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An Integrated Temporal Model of Belief and Attitude Change: An Empirical Test With the iPad

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Abstract:

Bhattacherjee and Premkumar (2004) propose a temporal model of belief and attitude change to understand fluctuating patterns of information technology (IT) usage. However, they overlook the role of perceived enjoyment in the process of temporal IT usage. Perceived enjoyment has become an increasingly important part of how consumers assess technology. Thus, we build on Bhattacherjee and Premkumar's model (BP model) and propose a new model by investigating the comparative role of perceived usefulness (PU) and perceived enjoyment (PE) for explaining temporal changes in users' beliefs and attitudes toward IT usage. We name our proposed model the integrated temporal model (ITM). Through an empirical study of iPad usage in a classroom setting at three different stages, we found that 1) the effect of PE on PU was stronger at the pre-usage (vs. post-usage) stage and that its effect was stronger at the initial-usage (vs. later-usage) stage; 2) while PE has a stronger effect than PU on attitude at both pre-usage and initial-usage stages, that was not the case at the later-usage stage; instead, the effect of PU on attitude was stronger at the later-usage (vs. initial-usage) stage; 3) the effect of disconfirmation on modified PU and PE was stronger at the initial (vs. later) stage, while the effect of PU and PE expectation on modified PU and PE was weaker at the initial (vs. later) stage. Our study extends the BP model to IT with hedonic elements (i.e., the iPad) and is the first of its kind to empirically examine the combined and relative impact of PU and PE on the temporal usage of IT with hedonic elements in the classroom setting.

Keywords: Integrated Temporal Model, ITM, Perceived Enjoyment, Perceived Usefulness, Expectation Disconfirmation Theory, The iPad, Pre-usage, Initial-usage, Later-usage.

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1 Introduction

Bhattacherjee and Premkumar (2004) integrate expectation-disconfirmation theory (EDT) and the information technology (IT) usage literature to propose a temporal research model of belief and attitude change to understand fluctuating patterns of IT usage. The Bhattacherjee and Premkumar model (BP model, Figure 1) theorizes the causative drivers and emergent mechanisms that drive temporal changes in user beliefs and attitudes toward IT usage. Specifically, they elaborate why perceived usefulness (PU) and attitude (cognitions) change as users gain first-hand experience in IT usage. They identify the role of two emergent factors (i.e., disconfirmation and satisfaction) in driving this change. Their model suggests that cognition change (namely, PU) is the most salient belief that drives IT usage and is the key determinant of long-term usage intention and behavior (Bhattacherjee, 2001; Davis 1989).

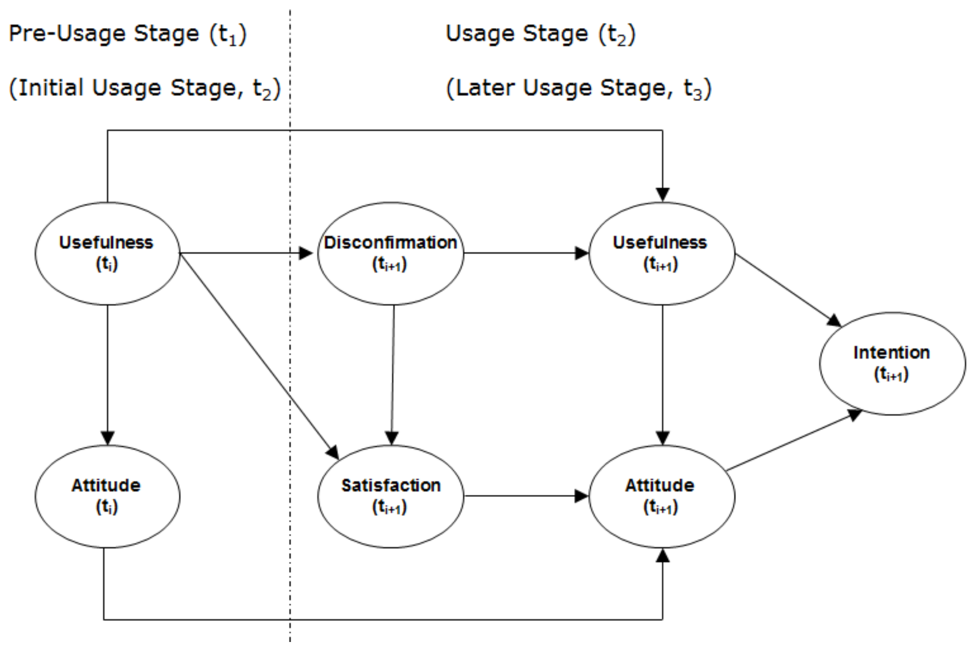


Figure 1. Research Model (BP Model) by Bhattacherjee and Premkumar (2004)

