) Contributions of family relationship factors to the identity formation process. *Journal of Counseling and Development*. 73(2)**:**159.

Scott SG, Bruce RA (1995) Decision-making style: The development and assessment of a new measure. *Educational and Psychological Measurement*. 55(5)**:**818-831.

Shetty AS, Chamukuttan S, Nanditha A, Raj R, Ramachandran A (2011)

Reinforcement of adherence to prescription recommendations in Asian Indian diabetes patients using short message service (SMS)–a pilot study. *J Assoc Physicians India*. 59**:**711-714.

Shimp TA (1981) Attitude toward the ad as a mediator of consumer brand choice. *Journal of Advertising*. 10(2)**:**9-48.

Smith TW, Houston BK, Zurawski RM (1984) Irrational beliefs and the arousal of emotional distress. *Journal of Counseling Psychology*. 31(2)**:**190-201.

Sobel ME (1982) Asymptotic confidence intervals for indirect effects in structural equation models. *Sociological Methodology*. 13**:**290-312.

Soongeun H, Jeoungkun K, Heeseok L (2008) Antecedents of use-continuance in information systems: Toward An Inegrative View. *Journal of Computer Information Systems*. 48(3)**:**61-73.

Spielberger CD, Gorsuch RL (1983) *State-trait anxiety inventory for adults: Manual, instrument, and scoring guide* (Mind Garden, Incorporated, Palo Alto, CA).

Spreng RA, MacKenzie SB, Olshavsky RW (1996) A reexamination of the determinants of consumer satisfaction. *The Journal of Marketing*. 66**:**15-32.

Stanton AL, Revenson TA, Tennen H (2007) Health psychology: psychological adjustment to chronic disease. *Annu. Rev. Psychol.* 58**:**565-592.

Straub D, Limayem M, Karahanna-Evaristo E (1995) Measuring system usage: Implications for IS theory testing. *Management Science*. 41(8)**:**1328-1342.

Sun Y, Wang N, Guo X, Peng Z (2013) Understanding the acceptance of mobile health services: A comparison and integration of alternative models. *Journal of Electronic Commerce Research*. 14(2)**:**183-200.

Swan JE, Trawick IF (1981) Disconfirmation of expectations and satisfaction with a retail service. *Journal of Retailing*. 57(3)**:**49-67.

Szymanski DM, Hise RT (2000) E-satisfaction: an initial examination. *Journal of Retailing*. 76(3)**:**309-322.

TalkingData (2015) *mHealth Market Data Report*.

Taylor SE, Aspinwall LG (1996) *Psychosocial aspects of chronic illness* (American Psychological Association, Washington, DC).

Teo H-H, Oh L-B, Liu C, Wei K-K (2003) An empirical study of the effects of interactivity on web user attitude. *International Journal of Human-Computer Studies*. 58(3)**:**281-305.

Teo TS, Lim VK, Lai RY (1999) Intrinsic and extrinsic motivation in Internet usage. *Omega*. 27(1)**:**25-37.

Thatcher JB, Perrewe PL (2002) An Empirical Examination of Individual Traits as Antecedents to Computer Anxiety and Computer Self-Efficacy. *Mis Quarterly*. 26(4)**:**381-396.

Thomson M (2006) Human brands: Investigating antecedents to consumers' strong attachments to celebrities. *Journal of marketing*. 70(3)**:**104-119.

Thomson M, MacInnis DJ, Park CW (2005) The ties that bind: Measuring the strength of consumers' emotional attachments to brands. *Journal of Consumer Psychology*. 15(1)**:**77-91.

Thong JYL, Hong S-J, Tam KY (2006) The effects of post-adoption beliefs on the expectation-confirmation model for information technology continuance. *International Journal of Human-Computer Studies*. 64(9)**:**799-810.

Tosi HL, Slocum JW (1984) Contingency theory: Some suggested directions. *Journal of Management*. 10(1)**:**9-26.

Trumbo CW, McComas KA, Kannaovakun P (2007) Cancer anxiety and the perception of risk in alarmed communities. *Risk Analysis*. 27(2)**:**337-350.

Van Beek N, Griez E (2003) Anxiety sensitivity in first-degree relatives of patients with panic disorder. *Behaviour Research and Therapy*. 41(8)**:**949-957.

Van der Heijden H (2004) User acceptance of hedonic information systems. *MIS Quarterly*. 28(4)**:**695-704.

Van der Pligt J, Zeelenberg M, van Dijk WW, de Vries NK, Richard R (1997) Affect, attitudes and decisions: Let's be more specific. *European Review of Social Psychology*. 8(1)**:**33-66.

Van Lange PA, Rusbult CE, Drigotas SM, Arriaga XB, Witcher BS, Cox CL (1997) Willingness to sacrifice in close relationships. *Journal of Personality and Social Psychology*. 72(6)**:**1373-1395.

Venkatesh V (2000) Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research*. 11(4)**:**342-365.

Venkatesh V, Brown SA (2001) A longitudinal investigation of personal computers in homes: adoption determinants and emerging challenges. *MIS Quarterly*. 25(1)**:**71-102.

Venkatesh V, Brown SA, Bala H (2013) Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems. *MIS Quarterly*. 37(1)**:**21-54.

