AN ANALYSIS OF INFORMATION TECHNOLOGY (IT) POST- ADOPTION BEHAVIOR

Md Rasel Al Mamun

Dissertation Prepared for the Degree of

DOCTOR OF PHILOSOPHY

UNIVERSITY OF NORTH TEXAS

August 2020

APPROVED:

Daniel A. Peak, Dissertation Chair
Victor R. Prybutok, Dissertation Co-Chair
Dean of the Toulouse Graduate School
Russell A. Torres, Committee Member
William D. Senn, Committee Member
Leon Kappelman, Chair of the Department of Information Technology and Decision Sciences
Marilyn Wiley, Dean of the G. Brint Ryan College of Business

Mamun, Md Rasel Al. *An Analysis of Information Technology (IT) Post- Adoption Behavior*. Doctor of Philosophy (Business), August 2020, 94 pp., 4 tables, 6 figures, references, 243 titles.

The primary focus of this research is explicating the role of emotion in IT post-adoption behavior. Studied in the context of intelligent personal assistants (IPA), a class of conversational artificial intelligence (AI), the first study integrates elements from computer science, communications, and IS disciplines. The research identifies two constructs vital for speech-based technologies, natural language understanding, and feedback, and examines their role in use decisions. This work provides guidance to practice on how best to allocate R&D investments in conversational AI. The second essay examines the IT continuance through the theoretical lens of the expectation-confirmation model (ECM), incorportating cognitive and emotional satisfaction into the ECM framework. Empirical testing of the model suggests that it offers additional clarity on IT continuance phenomena and provides a significant improvement to the explanatory power of ECM in the context of an emerging technology. The third essay is one of the earliest efforts to conceptualize and test a theoretical model that considers emotional attachment in IT continuance behavior. This essay develops a novel model to investigate this phenomenon based on emotional attachment theory, and empirically validates the proposed model in the context of conversational artificial intelligence systems. While the existing theories of IT continuance focus on purely rational, goal-oriented factors, this study incorporates non-cognitive aspects by including the emotional consequences of IT continuance and offers evidence that attachment can exist even in the absence of cognitive factors.

TABLE OF CONTENTS

Page

LIST OF TABLES AND FIGURES

Page

Tables

Figures

BACKGROUND

This research involves three studies that investigate information technology (IT) post-adoption behavior. The primary focus of this research is explicating the role of emotion in IT post-adoption behavior. Despite a significant body of behavioral research that points to the importance of emotion as a factor in human behavior, exiting theoretical guidance on IT post-adoption behavior has either completely ignored the contribution of emotion or has only superficially examined this important factor. This research represents a rigorous, theoretically grounded attempt to expand understanding of post-adoption phenomena by clarifying the role of emotion in use and continuance scenarios.

The first essay highlights the importance of considering the unique characteristics of a technology's surface structure when examining post-adoption use. Studied in the context of intelligent personal assistants (IPA), a class of conversational artificial intelligence (AI), this study integrates elements from computer science, communications, and IS disciplines. The research identifies two constructs vital for speech-based technologies, natural language understanding, and feedback, and examines their role in use decisions. This work expands our theoretical understanding of user behaviors related to natural language interface (NLI) systems and provides guidance to practice on how best to allocate R&D investments in conversational AI. The second essay examines the IT continuance through the theoretical lens of the expectation-confirmation model (ECM). This study makes important contributions to our understanding of IT continuance and incorporates cognitive and emotional satisfaction into the ECM framework. The proposed model also substitutes perceived benefit for perceived usefulness, which figures prominently in previous ECM models and fails to capture the non-utilitarian advantages of IT. Empirical testing of the model suggests that it offers additional clarity on IT continuance phenomena and provides

a significant improvement to the explanatory power of ECM in the context of emerging technology. The third essay is one of the earliest efforts to conceptualize and test a theoretical model that considers emotional attachment in IT continuance behavior. This essay develops a novel model to investigate this phenomenon based on emotional attachment theory, and empirically validates the proposed model in the context of conversational artificial intelligence systems. While the existing theories of IT continuance focus on purely rational, goal-oriented factors, this study incorporates non-cognitive aspects by including the emotional consequences of IT continuance and offers evidence that attachment can exist even in the absence of cognitive factors.

These three essays provide insight into the IT post-adoption phenomenon and extend the body of knowledge related to the cognitive and emotional consequences of IT post-adoption behavior. Moreover, this research will guide managers, vendors, and IT manufacturing companies to take operational and strategic decisions.

ESSAY 1

PERCEIVED QUALITY FACTORS IN THE VOICE-ENABLED COMPUTER USE: THE CASE OF INTELLIGENT PERSONAL ASSISTANTS

1.1 Introduction

High-performance computing platforms have become a part of our everyday life, whether it is in our homes, offices, or mobile environment. The growth of computing and high-speed internet has resulted in the development of Intelligent Personal Assistants (IPAs), where the modality of interaction between system and user is speech-based. Hauswald et al. (2015, p. 223) define IPA as, "… an application that uses inputs such as the user's voice, vision (images), and contextual information to provide assistance by answering questions in natural language, making recommendations, and performing actions." While innovators introduced AI voice recognition systems as early as the 1950s, the diffusion of such systems was limited by technical complexity and cost (Gu, Xu, Chu, & Zhang, 2015). These limitations have largely been erased by technological innovation and now speech-enabled devices such as IPA are a common fixture in many households. A recent survey of US consumers indicates that approximately 20% of consumers currently own at least one IPA device, with roughly 10% of non-IPA owners reporting they plan to purchase a device within the year (Voicebot, 2019).

IPAs are fundamentally different than other widely used consumer technologies as they replace the traditional, manual input and output (I/O) system in the computer architecture with natural language interaction (Canbek & Mutlu, 2016). Existing IS literature suggests that users are highly influenced by the surface structure of information technology and that advances that make the interaction process more transparent are likely to improve use outcomes (Burton-Jones & Grange, 2012). Thus the idiosyncrasies of speech-based interaction are likely to materially

impact the factors which govern the adoption and use of devices featuring natural language interfaces (NLIs). Many believe that NLIs provide the most intuitive and efficient means for users to interact with computers because humans already have extensive communication skills and do not need additional training. However, interpreting and generating natural language remain challenging tasks for computer-based systems (Yilmazyildiz, Read, Belpaeme, & Verhelst, 2016).

The communications and computer science literature identify common understanding and feedback as foundational capabilities for NLI systems (Dillmann, Kaiser, Klingspor, Morik, & Wallner, 1995). The common understanding for NLI systems such as IPAs requires the use of a wide range of complex linguistic processing techniques designed to explore the phonological, morphological, lexical, syntactic, semantic, discourse, and pragmatic elements of speech (Liddy, 1998). Feedback from machines also plays an important role in successful communication with intelligent machines by acknowledging commands and communicating the progress of assigned tasks (Klingspor, Demiris, & Kaiser, 1997). Among consumer-based technologies, these system characteristics are unique to IPA and despite the growing popularity of IPAs, we have a nascent understanding of how these factors influence their use. To date, no studies have examined the concepts of natural language understanding (NLU) and feedback in the context of IPA use.

The goal of this study is to examine how these foundational capabilities influence the perceptions of individuals, and how those perceptions influence satisfaction and use of IPAs. We examine this phenomenon through the theoretical lens of the IS Success Model (Delone & McLean, 2003) and position NLU and feedback as important antecedents of perceptions of IPA quality. Further, and consistent with the IS Success model, we posit that perceptions of quality influence perceptions of satisfaction and ultimately behavioral decisions to use IPAs. Thus, we

seek to answer the following research question: Are natural language understanding and feedback capabilities influential in decisions to use IPA technology?

The remainder of this paper is structured as follows. First, we offer a literature review that examines research on IPAs, NLU, and feedback, as well as provides the theoretical foundation for our work. Next, we present our theoretically grounded research model. We then provide an overview of our research method and our data analysis and results. We then discuss our findings and conclude the paper.

1.2 Literature Review

1.2.1 Intelligent Personal Assistants (IPAs)

IPAs allow the execution of a wide array of commands using only natural language input from the user (Reis, Paulino, Paredes, & Barroso, 2017). Such commands range from accessing internet information to controlling smart home appliances (Newman & Newman, 2000). Evolving from relatively rudimentary early devices that struggled to interpret even predetermined commands, modern IPAs are significantly more advanced than their predecessors, interpreting complex commands in challenging environmental conditions (Li, Deng, Gong, & Haeb-Umbach, 2014). These capabilities position IPAs on the cusp of significantly altering the keyboard/mouse paradigm of human-computer interaction and providing new hope for those with physical disabilities, repetitive stress injuries, and limited ability to manage the cognitive demands of reading and spelling (DeRosier & Farber, 2005). For the broader user community, IPAs might be the fastest and most convenient means of computing, as humans can speak much faster than traditional methods of interaction (Meeker, 2017).

Although the advancement of IPAs has been rapid and offers significant promise, substantial challenges remain, which may derail their widespread use. Improvements in the

technologies that underlie natural language interface (NLI), while impressive, still fail to support true conversational interaction. Research suggests that quality NLI has been inhibited by the vast range of words employed in human speech, unpredictable input, noisy environmental conditions, and many other technical issues (Santos, Rodrigues, Casal, Saleem, & Denisov, 2018). As NLI is a defining characteristic of modern IPAs, the ability of such devices to facilitate high-quality, natural language conversations is likely a critical factor in the adoption and continued use of IPA technologies.

1.2.2 Natural Language Understanding (NLU) and Feedback

All types of communication consist of two parts: the sender sends the message, and the receiver accepts it (Clark & Brennan, 1991). Successful communication requires mutual agreement between interlocutors that a given message has been received and understood (Clark & Wilkes-Gibbs, 1986). Facilitating these exchanges between humans and machines is the domain of NLI. The technologies behind such interfaces, such as speech recognition, natural language generation, and speech synthesis, have been the subjects of much research, design, and development over the last few decades. Such research has been highly technical and involves the application of a wide variety of artificial intelligence and machine learning approaches to improve voice-related interfaces (Hauswald et al., 2015; Saady, El-Borey, El-Dahshan, & Yahia, 2014). Such advancements have significantly enhanced the ability of machines to carry out simple human-like interactions (X. Yang, Aurisicchio, & Baxter, 2019). However, research on NLI interactions has shifted from a focus on simple one-way exchanges to more complex situations in which a series of exchanges form a conversation with meaning for both human and computer actors (Jiang et al., 2015). This new research focus exposes several shortcomings of existing approaches to the facilitation of understanding between humans and computers (Kiseleva et al., 2016). Thus, these

technologies are still far from the state where machines can engage in entirely open-ended conversations (Moore, 2014). Such systems are faced with the non-trivial task of establishing meaning based on word composition and structure, parts-of-speech, and grammar, among other cues (Chowdhury, 2003). The complexity in this task derives from the inherent abstruseness in both words and sentences, which require context to disambiguate (Jurafsky & Martin, 2009). A given word or a sentence may have a specific meaning in a given context or domain, defined by its relationship to other nearby words and sentences. NLU is, thus, a complex process that involves several inter-related linguistic processing levels (Chowdhury, 2003; Feldman, 1999; Liddy, 1998). Research indicates that differential support of these linguistic processing levels results in variation among NLI systems with respect to the level of NLU afforded between human and computer actors (Chowdhury, 2003; Feldman, 1999; Liddy, 1998).

In addition to ensuring understanding between conversational participants, the psychology and communications literature highlights the importance of feedback in conversational exchanges (Dillmann et al., 1995; Podsakoff & Farh, 1989). Feedback from the receiver to the sender plays an important role in successful communication by acknowledging to the sender that the receiver has understood the message (Dennis & Kinney, 1998), and is critical in order to meet the grounding criterion, a mutual belief that understanding of a given utterance has been achieved (Clark & Brennan, 1991). Feedback is defined as "evaluative information that is provided on the functioning of a system that is intended to correct variations from a productive pathway (Azevedo & Bernard, 1995, p. 111)." In human to human communication, feedback may be explicitly communicated via language or implicitly expressed through body language (movement, positioning, etc.). While there is no theoretical framework of feedback dedicated specifically to human-computer communication, a variety of existing theories and research paradigms

acknowledge the importance of this communication feature. Control theory, (Podsakoff & Farh, 1989), goal setting theory (Locke & Latham, 1990), the multiple-cue probability learning paradigm (Balzer & Doherty, 1989), social cognition theory (Bandura, 1991), derivatives of learned helplessness theory (Mikulincer, 2013) and others highlight the importance of feedback between senders and receivers.

While arguably more important in the context of NLI, the nature of such interfaces limit the opportunity for feedback between human and computer actors. In the context of IT, concurrent and sequential feedback (Krauss & Weinheimer, 1966) have been mapped to four types of feedback: positive acknowledgment, negative acknowledgment, repair, and proxy (Dennis & Kinney, 1998). Importantly, current NLI systems do not generally support concurrent feedback. As a result, feedback is exchanged explicitly and at a slower rate than that characterized by human-to-human conversation (Klingspor et al., 1997). Thus, "for conversational interaction, the system must generate acknowledgment to verify that commands are understood, and an intelligent response made to advise the user of actions needed or taken." (Marsic, Medl, & Flanagan, 2000, p. 1358).

Thus, the literature in a broad range of disciplines suggests that the goal of conversational interaction between humans and IPAs is dependent upon the ability of those devices to support NLU and provide feedback. Unfortunately, due to the technical nature of existing research on the topic of NLI, little is known about how such factors may influence the behaviors of users and, ultimately, the success of IPA technologies.

1.3 Theoretical Foundation

Examining the success of information systems (IS) is a central concern of the IS discipline (Sidorova, Evangelopoulos, Torres, & Johnson, 2013). Although numerous theoretical

perspectives inform our understanding of success in the context of IS, the Delone and McLean IS success model (DeLone & McLean, 1992, 2003) is the most frequently applied theoretical lens for understanding these phenomena (Sidorova et al., 2013). Through a review of the literature, the IS Success model identifies six dimensions as indicative of the success of information systems: system quality, information quality, service quality, IS use, user satisfaction, and net benefits (DeLone & McLean, 1992, 2003). System quality represents the technical capabilities of the system, information quality represents the quality of the informational outputs of the system, and service quality recognizes that information systems often provide both information and services (DeLone & McLean, 1992, 2003). In IS quality research, system quality, information quality, and service quality are antecedents of system use and user satisfaction. System use and user satisfaction, in turn, influence the net benefits associated with system use.

Quality is a central element of the IS success model; research has repeatedly demonstrated its importance in the decisions of individuals to continue the use of a given IS. System quality refers to the users' evaluation of an IS from the technical and design perspectives (Gable, Sedera, & Chan, 2008). Operationalization of perceived system quality varies in IS literature depending on the target technology, however, conceptualizations generally remain faithful to the notion of system quality as an evaluation of the technical capabilities of system function. The role of system quality in the acceptance and continued use of IS at both group and organizational levels has been extensively investigated (Delone & McLean, 2003; Halawi, McCarthy, & Aronson, 2008; J.-H. Wu & Wang, 2006).

The quality of IS outputs plays a vital role in overall perceptions and usage intention. Users have a strong preference for information they perceive as reliable, readily available, and understandable. IS researchers have investigated information quality extensively (Arazy, Nov,

Patterson, & Yeo, 2011). Delone and McLean (DeLone & McLean, 1992, 2003) define information quality as desirable characteristics of the outputs of a system. Although precise definitions of the construct vary (e.g., (Eppler, 2006; Taylor & Taylor, 1986)), information quality is generally conceptualized as consisting of multiple dimensions which focus on intrinsic aspects of the information as well as the context in which the information is intended to be used. The intrinsic aspect of information is evaluated based on dimensions such as accuracy, consistency, and currency of output information, while contextual judgments are based on dimensions such as completeness and format (Laumer, Maier, & Weitzel, 2017; Nelson, Todd, & Wixom, 2005). Despite this multidimensional conceptualization, information quality is generally measured as a single construct (Gable et al., 2008).

Service quality is the degree to which a service exceeds customer expectations (Parasuraman, Zeithaml, & Berry, 1990). Service quality was adopted by the IS discipline from the marketing literature in recognition that IS often provides both informational and service-related outputs (Delone & McLean, 2003; Petter, DeLone, & McLean, 2013). The increasing role of IS as a service provider prompted IS scholars to investigate the importance of service quality for IS success (Kettinger & Smith, 2009). Based on the critiques and proposals of several researchers (Prybutok, Kappelman, & Myers, 1997), Delone and McLean incorporated service quality as a predictor of user satisfaction in their revised IS success model (Delone & McLean, 2003). Subsequent investigations have demonstrated the value of service quality as a predictor of use and satisfaction at both the organizational and individual levels of research (Mohammadi, 2015).

Importantly, the original IS success model was presented primarily as a process model in which the authors posited causal relationships but did not verify these links empirically. However, subsequent research has demonstrated the potential of the IS success model as a causal model, and

numerous researchers have employed the IS success model in this fashion (Delone & McLean, 2003). In addition, researchers have often utilized portions of the overall IS success model to investigate a given success dimension of interest, at both organizational and individual levels (e.g., (Aparicio, Bacao, & Oliveira, 2017; H.-C. Kim & Hyun, 2016)). We follow in this tradition, using the IS success model as a theoretical lens to examine the role of NLU and feedback on perceptions of quality, which in turn are expected to influence user satisfaction and ultimately continued use of IPA technologies.

1.4 Research Model and Research Hypothesis

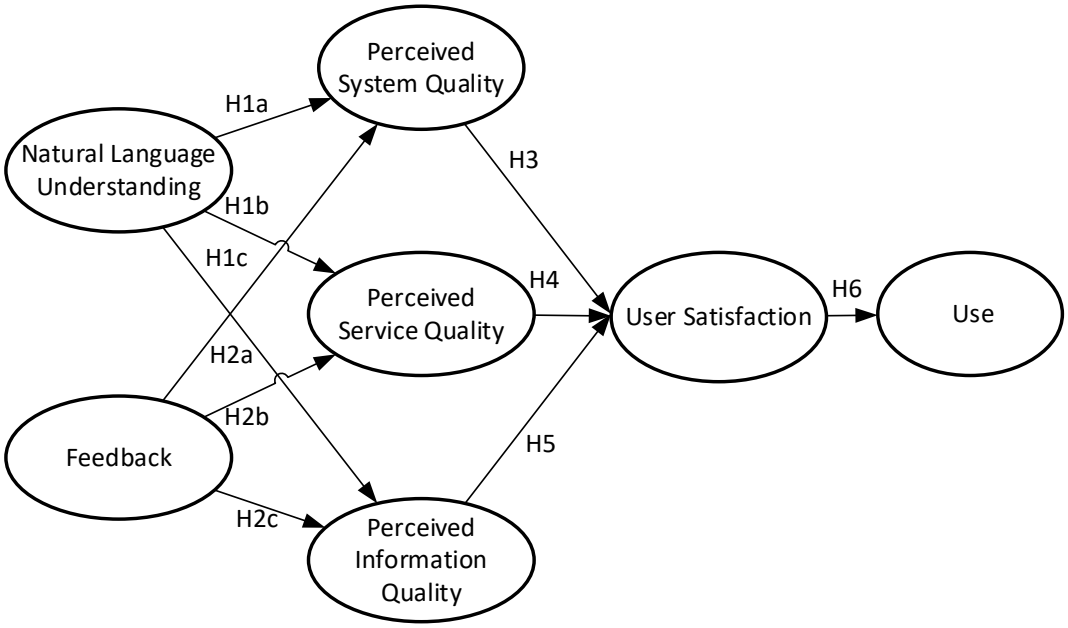

Figure 1.1: The proposed speech-based IPA research model

We posit that, because the modality of interaction with IPAs is limited to natural language commands, both NLU and Feedback will likely influence the perceptions of IPA users related to system, service, and information quality.

1.4.1 The Role of NLU

In the absence of a traditional keyboard and mouse, NLU is critically important as it

governs the ability of the system to interpret user inputs. IPA systems that lack sound NLU capabilities are likely to respond in an unreliable manner as the system may misinterpret the commands being issued. Similarly, the IPA systems may be viewed as inflexible due to the inability to correctly interpret and respond to the human agent. Both the reliability and flexibility of IT systems are viewed as important components of system quality (Wixom & Todd, 2005). Additionally, exchanges with such IPAs would likely devolve into slow, overly enunciated interactions. As voice communication is the only available interface mode to such systems, interactions would likely be viewed as highly encumbered and inhibit effective use of the system (Burton-Jones & Grange, 2012). Further, IPAs often prompt the user for additional input if a given command cannot be adequately interpreted. Thus, IPAs with poor NLU capabilities may become mired in an endless loop in which the user is prompted to either repeat or re-state a given command. In such circumstances, users may view the IPA as slow to respond with the desired information and perceive the IPA system as low quality due to its lack of timeliness (Wixom & Todd, 2005). Thus, the ability of the IPA to accurately interpret human speech is likely critical to the perception of system quality on the part of the user.