With the development of more innovative and intrinsically motivated IT, hedonic IT has become prevalent in the marketplace in the form of video games, MP3 players, and entertainment websites. IT that combines both utilitarian and hedonic elements has also gained popularity, such as tablet computers and smartphones. As such, scholars have explored the role of the affective aspect in IT usage (e.g., Van der Heijden, 2004). While the BP model significantly advances the information systems (IS) literature by moving from traditional static IT usage models (e.g., technology acceptance model (TAM), TAM 2, unified theory of acceptance and use of technology (UTAUT)) to temporal models that focus on understanding fluctuating patterns of IT usage, it leaves out an important variable: perceived enjoyment (PE). We need to pay attention to PE because consumer technologies have increasingly become the target of PE assessment together with the traditional PU evaluations.

In addition, the context of the BP model is, as with many IT usage models, utilitarian-based (e.g., application development software). From this perspective, the BP model may not be comprehensive enough to capture the interactive and hedonic capabilities of new IT, such as the iPad. Since the release of the Apple iPad in 2010, innovative ways of accessing and retrieving information have risen in education, health, business, personal use, and other fields. By the end of January 2015, over 250 million iPads were sold since its release in 2010 (Kastrenakes, 2015). The introduction of the iPad and other tablet computers has generated tremendous excitement given features that include a multi-touch screen, smooth shape, lightweight, thin design, ease of use, and high-quality retinal display. The touch-sensitive screen allows consumers to interact with the iPad interface with finger gestures (e.g., tap, flick, pinch, drag, spread; Villamor, Willis, & Wroblewski, 2010), which is particularly entertaining. To examine how consumers adopt and continue to use IT with hedonic elements, including PU alone is not enough (Norman, 2007). One also needs to capture users' PE and its effects.

Given the importance of PE, some studies have examined its role in IT adoption in the context of e-commerce adoption (Koufaris, 2002), movie website (Van der Heijden, 2004), decision support systems (Kamis, Koufaris, & Stern, 2008), impulsive buying (Parboteeah, Valacich, & Wells, 2009), and information and communication technology (Zhang, 2013). These studies have contributed greatly to IS research. However, most did not investigate the effects of PE of IT usage from a temporal perspective and, thus, have yielded little insight into the change process of individuals' PE belief with respect to the usage of IT with hedonic elements, an increasingly prominent IT. In particular, few studies to date have looked at the relative effect of PU and PE on attitude, satisfaction, and disconfirmation and whether such effects fluctuate across three different usage stages. As a result, we lack understanding as to how PE's effects change relative to those of PU over time. This information is crucial for scholars and practitioners who seek to understand which belief is more important at different usage stages.

To fill this gap in the literature, we extend the BP model to IT with hedonic elements by investigating the role of PE, which forms the second criterion of IT assessment, along with the role of PU in explaining temporal changes in user beliefs and attitudes toward IT usage. Specifically, we examine how the comparative effect of PU and PE changes across three different usage stages. In this paper, we refer to our proposed model as the integrated temporal model (i.e., ITM, Figure 2) of belief and attitude change. The model includes PE, PU, attitude, disconfirmation, and satisfaction, which make both theoretical and empirical advances concerning their relationships and dynamics during both pre-usage and post-usage stages.

To aid in traceability, we focus on iPad's usage for utilitarian purposes in the classroom setting. Unlike using iPad for entertainment purposes where one can predict the importance of PE well, it is less obvious about the comparative role of PU and PE when using the iPad for utilitarian purposes, which necessitate the current study. In this context, we propose that, even though PE matters at initial adoption, its importance fades over time with repeated usage. On the other hand, while PU matters less at the initial adoption, its importance becomes more salient with repeated usage.