Venkatesh V, Brown SA, Maruping LM, Bala H (2008) Predicting different conceptualizations of system use: the competing roles of behavioral intention, facilitating conditions, and behavioral expectation. *MIS Quarterly*. 32(3)**:**483-502.

Venkatesh V, Morris MG, Davis GB, Davis FD (2003) User acceptance of information technology: Toward a unified view. *MIS Quarterly*. 27(3)**:**425-478.

Venkatesh V, Speier C, Morris MG (2002) User acceptance enablers in individual decision making about technology: Toward an integrated model. *Decision Sciences*. 33(2)**:**297-316.

Vlachos PA (2012) Corporate social performance and consumer-retailer emotional attachment: The moderating role of individual traits. *European Journal of Marketing*. 46(11/12)**:**1559-1580.

Vlachos PA, Theotokis A, Pramatari K, Vrechopoulos A (2010) Consumer-retailer emotional attachment: Some antecedents and the moderating role of attachment anxiety. *European Journal of Marketing*. 44(9/10)**:**1478-1499.

Wang CY (2010) Service quality, perceived value, corporate image, and customer loyalty in the context of varying levels of switching costs. *Psychology & Marketing*. 27(3)**:**252-262.

Ward BW, Schiller JS, Goodman RA (2014) Multiple Chronic Conditions Among US Adults: A 2012 Update. *Preventing Chronic Disease*. 11**:**E62.

Weber JM, Malhotra D, Murnighan JK (2004) Normal acts of irrational trust: motivated attributions and the trust development process. *Research in Organizational Behavior*. 26**:**75-101.

Wegener DT, Petty RE (2001) *Understanding effects of mood through the elaboration likelihood and flexible correction models* (Lawrence Erlbaum Associat, Mahwaw, NJ).

Wetzels M, Odekerken-Schröder G, Van Oppen C (2009) Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. *MIS Quarterly*. 33(1)**:**177-195.

Wixom BH, Todd PA (2005) A theoretical integration of user satisfaction and technology acceptance. *Information Systems Research*. 16(1)**:**85-102.

Wu D, Lowry PB, Zhang D (2015) *Patient Compliance Behavior in a Mobile Healthcare System: An Integration of Theories of Rational Choice and Planned Behavior*. IEEE.

Wu L, Li J-Y, Fu C-Y (2011) The adoption of mobile healthcare by hospital's professionals: An integrative perspective. *Decision Support Systems*. 51(3)**:**587-596.

Xiaohui Y, Han H, Du Jiadong W, Liurong LC, Xueli Z, Haihua L, Darrell W, Joshua B (2014) *mHealth in China and the United States*. China Academy of Telecommunication Research of MIIT and Center for Technology Innovation at Brookings, Washington, DC.

Xu JD, Benbasat I, Cenfetelli RT (2013) Integrating service quality with system and information quality: an empirical test in the e-service context. *MIS Quarterly*. 37(3)**:**777-794.

Xue Y, Liang H, Wu L (2011) Punishment, justice, and compliance in mandatory IT settings. *Information Systems Research*. 22(2)**:**400-414.

Yang H-d, Yoo Y (2004) It's all about attitude: revisiting the technology acceptance model. *Decision Support Systems*. 38(1)**:**19-31.

Yang H-Y, Wang M-J (2012) What factors affect physicians' decisions to use an e-health care system? *Health*. 4(11)**:**1023-1028.

Yang K, Forney JC (2013) The Moderating Role of Consumer Technology Anxiety in Mobile Shopping Adoption: Differential Effects of Facilitating Conditions and Social Influences. *Journal of Electronic Commerce Research*. 14(4)**:**334-347.

Yin D, Bond S, Zhang H (2014) Anxious or angry? Effects of discrete emotions on the perceived helpfulness of online reviews. *MIS Quarterly*. 38(2)**:**539-560.

Young Im J, Hancer M (2014) Shaping travelers' attitude toward travel mobile

applications. *Journal of Hospitality and Tourism Technology*. 5(2)**:**177-193.

Zajonc RB (1998) *Emotions* (Oxford University Press, New York).

Zhang P (2013) The affective response model: a theoretical framework of affective concepts and their relationships in the ICT context. *MIS Quarterly*. 37(1)**:**247-274.

Zhang P, Li N (2004) *Love at first sight or sustained effect? The role of perceived affective quality on users' cognitive reactions to information technology*. Washington, DC.

Zhang X, Guo X, Lai K-h, Guo F, Li C (2014) Understanding gender differences in m-health adoption: A modified theory of reasoned action model. *Telemedicine and e-Health*. 20(1)**:**39-46.

Zhang X, Han X, Dang Y, Meng F, Guo X, Lin J (2017) User acceptance of mobile health services from users' perspectives: The role of self-efficacy and response-efficacy in technology acceptance. *Informatics for Health and Social Care*. 42(2)**:**194-206.

Zhang X, Yan X, Cao X, Sun Y, Chen H, She J (2017) The role of perceived e-health literacy in users' continuance intention to use mobile healthcare applications: an exploratory empirical study in China. *Information Technology for Development***:**1-26.