When initially introduced into the IS success model, service quality generally referenced the quality of the service provided by the IS organization and associated personnel. More recently, however, the definition of service quality has been expanded to include service provided by a specific system (Petter et al., 2013, p. 11). As such, contemporary investigations of service quality commonly consider user's perceptions of quality related to a specific IT artifact (H.-C. Kim & Hyun, 2016). Service quality is generally accepted to have five dimensions: tangibles, reliability, responsiveness, assurance, and empathy (Landrum, Prybutok, Peak, & Qin, 2010). In the context of service quality assessments of a specific IT artifact, empathy is less relevant than the other

dimensions as there is no human-to-human interaction. IPA systems that exhibit poor NLU capabilities are expected to diminish users' perceptions of service quality as measured by the four remaining dimensions. Tangibles generally refer to the physical elements of the IT artifact and are often related to user convenience (Landrum et al., 2010). Due to the burden introduced on the user when NLU is lacking, it is likely that users would view such IPA systems as having lower tangible characteristics. As noted above, inadequate NLU encumbers the user, requiring increased effort and time to elicit the desired system response. Such circumstances would likely inhibit perceptions of reliability and responsiveness. Finally, users faced with systems that require a high degree of effort to use may damage trust and confidence in the system, leading the user to question other aspects of the system's capabilities and damaging user perceptions of assurance.

The quality of inputs to a system has significant impacts on the informational products of the system (Torres, Sidorova, & Jones, 2018). Improperly formatted inputs may prevent the system from responding at all or result in outputs that are nonsensical or misleading (Burton-Jones & Grange, 2012). Such situations may result in suboptimal decision-making on the part of the user (Burton-Jones & Grange, 2012). As the modality of input for IPAs is a natural language, NLU is an important system capability to ensure accurate capture of user inputs in order to produce acceptable informational outputs. IPAs lacking NLU capabilities are likely to provide inaccurate and incomplete output information, intrinsic and extrinsic categories of information quality (Nelson et al., 2005). Thus, the NLU capabilities of an IPA regulate the quality of system inputs and, therefore, are likely to have a direct effect on the quality of its informational outputs. Thus, we posit:

H1a: Natural language understanding is positively associated with system quality.

H1b: Natural language understanding is positively associated with service quality.

H1c: Natural language understanding is positively associated with information quality.

1.4.2 The Role of Feedback

Feedback is an essential element of effective communication, in part, because it facilitates understanding between interlocutors (Krauss & Weinheimer, 1966). In particular, feedback provides a means to indicate understanding, or a lack thereof, and to seek further clarification (Dennis & Kinney, 1998). We argue that these characteristics of feedback are crucial to understanding its influence on user perceptions of quality, particularly in the context of IPA. Specifically, because IPAs may exhibit differences in the quality and quantity of feedback, those systems that possess superior feedback capabilities are likely to be judged as more conversationally adept and, thus, of higher quality.

The notions of input and output are fundamental to IS and the study of human-computer interaction. Output devices serve, not only to provide a means for the computer to present the desired informational outputs requested by a user, but also to inform the user about the status of, or problems with, such requests (Suhm, Myers, & Waibel, 2001). This latter task is functionally equivalent to the notion of feedback in the communications literature and plays an essential role in the cognitive and emotional state of individuals (Leavitt & Mueller, 1951; Maclay & Newman, 2017). As such, feedback is relatively common, albeit often overlooked, the feature of information systems. Feedback, regardless of type, is likely to influence perceptions of quality by providing reassurance about the operation of the system and improving the immediacy of response for long operations. The latency between the execution of a command and the associated response from a computer system is often disconcerting for users (Hong, Hess, & Hardin, 2013; Y. Lee, Chen, & Ilie, 2012). By acknowledging the receipt of a command, even if that command was not properly understood, the user gains insight into what might otherwise be an opaque computational operation. Further, in the circumstances marked by a high degree of latency, feedback may be

perceived as evidence of system responsiveness, improving the perception of both system and service quality.

In addition, negative acknowledgment, repair, and proxy modes of feedback provide a means to improve the quality of inputs to the system. As previously noted, improvements in the quality of data inputs are commonly associated with improvements in the quality of system function and informational outputs (Torres et al., 2018). Thus, in aggregate, feedback is likely to influence perceptions of system, service, and information quality.

Feedback can influence perceptions of responsiveness, reliability, assurance, and other similar dimensions of system and service quality. The use of feedback can improve the quality of system inputs and subsequent informational outputs associated with IPA processing. Furthermore, feedback is likely to influence perceptions of system, service, and information quality. Thus we posit:

H2a: Feedback is positively associated with system quality.

H2b: Feedback is positively associated with service quality.

H2c: Feedback is positively associated with information quality.

1.4.3 User Satisfaction

Satisfaction is ‘‘the sum of one’s feelings or attitudes [in a given situation] toward a variety of factors affecting that situation’’ (Bailey & Pearson, 1983). User satisfaction is a central measure of IS success, primarily due to its close interrelationship with IS use (Delone & McLean, 2003). The IS success model posits that system, service, and information quality singularly and jointly affect user satisfaction, and there is significant empirical support for the existence of causal relationships between quality and user satisfaction (Laumer et al., 2017; W.-T. Wang, Wang, & Liu, 2016). These relationships provide grounding for the influence of object-based quality beliefs

on use, by incorporating user satisfaction as an object-based attitude in the use of decision calculus (Wixom & Todd, 2005). User satisfaction is highly influenced by the degree to which user expectations are fulfilled through the use of a given technological artifact (Bhattacherjee, 2001b). IPAs which exhibit low levels of system quality is likely to be perceived as unreliable, slow, and incapable of supporting goal-based use (Burton-Jones & Grange, 2012), likely resulting in reduced satisfaction with the technology and its use. This logic also extends to perceptions of inadequate service quality among IPAs, and users interacting with such systems would likely view them as unable to fulfill basic expectations of the service function. Finally, as the informational outputs of a system are critical for its effective use (Burton-Jones & Grange, 2012), IPAs with poor information quality may be perceived as incapable of meeting user expectations for information accuracy and decision support. Thus, consistent with the IS success model and prevailing views regarding the role of quality in the establishment of user satisfaction, we posit that system, service, and information quality are important antecedents of user satisfaction.

H3: System quality is positively related to user satisfaction.

H4: Service quality is positively related to user satisfaction.

H5: Information quality is positively related to user satisfaction.

1.4.4 System Use

System use and its antecedents are among the most well established and consistent areas of IS research (Sidorova et al., 2013) and are highly related to the notion of user satisfaction (Petter et al., 2013). As noted by Delone and McLean (2003), use is a necessary precondition for the development of user satisfaction, however, in a causal sense, user satisfaction is a critical antecedent of use. Thus, satisfaction is "an evaluative effect resulting from users' transactional experience with the product" (Bhattacherjee, Perols, & Sanford, 2008, p. 18), but positive user

satisfaction is highly related to continued use (Bhattacherjee et al., 2008). As suggested by theory, contemporary research on the link between user satisfaction and use suggests a strong causal relationship (Petter et al., 2013; Turan, Tunç, & Zehir, 2015). Thus, we posit that user satisfaction is positively related to the continued use of IPAs.

H6: User satisfaction is positively related to use.

1.5 Research Method

1.5.1 Study Context and Sample

To test our theoretical framework, we examined the perceptions, satisfaction, and continuance decisions among regular users of IPAs. The research participants were recruited from undergraduate and graduate students from a large university in the Southwest United States. Students engaged in the study voluntarily and were offered extra credit for participation. A student sample was deemed appropriate, as prior research indicates that students are well-positioned to provide meaningful insight on issues related to user interface (Nguyen, Ta, & Prybutok, 2018). Invitations were sent to 813 students, 572 (70.36%) of which attempted the survey. Of these, 192 respondents indicated that they were not current users of IPA technology and were subsequently removed from consideration. An additional 58 responses were removed because respondents spent very little time engaged with the survey, casting doubt on the quality of the response. The resulting data set consisted of 322 respondents (39.61% usable response rate).

As expected with university students, respondents tended to be relatively young, with 284 reporting they were between 18 and 25 years of age. The majority of respondents, 181, reported their gender as female, with 138 reporting their gender as male and 3 choosing not to specify. Users reported a median value of 3 years of experience using IPAs.

1.5.2 Operationalization of Constructs and Data Capture

All participants reported using at least one of five popular IPA systems, Amazon Alexa, Google Home, Apple Siri, Microsoft Cortana, or Samsung Bixby. Each participant was encouraged to answer questions in the context of the IPA they use most frequently. Items for perceived system quality, perceived service quality, perceived information quality, user satisfaction, and use were contextualized from previously validated measures. Items for perceived system quality and perceived information quality were adopted from Nelson et al. (2005), perceived service quality from Landrum et al. (2010), satisfaction from Xu, Peak, and Prybutok (2015) and use from Mao and Ambrose (2004). Measurement items for natural language understanding and feedback were developed for this study. These items were created based on the characteristics of natural language understanding described by Liddy (1998) and Feldman (1999) and the characteristics of feedback described by Dennis and Kinney (1998). These scales were iteratively reviewed by a panel of academic experts to assess the face validity of the items and word choice. Following each iteration, minor adjustments were made to the wording of the items until the panel agreed that the scales were appropriate for the theoretical constructs they were intended to measure. All constructs were assessed using a 5-point Likert scale.

The survey also captured demographic information about each respondent as control variables, which may influence IPA use. To address the possibility of non-response bias, we compared early responses to late responses (Karahanna, Straub, & Chervany, 1999). Independent sample t-tests suggested no significant difference between the two groups.

1.6 Data Analysis and Result

The research model was tested using SmartPLS 2.0 (C. M. Ringle, Wende, & Will, 2005). PLS-SEM is appropriate for both prediction and theory building and is commonly employed in

exploratory research such as the present paper that seeks to situate new constructs in the context of existing theory (J. Hair, Hollingsworth, Randolph, & Chong, 2017b; P. B. Lowry & Gaskin, 2014). Further, PLS requires a minimal number of measurement items, a small sample size, and has relaxed assumptions about residual distributions, demonstrating it as both a powerful and flexible analytic technique (Chin, 1998a; Herman Wold, 2004).

1.6.1 Measurement Model Assessment

Measurement model assessment consisted of an analysis of reliability as well as convergent, and discriminant validity. Table 1.1 presents a summary of the measurement model assessment findings.

Table 1.1: Measurement Model Summary

	CR	AVE	Feedback	NLU	System Quality	Information Quality	Service Quality	Satisfaction	Use
Feedback	0.85	0.66	0.81						
NLU	0.89	0.67	0.47	0.82					
System Quality	0.87	0.70	0.36	0.52	0.83				
Information Quality	0.87	0.62	0.46	0.56	0.55	0.79			
Service Quality	0.84	0.63	0.47	0.53	0.67	0.63	0.79		
Satisfaction	0.95	0.81	0.49	0.60	0.58	0.63	0.70	0.90	
Use	0.92	0.80	0.26	0.36	0.39	0.31	0.37	0.46	0.89

Cells highlighted in yellow on the diagonal contain the square root of AVE.

Indicator reliability was first assessed by inspecting item loadings. An examination revealed that two items associated with the feedback construct unexpectedly cross-loaded with factors they were not intended to measure. These items were subsequently removed from further analysis. All remaining items had loadings in excess of 0.73. The internal consistency of our

scales was assessed using the composite reliability metric. Composite reliability is considered a more accurate measure of internal consistency than Cronbach's Alpha as it relies on actual loadings, rather than making the assumption that all indicators are equally reliable (Henseler, Ringle, & Sinkovics, 2009). While internal consistency values of 0.60 are acceptable in early, exploratory phases of research, values in excess of 0.70 are preferred (J. C. Nunnally & Bernstein, 1994). Observed composite reliabilities were all above 0.85, indicating adequate internal consistency (J. C. Nunnally & Bernstein, 1994). Having previously established the presence of both strong item loadings and satisfactory internal consistency (Hulland, 1999), convergent validity was further evaluated through examination of Average Variance Extracted (AVE). All AVE values exceeded 0.50, indicating that the latent variable explains at least half of the variation of its indicators (J. F. Hair, Ringle, & Sarstedt, 2011). Combined, these findings indicate satisfactory convergent validity. Discriminant validity was verified by ensuring that each latent variable shares more variance with its indicators than with other variables in the model (Fornell & Larcker, 1981). A comparison of the inter-construct correlations with the square root of the AVE indicates satisfaction of the Fornell-Larker criterion and suggests acceptable discriminant validity.

1.6.2 Common Method Bias

Based on (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), we employed a range of procedural techniques to mitigate the opportunity for common method bias. These included ensuring clarity in both survey instructions and survey items, protection of respondent anonymity, and the creation of psychological separation through the use of contextual shifts in the questionnaire. In addition, we conducted Harman's one-factor test (Harman, 1976) to seek evidence of common method bias. Results show that seven principal components were generated and the maximum variance explained by a single factor is approximately 37.5 percent. Thus, the

findings indicate that common method bias is not present (Podsakoff et al., 2003).

1.6.3 Structural Model Assessment

Having determined the reliability and validity of the psychometric properties of the measurement items, we evaluated the proposed relationships between latent constructs by examining the PLS path model. The results of the structural model assessment are presented in Figure 1.2.

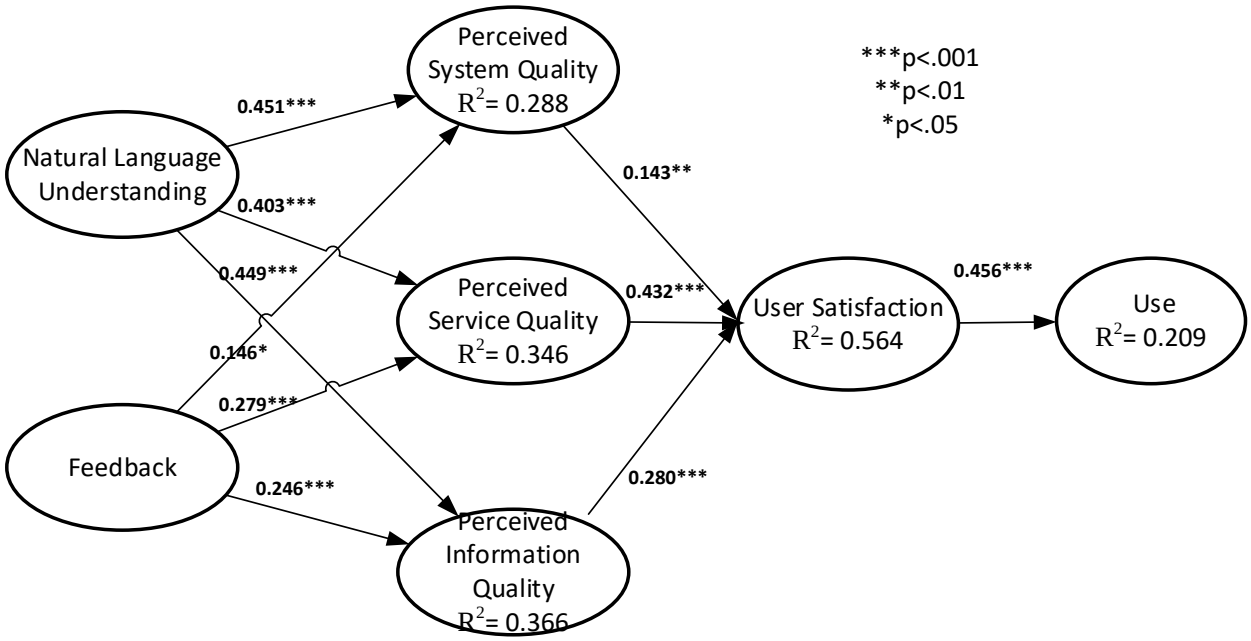

Figure 1.2: Structural Model Assessment Results

The results support the contention that, due to the special nature of human-computer interaction in the IPA context, NLU and feedback are important determinants of IPA use. As hypothesized, NLU positively influenced system quality ($\beta = 0.451, p < 0.001$), service quality ($\beta = 0.403, p < 0.001$), and information quality ($\beta = 0.449, p < 0.001$). Similarly, feedback also demonstrated a strong, positive relationship with system quality ($\beta = 0.146, p < 0.05$), service quality ($\beta = 0.279, p < 0.001$), and information quality ($\beta = 0.246, p < 0.001$). The combined influence of NLU and feedback on system, service, and information quality results in

R^2 values of 28.8%, 34.6%, and 36.6% respectively. As anticipated, our findings also support the importance of perceptions of quality as predictors of user satisfaction. System quality ($\beta = 0.143, p < 0.01$), service quality ($\beta = 0.432, p < 0.001$), and information quality ($\beta = 0.280, p < 0.001$) all exhibit significant, positive relationships with user satisfaction. Perceptions of quality explain 56.4% of the variation in user satisfaction. Finally, we find that user satisfaction is positively related to use ($\beta = 0.456, p < 0.001$), with an R^2 value of 20.9%. Post hoc Sobel testing revealed that the influence of NLU and feedback are partially mediated by perceptions of quality. Adding the direct effects of NLU and feedback on user satisfaction to the fully specified model does not reduce the significance of any hypothesized relationships and increases the R^2 of user satisfaction to 60.3%.

1.7 Discussion

While our understanding of IS use is well developed, the body of literature associated with this particular field of research must necessarily grow to accommodate changes in the characteristics of the underlying information technology artifacts. We argue that IPAs, which make use of a wide range of complex technologies related to conversational AI to facilitate natural language interaction between the user and the system, are fundamentally different from traditional IS technologies and their associated input/output approaches. Incorporating these idiosyncratic elements into our model, we find that all proposed relationships are significant and believe these findings to be of value to both academicians and practitioners alike.

For researchers, this study highlights the importance of incorporating unique characteristics of the surface structure of technology when examining how it is perceived by users. Importantly, most research related to IPAs and related technologies exists within the computer science discipline and is predominantly concerned with the technical aspects of the underlying

algorithms required for NLI-dependent technologies to function. However, this study recognizes that the actors that interact with a given technology, and the perceptions they hold, are as important as the characteristics of the technology itself. Thus, this study addresses a critical gap in the extant knowledge about the use of IPA devices by integrating elements from the computer science, communications, and information systems literature, and identifying two important constructs: NLU and feedback. These constructs, while presented in the context of IPA, are applicable to any NLI-based technology and will likely continue to grow in importance as the relative importance of screens and keyboards continues to decline (Gartner, 2016). In addition to introducing and validating these constructs, this research situates NLU and feedback in established theory, demonstrating the predictive potential of both constructs on traditional measures of IS success and use. Our results indicate that both NLU and Feedback are important in the formation of object-based beliefs. While the present paper examined how such beliefs inform attitudes and use, future research might examine these beliefs in a wide variety of other contexts. As such, our paper provides a scaffold for future work involving technologies such as IPA, conversational AI, and similar NLI-based tools.

For practice, our research highlights the importance of continued efforts to improve the NLU capabilities of existing IPA. This work suggests that, when interacting with a system that poorly interprets human speech and the underlying meaning it carries, users are likely to have strong negative impressions related to the system, service, and information quality associated with the device. Such beliefs and the negative attitude they engender, are likely to reduce use and potentially damage the organizational reputation in the market. Organizations are encouraged to continue investments into research related to conversational AI and other NLI technologies to improve the ability of IPAs to make sense of human speech. The incorporation, improvement, or

expansion of the feedback delivered by an IPA system may also result in significant increases in IPA use. As such, organizations should examine existing feedback capabilities and look for areas of improvement. Importantly, while the enhancement of both NLU and feedback provides a means to increase use, our findings suggest that NLU is significantly more important from a user perspective. Strategic efforts to increase the use of IPA systems should consider the relative importance of each capability.

The findings of this research provide previously unknown insight into the mechanisms that influence the use of IPA and other voice-centric technologies. However, these findings should be considered in light of several important limitations. First, this study employed a convenience sample of IPA users drawn from college students. It is possible that this sample is not representative of the population of IPA users and, thus, care should be exercised while generalizing the findings of this work. However, it is important to note that students are generally considered to be heavy users of consumer-based IT and are thus well-positioned to provide insights regarding the importance of system capabilities. Future research should consider drawing a more representative sample of IPA consumers. Second, this study limited its investigation to participants that interact with IPAs in the English language. While the English-speaking population represents a significant portion of IPA users (Reis et al., 2017), we acknowledge that the NLU capabilities of a given IPA may vary by language. Studies that replicate this research in the context of other languages may provide additional insight into the importance of NLU. Third, it is generally recognized that use evolves and that influential factors may shift over time. However, this study employed a cross-sectional survey to examine the importance of NLU and feedback. We believe both factors are likely important for the duration of use but recognize that the level of their importance may change as a user becomes more familiar with the peculiarities of

the particular IPA with which they interact. Future work may consider longitudinal approaches to examine the evolution of NLU and feedback as to quality antecedents.