In Section 2, we review the theoretical foundation and relevant literature. In Section 3, we develop the hypotheses. In Section 4, we describe the research method and, in Section 5, present the analysis of results. Finally, in Section 6, we conclude the paper by discussing its theoretical and practical implications and limitations and suggest areas for future research.

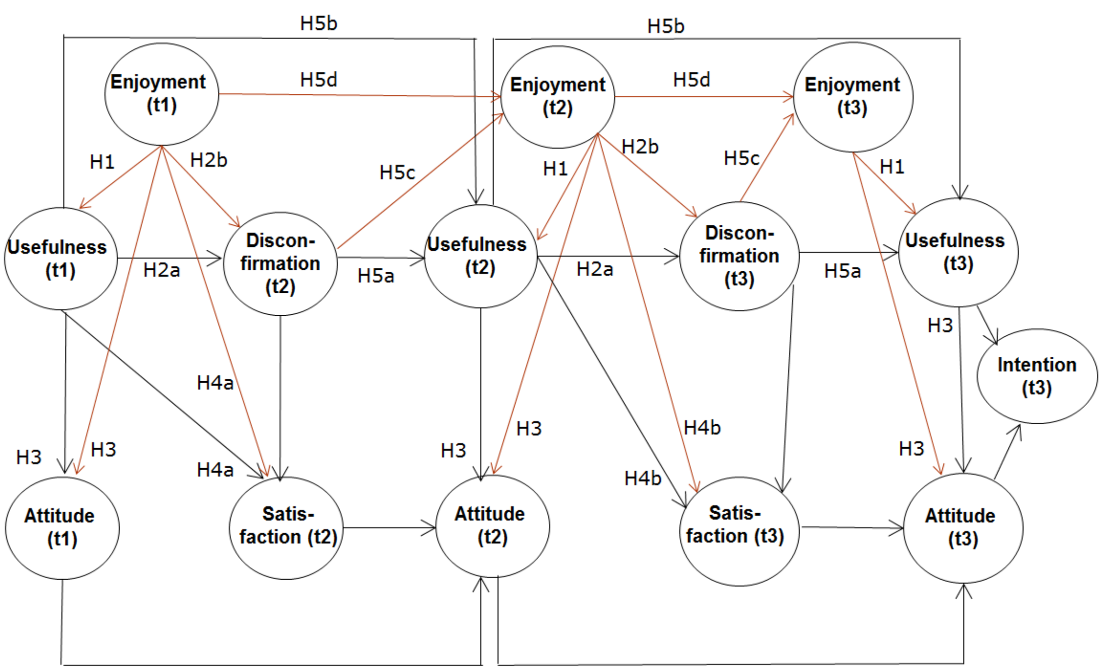


Figure 2. Proposed Integrated Temporal Model (ITM) of Belief and Attitude Change

2 Theoretical Background

2.1 Two-stage Theoretical Model of Cognition Change (BP Model)

Based on EDT (Oliver, 1980) and TAM (Davis, 1989) research, Bhattacherjee and Premkumar (2004) propose a temporal model of belief and attitude change (Figure 1) that extends the traditional static (one-time) models of IT usage by taking a dynamic perspective and that includes emergent constructs that can explain temporal patterns in IT usage. The process model depicted in EDT posits that users first form an initial pre-usage expectation (belief) about a product, experience its usage over time, and then form post-usage perceptions of it. Two emergent constructs contained in EDT that drive the belief and attitude change from pre-usage state to usage stage are disconfirmation and satisfaction. Disconfirmation captures the dissonance between a user's original expectations (baseline or reference level) and actual experience. Disconfirmation could be positive or negative depending on whether the actual experience is above or below initial expectations. If the actual experience is higher than initial expectations, positive disconfirmation occurs. If the actual experience is lower than initial expectations, negative disconfirmation occurs. Satisfaction is an individual's emotional state after using an IT (Bhattacherjee & Premkumar 2004; Sun, Fang, Lim, & Straub, 2012). Disconfirmation and initial expectation jointly determine an individual's extent of satisfaction with using IT.