1.8 Conclusion

The goal of this study was to examine how NLU and feedback capabilities influence the quality perceptions of individuals, and how those perceptions influence satisfaction and use of IPAs. Based on the contention that IPAs and similar systems that employ a speech-based modality are fundamentally different from technologies that use more traditional means of human-computer interaction, we develop a model of IPA use based on the IS success model. We find that both NLU and feedback are important antecedents of system, service, and information quality. Further, we find that these perceptions of quality are significantly related to user satisfaction and use. In so doing, we address an important gap in our understanding of use by acknowledging the unique idiosyncrasies of NLI-dependent technologies and incorporating new constructs to reflect the surface structure of these systems.

Appendix A1. Measurement Items

Constructs	Items	Source
Natural Language Understanding (NLU)	IPA understand what I say.	Liddy (1998) and Feldman (1999)
	IPA can interpret my questions and commands.	
	IPA can make sense of my questions and commands.	
	IPA gets meaning of my words.	
Feedback	IPA acknowledge me if it understands my command.*	Dennis, A. R., & Kinney, S. T. (1998)
	IPA acknowledge me if it does not understand my command.*	
	IPA corrects my commands.	
	IPA clarifies my commands.	
	IPA completes my commands if I do not complete.	

Constructs	Items	Source
Perceived System Quality	IPA can be adapted to meet a variety of needs. (flexibility)*	Nelson, R. R., Todd, P. A., & Wixom, B. H. (2005)
	IPA can flexibly adjust to new demands or conditions. (flexibility)*	
	IPA is versatile in addressing needs as they arise. (flexibility)*	
	IPA does not take long time to respond to my requests. (response time)	
	IPA returns answer to my request quickly. (response time)	
	IPA operates reliably. (Reliability)	
	IPA perform reliably. (Reliability)*	
	IPA effectively integrates data from different source. (Integration)*	
Perceived Information Quality	IPA provides me with a complete set of information. (completeness)	Nelson, R. R., Todd, P. A., & Wixom, B. H. (2005)
	IPA provides me with comprehensive information. (completeness)	
	IPA provides me correct information. (accuracy)	
	The information provided by IPA is well formatted. (format)	
	IPA provides me with the most current information. (currency)*	
Perceived Service Quality	The IPA is dependable. (Reliability)*	Landrum, H.T., Prybutok, V.R., Peak, D.A. and Qin, H. (2010)
	The IPA performs the service promptly. (Responsiveness)	
	The IPA users find it secure and reassuring. (Assurance)*	
	The IPA provides courteous user support. (Assurance)	
	The IPA services are convenient. (Tangibles)	
User Satisfaction	I feel very satisfied with the overall experience provided by the IPA.	Chenyan Xu, Daniel Peak, Victor Prybutok (2015)
	I am very pleased with the overall experience provided by the IPA.	
	I am very contented with the overall experience provided by the IPA.	

Constructs	Items	Source
	I feel delight with the overall experience provided by the IPA.	
Use	I use IPA a lot.	Mao, E., & Ambrose, P. (2004)
	I use IPA whenever possible	
	I use IPA frequently	
	I use IPA whenever appropriate*	

* Item removed from analysis due to low- or cross-loading.

ESSAY 2

EMOTIONAL SATISFACTION AND IS CONTINUANCE BEHAVIOR: RESHAPING THE EXPECTATION-CONFIRMATION MODEL1

2.1 Introduction

The success of information technology (IT) depends on the continuance of its usage (Bhattacherjee, 2001b). Following initial IT adoption, users cannot experience the benefits of a particular technology without continuing to use it. Therefore, it is no wonder that academics have occasioned IT continuance, a form of post-adoption behavior, to be a leading IT research area for some time (Limayem, Hirt, & Cheung, 2007). As it investigates IT continuance, described in the expectation-confirmation model (ECM), this research introduces and examines bilateral components of the user satisfaction variable, namely cognitive and emotional satisfaction. It also probes the more inclusive effects of perceived benefit, which we substute for ECM's better-know but less-suitable construct, perceived usefulness.

Several well-known theories explain IT continuance behavior from an objective view. These theories frame IT as a utilitarian tool and examine continuance as a function of cognitive user satisfaction, which has helped establish user satisfaction as the key predictor of IT continuance (Bhattacherjee, 2001b; Bhattacherjee & Lin, 2015; P. Lowry, Gaskin, & Moody, 2015). While straightforward, the utilitarian approach overlooks the relevance of other potent human factors, such as emotion.

However, in recent years technology is being used heavily for personal activities as well as for workplace activities. While previous authors constructed theories and models to evaluate

[1] This chapter is presented in its entirety from Mamun, M. R. A., Senn, W. D., Peak, D. A., Prybutok, V. R., & Torres, R. A. (2020). Emotional Satisfaction and IS Continuance Behavior: Reshaping the Expectation-Confirmation Model. International Journal of Human–Computer Interaction, 1-10. with permission from Taylor & Francis.

continuance behavior in workplace settings, new models are needed to evaluate continuance behavior in personal settings. Thus, this research presents a significant effort to construct a model that is useful for the evaluation of technology continuance in both workplace and personal settings. ECM was created to investigate the continuance behavior in workplace settings; this study reshapes the ECM to evaluate continuance both for the workplace and personal use.

Recent consumer literature advises that user satisfaction is a bilateral construct arising from cognitive and emotional factors (Gallarza, Ruiz-Molina, & Gil-Saura, 2016; M.-K. Kim, Park, Park, Kim, & Kim, 2018; Oliver, 2014). To capture the attributes of these paired factors, this research draws from the consumer literature and embraces both the cognitive and emotional satisfaction constructs as twofold contributors to IT continuance (Liljander & Strandvik, 1997; Westbrook & Oliver, 1991). Thus, the study seeks to better explicate the bipartite nature of satisfaction and its influence on IT user continuance.

Similarly, the IT continuance literature generally regards IT as a utilitarian mechanism designated for workplace settings. Researchers almost exclusively have leveraged the utilitarian variable, perceived usefulness, for studying IT user continuance. For example, perceived usefulness in ECM refers to a cognitive assessment of a technology's utility but fails to capture expressive user qualities (T.-C. Lin, Wu, Hsu, & Chou, 2012). Alas, utilitarian measures typically slight the affective advantages discerned by receptive users (Ladhari, Souiden, & Dufour, 2017). Supporting our stance, Delone and Mclean (2004) suggest that IT adoption research should consider a range of non-utilitarian benefits, rather than entirely rely on proxy benefit measures like perceived usefulness (Petter et al., 2013). Hence, this research contends that perceived benefit, which apprehends advantages that exceed those captured by perceived usefulness, therefore should replace perceived usefulness when examining IT user continuance intention, so stimulating data

richness.

Within the IS discipline, Bhattacherjee's (2001b) ECM is widely used to investigate user continuance intention for a system. ECM was developed based on Oliver's (1980) expectation-confirmation theory (ECT), where satisfaction is the primary predictor of continuance intention, followed by confirmation of pre-adoption expectations and perceived usefulness. ECT and ECM provide a constructive framework for developing a model that investigates post-adoption IT continuance; this research proposes an amended ECM that targets post-adoption continuance. Based on ECT and ECM, we partition the user satisfaction construct into cognitive and emotional components. This work observes that IS research largely has overlooked the bilateral cognitive and emotional properties of IT user satisfaction (Krasnova, Widjaja, Buxmann, Wenninger, & Benbasat, 2015). Responding to the opportunity, this study conceptualizes and tests a new theoretical model—one that incorporates the constructs above—to advance understanding of IT user continuance behavior in the workplace and organizational venues. To enrich the informativeness of our data, we also replace the standard ECM construct, perceived usefulness, with the more-inclusive perceived benefit. We then validate the model with empirical data collected via an online survey of intelligent personal assistant (IPA) users.

To validate the new model, we ask: how do the bilateral effects arising from cognitive and emotional satisfaction influence IT user continuance behavior? This work's theoretical contributions include a new model that addresses the question by explaining IT continuance for individuals and organizations, and scrutinizing whether expectation confirmation and perceived benefit favorably impact the bilateral satisfaction constructs, thus leading to a positive IT user continuance outcome. Practically, the work provides insight into IT continuance that is expedient for decisionmakers, including managers, vendors, and manufacturers.

The remainder of the paper is organized, as follows. The ensuing section outlines the theoretical background and reviews the relevant literature. The following section explains the details of the hypothesis development and presents the subsequent research model. Next, this work presents the research methodology and data collection processes used to test the research model. Subsequently, we discuss the results of the data analysis, followed by findings, limitations, future research directions, and a conclusion.

2.2 Theoretical Background and Literature Review

Several research streams about satisfaction, benefit, and perceived usefulness reveal research gaps that motivate this study. The consumer behavior theory, ECT, is used by information systems researchers in the development of ECM. ECM shows that confirmation of expectations and perceived usefulness lead to satisfaction, which is the main predictor of continuance intention. Marketing theory suggests that satisfaction contains emotive and cognitive dimensions (Dubé & Menon, 2000; Westbrook & Oliver, 1991). Researchers also argue that benefit can better explain adoption intention compared with perceived usefulness as it encompasses additional advantages over usefulness (Delone & Mclean, 2004; Oghuma, Chang, Libaque-Saenz, Park, & Rho, 2015).

2.2.1 ECT and ECM

ECT is an extensively used theory in consumer behavior literature. It is frequently used to examine consumer satisfaction and post-purchase behaviors such as repurchasing (Anderson & Sullivan, 1993; Churchill Jr & Surprenant, 1982; Oliver, 1980, 1993). This theory is used not only to explain the pre-behavior variables such as expectation but also to explain the post-behavior variables such as performance (C. S. Lin, Wu, & Tsai, 2005). The expectation-confirmation model (ECM) (Bhattacherjee, 2001b) was developed based on expectation-confirmation theory (ECT) where satisfaction is the primary predictor of continuance intention followed by confirmation of

post-adoption expectations, and it is a widely used model to investigate the continuance intentions of a consumer of IT.

The ECM explains that confirmation of the utilitarian value of any technology, perceived usefulness, leads to user satisfaction, and satisfaction leads to the intention to continue to use that particular technology. Perceived usefulness and confirmation of expectation together determine satisfaction, and confirmation has an impact on perceived usefulness. The existing literature on ECM has predominantly focused on post-adoption expectation and perceived usefulness of ECT. In order to improve the explanatory power of the ECM, researchers have added many context-specific constructs into the model as antecedents, mediators or moderators of the existing structural components (Akter, Ray, & D'Ambra, 2013; Bhattacherjee, 2001a, 2001b; C.-P. Lin & Bhattacherjee, 2009). Considering these models and their empirical settings, it is evident that almost all of them examined IT as a utilitarian tool used to enhance user performance and productivity.

2.2.2 Affective Measures in User Satisfaction

Although the original ECM model and its extensions utilize user satisfaction as the main predictor of IT continuance, there is a debate about whether satisfaction is strictly a cognitive construct or a combination of cognitive and emotional constructs (Babin & Griffin, 1998; Crooker & Near, 1998). Marketing literature suggests that emotion is one of the core components of satisfaction (Dubé & Menon, 2000; Westbrook & Oliver, 1991). Oliver Richard (1997) and Oliver (2014) explain that satisfaction consists of both evaluative (cognitive) and emotional components. However, Goodhue (1995) explains that the assumption, better information systems performance leads to higher user satisfaction, is inconsistent with the results of previous studies. Hence, previous models may not adequately explain user satisfaction. Several studies suggest that a lack

of addressing psychological issues during the development and implementation of theoretical models is a major reason for failing to meet the objective of adequately explaining user satisfaction (Franklin, Pain, Green, & Owen, 1992; Markus & Keil, 1994).

Many scholars argue that the omission of an emotional component of satisfaction is a critical issue in satisfaction-related research and suggest that the inclusion of a separate emotional satisfaction construct is needed (Liljander & Strandvik, 1997; Stauss & Neuhaus, 1997). Cronin Jr, Brady, and Hult (2000), in their empirical study, also found that satisfaction not only contains an emotional and cognitive component but also significantly influence behavioral intention. Wong (2004), in a study of retail services, found a positive correlation of emotional satisfaction to both relationship quality and customer loyalty. Hospitality service research uses emotional satisfaction as a partial mediator of perceived service quality and behavioral intention (Ladhari, 2009). In recent studies in marketing, emotional satisfaction is considered a critical construct to measure behavioral intention (Ladhari et al., 2017; Prayag, Hosany, & Odeh, 2013), and customer loyalty (Giovanis, Zondiros, & Tomaras, 2014; Hartono & Raharjo, 2015).

2.2.3 Perceived Benefit and Perceived Usefulness

As we discussed, Bhattacherjee (2001b) provides a parsimonious framework in ECM to explain the continuance intention of IT where perceived usefulness plays an important role in determining both satisfaction and continuance intention. Bhattacherjee (2001b) adopted perceived usefulness from the technology acceptance model (TAM) where perceived usefulness refers to the users' cognitive evaluation of the utility of using technology. It is essential to mention that TAM explains the initial adoption intention of users of technologies, for work purposes, in organizational settings. However, several other researchers discussed the importance of including additional benefits as core to user's decision making concerning continuing to use IT (Delone & Mclean,

2004; Ramirez Jr, Dimmick, Feaster, & Lin, 2008). Following Kim et al.'s (2008) definition in the e-commerce domain, this research defines perceived benefit as the technology users' assessed beliefs concerning the degree to which the user will be better off from having interacted with the technology. Perceived benefit consists of context specific functional and non-functional motives (Bhatnagar & Ghose, 2004; Forsythe, Liu, Shannon, & Gardner, 2006). Thus, Childers, Carr, Peck, and Carson (2001) shows perceived benefits as the potential antecedent to IT use. Again, in contrast to a model cognitively evaluating technology by employing the perceived usefulness construct, perceived benefit captures a broader range of subjective evaluations of technology that produce both cognitive and affective evaluations of technology (Oliver, 1980).

When technology is used exclusively in a workplace setting, managers tend to emphasize financial benefits to the organization. They pay little attention to the emotions or passions of the users. Perceived usefulness refers to the users' cognitive evaluation of the utility of using technology and it is an antecedent of continuance intention. The ECM model (Bhattacherjee) explains perceived usefulness in terms of users' performance, productivity, and effectiveness and does not address other advantages that technology might provide. Notably, the study does not consider other context-specific benefits that can create a passion for using technology and that may influence continuance behavior (Seddon, 1997).

In the present study, the researchers investigate continuance behavior both for the workplace and personal use. Thus, following Seddon (1997), the researchers examine a range of benefits that managers usually exclude in workplace evaluations. In this new model, benefits refer to the degree to which the user will be better off from having interacted with the technology and is measured in terms of convenience, time savings, and swift completion of tasks along with increased productivity.

The preliminary literature review identifies a gap in IT continuance research regarding the emotional component of user satisfaction. There appears to a significant lack of empirical evidence to determine which of the elements of satisfaction functions as a better predictor of continuance intention. This is important because existing satisfaction literature shows that only the cognitive element of satisfaction is not adequate to serve as an effective predictor of continuance intention. Researchers also suggest that there is a need for research investigating IT continuance at an individual level in both homes and the workplace, and should consider a range of advantages beyond perceive usefulness.

2.3 Hypotheses and Research Model

Drawing from satisfaction and consumer literature, the authors posit that the satisfaction construct in ECM be partitioned into cognitive and emotional components and that perceived benefit can better serve as a replacement for perceived usefulness in ECM. Building on this theoretical foundation, we develop hypotheses showing the links among confirmation, benefit, cognitive satisfaction, emotional satisfaction, and continuance intention.

Confirmation refers to the extent to which the tangible experience of IT use confirms initial user expectations. Bhattacherjee (2001b) explains confirmation as ‘‘…the realization of the expected benefits of IS use.” By validating ECM in the online banking continuance context, Bhattacherjee (2001b) observed that confirmation produced a positive impact on perceived usefulness and satisfaction. Several other studies in different settings tested this model and its extensions and found the same results [e.g. in mobile health (Akter et al., 2013; X. Lin, Featherman, & Sarker, 2017), in SNS (Mouakket, 2015), mobile banking (Yuan, Liu, Yao, & Liu, 2016)].

These prior studies considered perceived usefulness as a cognitive belief and tested the

models in organizational settings. However, Delone and Mclean (2004) explain that instead of considering proxy benefit measures, such as perceived usefulness and satisfaction, additional benefits are necessary. Ramirez Jr et al. (2008) discussed the value of including benefits (services) as the core in user acceptance. T.-C. Lin et al. (2012), in their study of investigation IPTV continuance intention, found a significant positive effect of confirmation on benefit. As modern technologies inspire both utilitarian and hedonic values, this research expects that IT likely will exert positive effects on perceived benefit (T.-C. Lin et al., 2012).

Again, ECT shows the positive relationship between confirmation and satisfaction. Prior ECT and ECT based studies (Bhattacherjee, 2001b; Bhattacherjee & Premkumar, 2004; Venkatesh, Thong, Chan, Hu, & Brown, 2011) in different context noted a significant relationship between confirmation and satisfaction. However, as described above, all the ECT and ECM based studies considered overall satisfaction ignoring the examination of the effect of confirmation on both its emotional and cognitive component of satisfaction separately. Recent satisfaction research in marketing (Gallarza et al., 2016; Hartono & Raharjo, 2015; Zain, Zahari, Hanafiah, & Zulkifly, 2017) and IS field (M.-K. Kim et al., 2018) suggest that we should not overlook the effective and cognitive need of consumers or users. Thus, we sub-divide user satisfaction into two components, cognitive and emotional satisfaction, and hypothesize:

H1a: User confirmation is positively associated with IT perceived benefit

H1b: User confirmation is positively associated with IT cognitive satisfaction

H1c: User confirmation is positively associated with IT emotional satisfaction

Several research studies explain that perceived benefit consists of functional and nonfunctional motives depending on the situational context (Bhatnagar & Ghose, 2004; Forsythe et al., 2006). Literature suggests that users perceive several benefits by using modern technologies

(increased convenience, timesaving, increase productivity) compared to traditional IT (Matney, 2015; Meeker, 2017).

Oliver and DeSarbo (1988), the original author of ECT, theorized the relationship between perception, satisfaction, and continuance intention. Numerous empirical studies also found that perceived benefit has a significant positive impact on satisfaction and continuance intention (T.-C. Lin et al., 2012; Zhou, Fang, Vogel, Jin, & Zhang, 2012). As benefits convey both functional and nonfunctional motivation, it should influence both cognitive and emotional components of satisfaction in the context of an IT. Thus, we propose that:

H2a: User IT perceived benefit is positively associated with IT cognitive satisfaction

H2b: User IT continuance intention is positively associated with IT perceived benefit

H2c: User IT perceived benefit is positively associated with IT emotional satisfaction

Empirical studies in various contexts showed that user satisfaction positively influences user continuance intention (Basak & Calisir, 2015; Bhattacherjee, 2001; Bhattacherjee & Premkumar, 2004). Marketing research reasoned that satisfaction is a blend of cognitive and emotional factors (Dubé & Menon, 2000; Westbrook & Oliver, 1991). Oliver Richard (1997) and Oliver (2014) explain that satisfaction forms with evaluative (cognitive) and emotional components or both. Thus, we argue, cognitive satisfaction refers to users' rational assessment of utilitarian or functional elements while using a system (Au, Ngai, & Cheng, 2002) and emotional satisfaction which is related to emotional responses from IT user experience positively impact IT continuance behavior. Therefore, we hypothesize:

H3: User cognitive satisfaction with IT initial use is positively associated with IT continuance intention

H4: User emotional satisfaction with IT initial use is positively associated with IT continuance intention

2.3.1 The Confirmation-Satisfaction Research Model

This research combines the foregoing hypotheses into the confirmation-satisfaction research model (Figure 2.1), as illustrated below.