Grounded in the TAM literature that has demonstrated PU and attitude are key predictors of IT usage intention, Bhattacherjee and Premkumar (2004) link PU and attitude in the pre-usage stage with those in the usage stage and posited disconfirmation and satisfaction as emergent constructs influencing post-usage PU and attitude (Figure 1). Combining the EDT and the TAM literatures, the BP model posits that initial beliefs (PU) of IT influence pre-usage attitude, usage-stage satisfaction, and usage-stage disconfirmation. Accordingly, usage-stage disconfirmation influences usage-stage PU given that they both represent user beliefs about IT usage, while usage-stage satisfaction influences usage-stage attitude. Given that usage-stage cognitions result from both prior cognitions and deviation from the prior cognitions due to actual experience (Helson, 1964; Oliver, 1980), Bhattacherjee and Premkumar link pre-usage beliefs (PU and attitude) to usage-stage beliefs (PU and attitude).

The BP model also extends the two-stage model of belief and attitude change to a three-stage model with one pre-usage stage and two usage stages because users revise their prior cognitions as they experience more IT usage. Thus, we can expect disconfirmation and satisfaction to continuously influence consequent beliefs and attitudes. Nevertheless, the magnitudes of disconfirmation, satisfaction, belief, and attitude change are expected to decrease from pre-to-initial usage stage to initial-to-later usage stage because expectation stabilizes and better agrees with actual experience (Bhattacherjee & Premkumar, 2004).

For IT with hedonic elements, PU is still essential to understanding the adoption and continued usage of IT. PU is the extent to which users believe that using a system will enhance their task performance. As Table 1 reviews, PU included in the BP model has frequently emerged as the key construct in studying shopping websites (Jiang & Benbasat, 2007), mobile services (Xu, 2006; Hong, Thong, Moon, & Tam, 2008), collaborative technologies (Kang, Lim, Kim, & Yang, 2012), online decision aids (Wang & Benbasat 2005), and other IS (Burton-Jones & Hubona, 2006; Kamis et al., 2008; Kamis, Stern, & Ladik, 2010).

2.2 Importance of Perceived Enjoyment

One can derive theoretical support to include both PU and PE in our proposed ITM from the motivational model (Deci, 1975) and IS research literature. The motivational model distinguishes between intrinsic and extrinsic motivators of behavior, which suggests that individuals may be motivated to use an information system or device due to intrinsic rewards derived or perceived benefits. IS researchers (Davis, Bagozzi, & Warshaw, 1992; Igbaria, Parasuraman, & Baroudi, 1996; Van der Heijden, 2004; Venkatesh, Speier, & Morris, 2002) have adapted the motivational model to the context of IT usage and conceptualized that PU focuses on extrinsic motivation and that PE focuses on intrinsic motivation. They have done so because PU deals with the benefit that is external to the system-user interaction (i.e., improving job productivity) and PE, as an intrinsic motivation, is related to the fun that one can derive from using the system itself (Ke, Tan, Sia, & Wei, 2012).

Table 1. Literature Review on Key Constructs and Usage Stages in IT Usage

	Key constructs				Usage stages			IT adopted
	PE	PU	Disconfirmation	Satisfaction	Pre-usage	Initial post-usage	Later post-usage	
Bhattacherjee & Premkumar (2004)		x	x	x	x	x	x	Computer-based tutorial & rapid application-development software
Venkatesh & Sandeep (2010)		x	x		x	x		Human resource information system
Lankton & McKnight (2012)		x	x	x	x	x		Microsoft Access
Kamis et al. (2010)	x	x		x		x		Website with decision support systems (DSS)
Parboteeah et al. (2009)	x	x				x		Shopping website
Davis et al. (1992)	x	x		x		x		Word processing system
Childers, Carr, Peck, & Carson (2001)	x	x				x		Shopping website
Jiang & Benbasat (2007)	x					x		Shopping website
Wang & Benbasat (2005)	x					x		Online recommendation agent
Bruner & Kumar (2005)	x	x				x		Shopping website
Kamis et al. (2008)	x	x				x		Website with DSS
Kang et al. (2012)		x				x		Collaborative technologies
Burton-Jones & Hubona (2006)		x					x	Email and Microsoft Word
Koufaris (2002)	x	x					x	Shopping website
Van der Heijden (2004)	x	x		x			x	Movie website
Nysveen, Pedersen, & Thorbjørnsen (2005)	x	x					x	Mobile service
Bhattacherjee (2001)		x	x	x			x	Online banking
Lin & Bhattacherjee (2010)	x						x	Online video games
Igbaria et al. (1996)	x	x					x	Microcomputer
Hong et al. (2008)	x	x					x	Mobile data service
Setterstrom, Pearson, & Orwig (2013)	x	x			x		x	Web-enabled cell phone
Kim & Oh (2011)	x				x		x	Mobile data services
Venkatesh (2000)	x	x			x	x	x	Help desk system, property management system payroll application
Zhang (2013)	x			x				Information and communication technology