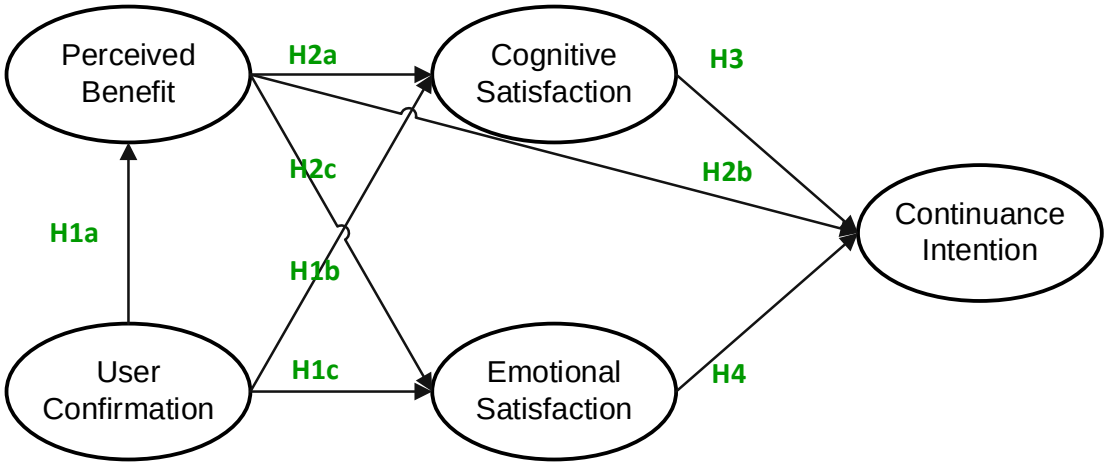

Figure 2.1: The confirmation-satisfaction research model

2.4 Research Method

2.4.1 Study Context and Sample

In order to test the proposed theoretical model, an online survey was administered to students from a large public university in the southwestern United States. The survey incorporated five constructs: confirmation, benefit, cognitive satisfaction, emotional satisfaction, and continuance intention. This research measured all constructs using multi-item scales contextualized from previously validated measures. We adapted three items related to cognitive satisfaction and four items related to emotional satisfaction from Yu and Dean (2001), three items related to confirmation and three items related to continuance intention from Bhattacherjee (2001b), and four items related to benefit from D. J. Kim et al. (2008). Two items relevant to the study construct (i.e., emotional satisfaction and perceived benefit) displayed unacceptable cross-loadings with irrelevant items, so the authors removed the offending items and achieved a clean

factor result.

Along with the measured constructs, demographic characteristics of the participants and years of experience using IPA were also captured. All variables except for the demographic and years of experience items were assessed using a 5-point Likert scale. A structural equation model is developed and analyzed using a partial least squares equation modeling (PLS-SEM) approach. We performed both the measurement model and structural model for data analysis to test our proposed research model. PLS-SEM is appropriate for this study because of PLS analyses structural equation models, including measurement and structural models with multi-item variables that contain direct, indirect, and interaction effects (Chin, 1998b). We used SmartPLS 3.0 (C. Ringle, Wende, & Becker, 2014) for this study to run the analysis.

2.4.2 Sample and Data Collection

The authors drew the sample for this research from students attending a large public university in the southwestern United States as mentioned above. The authors recruited graduate and undergraduate students through classroom announcements. Students voluntarily participated and received extra credit as an incentive to participate. As students represent a crucial subset of voice user interface (VUI) consumers of the candidate population (Nguyen et al., 2018), the researchers considered them an appropriate population for this study. The researchers sent invitations to 1076 students attending several courses and received 794 responses, resulting in a 74% response rate. Among these, 304 respondents indicated that they were users of any type of IPA and were removed from consideration. Data cleaning resulted in the removal of an additional 108 responses casting dought on the quality of responses as they spent little time for responding to the survey. The authors finally considered 382 (36% usable response rate) responses for further analysis. We present respondent demographics in Table 2.1.

Table 2.1: Respondent Demographics

Gender	*Num*	*Freq*	*Cum Freq*
Male	194	50.8%	50.8%
Female	185	48.4%	99.2%
Not specified	3	0.8%	100.0%
TOTALS	**382**	**100.0%**	

Age	*Num*	*Freq*	*Cum Freq*
18 to 25	333	87%	87.2%
26 to 35	42	11%	98.2%
More than 35	7	2%	100.0%
TOTALS	**382**	**100%**	

IPA Usage	*Num*	*Freq*	*Cum Freq*
Standalone IPA	175	45.8%	45.8%
IPA app	207	54.2%	100.0%
TOTALS	**382**	**100.0%**	

First Language	*Num*	*Freq*	*Cum Freq*
English	301	79%	78.8%
Others	81	21%	100.0%
TOTALS	**382**	**100.0%**	

IPA Usage	*Num*	*Freq*	*Cum Freq*
Work	33	9%	8.6%
Entertainment	167	44%	52.4%
Both	182	48%	100.0%
TOTALS	**382**	**100%**	

Avg Times a Day Used	*Avg Years Used*
4	**3.5**

As expected, a majority of the respondents were young adults with 333 reportedly aged between 18 and 25 years. The study used 194 male and 185 female respondents; the numbers of while male and female respondents were nearly identical. Three respondents failed to select a gender. Overall, users averaged 3.5 years of experience using IPAs.

2.4.3 Non-Response Bias

To address the prospect of non-response bias, the authors compared 90% of the early responses to 10% of the late responses for respondents in each class (Karahanna et al., 1999). The independent sample t-test for comparing the groups indicated no significant differences between the two groups, suggesting a lack of non-response bias.

2.5 Data Analysis and Results

2.5.1 Measurement Model

After creating the research survey, we twice submitted it to a panel of four experts and made necessary corrections pursuant to their suggestions and comments. After collecting and cleaning the data, the researchers conducted factor analysis, with the results as displayed in Table 2.2. The

authors tested the internal consistency of the research model to ensure it evidenced satisfactory psychometric properties. We analyzed the instrument's reliability, convergent validity, and discriminant validity to assess the overall validity of its constructs (Bollen, 1989; Chin & Todd, 1995).

Table 2.2: Construct Factor Loadings

Items	Conf	Prcvd Benefit	Cog Sat	Emo Sat	Cont Int
Perceived Benefit 1	0.850	0.474	0.489	0.618	0.631
Perceived Benefit 2	0.814	0.446	0.471	0.569	0.628
Perceived Benefit 3	0.849	0.472	0.498	0.569	0.666
Cognitive Satisfaction 1	0.458	0.831	0.650	0.495	0.534
Cognitive Satisfaction 2	0.436	0.777	0.613	0.452	0.520
Cognitive Satisfaction 3	0.442	0.802	0.618	0.486	0.525
Confirmation 1	0.510	0.649	0.865	0.599	0.638
Confirmation 2	0.512	0.656	0.861	0.603	0.623
Confirmation 3	0.436	0.661	0.789	0.539	0.535
Continuance Intention 1	0.605	0.523	0.603	0.872	0.636
Continuance Intention 2	0.521	0.426	0.528	0.750	0.558
Continuance Intention 3	0.616	0.530	0.597	0.870	0.620
Emotional Satisfaction 1	0.612	0.530	0.606	0.613	0.829
Emotional Satisfaction 2	0.695	0.568	0.616	0.621	0.873
Emotional Satisfaction 3	0.677	0.599	0.633	0.652	0.890

Cells highlighted in yellow on the diagonal contain the square root of AVE

This research calculated Cronbach's alpha and Fornell's composite reliability to assess internal consistency (Fornell & Larcker, 1981). The coefficients of all Cronbach reliability variables scored higher than the minimum cutoff value of 0.60 (J. Nunnally, 1978), 0.65 (J.-N. Lee & Kim, 1999), and 0.70 (J. Nunnally, 1978; J. C. Nunnally & Bernstein, 1994). Composite reliability is considered a better measure of internal consistency, as it relies on the actual loadings to construct while Cronbach's alpha considers each item the same weights (Fornell & Larcker,

1981). The composite reliabilities (CR) of the constructs demonstrate a value higher than 0.7, evincing adequate internal consistency (Fornell & Larcker, 1981; J. Nunnally, 1978). All average variance extracted (AVE) values that imply the percent of variance explained by measurement items scored higher than the recommended cutoff value 0.5 (Fornell & Larcker, 1981). Table 2.3 shows the values of CR and AVE. The correlations between the variables scored lower than the square root of the AVEs, signifying an acceptable discriminant validity of the constructs (Chin, 1998a; Fornell & Larcker, 1981), as shown in Table 2.3.

Table 2.3: Correlations of Latent Variables

Items	Conf	Prcvd Benefit	Cog Sat	Emo Sat	Cont Int	AVE	CR
Confirmation	0.84					0.70	0.88
Perceived Benefit	0.58	0.84				0.70	0.88
Cognitive Satisfaction	0.78	0.55	0.80			0.65	0.85
Emotional Satisfaction	0.72	0.77	0.67	0.87		0.75	0.90
Continuance Intention	0.69	0.70	0.60	0.73	0.83	0.69	0.87

Cells highlighted in yellow on the diagonal contain the square root of AVE

2.5.2 Common Method Bias

Common method bias is one of the most-frequently mentioned measurement errors in self-report survey research (Esfandiar, Sharifi-Tehrani, Pratt, & Altinay, 2017; Malhotra, Schaller, & Patil, 2017). To reduce it, we provided clear instructions validated by an expert panel, protected respondent-researcher anonymity, ruled out the ambiguity of survey items, and separated dependent and independent variables (Tajvidi, Richard, Wang, & Hajli, 2018). We also employed Harman's one-factor test to assess common method bias (Podsakoff & Organ, 1986). Five key constructs emerged from the test result. The maximum co-variance explained by a single factor is

35.38 percent, indicating that the research data is unaffected by common method bias.

2.5.3 Structural Model Assessment

The assessment of the structural model includes estimating path coefficients as well as R2s, which indicates the predictive ability of independent variables. To test our hypotheses, we applied SmartPLS 3.0 (C. Ringle et al., 2014; C. M. Ringle et al., 2005). As shown in Figure 2.2, the expectation confirmation construct demonstrates a positive effect on benefit, cognitive satisfaction, and emotional satisfaction. Users' cognitive satisfaction has a positive effect on users' continuance intention. Cognitive satisfaction had a strong positive effect on emotional satisfaction with IPAs. Emotional satisfaction demonstrates a strong positive impact on continuance intention. As expected, IPA user emotional satisfaction has higher impact on continuance intention ($\beta = 0.37$, $t = 3.44$, $p < .001$) compared to cognitive satisfaction ($\beta = 0.18$, $T = 2.16$, $p < .05$). The R2s for the perceived benefit, emotional satisfaction, cognitive satisfaction, and continuance intention variables are 0.34, 0.63, 0.70, and 0.60, respectively, indicating the model explains a large portion of construct variance.

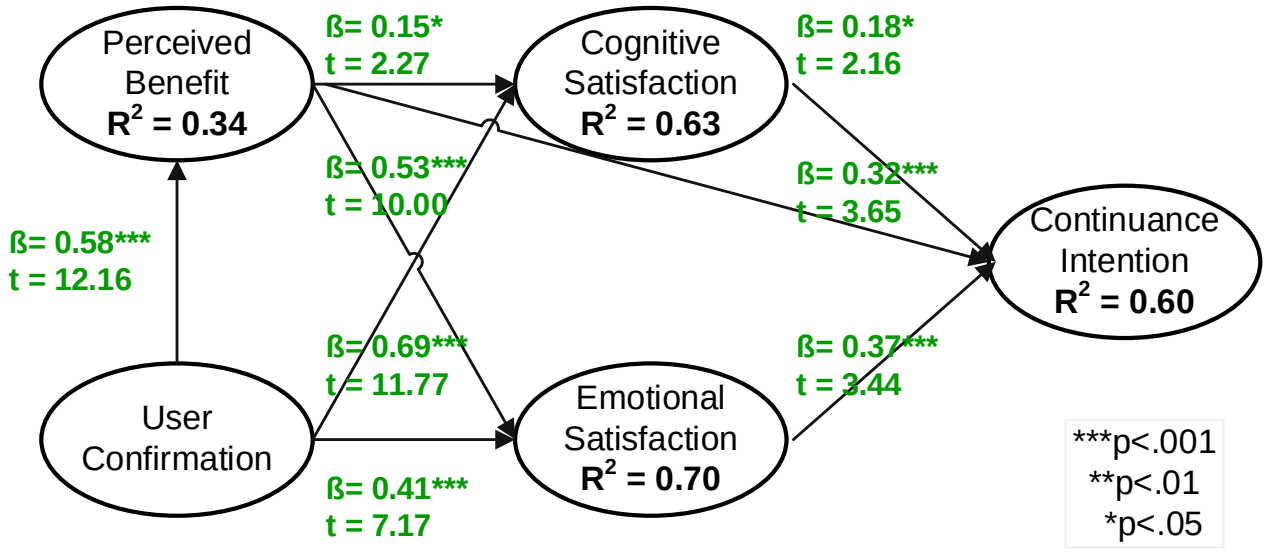

Figure 2.2: The Fitted Model

2.6 Discussion

All paths in the proposed model are significant. The R2s, notably the two satisfaction constructs and the continuance intention construct, explain a substantial portion of the variance, indicating the suitability of the model for this research. The authors developed and the model by collecting empirical data from emerging technology users, finding that expectation confirmation and perceived benefit significantly impact both cognitive and emotional components of satisfaction. Results indicate that the contributing variables strongly influence continuance intention.

2.6.1 Contributions to Research

This study makes the following contributions to IT continuance research:

1. This research develops and tests an extended ECM framework to investigate IT continuance behavior for both workplace and personal use. Previous IT continuance research draws extensively from TAM, UTAUT (Davis, 1989; Venkatesh, Morris, Davis, & Davis, 2003), ECM (Bhattacherjee, 2001b), and models that stem from ECM (Bhattacherjee & Lin, 2015). We observe that IS researchers tend to overlook the bilateral nature of satisfaction and the significant affective advantages that IT can bestow. This notion is consistent with De Guinea and Markus (2009), who claims that both cognitive and emotional components influence IT continuance. Accordingly, this research advocates a new model that integrates cognitive satisfaction and emotional satisfaction, affording more comprehensive insights into IT continuance.

2. In the proposed model, this research substitutes perceived benefit for perceived usefulness. Although perceived usefulness figures prominently in the original ECM and its derivatives, an unwelcome ECM shortcoming is it fails to capture the emotional advantages of IT, which remain indispensable with image-conscious young adults (e.g., the iPhone “cool factor”)

(Sundar, Tamul, & Wu, 2014). Our proposed model addresses the deficiency by replacing perceived usefulness with perceived benefit, which apprehends ancillary returns beyond those captured by previous models. Based on the favorable results of the study, we advocate replacing perceived usefulness in ECM scenarios, so directing previously-unmeasured remunerations that increase the explanatory power of user continuance and contribute new guidance in support of IT research.

3. Where the previous continuance models emphasized the evaluation of continuance behavior solely in the workplace, or solely in personal use, or on an ad hoc basis for individual technology, this research has built and tested a general model to evaluate IT continuance behavior in both workplace settings and personal settings, as well as individual technologies.

4. Finally, this research extends the body of knowledge related to the cognitive and emotional consequences of IT post-adoption behavior (Beaudry & Pinsonneault, 2010; Zhang, 2013). For example, within typical situations, one may experience emotional satisfaction with an IT but not cognitive satisfaction, or vice versa. However, in cases where users demonstrate emotional response by irrational behavior or other dysfunctionality, the new model can capture such psychological aberrations and explain salient repercussions in the continuance variable (Chen, Jong, & Lai, 2014; Mayer, Davis, & Schoorman, 1995).

2.6.2 Contributions to Practice

This study addresses numerous issues pertinent to IT managers who are concerned with the continuance behavior of organizational users, vendors with client users, and technology manufacturing companies with that target product users:

1. The IT product team should measure emotional responses to assess and act on feedback arising from either normal or non-normal behaviors. Negative normal symptoms may include user

exhaustion, low levels of IT satisfaction, and firm intentions to reduce or even discontinue using the IT—truly unwanted outcomes.

2. Our results indicate that managers should monitor cognitive and emotional satisfaction routinely. Our research findings suggest that cognitive and emotional user satisfaction are vital drivers of IT continuance intention and therefore are necessary for IT product success. As it nurtures product longevity, IT continuance is no less critical than initial adoption. In reality, product discontinuance following initial adoption typically incurs sunk costs for the failed product and opportunity costs for replacement products, compelling additional investment, research, development, testing, and installation prior to another adoption. Moreover, our new model illustrates that emotional satisfaction exerts a stronger influence on continuance than does cognitive satisfaction. Thus, emotional satisfaction contributes to a robust influence not only on user performance but also on continuance behavior.

3. Managers should consider the wider range of potential advantages delivered by this new model, which extends additional user assessment criteria beyond job performance. Our findings indicate that perceived benefit exhibits a strong positive effect on both cognitive and emotional satisfaction, as well as on user continuance intention. Thus, vendors and manufacturing companies should consider these advantages, along with work performance.

4. Finally, this study provides managers, vendors, and technology manufacturing firms with needed insight into user continuance behavior, which can help guide operational and even strategic decisions that affect IT users. As this research draws upon the bilateral components of satisfaction, cognitive, and emotional satisfaction, it reveals that these factors individually contribute toward continuance intention. Because emotional satisfaction exerts more influence on continuance than cognitive satisfaction, managers may wish to identify and focus the application

of specific product characteristics that elicit positive emotional satisfaction.

2.6.3 Limitations and Future Research

The authors suggest that readers interpret these research findings in the context of the study's limitations.

1. The authors selected IPA users for this study from a convenience sample of college students in a large, diverse business school at a research university in the Southwest USA. Hence, we suggest caution when generalizing these findings, as the sample may not be representative of the broader population of IPA users throughout the nation or the world. Conversely, our diverse students are well-situated for being subjects. Being informed, frequent users of technology and consumer-based IT products, our students are appropriate subjects in IT research in studies such as this. As IT product consumers, they appear ideally positioned to provide insight through their assessments of IT system capabilities. However, to confirm these views, future studies should examine IPA users in a variety of other contexts.

2. This study is cross-sectional and by definition, executed at a single moment in time. IS research also indicates that post-adoption behaviors tend to change over time (Zheng, Zhao, & Stylianou, 2013). To overcome these limitations, future research may consider longitudinal approaches to investigate more thoroughly the relationships between behaviors and the influencing variables.

3. The authors analyzed the perceived benefit as a unitary construct. Because the IS literature often employs perceived benefit as a multidimensional construct, especially when measuring it together with perceived risk (Bruhn, Schnebelen, & Schäfer, 2014; Zhou et al., 2012), future research may wish to investigate the role of each dimension of benefit. The dimensions are

expressed in a four-factor scale; it is often employed in conjunction with perceived risk, which is expressed in a three-factor scale (Forsythe et al., 2006).

2.7 Conclusion

This research examined how the cognitive and emotional components of satisfaction separately influence IT continuance behavior. Through modification of the widely used IT continuance framework, ECM, the researchers conceptualized the model as presented. The authors developed and tested the model by collecting empirical data from emerging technology users (IPA users), finding that expectation confirmation and perceived benefit significantly impact both cognitive and emotional components of satisfaction. The authors also observe that emotional satisfaction exerts a stronger influence on IT continuance behavior when compared with cognitive satisfaction. By presenting these findings, the authors contribute to filling a research gap in the lT literature and make a significant contribution to understanding post-adoption behavior. Overall, this work contributes to a new perspective on IT continuance research.

Appendix A2. Measurement Items

Constructs	Items	Source
Confirmation	My experience with using <piped text> was better than I expected.	Bhattacherjee, A. (2001)
	The functionality provided by <piped text> was better than I expected.	
	Overall, <piped text> confirmed most of my expectations about using it.	
Perceived Benefit	I think that using <piped text> is convenient.*	Kim, D. J., Ferrin, D. L., & Rao, H. R. (2008)
	I can save time by using <piped text>.	
	<Piped text> enable me to complete my tasks more quickly.	
	<Piped text> increase my productivity (saving time, allowing me to do my work while commanding by natural speech).	

Constructs	Items	Source
Cognitive Satisfaction	<Piped text> understands my commands satisfactorily.	Yu, Y. T., & Dean, A. (2001)
	The feedback <piped text> provides is satisfactory.	
	The information <piped text> provides is satisfactory.	
Emotional Satisfaction	So far, My overall experience with <piped text> makes me feel happy.*	Yu, Y. T., & Dean, A. (2001)
	So far, My overall experience with <piped text> makes me feel hopeful.	
	So far, My overall experience with <piped text> makes me feel positively surprised.	
	So far, My overall experience with <piped text> makes me feel delighted.	
Continuance Intention	I intend to continue using <piped text> rather than discontinue their use.	Bhattacherjee, A. (2001)
	My intentions are to continue using <piped text> rather than use alternative means (e.g., traditional web browsing)	
	If I could, I would like to discontinue my use of <piped text> (reverse coded).	

* Item removed from analysis due to low- or cross-loading. <Piped text>= the name of the IPA (such as google home) they use. Used <piped text> in the survey

ESSAY 3

UNDERSTANDING THE ROLE OF ATTACHMENT IN IT CONTINUANCE BEHAVIOR: AN EMOTIONAL ATTACHMENT MODEL

3.1 Introduction

For over a decade, Information Technology (IT) continuance research has been a significant area of interest in information systems (IS) (Kane & Labianca, 2011; Stein, Newell, Wagner, & Galliers, 2015). Where early IT success depends on its initial adoption, long-term success depends on sustained utilization (Bhattacherjee, 2001b). Accordingly, following an IT initial adoption, extended utilization prolongs user benefits, while suspended utilization negates potential user benefits and also squanders invested time and financial resources. Despite the importance of IT continuance to the discipline, benefit/cost theories in IT continuance are generally absent from the literature.

Several theories and extensions investigate individual motivation or habitual response for IT continuance in workplace settings, such as the expectation-confirmation model (ECM) (Bhattacherjee, 2001b), the IT continuance unified model (Bhattacherjee & Lin, 2015), and the multi-motive information System Continuance Model (MISC) (P. Lowry et al., 2015). Still, these IT theories ignore emotion, an exceptionally potent human factor. This research investigates the importance of emotion for users of intelligent personal assistants (IPA). IPA is an advanced, intelligent technology, containing a voice user interface (VUI). IPAs exhibit human-like behavior.

Emotion figures prominently in consumer psychology and social psychology literature. These disciplines suggest that emotional attachment creates long-term relationships or engenders situations that prolong relationships (Bowlby, 1979; Thomson, MacInnis, & Park, 2005; Tidwell, Reis, & Shaver, 1996). This work proposes that the long-term relationships explained in the social

psychology/consumer psychology contexts are analogous to user IT continuance in an IS context. Furthermore, this research contextualizes emotional attachment from the former areas to IT users' continuance behavior.

While studies that investigate the role of emotion in IT continuance are rare, IS researchers have considered other human factors. For example, the literature identifies attitude as a major predictor of IT continuance intention (P. Lowry et al., 2015; Nguyen et al., 2018; Venkatesh et al., 2011; B. Wu & Chen, 2017). Although attitude, like emotion, is an affective construct, Oliver (1980) argued that attitude is not a robust predictor of post-adoption behaviors, such as continuance. While attitude can explain pre-adoption behavior, such as use intention, satisfaction better predicts post-adoption behavior, such as continuance intention (Oliver, 1980). Based on Oliver's (1980) expectation-confirmation theory (ECT), Bhattacherjee (2001b) developed the expectation-confirmation model (ECM), where satisfaction is the primary predictor of continuance intention. Bhattacherjee and Lin (2015) followed with the unified model of IT continuance, which integrated the theories of reasoned action, experiential response, and habitual response. In their model, which focused on continuance in utilitarian systems, satisfaction also is a significant predictor.

Researchers in the IS literature widely use the preceding theories for investigating IT continuance, where satisfaction predominates as the major predictor of IT continuance. However, we find no agreement on how to classify the variable. Whether satisfaction is a cognitive construct, an emotional construct, or a combination of emotive and cognitive components remains open for debate (Babin & Griffin, 1998; Crooker & Near, 1998; Mamun, Senn, Peak, Prybutok, & Torres, 2020; Oliver, 2014).

Emotional attachment influences IT continuance (Bagozzi, 2007; Beaudry & Pinsonneault,

2010; De Guinea & Markus, 2009). IT continuance research, e.g., (Bhattacherjee, 2001b), includes extensions of ECM that include emotion [e.g., (X. Lin et al., 2017; Oghuma, Libaque-Saenz, Wong, & Chang, 2016)]. However, these studies did not follow the systematic theory development procedure explained by Bagozzi (2007) to examine the effect of emotion in IT continuance. Stein et al. (2015) observe that existing IT continuance models that do incorporate emotional constructs appear to be ad hoc and do not exhibit sufficient rigor. While prior studies proffer emotion-oriented theories in IT adoption studies (McGrath, 2006; C.-Y. Wang, Seng-cho, & Chang, 2009), the theories are rational—not emotive—and goal-oriented. Furthermore, these theories omit both non-cognitive human behavior and attention to emotion (Bagozzi, 2007; Thompson, 2012). Stein et al. (2015) lament that IS research does not define emotion-related concepts with clarity. Other research suggests existing IT continuance research methods unjustifiably emphasize a variance approach, and link downstream processes to an IT stimulus, while stimulus-related emotions are little explored. Moreover, such research does not identify the IT event mechanism that elicits user emotions (Stein et al., 2015).

Such concerns represent a research opportunity for developing a model in the IT context through attachment theory, which is established in the reference disciplines of social psychology/consumer psychology. This study adopts the attachment theory and contextualizes it to formulate a new model in the context of IT. Based on existing IT continuance research, as well as the needs and opportunities for integrating emotion from reference disciplines into an IS context, this work presents an EA model intended for investigating the role of emotion in users' intention to continue using IT. The results suggest that both an individual's emotional attachment and emotional trust in IT significantly influence their IT continuance intention. Furthermore, the quality of an individual's interaction with and emotional trust in IT positively influence emotional

attachment to IT.

This research contributes to IS research by developing and testing the EA model. It contributes to IT theory by demonstrating—for the first time—the viability of ascribing attachment theory to an IT context and specifically to IT continuance behavior. This research fills a critical research gap in IT post-adoption literature and provides knowledge about the research value of emotional attachment in IT post-adoption behavior. Finally, this research contributes to the growing body of IT research that investigates the emotional consequences of IT adoption (e.g., (Beaudry & Pinsonneault, 2010; Zhang, 2013)). Research questions include: 1. what are the salient factors of IT continuance, and 2. how do these factors influence continuance behavior?

This study organizes the remainder of this work as follows. The article next describes the theoretical background and literature review, the research method, and explains the conceptual model and hypothesis development. It presents the research methodology and data collection used to test the research model and discusses the results of the data analysis. The article ends with a discussion of findings and implications, followed by contributions, limitations, suggestions for future research, and ends with a conclusion.

3.2 Theoretical Background and Literature Review

3.2.1 Attachment Theory

The attachment theory originates in social psychology, where it was developed by Bowlby (1979, 1980) from ethology, control system theory and cognitive science components to explain parent-infant relationships. In the revised version of attachment theory, Bowlby (1982) embraced the Hinde (1976a) suggestion about characterizing the relationship. According to Hinde (1976a), the various dimensions of interaction, affection, openness form long-term relationships. Bowlby (1982) explains that these components create an attachment that eventually creates long-term

relationships.

Besides explaining infant-parent relationships, child-parent relationships (Bowlby, 1980), adult romantic relationships (Hazan & Shaver, 1994), friendships, and kinships (Trinke & Bartholomew, 1997; Weiss, 1988), previous research used attachment theory to explain attachment of people to locations and animate objects. For example, such research explained human attachment to pets (Hirschman, 1994), places (Rubinstein & Parmelee, 1992), celebrities (Alperstein, 1991). In marketing research, researchers described consumer attachment to a variety of properties, such as gifts (Mick & DeMoss, 1990), collectibles (Slater, 2001), places of residence (Hill & Stamey, 1990), brands (Schouten & McAlexander, 1995; Thomson et al., 2005), companies (Vlachos, Theotokis, Pramatari, & Vrechopoulos, 2010; S.-B. Yang, Lee, Lee, & Koo, 2019), and other favored objects of consumers (Dwayne Ball & Tasaki, 1992). In consumer behavior research, Slater (2001) found consumers exhibited strong emotional attachments to Coke® and Hallmark Cards®. In IT online communities, Ren et al. (2012) employed attachment theory to investigate the development of social bonding relationships. Finally, in IS virtual reality (VR) research, Suh, Kim, and Suh (2011) found that user-technology emotional attachment impacts intention to use avatars.

3.2.2 Emotional Attachment

According to attachment theory, attachment does not exclusively facilitate social bonds and is not limited in application to child-parent relationships. Bowlby describes emotional attachment as “an emotion-laden target-specific bond between a person and a specific object” (Thomson et al., 2005, p. 77). The strength of attachment varies, depending on the intensity of human feelings concerning interaction, passion, love, and affection (Aron & Westbay, 1996; Bowlby, 1979; Brennan, Clark, & Shaver, 1998; Sternberg, 1987). Attachment can catalyze strong

bonds in different stages and different situations in human life such as child-parent relationships, child-playmate relationships, intrafamily relationships, and so forth (Bowlby, 1979, 1980; Hazan & Shaver, 1994; Trinke & Bartholomew, 1997; Weiss, 1988).

Various human behaviors reveal strong emotional attachments (Bowlby, 1980; Hazan & Zeifman, 1999). Though some researchers report that the attachments become stronger in the context of a threat (Bowlby, 1980; Sroufe & Waters, 1977), Hazan and Shaver (1987; 1994) proffer an attachment extension for explaining both adolescent and adult romantic relationships. They find that the relative immaturity of adolescents negatively impacts coping ability, while most adults can cope with the threat.

Good interaction quality with the attachment figure develops strong attachment emotions. Strong attachment stimulates desires to maintain proximity to the attachment figure, such that separation from the attachment object negates positive emotions, fuels anxiety, and promotes mental fatigue (Hazan & Zeifman, 1999). According to Tidwell et al. (1996), positive emotional states (emotional trust) and intimacy (interaction) are major contributors to attachment in a given relationship.

3.2.3 Interaction Quality

Like emotional attachment, interaction quality emanates from the social psychology discipline. Researchers in that field have measured interactional quality to explain interpersonal relationships, such as infant-mother relationships (Bowlby, 1979), child-parent relationships (Bowlby, 1979), and romantic relationships (Bowlby, 1979). Consumer psychology uses interaction quality to assess marketing relationships, such as buyer-seller (Cheng, 2020) and consumer-brand interaction (France, Grace, Lo Iacono, & Carlini, 2020; Singh, Bajpai, & Kulshreshtha, 2020). In IS, scholars examine the interaction quality of interactive systems, such

as social networks and online gaming—all which can foster the creation of robust interpersonal bonds amongst system users (C. P. Lin & Bhattacherjee, 2010). Similar to customer-brand interaction in consumer literature (called mechanical interaction), IS researchers observe quality bond creation between users and objects, such as commonly seen between users and apps (Choi & Kim, 2004; Lien, Cao, & Zhou, 2017).

3.2.4 Emotional Trust

The components of emotional trust can be traced to the twentieth-century economics literature, which developed the concepts of principal-agent theory, moral hazard, and insurance. The scenario depicts a principal who hires the agent to act on their behalf; the principal attempts to minimize payments to the agent without degrading or losing the agent's services. Conversely, the agent attempts to maximize receipts without damaging or losing the engagement. This optimization problem frames the principal-agent relationship around mutual trust, conditioned by competing goals, and whether the fees/receipts can sustainably satisfy both parties. Should the funding levels not be satisfactory, moral hazard raises trust red flags for one or both parties (Arrow, 1968; Pauly, 1968).

Nearly fifty years later, various IS researchers model trust as a trustor-trustee relationship, where the trustor exhibits trusting perceptions or beliefs that the trustees' attributes will benefit them (Hoehle, Zhang, & Venkatesh, 2015; McKnight, Choudhury, & Kacmar, 2002). Trusting beliefs are the trustor's cognitive opinions that embody rational expectations of trust; 'good reasons' serve as the basis of trust decision (S. X. Komiak & Benbasat, 2004; Lewis & Weigert, 1985). Lewis and Weigert (1985) affirm that trust possesses both emotional and cognitive foundations. Greenspan et al. (2000) explain: "Trust can be based upon the rational appraisal of a partner's reliability and competence, and upon feelings of concern and attraction" (Greenspan,

Goldberg, Weimer, & Basso, 2000, p. 253).

In this research, emotional trust is "…the extent to which one feels secure and comfortable about relying on the trustee" (S. Y. Komiak & Benbasat, 2006, p. 943). Emotional trust encompasses a person's cognitive beliefs about, faith in, and emotional reactions to the trustee (S. Y. Komiak & Benbasat, 2006; Rempel, Holmes, & Zanna, 1985). Emotional trust encapsulates the trustor's feelings concerning their required reliance on the trustee. Typically, a trustor will seek a psychological state of assurance and comfort to self-justify reliance on a trustee (S. X. Komiak & Benbasat, 2004; Lewis & Weigert, 1985).

Outside of the IS discipline, where conceptualizing trusting beliefs predominates, the general literature illustrates two other types of trust. 1. Trusting intention, which is the trustor's willingness to depend on a trustee in a given situation. 2. Disposition to trust, which is the extent to which a person displays a willing tendency to depend on others—across a broad spectrum of situations and persons. (S. Y. Komiak & Benbasat, 2006, p. 943). This research incorporates only emotional trust in the EA model. Our focus on emotional trust makes the model consistent with attachment theory, which explains only the emotional state of an individual. Excluding other trust constructs is also a similar notion after McKnight, Cummings, and Chervany (1998), as they excluded attitudes and behaviors to study trust of organizational participants noting, "The distinction between trusting beliefs and trusting intention follows the Fishbein and Ajzen (1975) typology separating constructs into beliefs, attitude, intentions, and behaviors." Thus, their paper excluded attitudes and behaviors to focus on the cognitive domain (McKnight et al., 1998, p. 474).

3.3 Emotional Attachment Differs from Other Emotion-Related IS Constructs

In this research, emotional attachment brings new value beyond other emotion-related IS constructs, such as user attitude and user satisfaction. The value of this approach is that it provides

a hedonic measure, in addition to attitude and satisfaction, as a predictor of IT continuance behavior.

3.3.1 User Attitude

Users who are emotionally attached to a particular technology also are likely to demonstrate a positive attitude toward it. However, Emotional attachment differs from user attitude. 1. Attachment develops over time based on the interaction quality between individual and attachment object (Baldwin, Keelan, Fehr, Enns, & Koh-Rangarajoo, 1996). Conversely, attitude develops based on the evaluative reactions of individuals to an object, and it may develop without any direct contact with the technology. Thus, users may possess a positive attitude toward a particular technology without any firsthand experience with it. 2. Consumer psychology suggests that consumers may hold a positive attitude toward many objects at a time and value each of them a little. However, consumers also can emotionally attach to a few objects at a time and valued each a great deal (Dwayne Ball & Tasaki, 1992; Richins, 1994). Finally, the emotional attachment of individuals to an object includes specific behaviors such as separation distress, proximity maintenance (Bowlby, 1979). In contrast, attitude is not an attachment factor; attitude is highly situational and context-specific. Neither does it exhibit separation distress (Sheppard, Hartwick, & Warshaw, 1988).

3.3.2 User Satisfaction

An individual who is emotionally attached to an object likely will be satisfied with it. However, emotional attachment differs from user satisfaction. Satisfaction is a combination of cognitive and emotional components (Oliver Richard, 1997). Although users may be satisfied with the technology, their satisfaction may be evaluative, emotional, or mixed, where an emotional attachment is a reflection of emotional bond. Satisfaction does not carry behavioral indicators,

such as separation distress or proximity maintenance. In contrast, emotional attachment does carry behavioral indicators. Satisfaction can occur immediately. In contrast, emotional attachments develop over time and with multiple interactions. Finally, in IS research researchers generally use satisfaction as an evaluative construct. In contrast, attachment in this work is an emotion-laden construct.

3.3.3 User Engagement

Previous researchers have studied engagement and its consequences in various contexts, such as technology use (Mamun & Kim, 2018), consumers behavior (Heinonen, 2018), politics (Xenos, Vromen, & Loader, 2014), education (Junco, Elavsky, & Heiberger, 2013), health care (Barrett, Oborn, & Orlikowski, 2016), and the online health community (Hur, Cousins, & Stahl, 2019). At face, the term engagement seems similar to the attachment. Nevertheless, engagement differs. Researchers define engagement differently in different disciplines and different contexts; most researchers suggest that engagement embraces three components: cognitive engagement, emotional engagement, and behavioral engagement (Brodie, Hollebeek, Ilic, & Juric; Hur et al., 2019). Cognitive engagement describes a person's mental state in the activity, characterized as active, complex, or cognitive processing (Hur et al., 2019, p. 525). Behavioral engagement during the activity indicates the extent of attention, effort, concentration, and persistence exhibited by the individual (Hur et al., 2019, p. 525). Emotional engagement during the activity refers to the degree of emotional bonding or impact that occurs (Hur et al., 2019, p. 525).

Thus, engagement reflects an individual's involvement during the activity (i.e., during the work, during using a technology) where the person maintains a level of emotional attachment even when they are not involved in the activity. Other literature explains emotional engagement in terms of attitude, enjoyment, and interest (Hampden-Thompson & Bennett, 2013; Kanaparan, Cullen, &

Mason, 2019), which also differs from emotional attachment.

3.4 An Emotional Attachment Model of IT Continuance

Interaction is one of the more influential variables for characterizing relationships (Bretherton, 1985). Hinde (1976b) describes relationships in concert with content, diversity, and qualities of the component interactions. Choi and Kim (2004, p. 13) define interaction as the behavior of communicating with two or more objects that affect each other; user interaction with an object or system is termed personal interaction. Interaction includes the manner of communications, frequency of communications, the way or format that the objects respond, and so forth (Laurel, 2013).

From the very beginning of electronic computing, psychologists embarked on a quest to recognize and shape human-computer interaction. Comparatively-recent interactive technologies, such as voice-user interface, instant messaging, and automated chatbot, have altered the ways contemporary users interact and communicate (Laurel, 2013). Laurel (2013) explains a feeling called companion effect when users experience interaction with such technologies. In psychology research, attachment theory supports the companion effect. Bowlby (1979) suggested that the nature of a person's interaction with an object heralds the degree of emotional attachment with that object. Thus, this research hypothesizes:

> *H1: The quality of user interaction with an IT positively influences their emotional attachment to that IT.*

Researchers studied the association between interaction and emotional trust in many contexts, such as in inter-organizational trust (Tu & Xu, 2020), inter-personal cooperation (McAllister, 1995), mobile-commerce service (Sarkar, Chauhan, & Khare, 2020), trust in virtual communities (Frey & Lüthje, 2011), and service delivery (Lanin & Bila, 2017). Although in the context of IS research, scholars have yet to empirically study interaction-emotional trust

relationships, human-computer interaction (HCI) research provides support for this relationship (Choi & Kim, 2004; Laurel, 2013). McAllister (1995) empirically shows that organizational interaction positively influences emotional trust. C. P. Lin and Bhattacherjee (2010) noted technologies that exhibit a high level of interaction inspire positive user attitudes toward those technologies. HCI research indicates that direct interaction with an object engenders an emotional bond/feelings with the object (Laurel, 2013). This research suggests the positive bond/feelings are emotional trust. Thus, this work hypothesizes:

> *H2: The quality of user interaction with an IT positively influences their emotional trust in that IT.*

The ability to trust is a crucial factor to enrich attachment (S.-B. Yang et al., 2019). Social psychology literature provides evidence of the positive impact of trust on emotional attachment (Burke & Stets, 1999). In the customer psychology literature, Esch, Langner, Schmitt, and Geus (2006) explains that customers feel attached to a particular brand when he or she trusts the brand. Thomson (2006) argued that emotional security enhances the strength of emotional attachment. According to S. Y. Komiak and Benbasat's (2006) and Ismagilova, Slade, Rana, & Dwivedi's (2019) definition of emotional trust, emotional trust is a function of emotional security. Thus, we argue that emotional trust has a positive effect on emotional attachment. S.-B. Yang et al. (2019) in their research on trust in business organization explains that emotional trust is the base of the attachment development process. Thus, this research hypothesizes:

> *H3: User emotional trust with an IT positively influences their emotional attachment to that IT.*

In this research, emotional trust is the extent to which the trustor feels comfortable and secure concerning their reliance on the trustee. Emotional trust encompasses a person's cognitive faith in, beliefs about, and emotional reactions to the trustee (S. Y. Komiak & Benbasat, 2006).