Note: we based the categories of initial-usage and later-usage on whether subjects experienced the studied IT before the time of their studies.

Consistent with prior IS literature in representing users' intrinsic motivation, we propose that we should add the PE construct to the BP model and define it as the extent to which an individual perceives the activity of using a system "to be enjoyable in its own right, apart from any performance consequences that may be anticipated" (Davis et al., 1992, p. 1113; van der Heijden, 2004). PE is an affective measure of a user's perception of whether or not interaction with a system is exciting and pleasant (Bruner & Kumar, 2005; Csikszentmihalyi, 1975; Kamis et al., 2008; Koufaris, 2002; Novak, Hoffman, & Yung, 2000). The IS literature has adopted PE to characterize users' feeling (See our review in Table 1) and shown it to be an important affective factor (Cyr, Head, & Ivanov, 2009; Hong et al., 2008; Koufaris, 2002; Kamis et al., 2008; Sun & Zhang, 2008; van der Heijden, 2004). For example, research has PE to be a key factor in capturing users' affective reactions in using an online decision support systems (Kamis et al., 2008), video games (Lin & Bhattacherjee, 2010), 3D virtual worlds (Nah, Eschenbrenner, & DeWester, 2011). Research has also found it to more strongly predict behavioral intention to use compared to PU for hedonic IS (Van der Heijden, 2004; Norman, 2007). Prior research also indicates that PE affects PU since users might spend more time with IT that is more entertaining, which results in higher productivity (Venkatesh et al., 2002).

Although Table 1 reveals the importance of PE in studies of IT usage, to our knowledge, few studies have examined how the effect of PE (and its effect relative to PU) changes over time from pre-usage to initial usage and from initial usage to later usage. While some studies have included both the pre-usage and post-usage stages, they have focused mainly on PU instead of PE. While this conceptualization is certainly valid when the research target is organizational IT, such as Microsoft Access or human resource IS, its utility may fade when dealing with IT with hedonic elements.

While Setterstrom et al. (2013) and Kim and Oh (2011) examined the impact of PE on both initial adoption and continued use of IT, they collected the data at a single point and classified subjects into two groups (initial adoption and continued use) based on their past IT experience. As a result, they could not examine how the same individuals' expectation and perception evolved from one time to another. Thus, the research question about how the effect of PE relative to PU on attitude, disconfirmation, and satisfaction change at different usage stages remains unanswered. We also depart from Venkatesh's (2000) study about the temporal effect of PE on perceived ease of use in three aspects. First, we study the temporal effect of PE from the expectation disconfirmation perspective; as such, we can examine PE's temporal effect on disconfirmation, satisfaction, and attitude. Second, we study the relative effect of PU and PE on these constructs mentioned across different usage stages. Third, we focus on the IT with hedonic elements where one can expect the role of PE to be more influential, while Venkatesh (2000) studied utilitarian systems, such as property management and payroll application.

While other affective factors exist such as perceived playfulness, flow, cognitive absorption, and aesthetics, we selected PE as a representation of affective factors in the ITM for several reasons. Describing the degree of cognitive spontaneity in technology interactions (Webster & Martocchio, 1992, p. 204; Venkatesh 2000), perceived playfulness is an individual difference variable that is system independent. Since we focus on the affective usage of the hedonic IT, we propose to include PE as a system-specific concept in the ITM.

Flow is a valuable construct in capturing users' affect (Nah, Eschenbrenner, Zeng, Telaprolu, & Sepehr, 2014). However, "flow is too broad and ill-defined because of the numerous ways it has been operationalized, tested, and applied" (Koufaris, 2002, p. 207). Nevertheless, the emotional component of flow (namely, PE) is a strong indicator of flow and has become a common measure of it (Zhang, 2013).

Cognitive absorption is "a state of deep involvement with software" that is exhibited through five dimensions: temporal dissociation, focused immersion, heightened enjoyment, control and curiosity (Agarwal & Karahanna, 2000). PE is one of its five dimensions and captures the affective elements, while the other four dimensions represent cognitive functions (Wakefield & Whitten, 2006). Since the BP model already has PU that represents the cognitive component in the IT adoption and usage process, we believe that PE that focuses on the affective component can better inform the user-adoption process and usage of IT with hedonic elements.

The term "aesthetic" refers to an artistically beautiful or pleasing appearance (Tractinsky, 2004). Aesthetic responses are usually elicited by external stimuli (Kim, Lee, & Choi, 2003) and, therefore, tend to be associated with objects (e.g., the screen design is attractive), while PE is related to behaviors (e.g., using the system is enjoyable). Based on the theoretical relationship between object-based and behavioral evaluations (Wixom & Todd, 2005), aesthetic responses (object-based belief) are antecedents of PE, a behavioral belief (Cyr, Head, & Ivanov, 2006). Since PU is a behavioral evaluation in the BP model, PE, as a behavioral belief, is an appropriate addition to the BP model.

Table 2 summarizes the similarities and differences among PE, perceived playfulness, flow, cognitive absorption, and aesthetic. In Section 3, we propose our hypotheses regarding the consequences (e.g., attitude) and antecedents (e.g., disconfirmation) of PE from a multi-usage stage perspective in the EDT framework.

Table 2: Differences and Similarities between Enjoyment and Other Factors

	Definition	Similarities	Differences
Playfulness	The degree of cognitive spontaneity in IS interactions (Webster & Martocchio, 1992, p. 204; Venkatesh, 2000).	Same as enjoyment, playfulness captures a users' intrinsic motivation (perceptions of pleasure and satisfaction from performing the behavior) (Vallerand, 1997).	Perceived playfulness is an individual difference variable that is system independent, while enjoyment is a system-specific concept.
Flow	The holistic sensation that people feel when they act with total involvement (Csikszentmihalyi, 1975, p. 36; Koufaris, 2002).	Flow contains enjoyment, an emotional component of flow.	Flow is a broader concept that contains enjoyment in addition to control and concentration. While enjoyment captures the emotional component of flow, the latter two capture the cognitive component of flow.
Cognitive absorption	A state of deep involvement with software that individuals exhibit through five dimensions: temporal dissociation, focused immersion, heightened enjoyment, control, and curiosity (Agarwal & Karahanna, 2000).	Same as enjoyment, it is a variable related to intrinsic motivation.	Cognitive absorption is a broader concept that contains enjoyment and the other four dimensions of cognitive nature. In addition, cognitive absorption is a state variable that describes how people are deeply involved in an activity. PE, on the other hand, is more evaluative.
Aesthetics	An artistically beautiful or pleasing appearance (Tractinsky, 2004).	Both enjoyment and aesthetics are affective concepts.	Enjoyment is associated with behaviors (Zhang, 2013), while aesthetic is associated with an object (Kim et al., 2003). Consequently, researchers consider aesthetics as an antecedent of enjoyment (Cyr et al., 2006)

3 Hypotheses Development

We first examine the effect of PE on PU from a temporal perspective. Next, we investigate the comparative effects of PU and PE on disconfirmation, attitude, and satisfaction at different usage stages. Finally, we study the relative effects of PU and PE expectation and disconfirmation on subsequent PU and PE beliefs at both initial- and later-usage stages.

3.1 The Effect of PE on PU across Different Usage Stages

We propose that the effect of PE on PU attenuates over time. Prior IS research suggests that PE influences PU, a key determinant of IT usage (Venkatesh et al., 2002). This prior research argues that PE can lead to increased user attention on tasks and subsequently lead to increased work quality (e.g., PU). In particular, beliefs about PE play a significant role in one's acceptance of IT usage (Davis et al., 1992; Koufaris, 2002; Shang, Chen, & Shen, 2005; Van der Heijden, 2004; Yi & Hwang, 2003). Such PE extends from online shopping (Bauer, Falk, & Hammerschmidt, 2006) to impulse buying (Parboteeah et al., 2009), mobile advertising via SMS (Xu, 2006), and mobile entertainment services (Shih, 2011).