Emotional trust encapsulates the trustor's feelings concerning their required reliance on the trustee. According to the theory of reasoned action (TRA) (Fisbein & Ajzen, 1975), a positive attitude toward a behavior positively influences behavioral intention. Research supports the positive effects of attitude on continuance intention (Nguyen et al., 2018; Schwarz, Schwarz, Jung, Pérez, & Wiley-Patton, 2012). In the context of mobile health service, research also indicates a positive effect of emotional trust on continuance intention (Meng, Guo, Zhang, Peng, & Lai, 2020). Thus, this study hypothesizes:

> *H4: User emotional trust in an IT positively influences their continuance intention for that IT.*

Tangible indications of affection and relationship commitment, one person to another, reveal an emotional attachment between them (Asendorpf et al., 2013; Drigotas & Rusbult, 1992). In this research, commitment is the degree to which one adopts a long-term view of the relationship and exhibits willingness to persevere in difficult times (Thomson et al., 2005). Is researchers have used attachment and commitment interchangeably (Ellemers, Spears, & Doosje, 1997; Ren et al., 2012). Studies found commitment demonstrates a robust, positive effect on continuance intention (Vatanasombut, Igbaria, Stylianou, & Rodgers, 2008; Zhou et al., 2012; Zhou, Jin, Fang, & Vogel, 2015). Continuance intention is a long-term user decision to continue employing a particular IS technology (Bhattacherjee, 2001b). We contend that intention to maintain a long-term relationship (borrowed from a social and service context) is similar to continuance intention in the IT context. Furthermore, we believe emotional attachment predicts IT continuance intention. Finally, in a sharing economy of travelers, S.-B. Yang et al. (2019) demonstrate the positive effect of emotional attachment on continuance intention. Thus, this research hypothesizes:

> *H5: User emotional attachment to an IT positively influences their continuance intention of that IT.*

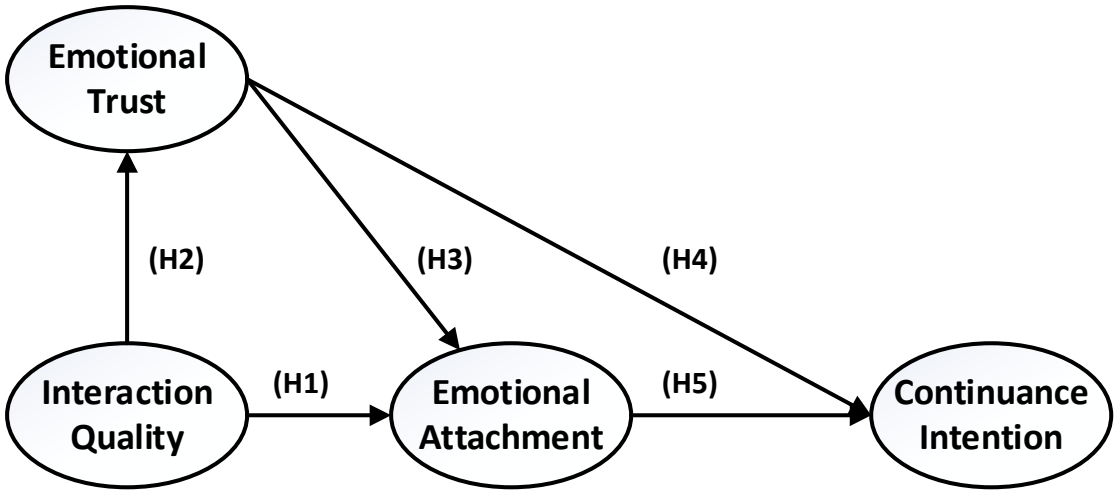

Figure 3.1: The Emotional Attachment (EA) Model

3.5 Research Method

3.5.1 Study Context and Sample

To test the proposed theoretical framework, an online survey was administered to undergraduate and graduate students from a large public university in the United States. This research incorporated four constructs in the online survey: interaction quality, emotional trust, emotional attachment, and continuance intention. Students voluntarily involved in the study and received extra credit as an incentive for their participation. Participants answered the survey questionnaires based on their experience of using an intelligent technology called intelligent personal assistant (IPA).

A student sample was considered an appropriate population for this study (Nguyen et al., 2018) because students comprise a crucial subset of voice user interface (VUI) consumers. Researchers sent survey invitations to 807 students attending several courses and received 538 (67%) responses. Among the respondents, 177 indicated that they do not use any types of IPAs and were removed from the sample. This investigation removed 73 additional responses as participants spent less than 3 minutes for responding to the survey casting doubt of the quality of

response. The resulting data set finally considered is 288 (rate 37%) for analysis. As expected, most of the respondents were young, 225 reported age range between 18 to 25. Among the respondents, 170 are male, 117 are female and one did not specify. 18 respondents use IPAs for only work, 132 used for entertainment only, and 138 use both for work and entertainment. The median value of the experience of using IPA is 2.75 years.

3.5.2 Operationalization of Constructs and Data Capture

All participants in this study reported using at least one of five popular IPA systems: Google Home, Amazon Alexa, Microsoft Cortana, Apple Siri, or Samsung Bixby. Participants were encouraged to answer the questions based on their experience using the IPA they use most frequently. This work contextualized items for interaction quality, emotional trust, emotional attachment, and continuance intention from previously validated measures.

This study adapted four items for interaction quality from C. P. Lin and Bhattacherjee (2010) and developed one new item with the agreement of a panel of academic experts, three items for emotional trust from S. Y. Komiak and Benbasat (2006), ten items for emotional attachment from (Suh et al., 2011) and three items continuance intention form (Bhattacherjee, 2001b). All measurement items used a 5-point Likert scale. Two items related to interaction quality construct and six items related to emotional attachment construct were removed as they displayed unacceptable cross-loadings. All items are presented for review in Appendix A.

3.5.3 Non-Response Bias

An independent sample t-test was conducted to compare early responses to late responses to address the possibility of non-response bias (Karahanna et al., 1999). The result of the t-test suggests no significant difference between the two groups, meaning a lack of non-response bias.

3.6 Data Analysis and Results

This research developed and analyzed a structural equation model using a partial least-squares equation modeling (PLS-SEM) approach. Both the measurement and structural model assessment for data analysis was performed to test the proposed research model. SmartPLS 3.0 (C. Ringle et al., 2014) was employed for the analysis of data. PLS-SEM is an appropriate approach for this research because it is suitable for both prediction and theory-building (J. Hair, Hollingsworth, Randolph, & Chong, 2017a). Moreover, PLS is a powerful and flexible analytic technique that requires a small sample size, a minimal number of measurement items and it has relaxed assumptions about residual distributions (Chin, 1998a; H Wold, 2004).

3.6.1 Measurement Model Assessment

To assess the measurement model, an analysis of reliability, as well as convergent and discriminant validity, were performed. The summary of findings for the measurement model is presented in Table 3.1.

Table 3. 1 Measurement Model Summary

Constructs	Inter Qual	Emo Trust	Emo Att	Cont Int	AVE	CR
Interaction Quality	0.71				0.51	0.75
Emotional Trust	0.56	0.86			0.74	0.90
Emotional Attachment	0.54	0.46	0.74		0.55	0.83
Continuance Intention	0.39	0.57	0.25	0.75	0.56	0.79

Cells highlighted in yellow on the diagonal contain the square root of average variance explained (AVE). CR = Composite reliability.

This examination first assessed indicator reliability by examining factor loadings. This analysis revealed that two items related to interaction quality and six items related to emotional attachment displayed low factor loadings and removed from further analysis. This research assessed the internal consistency using composite reliability (CR) metric. This analysis used CR

because researchers consider it more accurate compared to Cronbach's Alpha; it relies on actual loadings, whereas Cronbach's Alpha assumes all indicators are equally reliable (Henseler et al., 2009). According to J. C. Nunnally and Bernstein (1994), values for internal consistency values of 0.60 are acceptable; values of 0.70 or more are preferable in early, exploratory phases of research. The observed composite reliabilities in this research indicate adequate internal consistency as all were above 0.75. This study further evaluated the Average Variance Extracted (AVE). All AVE values exceeded 0.50, meaning that the latent variable explains at least half of the variation of its indicators (J. F. Hair et al., 2011). These combined findings demonstrate satisfactory convergent validity in the model. Discriminant validity was ascertained by calculating the square roots of the AVEs. A comparison of the inter-construct correlations with the AVE square roots indicates the latent variables share more variance with their indicators than with other variables, thus indicating satisfactory discriminant validity (Fornell & Larcker, 1981).

3.6.2 Common Method Bias

Common method bias (CMB) is one of the most-frequently mentioned measurement errors is in self-reported survey research (Esfandiar et al., 2017; Malhotra et al., 2017). This research employed a range of techniques suggested by Podsakoff et al. (2003) to reduce CMB, as follows. An expert panel validated the survey instructions for clarity, privacy, and respondent anonymity. The panel assisted in eliminating the perceived ambiguity of survey items and segregated independent and dependent variables. For evidence of CMB, Harman's one-factor test (Harman, 1976) was employed. This study performed principal components (PC) analysis, entering the items into an unrotated PC table to generate p scores and finding four principal components where the maximum variance explained by a single factor is approximately 34.6 percent. Thus, the findings represent that CMB is not present (Podsakoff et al., 2003).

3.6.3 Structural Model Assessment

After assessing the reliability and validity of the measurement items, this research evaluated the proposed relationships between latent constructs by examining the PLS path model. The structural model analysis includes estimating path coefficients (t scores in parentheses) as well as R2 values; Figure 3.2 details the fitted model results.

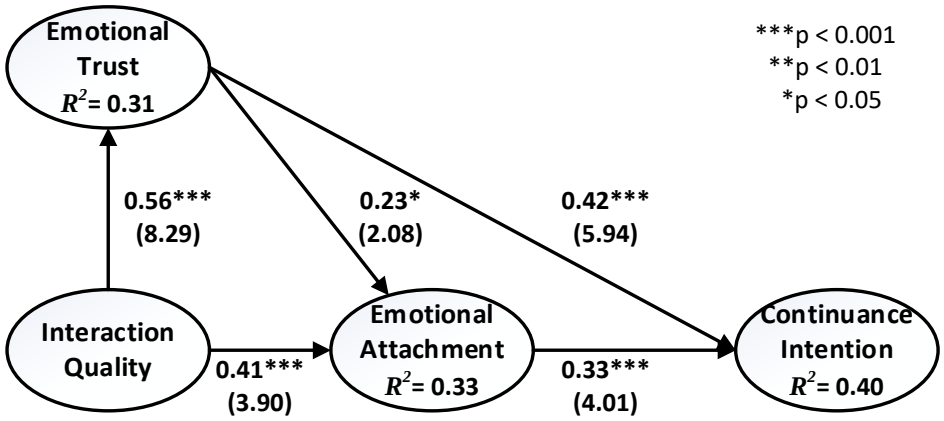

Figure 3.2: The Fitted Emotional Attachment (EA) Model

In the EA model, interaction quality demonstrates strong positive effects on emotional attachment ($\beta = 0.41$, $t = 3.90$, $p < 0.001$) and emotional trust ($\beta = 0.56$, $t = 8.29$, $p < 0.001$). Interaction quality influences emotional trust with R^2 values of 0.31, indicating interaction quality explains 31% of the emotional trust variation. Emotional trust indicates a positive effect on both emotional attachment ($\beta = 0.23$, $t = 2.08$, $p < 0.001$) and continuance intention ($\beta = 0.42$, $t = 5.94$, $p < 0.001$). The combined influence of interaction quality and emotional trust on emotional attachment elicits an R^2 of 33%. Finally, emotional attachment indicates a strong positive impact on continuance intention ($\beta = 0.33$, $t = 4.01$, $p < 0.001$); emotional trust and emotional attachment together explain 40% of the variation in continuance intention.

3.7 Discussion

This research investigates the role of emotion for technology users in general and

intelligent personal assistant (IPA) users in particular. This study developed an emotional attachment (EA) model with four contextualized constructs: interaction quality from C. P. Lin and Bhattacherjee (2010) and a panel of academic experts, emotional trust from S. Y. Komiak and Benbasat (2006), emotional attachment from Suh et al. (2011), and continuance intention from Bhattacherjee (2001b). To test the proposed EA theoretical framework, this research administered an online survey to undergraduate and graduate students—a representative subset of IPA voice interface consumers—that incorporated the four constructs. Validity testing indicates that the EA theoretical framework meets validity requirements for analyzing the effects of the three antecedent constructs on IT continuance intention.

Key findings suggest that emotional attachment play significant roles in IT continuance intention followed by interaction quality and emotional trust, thus sustaining the adoption of attachment theory from other disciplines to an IT context. Findings indicate that interaction quality, emotional attachment, and emotional trust positively influence post-adoption IT continuance—strongly suggesting that satisfaction and emotion both impact continuance. In light of the findings, theoretical implications portend that when calculating potential lifespans of emerging technologies, measuring user satisfaction, in the absence of emotional attachment to the product/brand, is insufficient. Practical implications suggest that IT manufacturers, managers, and vendors could extend their revenue streams and reduce sunk costs by integrating both interaction quality and emotional attachment into their products.

3.7.1 Contributions

3.7.1.1 Theoretical Contributions

This study makes vital theoretical contributions to IT post-adoption research.

1. This research developed and tested a new model that employs—for the first time—

attachment theory to investigate the effects of emotion on IT continuance behavior. In doing so, it ascribes attachment theory to an IT context and specifically to IT continuance behavior. Having originated in the social psychology literature, attachment theory explains social and human-to-human emotional bonding. Adopted in the marketing literature, it describes consumer and brand attachment. In the IS literature, Suh et al. (2011) employed emotional attachment theory to investigate intention to use. In its contribution, this research included independent variables interaction quality and emotional trust, finding that the new emotional attachment model better describes IT continuance behavior.

2. This research extends IS understanding of how emotion influences continuance behavior in the IT post-adoption research era. While prior IT post-adoption research emphasized cognitive or hedonic evaluation of technology, i.e., (Bhattacherjee, 2001b; Bhattacherjee & Lin, 2015), this study verifies the user-technology emotional bond and its effect on IT continuance behavior.

3. This research adds to the body of IT research by investigating the emotional consequences of IT adoption, e.g., (Beaudry & Pinsonneault, 2010; Zhang, 2013)]. While previous studies overlooked the emotional consequences of technology adoption, this research investigated the emotional bond between users and technology—a bond shaped by user-technology interaction and the effects of continued IT use.

3.7.1.2 Practical Contributions

This study makes contributions pertinent to managers, vendors, and technology manufacturing companies.

1. Managers may consider the emotional effects of user-technology interaction to achieve increased productivity and extended IT continuance. Because emotional attachment influences

success, overlooking user emotional attachment with previous and new technologies may instigate productivity decline through increased cognitive and emotional user exhaustion. Following IT initial adoption, extended utilization prolongs user benefits, while suspended utilization negates potential user benefits and squanders invested time and financial resources (Nielsen & Persson, 2017).

2. When making longer-term decisions to acquire technologies, both vendors and managers may consider the role of user emotion in IT adoption. Along with measured satisfaction and technology resistance data, this research suggests that the IT users' emotional attachment, either to older or newer technologies, is material. In addition, contemporary feasibility analyses should factor in the benefits of user emotion and trust when assessing the appropriateness of technologies for a user population (Xu et al., 2015).

3. Technology manufacturing companies may consider the IT emotional attachment of target customers when formulating their strategic business plans and aligning their IT plans (Peak, Guynes, Prybutok, & Xu, 2011). The efficiency of technology does not guarantee that users will continue using it—partly because of the influence of emotional factors. This research suggests that technology manufacturers prudently integrate interactive features into their new technologies, designing them to forge strong user-technology emotional attachments that can extend the life of the application (Y. Wu, Cui, Nie, & Zhou, 2017).

3.7.1.3 Limitations and Future Research

This study interpreted the result of the study subject to several limitations.

1. This research focused on a particular type of intelligent technology called intelligent personal assistant (IPA). Future researchers may wish to measure emotional attachment and its effects when delivered by other technologies, and especially emergent IT.

2. Emotional attachment toward VUI technology versus a non-VUI technology may be different. Moreover, this research selected IPA users for this study from a convenience sample of college students. Hence, this research suggests caution for generalizing the findings of this research, as the sample may not be representative of a broader population of IPA users. However, we note that students in the business school of a large research university are conspicuous IT product and service consumers. Therefore, these students seem well-positioned representatives that can provide insight into IT system capabilities. For a broader view, this research suggests future research should consider a larger sample of IPA consumers, as well as a wider variety of technology users.

3. This research is cross-sectional, examining a specific group of individuals at a single moment in time. The IS literature acknowledges that post-adoption behaviors tend to change over time (Zheng et al., 2013). Therefore, future work should consider collecting time-series data to investigate the longitudinal impact of emotional attachment on IT continuance behavior.

4. This investigation did not include the antecedents of interaction quality. IT literature suggests goal, operation, and feedback as antecedents of interaction quality—especially when measuring mechanical interaction (Choi & Kim, 2004). This research measures user-technology interaction; future research should consider the antecedents.

5. Future research may also consider how user satisfaction and emotion both impact IT continuance, as well as how these dimensions measured longitudinally data affect the shape of the product/service life cycle curve.

3.8 Conclusion

This research successfully investigated the influence of emotional attachment on IT continuance behavior. In the context of IPA technology and based on the attachment theory

adopted from the social psychology/consumer psychology literature (Bowlby, 1979, 1982), this research conceptualized the model as presented. It tested the proposed model by collecting empirical data from emerging technology users (IPA users). Findings suggest that interaction quality and emotional trust together impact emotional attachment; EA exerts a robust and positive effect on IT continuance intention. This research contributes by filling a critical research gap in IT post-adoption literature and providing knowledge about the research value of emotional attachment in IT post-adoption behavior. This research contributes to practical knowledge by inferring that IT manufacturers, managers, and vendors could extend their revenue streams and reduce sunk costs by integrating both interaction quality and emotional attachment into their products. In summary, this research opens a new perspective on IT post-adoption research.

Appendix A3. Measurement Items

Constructs	Items		Source
Emotional Trust	I feel secure to interact with IPA for my tasks.		Komiak, S. Y., & Benbasat, I. (2006)
	I feel comfortable to interact with IPA for my tasks.		
	I feel content to interact with IPA for my tasks.		
Interaction Quality	IPA completes my commands if I do not complete them.*		Lin, C. P., & Bhattacherjee, A. (2010) (Item 5 is new).
	IPA immediately start working as I command it.*		
	IPA responses like a human.		
	I can freely talk with IPA .		
	IPA immediately response through voice when I ask anything.		
Emotional Attachment	Describe the extent to which the following words describe your typical feelings toward IPA :		Suh, K. S., Kim, H., & Suh, E. K. (2011)
	affectionate* lovely* peaceful friendly attached*	bonded* connected* passionate* delighted captivated	

Constructs	Items	Source
Continuance Intention	I intend to continue using IPA rather than discontinue their use.	Bhattacherjee, A. (2001)
	My intentions are to continue using IPA rather than use alternative means (e.g., traditional web browsing).	
	If I could I would continue of IPA.	

* Item removed from analysis due to low- or cross-loading. IPA= the name of the IPA they use. Used <piped text> in the survey

CONCLUSION

Essay 1

Despite the growing popularity of intelligent personal assistants (IPAs) like Amazon Alexa, Google Home, Apple Siri, and Microsoft Cortana, research indicates little about which factors influence their use. We contend that, because of the voice-based modality of interaction associated with IPAs, investigations of use behaviors in this context should consider the idiosyncrasies of this type of human-computer interaction. By integrating perspectives from the information systems, computer science, and communications disciplines, we identify two constructs appropriate for examining voice-enabled technologies: natural language understanding (NLU) and feedback. Guided by the IS success model, we incorporate these foundational components of natural language communication into a framework designed to explain IPA use behaviors. Empirical testing of our model indicates that both NLU and feedback are significant in the formation of quality beliefs, which explain approximately 56% of the variation of user satisfaction and 21% of the variation in use. This research addresses a critical gap in the IS literature, contributing knowledge about IPA use, introduces the NLU and feedback constructs to IS, integrates them into IS success theory, and creates a new model for IPA systems.

Essay 2

This research develops and tests an extended Expectation-Confirmation Model (ECM) framework to investigate IT continuance behavior for the workplace and personal use. After collecting empirical data from emerging technology users, the authors created a new model that considers the oft-slighted bilateral nature of user satisfaction, which is divisible into cognitive and emotional satisfaction elements. The proposed model substitutes perceived benefit for perceived usefulness, which figures prominently in previous ECM models and yet fails to capture the non-

utilitarian advantages of IT. Also, the new model captures emotional aberrations and demonstrates repercussions in the continuance dependent variable.

Our findings indicate that perceived benefit exhibits a strong positive effect on both cognitive and emotional satisfaction, as well as on user continuance intention. Further, results suggest that cognitive and emotional satisfaction are vital drivers of continuance and are necessary for IT product success. Moreover, emotional satisfaction exerts a stronger influence on continuance than does cognitive satisfaction, which implies that managers should emphasize emotional advantages, together with work performance. The IT product team can derive practical information from measured emotional responses arising from either normal or non-normal user behaviors. Overall, this work fills a research void in the IS literature, contributes to understanding IT post-adoption behavior, and describes a new perspective in IT continuance research.

Essay 3

This research investigates the importance of emotion among users of intelligent personal assistants (IPA). It presents an emotional attachment (EA) model for studying information technology (IT) continuance, i.e., the users' intention to continue using IT. This research adopts attachment theory in social psychology/consumer psychology literature and formulates a new model in the context of IT. Accordingly, this work derived five research hypotheses. They constructed an online survey of emerging-technology users, confirmed the constructs using factor analysis, and empirically validated the hypotheses by employing a partial least-squares equation modeling (PLS-SEM) approach.

The results suggest that both an individual's emotional attachment and emotional trust in IT significantly influence their IT continuance intention. Furthermore, the quality of an individual's interaction with and emotional trust in IT positively influences emotional attachment

to IT. This study contributes to the IT theory by demonstrating the viability of ascribing attachment theory within an IT context and specifically to IT continuance behavior. This study contributes to IT post-adoption research by developing and validating a new model that advances new perspectives on IT continuance behavior. The research develops and tests a new approach in IT post-adoption and the results support the value of emotional attachment in IT post-adoption behavior.

REFERENCES

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.