However, we propose that PE's effect on PU weakens over time. Indeed, the concept of habituation, which maintains that people respond less to a sensory stimulus the more frequently they are exposed to it, supports this proposition (McSweeney & Swindell, 1999). Applying the habituation literature to the use of IT with hedonic elements, we expect that the effect of PE in influencing a user's PU will decrease in the subsequent usage stages. For example, one might find that individuals enjoyed the animated assistant icons in Microsoft Office 97 at first and that enjoyment affected their PU toward using Office but that became boring and/or bothersome later on so that PE had a lesser influence on their PU towards using

Microsoft Office 97. Similarly, while flicking through photos on an iPad is enjoyable at the beginning, we feel less enjoyment associated with the flicking feature after using it repeatedly. The initial PE of IT with hedonic elements might have a significant influence in forming users' PU. However, the excitement expected might decrease after users actually experience it and further decrease after repeated use. These statements agree with a considerable amount of psychological research on affective forecasting that has revealed that individuals often overestimate the affective effect of future events (Wilson & Gilbert, 2013; Gilbert, Driver-Linn, & Wilson, 2002; Dunn, Wilson, & Gilbert, 2003). In addition, the notion of consumption satiation in the marketing literature (Redden, 2008) supports our argument. Consumption satiation refers to a decrease in enjoyment from consuming a product or service (Redden, 2008). This satiation occurs because consumers habituate and subsequently satiate on enjoyment as they repeat them. Accordingly, the initial expectation for IT with hedonic elements such as PE should have a greater effect on PU in the early-usage stage than the effects at the later-usage stage. Therefore, we hypothesize that:

H1a: PE more strongly affects PU at the pre-usage stage than at the initial-usage stage.

H1b: PE more strongly affects PU at the pre-usage stage than at the later-usage stage.

H1c: PE more strongly affects PU at the initial-usage stage than at the later-usage stage.

3.2 The Comparative Effect of PU and PE across Different Usage Stages

Disconfirmation is the discrepancy between expectations and actual experiences. Better-than-expected outcomes lead to positive disconfirmation and worse-than-expected outcomes lead to negative disconfirmation (Oliver, 1980). As theorized in the BP model, the magnitudes of disconfirmation decrease from the initial-usage to later-usage stage because expectation stabilizes and better agrees with actual experience (Bhattacherjee & Premkumar, 2004). Applying this theorization to IT with hedonic elements, one can expect a high level of PU and PE expectation to more likely result in a high level of negative PU and PE disconfirmation, respectively, and a low level of PU and PE expectation to more likely result in a high level of positive PU and PE disconfirmation, respectively. EDT suggests that users' pre-usage beliefs and attitudes are usually based on second-hand information, such as prior experience with a vendor's other products, peer or social network recommendations, or mass media channels. As such, sources of information might not be accurate and realistic and, thus, cause users to form biased beliefs that either positively or negatively deviate from their first-hand experience (Bhattacherjee & Premkumar, 2004). After experiencing an IT system, users will update their initial PU and PE expectation, and the subsequent PU and PE expectation will be closer to the actual experience. In other words, PU and PE expectation at the initial-usage stage will be more accurate and certain than that at the pre-usage stage. In the context of multiattribute models, research has documented that individuals discount attribute evaluation if that attribute performance is with higher uncertainty (Meyer, 1981; Wirtz & Bateson, 1999). For example, when a new product feature is associated with greater uncertainty, it contributes less to the choice probability of the enhanced product (Nowlis & Simonson, 1996; Sun, 2013). Therefore, we expect PU and PE expectation at the pre-usage with higher uncertainty to carry less weight in influencing disconfirmation, as compared to PU and PE at the initial-usage stage that is based on the first-hand experience. Thus, we hypothesize that:

H2a: PU more strongly affects disconfirmation at the later-usage stage than at initial-usage stage.