Alperstein, N. M. (1991). Imaginary social relationships with celebrities appearing in television commercials. *Journal of Broadcasting & Electronic Media, 35*(1), 43-58.

Anderson, E. W., & Sullivan, M. W. (1993). The antecedents and consequences of customer satisfaction for firms. *Marketing science, 12*(2), 125-143.

Aparicio, M., Bacao, F., & Oliveira, T. (2017). Grit in the path to e-learning success. *Computers in Human Behavior, 66*, 388-399.

Arazy, O., Nov, O., Patterson, R., & Yeo, L. (2011). Information quality in Wikipedia: The effects of group composition and task conflict. *Journal of management information systems, 27*(4), 71-98.

Aron, A., & Westbay, L. (1996). Dimensions of the prototype of love. *Journal of personality and social psychology, 70*(3), 535.

Arrow, K. J. (1968). The economics of moral hazard: further comment. *The american economic review, 58*(3), 537-539.

Asendorpf, J., Banse, R., Euler, H., Haas, H., Waldenmaier, C., Fiske, A., . . . Campos, B. (2013). A longitudinal test of the investment model: The development (and deterioration) of satisfaction and commitment in heterosexual involvements. *Psychologische Rundschau, 64*(3), 153-166.

Au, N., Ngai, E. W., & Cheng, T. E. (2002). A critical review of end-user information system satisfaction research and a new research framework. *Omega, 30*(6), 451-478.

Azevedo, R., & Bernard, R. M. (1995). A meta-analysis of the effects of feedback in computer-based instruction. *Journal of Educational Computing Research, 13*(2), 111-127.

Babin, B. J., & Griffin, M. (1998). The nature of satisfaction: an updated examination and analysis. *Journal of Business Research, 41*(2), 127-136.

Bagozzi, R. P. (2007). The legacy of the technology acceptance model and a proposal for a paradigm shift. *Journal of the association for information systems, 8*(4), 3.

Bailey, J. E., & Pearson, S. W. (1983). Development of a tool for measuring and analyzing computer user satisfaction. *Management science, 29*(5), 530-545.

Baldwin, M. W., Keelan, J. P. R., Fehr, B., Enns, V., & Koh-Rangarajoo, E. (1996). Social-cognitive conceptualization of attachment working models: Availability and accessibility effects. *Journal of personality and social psychology, 71*(1), 94.

Balzer, W. K., & Doherty, M. E. (1989). Effects of cognitive feedback on performance. *Psychological bulletin, 106*(3), 410.

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behavior and Human Decision Processes, 50*(2), 248-287.

Barrett, M., Oborn, E., & Orlikowski, W. (2016). Creating value in online communities: The sociomaterial configuring of strategy, platform, and stakeholder engagement. *Information systems research, 27*(4), 704-723.

Beaudry, A., & Pinsonneault, A. (2010). The other side of acceptance: studying the direct and indirect effects of emotions on information technology use. *MIS Quarterly*, 689-710.

Bhatnagar, A., & Ghose, S. (2004). A latent class segmentation analysis of e-shoppers. *Journal of Business Research, 57*(7), 758-767.

Bhattacherjee, A. (2001a). An empirical analysis of the antecedents of electronic commerce service continuance. *Decision support systems, 32*(2), 201-214.

Bhattacherjee, A. (2001b). Understanding information systems continuance: an expectation-confirmation model. *MIS quarterly*, 351-370.

Bhattacherjee, A., & Lin, C.-P. (2015). A unified model of IT continuance: three complementary perspectives and crossover effects. *European Journal of Information Systems, 24*(4), 364-373.

Bhattacherjee, A., Perols, J., & Sanford, C. (2008). Information technology continuance: A theoretic extension and empirical test. *Journal of Computer Information Systems, 49*(1), 17-26.

Bhattacherjee, A., & Premkumar, G. (2004). Understanding changes in belief and attitude toward information technology usage: A theoretical model and longitudinal test. *MIS quarterly*, 229-254.

Bollen, K. A. (1989). The consequences of measurement error. *Structural Equations with Latent Variables*, 151-178.

Bowlby, J. (1979). The Making and Breaking of Affectional Bonds. London (Tavistock) 1979.

Bowlby, J. (1980). Attachment and loss: Loss, sadness and depression (Vol. 3): New York: Basic Books.

Bowlby, J. (1982). Attachment and loss: retrospect and prospect. *American journal of Orthopsychiatry, 52*(4), 664.

Brennan, K. A., Clark, C. L., & Shaver, P. R. (1998). Self-report measurement of adult attachment: An integrative overview.

Bretherton, I. (1985). Attachment theory: Retrospect and prospect. *Monographs of the society for research in child development*, 3-35.

Brodie, R., Hollebeek, L., Ilic, A., & Juric, B. propositions & implications for research in (2011a). Customeren gagement: Conceptual domain, fundamental service marketing. *Journal of Service Research, 14*(3), 252-271.

Bruhn, M., Schnebelen, S., & Schäfer, D. (2014). Antecedents and consequences of the quality of e-customer-to-customer interactions in B2B brand communities. *Industrial Marketing Management, 43*(1), 164-176.

Burke, P. J., & Stets, J. E. (1999). Trust and commitment through self-verification. *Social Psychology Quarterly*, 347-366.

Burton-Jones, A., & Grange, C. (2012). From use to effective use: a representation theory perspective. *Information systems research, 24*(3), 632-658.

Canbek, N. G., & Mutlu, M. E. (2016). On the track of Artificial Intelligence: Learning with intelligent personal assistants. *Journal of Human Sciences, 13*(1), 592-601.

Chen, S.-C., Jong, D., & Lai, M.-T. (2014). Assessing the relationship between technology readiness and continuance intention in an E-appointment system: relationship quality as a mediator. *Journal of medical systems, 38*(9), 76.

Cheng, J. (2020). Bidirectional Relationship Progression in Buyer–Seller Negotiations: Evidence from South Korea. *Group Decision and Negotiation*, 1-28.

Childers, T. L., Carr, C. L., Peck, J., & Carson, S. (2001). Hedonic and utilitarian motivations for online retail shopping behavior. *Journal of retailing, 77*(4), 511-535.

Chin, W. W. (1998a). Commentary: Issues and opinion on structural equation modeling: JSTOR.

Chin, W. W. (1998b). The partial least squares approach to structural equation modeling. *Modern methods for business research, 295*(2), 295-336.

Chin, W. W., & Todd, P. A. (1995). On the use, usefulness, and ease of use of structural equation modeling in MIS research: a note of caution. *MIS quarterly*, 237-246.

Choi, D., & Kim, J. (2004). Why people continue to play online games: In search of critical design factors to increase customer loyalty to online contents. *CyberPsychology & behavior, 7*(1), 11-24.

Chowdhury, G. G. (2003). Natural language processing. *Annual review of information science and technology, 37*(1), 51-89.

Churchill Jr, G. A., & Surprenant, C. (1982). An investigation into the determinants of customer satisfaction. *Journal of marketing research, 19*(4), 491-504.

Clark, H. H., & Brennan, S. E. (1991). Grounding in communication. *Perspectives on socially shared cognition, 13*(1991), 127-149.

Clark, H. H., & Wilkes-Gibbs, D. (1986). Referring as a collaborative process. *Cognition, 22*(1), 1-39.

Cronin Jr, J. J., Brady, M. K., & Hult, G. T. M. (2000). Assessing the effects of quality, value, and customer satisfaction on consumer behavioral intentions in service environments. *Journal of retailing, 76*(2), 193-218.

Crooker, K. J., & Near, J. P. (1998). Happiness and satisfaction: Measures of affect and cognition? *Social Indicators Research, 44*(2), 195-224.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS quarterly*, 319-340.

De Guinea, A. O., & Markus, M. L. (2009). Why break the habit of a lifetime? Rethinking the roles of intention, habit, and emotion in continuing information technology use. *MIS Quarterly*, 433-444.

DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information systems research, 3*(1), 60-95.

Delone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: a ten-year update. *Journal of management information systems, 19*(4), 9-30.

Delone, W. H., & Mclean, E. R. (2004). Measuring e-commerce success: Applying the DeLone & McLean information systems success model. *International Journal of electronic commerce, 9*(1), 31-47.

Dennis, A. R., & Kinney, S. T. (1998). Testing media richness theory in the new media: The effects of cues, feedback, and task equivocality. *Information systems research, 9*(3), 256-274.

DeRosier, R., & Farber, R. S. (2005). Speech recognition software as an assistive device: a pilot study of user satisfaction and psychosocial impact. *Work, 25*(2), 125-134.

Dillmann, R., Kaiser, M., Klingspor, V., Morik, K., & Wallner, F. (1995). *Teaching and understanding intelligent service robots: A Machine Learning Approach.* Paper presented at the 19. Deutsche Jahrestagung für Künstliche Intelligenz (KI'95 Workshop: Informationsverarbeitung in Servicerobotern).

Drigotas, S. M., & Rusbult, C. E. (1992). Should I stay or should I go? A dependence model of breakups. *Journal of personality and social psychology, 62*(1), 62.

Dubé, L., & Menon, K. (2000). Multiple roles of consumption emotions in post-purchase satisfaction with extended service transactions. *International Journal of Service Industry Management, 11*(3), 287-304.

Dwayne Ball, A., & Tasaki, L. H. (1992). The role and measurement of attachment in consumer behavior. *Journal of consumer psychology, 1*(2), 155-172.

Ellemers, N., Spears, R., & Doosje, B. (1997). Sticking together or falling apart: In-group identification as a psychological determinant of group commitment versus individual mobility. *Journal of personality and social psychology, 72*(3), 617.

Eppler, M. J. (2006). *Managing information quality: Increasing the value of information in knowledge-intensive products and processes*: Springer Science & Business Media.

Esch, F. R., Langner, T., Schmitt, B. H., & Geus, P. (2006). Are brands forever? How brand knowledge and relationships affect current and future purchases. *Journal of product & brand management*.

Esfandiar, K., Sharifi-Tehrani, M., Pratt, S., & Altinay, L. (2017). Understanding entrepreneurial intentions: A developed integrated structural model approach. *Journal of Business Research*. doi:https://doi.org/10.1016/j.jbusres.2017.10.045

Feldman, S. (1999). NLP meets the jabberwocky: Natural language processing in information retrieval: Search Engine Section.(Online, Ed.) Online (Weston, CT), 23 (3), 62–72.

Fisbein, M., & Ajzen, I. (1975). Belief, attitude, intention and behavior: An introduction to theory and research. *Massachusetts, Addison-Wiley Publishing Company*.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 39-50.

Forsythe, S., Liu, C., Shannon, D., & Gardner, L. C. (2006). Development of a scale to measure the perceived benefits and risks of online shopping. *Journal of interactive marketing, 20*(2), 55-75.

France, C., Grace, D., Lo Iacono, J., & Carlini, J. (2020). Exploring the interplay between customer perceived brand value and customer brand co-creation behaviour dimensions. *Journal of Brand Management*, 1-15.

Franklin, I., Pain, D., Green, E., & Owen, J. (1992). Job design within a human centred (system) design framework. *Behaviour & Information Technology, 11*(3), 141-150.

Frey, K., & Lüthje, C. (2011). Antecedents and consequences of interaction quality in virtual end-user communities. *Creativity and Innovation Management, 20*(1), 22-35.

Gable, G. G., Sedera, D., & Chan, T. (2008). Re-conceptualizing information system success: The IS-impact measurement model. *Journal of the Association for Information Systems, 9*(7), 377.

Gallarza, M. G., Ruiz-Molina, M. E., & Gil-Saura, I. (2016). Stretching the value-satisfaction-loyalty chain by adding value dimensions and cognitive and affective satisfactions: a causal model for retailing. *Management Decision, 54*(4), 981-1003.

Gartner. (2016). Top Strategic Predictions for 2017 and Beyond: Surviving the Storm Winds of Digital Disruption. *Retrieved March 22, 2018, from https://www.gartner.com/binaries/content/assets/events/keywords/cio/ciode5/top_strategic_predictions_fo_315910.pdf*

Giovanis, A. N., Zondiros, D., & Tomaras, P. (2014). The antecedents of customer loyalty for broadband services: The role of service quality, emotional satisfaction and corporate image. *Procedia-Social and Behavioral Sciences, 148*, 236-244.

Goodhue, D. L. (1995). Understanding user evaluations of information systems. *Management science, 41*(12), 1827-1844.

Greenspan, S., Goldberg, D., Weimer, D., & Basso, A. (2000). *Interpersonal trust and common ground in electronically mediated communication.* Paper presented at the Proceedings of the 2000 ACM conference on Computer supported cooperative work.

Gu, Z., Xu, X., Chu, C., & Zhang, Y. (2015). *To write not select, a new text entry method using joystick.* Paper presented at the International Conference on Human-Computer Interaction.

Hair, J., Hollingsworth, C. L., Randolph, A. B., & Chong, A. Y. L. (2017a). An updated and expanded assessment of PLS-SEM in information systems research. *Industrial Management & Data Systems*.

Hair, J., Hollingsworth, C. L., Randolph, A. B., & Chong, A. Y. L. (2017b). An updated and expanded assessment of PLS-SEM in information systems research. *Industrial Management & Data Systems, 117*(3), 442-458.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing theory and Practice, 19*(2), 139-152.

Halawi, L. A., McCarthy, R. V., & Aronson, J. E. (2008). An empirical investigation of knowledge management systems' success. *Journal of Computer Information Systems, 48*(2), 121-135.

Hampden-Thompson, G., & Bennett, J. (2013). Science teaching and learning activities and students' engagement in science. *International Journal of Science Education, 35*(8), 1325-1343.

Harman, H. H. (1976). *Modern factor analysis*: University of Chicago press.

Hartono, M., & Raharjo, H. (2015). Exploring the mediating role of affective and cognitive satisfaction on the effect of service quality on loyalty. *Total Quality Management & Business Excellence, 26*(9-10), 971-985.

Hauswald, J., Laurenzano, M. A., Zhang, Y., Li, C., Rovinski, A., Khurana, A., . . . Tang, L. (2015). *Sirius: An open end-to-end voice and vision personal assistant and its implications for future warehouse scale computers.* Paper presented at the ACM SIGPLAN Notices.

Hazan, C., & Shaver, P. (1987). Romantic love conceptualized as an attachment process. *Journal of personality and social psychology, 52*(3), 511.

Hazan, C., & Shaver, P. R. (1994). Attachment as an organizational framework for research on close relationships. *Psychological inquiry, 5*(1), 1-22.

Hazan, C., & Zeifman, D. (1999). Pair bonds as attachments. *Handbook of attachment: Theory, research, and clinical applications*, 336-354.

Heinonen, K. (2018). Positive and negative valence influencing consumer engagement. *Journal of Service Theory and Practice*.

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing *New challenges to international marketing* (pp. 277-319): Emerald Group Publishing Limited.

Hill, R. P., & Stamey, M. (1990). The homeless in America: An examination of possessions and consumption behaviors. *Journal of consumer research, 17*(3), 303-321.

Hinde, R. A. (1976a). Interactions, relationships and social structure. *Man*, 1-17.

Hinde, R. A. (1976b). On describing relationships. *Journal of child psychology and psychiatry, 17*(1), 1-19.

Hirschman, E. C. (1994). Consumers and their animal companions. *Journal of consumer research, 20*(4), 616-632.

Hoehle, H., Zhang, X., & Venkatesh, V. (2015). An espoused cultural perspective to understand continued intention to use mobile applications: a four-country study of mobile social media application usability. *European Journal of Information Systems, 24*(3), 337-359.

Hong, W., Hess, T. J., & Hardin, A. (2013). When filling the wait makes it feel longer: a paradigm shift perspective for managing online delay. *MIS quarterly*, 383-406.

Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: a review of four recent studies. *Strategic management journal, 20*(2), 195-204.

Hur, I., Cousins, K. C., & Stahl, B. C. (2019). A critical perspective of engagement in online health communities. *European Journal of Information Systems, 28*(5), 523-548.

Ismagilova, E., Slade, E. L., Rana, N. P., & Dwivedi, Y. K. (2019). The effect of electronic word of mouth communications on intention to buy: A meta-analysis. *Information Systems Frontiers*, 1-24.

Jiang, J., Hassan Awadallah, A., Jones, R., Ozertem, U., Zitouni, I., Gurunath Kulkarni, R., & Khan, O. Z. (2015). *Automatic online evaluation of intelligent assistants.* Paper presented at the Proceedings of the 24th International Conference on World Wide Web.

Junco, R., Elavsky, C. M., & Heiberger, G. (2013). Putting twitter to the test: Assessing outcomes for student collaboration, engagement and success. *British Journal of Educational Technology, 44*(2), 273-287.

Jurafsky, D., & Martin, J. H. (2009). Speech and language processing: An introduction to natural language processing, computational linguistics, and speech recognition (pp. 1-1024): Prentice Hall, Pearson Education International.

Kanaparan, G., Cullen, R., & Mason, D. (2019). Effect of self-efficacy and emotional engagement on introductory programming students. *Australasian Journal of Information Systems, 23*.

Kane, G. C., & Labianca, G. (2011). IS avoidance in health-care groups: A multilevel investigation. *Information Systems Research, 22*(3), 504-522.

Karahanna, E., Straub, D. W., & Chervany, N. L. (1999). Information technology adoption across time: a cross-sectional comparison of pre-adoption and post-adoption beliefs. *MIS quarterly*, 183-213.

Kettinger, W. J., & Smith, J. (2009). Understanding the consequences of information systems service quality on IS service reuse. *Information & Management, 46*(6), 335-341.

Kim, D. J., Ferrin, D. L., & Rao, H. R. (2008). A trust-based consumer decision-making model in electronic commerce: The role of trust, perceived risk, and their antecedents. *Decision Support Systems, 44*(2), 544-564.

Kim, H.-C., & Hyun, M. Y. (2016). Predicting the use of smartphone-based Augmented Reality (AR): Does telepresence really help? *Computers in Human Behavior, 59*, 28-38.

Kim, M.-K., Park, M.-C., Park, J.-H., Kim, J., & Kim, E. (2018). The role of multidimensional switching barriers on the cognitive and affective satisfaction-loyalty link in mobile communication services: Coupling in moderating effects. *Computers in Human Behavior, 87*, 212-223.

Kiseleva, J., Williams, K., Hassan Awadallah, A., Crook, A. C., Zitouni, I., & Anastasakos, T. (2016). *Predicting user satisfaction with intelligent assistants.* Paper presented at the Proceedings of the 39th International ACM SIGIR conference on Research and Development in Information Retrieval.

Klingspor, V., Demiris, J., & Kaiser, M. (1997). Human-robot communication and machine learning. *Applied Artificial Intelligence, 11*(7), 719-746.

Komiak, S. X., & Benbasat, I. (2004). Understanding customer trust in agent-mediated electronic commerce, web-mediated electronic commerce, and traditional commerce. *Information technology and management, 5*(1-2), 181-207.

Komiak, S. Y., & Benbasat, I. (2006). The effects of personalization and familiarity on trust and adoption of recommendation agents. *MIS quarterly*, 941-960.

Krasnova, H., Widjaja, T., Buxmann, P., Wenninger, H., & Benbasat, I. (2015). Research note—why following friends can hurt you: an exploratory investigation of the effects of envy on social networking sites among college-age users. *Information systems research, 26*(3), 585-605.

Krauss, R. M., & Weinheimer, S. (1966). Concurrent feedback, confirmation, and the encoding of referents in verbal communication. *Journal of personality and social psychology, 4*(3), 343.

Ladhari, R. (2009). Service quality, emotional satisfaction, and behavioural intentions: A study in the hotel industry. *Managing Service Quality: An International Journal, 19*(3), 308-331.

Ladhari, R., Souiden, N., & Dufour, B. (2017). The role of emotions in utilitarian service settings: The effects of emotional satisfaction on product perception and behavioral intentions. *Journal of Retailing and Consumer Services, 34*, 10-18.

Landrum, H. T., Prybutok, V. R., Peak, D. A., & Qin, H. (2010). Using importance ratings to create an information service quality measure. *International Journal of Services and Standards, 6*(3-4), 295-307.

Lanin, D., & Bila, A. (2017). Relationship Interaction Quality with Physical Environment Quality and Outcome Quality in Improving Public Service Based Brady and Cronin Model. *TOWARDS OPEN GOVERNMENT*.

Laumer, S., Maier, C., & Weitzel, T. (2017). Information quality, user satisfaction, and the manifestation of workarounds: a qualitative and quantitative study of enterprise content management system users. *European journal of information systems, 26*(4), 333-360.

Laurel, B. (2013). *Computers as theatre*: Addison-Wesley.

Leavitt, H. J., & Mueller, R. A. (1951). Some effects of feedback on communication. *Human Relations, 4*(4), 401-410.

Lee, J.-N., & Kim, Y.-G. (1999). Effect of partnership quality on IS outsourcing success: conceptual framework and empirical validation. *Journal of management information systems, 15*(4), 29-61.

Lee, Y., Chen, A. N., & Ilie, V. (2012). Can online wait be managed? The effect of filler interfaces and presentation modes on perceived waiting time online.

Lewis, J. D., & Weigert, A. (1985). Trust as a social reality. *Social forces, 63*(4), 967-985.

Li, J., Deng, L., Gong, Y., & Haeb-Umbach, R. (2014). An overview of noise-robust automatic speech recognition. *IEEE/ACM Transactions on Audio, Speech, and Language Processing, 22*(4), 745-777.

Liddy, E. D. (1998). Enhanced text retrieval using natural language processing. *Bulletin of the Association for Information Science and Technology, 24*(4), 14-16.

Lien, C.-H., Cao, Y., & Zhou, X. (2017). Service quality, satisfaction, stickiness, and usage intentions: An exploratory evaluation in the context of WeChat services. *Computers in Human Behavior, 68*, 403-410.

Liljander, V., & Strandvik, T. (1997). Emotions in service satisfaction. *International Journal of Service Industry Management, 8*(2), 148-169.

Limayem, M., Hirt, S. G., & Cheung, C. M. (2007). How habit limits the predictive power of intention: The case of information systems continuance. *MIS quarterly*, 705-737.

Lin, C.-P., & Bhattacherjee, A. (2009). Understanding online social support and its antecedents: A socio-cognitive model. *The Social Science Journal, 46*(4), 724-737.

Lin, C. P., & Bhattacherjee, A. (2010). Extending technology usage models to interactive hedonic technologies: a theoretical model and empirical test. *Information systems journal, 20*(2), 163-181.

Lin, C. S., Wu, S., & Tsai, R. J. (2005). Integrating perceived playfulness into expectation-confirmation model for web portal context. *Information & Management, 42*(5), 683-693.

Lin, T.-C., Wu, S., Hsu, J. S.-C., & Chou, Y.-C. (2012). The integration of value-based adoption and expectation–confirmation models: An example of IPTV continuance intention. *Decision Support Systems, 54*(1), 63-75.

Lin, X., Featherman, M., & Sarker, S. (2017). Understanding factors affecting users' social networking site continuance: a gender difference perspective. *Information & Management, 54*(3), 383-395.

Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting & task performance*: Prentice-Hall, Inc.

Lowry, P., Gaskin, J., & Moody, G. (2015). Proposing the multi-motive information systems continuance model (MISC) to better explain end-user system evaluations and continuance intentions.

Lowry, P. B., & Gaskin, J. (2014). Partial least squares (PLS) structural equation modeling (SEM) for building and testing behavioral causal theory: When to choose it and how to use it. *IEEE transactions on professional communication, 57*(2), 123-146.

Maclay, H., & Newman, S. (2017). Two variables affecting the message in communication. *Decisions, values, and groups, 1*, 218-228.

Malhotra, N. K., Schaller, T. K., & Patil, A. (2017). Common Method Variance in Advertising Research: When to Be Concerned and How to Control for It. *Journal of Advertising, 46*(1), 193-212. doi:10.1080/00913367.2016.1252287

Mamun, M. R. A., & Kim, D. (2018). The effect of perceived innovativeness of student response systems (SRSS) on classroom engagement.

Mamun, M. R. A., Senn, W. D., Peak, D. A., Prybutok, V. R., & Torres, R. A. (2020). Emotional Satisfaction and IS Continuance Behavior: Reshaping the Expectation-Confirmation Model. *International Journal of Human–Computer Interaction*, 1-10.

Mao, E., & Ambrose, P. (2004). A theoretical and empirical validation of is success models in a temporal and quasi volitional technology usage context. *AMCIS 2004 Proceedings*, 476.

Markus, M. L., & Keil, M. (1994). If we build it, they will come: Designing information systems that people want to use. *MIT Sloan Management Review, 35*(4), 11.

Marsic, I., Medl, A., & Flanagan, J. (2000). Natural communication with information systems. *Proceedings of the IEEE, 88*(8), 1354-1366.

Matney, L. (2015). A Battle Royale Of Digital Assistants: The Big 5. Retrieved from http://techcrunch.com/gallery/a-battle-royale-of-digital-assistants-the-big-5/

Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An integrative model of organizational trust. *Academy of management review, 20*(3), 709-734.

McAllister, D. J. (1995). Affect-and cognition-based trust as foundations for interpersonal cooperation in organizations. *Academy of management journal, 38*(1), 24-59.

McGrath, K. (2006). Affection not affliction: The role of emotions in information systems and organizational change. *Information and Organization, 16*(4), 277-303.

McKnight, D. H., Choudhury, V., & Kacmar, C. (2002). Developing and validating trust measures for e-commerce: An integrative typology. *Information systems research, 13*(3), 334-359.

McKnight, D. H., Cummings, L. L., & Chervany, N. L. (1998). Initial trust formation in new organizational relationships. *Academy of Management review, 23*(3), 473-490.

Meeker, M. (2017). Internet trends report. Retrieved from https://www.recode.net/2017/5/31/15693686/mary-meeker-kleiner-perkins-kpcb-slides-internet-trends-code-2017

Meng, F., Guo, X., Zhang, X., Peng, Z., & Lai, K.-H. (2020). *Examining the Role of Technology Anxiety and Health Anxiety on Elderly Users' Continuance Intention for Mobile Health*

Services Use. Paper presented at the Proceedings of the 53rd Hawaii International Conference on System Sciences.

Mick, D. G., & DeMoss, M. (1990). Self-gifts: Phenomenological insights from four contexts. *Journal of consumer research, 17*(3), 322-332.

Mikulincer, M. (2013). *Human learned helplessness: A coping perspective*: Springer Science & Business Media.

Mohammadi, H. (2015). Factors affecting the e-learning outcomes: An integration of TAM and IS success model. *Telematics and Informatics, 32*(4), 701-719.

Moore, R. K. (2014). *Spoken language processing: time to look outside?* Paper presented at the International Conference on Statistical Language and Speech Processing.

Mouakket, S. (2015). Factors influencing continuance intention to use social network sites: The Facebook case. *Computers in Human Behavior, 53*, 102-110.

Nelson, R. R., Todd, P. A., & Wixom, B. H. (2005). Antecedents of information and system quality: an empirical examination within the context of data warehousing. *Journal of management information systems, 21*(4), 199-235.

Newman, D., & Newman, D. (2000). *Talk to your computer: speech recognition made easy*: Waveside.

Nguyen, Q. N., Ta, A., & Prybutok, V. (2018). An Integrated Model of Voice-User Interface Continuance Intention: The Gender Effect. *International Journal of Human–Computer Interaction*, 1-16.

Nielsen, P. A., & Persson, J. S. (2017). Useful business cases: value creation in IS projects. *European Journal of Information Systems, 26*(1), 66-83.

Nunnally, J. (1978). Psychometric theory (2nd edit.) mcgraw-hill. *Hillsdale, NJ*.

Nunnally, J. C., & Bernstein, I. (1994). *Psychometric Theory (McGraw-Hill Series in Psychology)* (Vol. 3): McGraw-Hill New York.

Oghuma, A. P., Chang, Y., Libaque-Saenz, C. F., Park, M.-C., & Rho, J. J. (2015). Benefit-confirmation model for post-adoption behavior of mobile instant messaging applications: A comparative analysis of KakaoTalk and Joyn in Korea. *Telecommunications Policy, 39*(8), 658-677.

Oghuma, A. P., Libaque-Saenz, C. F., Wong, S. F., & Chang, Y. (2016). An expectation-confirmation model of continuance intention to use mobile instant messaging. *Telematics and Informatics, 33*(1), 34-47.

Oliver Richard, L. (1997). Satisfaction: A behavioral perspective on the consumer. *New York ' NY: Irwin-McGraw-Hill*.

Oliver, R. L. (1980). A cognitive model of the antecedents and consequences of satisfaction decisions. *Journal of marketing research*, 460-469.

Oliver, R. L. (1993). Cognitive, affective, and attribute bases of the satisfaction response. *Journal of consumer research, 20*(3), 418-430.

Oliver, R. L. (2014). *Satisfaction: A behavioral perspective on the consumer: A behavioral perspective on the consumer*: Routledge.

Oliver, R. L., & DeSarbo, W. S. (1988). Response determinants in satisfaction judgments. *Journal of consumer research, 14*(4), 495-507.

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1990). Delivering quality service. *Nova Yorque: The Free Press*.

Pauly, M. V. (1968). The economics of moral hazard: comment. *The american economic review, 58*(3), 531-537.

Peak, D. A., Guynes, C. S., Prybutok, V. R., & Xu, C. (2011). Aligning Information Technology With Business Strategy: An Action Research Approach. *Journal of Information Technology Case and Application Research, 13*(1), 16-42. doi:10.1080/15228053.2011.10856200

Petter, S., DeLone, W., & McLean, E. R. (2013). Information systems success: The quest for the independent variables. *Journal of management information systems, 29*(4), 7-62.

Podsakoff, P. M., & Farh, J.-L. (1989). Effects of feedback sign and credibility on goal setting and task performance. *Organizational Behavior and Human Decision Processes, 44*(1), 45-67.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of applied psychology, 88*(5), 879.

Podsakoff, P. M., & Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of management, 12*(4), 531-544.

Prayag, G., Hosany, S., & Odeh, K. (2013). The role of tourists' emotional experiences and satisfaction in understanding behavioral intentions. *Journal of Destination Marketing & Management, 2*(2), 118-127.

Prybutok, V. R., Kappelman, L. A., & Myers, B. L. (1997). A comprehensive model for assessing the quality and productivity of the information systems function: toward a theory for information systems assessment. *Information Resources Management Journal, 10*(1), 6-26.

Ramirez Jr, A., Dimmick, J., Feaster, J., & Lin, S.-F. (2008). Revisiting interpersonal media competition: The gratification niches of instant messaging, e-mail, and the telephone. *Communication Research, 35*(4), 529-547.

Reis, A., Paulino, D., Paredes, H., & Barroso, J. (2017). *Using Intelligent Personal Assistants to Strengthen the Elderlies' Social Bonds.* Paper presented at the International Conference on Universal Access in Human-Computer Interaction.

Rempel, J. K., Holmes, J. G., & Zanna, M. P. (1985). Trust in close relationships. *Journal of personality and social psychology, 49*(1), 95.

Ren, Y., Harper, F. M., Drenner, S., Terveen, L., Kiesler, S., Riedl, J., & Kraut, R. E. (2012). Building member attachment in online communities: Applying theories of group identity and interpersonal bonds. *MIS quarterly*, 841-864.

Richins, M. L. (1994). Special possessions and the expression of material values. *Journal of consumer research, 21*(3), 522-533.

Ringle, C., Wende, S., & Becker, J. (2014). Software SmartPLS 3.0: SmartPLS, Hamburg, available at: www. smartpls. com.

Ringle, C. M., Wende, S., & Will, A. (2005). SmartPLS 2.0 *Available in http://www. smartpls. de*.

Rubinstein, R. I., & Parmelee, P. A. (1992). Attachment to place and the representation of the life course by the elderly *Place attachment* (pp. 139-163): Springer.

Saady, M. R., El-Borey, H., El-Dahshan, E.-S. A., & Yahia, A. S. (2014). Stand-alone intelligent voice recognition system. *Journal of Signal and Information Processing, 5*(04), 179.

Santos, J., Rodrigues, J. J., Casal, J., Saleem, K., & Denisov, V. (2018). Intelligent personal assistants based on internet of things approaches. *IEEE Systems Journal, 12*(2), 1793-1802.

Sarkar, S., Chauhan, S., & Khare, A. (2020). A meta-analysis of antecedents and consequences of trust in mobile commerce. *International Journal of Information Management, 50*, 286-301.

Schouten, J. W., & McAlexander, J. H. (1995). Subcultures of consumption: An ethnography of the new bikers. *Journal of consumer research, 22*(1), 43-61.

Schwarz, A., Schwarz, C., Jung, Y., Pérez, B., & Wiley-Patton, S. (2012). Towards an understanding of assimilation in virtual worlds: the 3C approach. *European Journal of Information Systems, 21*(3), 303-320.

Seddon, P. B. (1997). A respecification and extension of the DeLone and McLean model of IS success. *Information systems research, 8*(3), 240-253.

Sheppard, B. H., Hartwick, J., & Warshaw, P. R. (1988). The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. *Journal of consumer research, 15*(3), 325-343.

Sidorova, A., Evangelopoulos, N., Torres, R., & Johnson, V. (2013). *A survey of core research in information systems*: Springer.

Singh, D., Bajpai, N., & Kulshreshtha, K. (2020). Brand Experience-Brand Love Relationship for Indian Hypermarket Brands: The Moderating Role of Customer Personality Traits. *Journal of Relationship Marketing*, 1-22.

Slater, J. S. (2001). Collecting brand loyalty: A comparative analysis of how Coca-Cola and Hallmark use collecting behavior to enhance brand loyalty. *ACR North American Advances*.

Sroufe, L. A., & Waters, E. (1977). Attachment as an organizational construct. *Child development*, 1184-1199.

Stauss, B., & Neuhaus, P. (1997). The qualitative satisfaction model. *International Journal of Service Industry Management, 8*(3), 236-249.

Stein, M.-K., Newell, S., Wagner, E. L., & Galliers, R. D. (2015). Coping with Information Technology: Mixed Emotions, Vacillation, and Nonconforming Use Patterns. *Mis Quarterly, 39*(2), 367-392.

Sternberg, R. J. (1987). Liking versus loving: A comparative evaluation of theories. *Psychological Bulletin, 102*(3), 331.

Suh, K.-S., Kim, H., & Suh, E. K. (2011). What if your avatar looks like you? Dual-congruity perspectives for avatar use. *MIS quarterly*, 711-729.

Suhm, B., Myers, B., & Waibel, A. (2001). Multimodal error correction for speech user interfaces. *ACM transactions on computer-human interaction (TOCHI), 8*(1), 60-98.

Sundar, S. S., Tamul, D. J., & Wu, M. (2014). Capturing "cool": Measures for assessing coolness of technological products. *International Journal of Human-Computer Studies, 72*(2), 169-180.

Tajvidi, M., Richard, M.-O., Wang, Y., & Hajli, N. (2018). Brand co-creation through social commerce information sharing: The role of social media. *Journal of Business Research*. doi:https://doi.org/10.1016/j.jbusres.2018.06.008

Taylor, R. S., & Taylor, R. S. (1986). *Value-added processes in information systems*: Greenwood Publishing Group.

Thompson, M. (2012). People, practice, and technology: Restoring Giddens' broader philosophy to the study of information systems. *Information and Organization, 22*(3), 188-207.

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

Thomson, M., MacInnis, D. J., & Park, C. W. (2005). The ties that bind: Measuring the strength of consumers' emotional attachments to brands. *Journal of consumer psychology, 15*(1), 77-91.

Tidwell, M.-C. O., Reis, H. T., & Shaver, P. R. (1996). Attachment, attractiveness, and social interaction: a diary study. *Journal of personality and social psychology, 71*(4), 729.

Torres, R., Sidorova, A., & Jones, M. C. (2018). Enabling firm performance through business intelligence and analytics: A dynamic capabilities perspective. *Information & Management, 55*(7), 822-839.

Trinke, S. J., & Bartholomew, K. (1997). Hierarchies of attachment relationships in young adulthood. *Journal of social and personal relationships, 14*(5), 603-625.

Tu, W., & Xu, Y. (2020). The evolution of interorganizational trust in cross-sector collaborations: Two comparative cases from China. *Nonprofit Management and Leadership*.

Turan, A., Tunç, A. Ö., & Zehir, C. (2015). A theoretical model proposal: Personal innovativeness and user involvement as antecedents of unified theory of acceptance and use of technology. *Procedia-Social and Behavioral Sciences, 210*, 43-51.

Vatanasombut, B., Igbaria, M., Stylianou, A. C., & Rodgers, W. (2008). Information systems continuance intention of web-based applications customers: The case of online banking. *Information & Management, 45*(7), 419-428.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.

Venkatesh, V., Thong, J. Y., Chan, F. K., Hu, P. J. H., & Brown, S. A. (2011). Extending the two-stage information systems continuance model: Incorporating UTAUT predictors and the role of context. *Information Systems Journal, 21*(6), 527-555.

Vlachos, P. A., Theotokis, A., Pramatari, K., & Vrechopoulos, A. (2010). Consumer-retailer emotional attachment. *European Journal of Marketing*.

Voicebot. (2019). Voice Assistant Consumer Adoption Report 2018. *Retrived on May 9, 2019 from https://voicebot.ai/voice-assistant-consumer-adoption-report-2018/*.

Wang, C.-Y., Seng-cho, T. C., & Chang, H.-C. (2009). *Emotion and motivation: Understanding user behavior of web 2.0 application.* Paper presented at the 2009 Sixth International Conference on Information Technology: New Generations.

Wang, W.-T., Wang, Y.-S., & Liu, E.-R. (2016). The stickiness intention of group-buying websites: The integration of the commitment–trust theory and e-commerce success model. *Information & Management, 53*(5), 625-642.

Weiss, R. S. (1988). Loss and recovery. *Journal of Social Issues, 44*(3), 37-52.

Westbrook, R. A., & Oliver, R. L. (1991). The dimensionality of consumption emotion patterns and consumer satisfaction. *Journal of consumer research, 18*(1), 84-91.

Wixom, B. H., & Todd, P. A. (2005). A theoretical integration of user satisfaction and technology acceptance. *Information systems research, 16*(1), 85-102.

Wold, H. (2004). Partial least squares. *Encyclopedia of statistical sciences, 9*.

Wold, H. (2004). Partial least squares. Encycl. *Stat. Sci, 9*, 1-10.

Wong, A. (2004). The role of emotional satisfaction in service encounters. *Managing Service Quality: An International Journal, 14*(5), 365-376.

Wu, B., & Chen, X. (2017). Continuance intention to use MOOCs: Integrating the technology acceptance model (TAM) and task technology fit (TTF) model. *Computers in Human Behavior, 67*, 221-232.

Wu, J.-H., & Wang, Y.-M. (2006). Measuring KMS success: A respecification of the DeLone and McLean's model. *Information & Management, 43*(6), 728-739.

Wu, Y., Cui, H., Nie, H., & Zhou, Y. (2017). Get website moving Get readers coming-A delightful user experience design make an online library lovable.

Xenos, M. A., Vromen, A., & Loader, B. D. (2014). The great equalizer? Patterns of social media use and youth political engagement in three advanced democracies *The Networked Young Citizen* (pp. 33-54): Routledge.

Xu, C., Peak, D., & Prybutok, V. (2015). A customer value, satisfaction, and loyalty perspective of mobile application recommendations. *Decision Support Systems, 79*, 171-183.

Yang, S.-B., Lee, K., Lee, H., & Koo, C. (2019). In Airbnb we trust: Understanding consumers' trust-attachment building mechanisms in the sharing economy. *International Journal of Hospitality Management, 83*, 198-209.

Yang, X., Aurisicchio, M., & Baxter, W. (2019). Understanding Affective Experiences With Conversational Agents.

Yilmazyildiz, S., Read, R., Belpaeme, T., & Verhelst, W. (2016). Review of semantic-free utterances in social human-robot interaction (vol 32, pg 63, 2016). *INTERNATIONAL JOURNAL OF HUMAN-COMPUTER INTERACTION, 32*(9), 745-745.

Yu, Y.-T., & Dean, A. (2001). The contribution of emotional satisfaction to consumer loyalty. *International Journal of Service Industry Management, 12*(3), 234-250.

Yuan, S., Liu, Y., Yao, R., & Liu, J. (2016). An investigation of users' continuance intention towards mobile banking in China. *Information Development, 32*(1), 20-34.

Zain, N. A. M., Zahari, M. S. M., Hanafiah, M. H., & Zulkifly, M. I. (2017). Medical tourism: Tourist information sources, satisfaction and post behavioral. *Journal of Tourism, Hospitality & Culinary Arts, 9*(2), 23-34.

Zhang, P. (2013). The affective response model: A theoretical framework of affective concepts and their relationships in the ICT context. *MIS Quarterly*, 247-274.

Zheng, Y., Zhao, K., & Stylianou, A. (2013). The impacts of information quality and system quality on users' continuance intention in information-exchange virtual communities: An empirical investigation. *Decision Support Systems, 56*, 513-524.

Zhou, Z., Fang, Y., Vogel, D. R., Jin, X.-L., & Zhang, X. (2012). Attracted to or locked in? Predicting continuance intention in social virtual world services. *Journal of Management Information Systems, 29*(1), 273-306.

Zhou, Z., Jin, X.-L., Fang, Y., & Vogel, D. (2015). Toward a theory of perceived benefits, affective commitment, and continuance intention in social virtual worlds: cultural values (indulgence and individualism) matter. *European Journal of Information Systems, 24*(3), 247-261.