H2b: PE more strongly affects disconfirmation at the later-usage stage than at initial-usage stage.

Bhattacherjee and Premkumar (2004) theorize and empirically support the influence of PU of IT usage on attitude. In addition to the positive effect of PU on IT usage, research has established the direct and indirect relationship between PE and IT usage (Dabholkar & Bagozzi, 2002; Van der Heijden, 2004; Venkatesh, 2000). The next research question queries which one (PE or PU) has a greater effect and whether the effect persists across different usage stages.

The relative importance of PU and PE might depend on the types of IT usage (Van der Heijden, 2004). In the context of IT with hedonic elements, we expect that PE will have a stronger effect than PU in shaping users' attitudes at the pre-usage and initial-usage stages. Prior IS research has confirmed that PE plays a more dominant role in the use of household technology (because of its hedonic-oriented nature) while PU is more dominant in corporate systems usage (Venkatesh & Brown, 2001). In addition, research has also confirmed that PE more strongly predicts users' consequent beliefs than PU in using movie websites (Van der Heijden, 2004), a hedonic system. These studies focus on the initial-usage of IT with hedonic elements. We extend their theorization and findings to the context of iPad usage in the pre-usage and initial-usage stages. The iPad, as a household technology, is more of an entertainment product[1]. Thus, we hypothesize that PE more strongly predicts attitude than PU. In addition, given the relatively hedonic nature of iPad, one can reasonably expect that individuals' PE expectation rather than their PU expectation will largely determine their attitude towards the iPad. Therefore, we hypothesize that:

H3a: PE more strongly predicts attitude than PU in the pre-usage stage

H3b: PE more strongly predicts attitude than PU in the initial-usage stage.

While PU matters less at the initial-usage stage, we expect that its importance will become more salient with repeated usage. We base our prediction on past cross-sectional empirical research that has shown that PU has a stronger effect on attitude for users with more (compared to those with less) experience (Karahanna et al., 1999; Kim, Choi, & Han, 2009). The rationale is that, as more information about the attitude object becomes available with more experience, users will be more able to assess the object clearly and confidently. Applying this conceptualization to the current context from a temporal perspective, users with more iPad experience can more confidently evaluate the affordance and features of iPad as compared to those using the iPad the first time. Our inference is consistent with the consumer behavior literature that reveals that users grow more confident in the PU of a product or a service as their experience with that product or service accumulates (Homburg, Koschate, & Hoyer, 2006). Thus, PU formed at the later-usage stage may predict attitude stronger than that at the initial-usage stage. Thus, we hypothesize that:

H3c: PU has a stronger effect on attitude at the later-usage stage than at the initial-usage stage.

As TAM2 theorizes (Venkatesh & Davis, 2000), PU forms as a result of a cognitive comparison between what a system can do and what needs to be done. TAM2 further holds that, even over time, individuals will continue to rely on the match between their job goals and the consequences of system usage as a basis for their ongoing PU perceptions. Indeed, studies with financial systems and customer account management systems empirically support PU's strong effect on attitude over time (Venkatesh & Davis, 2000).

When examining IT with hedonic elements, despite the relatively stronger effect of PE over PU in influencing attitude at the early-usage stage (H3a and H3b), we posit that PE's effect on attitude will attenuate at the later-usage stage. The reasons are similar to those we present for PE's weakening effect on PU over time (H1); namely, because the overestimated effect of excitement on attitude decreases gradually as consumption satiation occurs and the novelty effect drops. In contrast, we expect PU's effect on attitude at the early-use stage to become stronger at the later stage in accordance with H3c. Thus, PE's relatively strong effect on attitude will diminish at the later stage compared to PU. Eventually, we expect PE will not have a stronger effect on attitude than PU will. Thus, we hypothesize that:

H3d: PE does not more strongly predict attitude than PU in the later-usage stage.

As we explain for H3a and H3b, when examining IT with a greater amount of hedonic elements, PE has a stronger effect than PU in shaping user belief (Venkatesh & Brown, 2001; Van der Heijden, 2004) in the pre-usage and initial-usage stages. Although PU might play a more important role for productivity-orientated systems, its influence will be less when it comes to an iPad with hedonic elements including pleasurable aspects of the haptic and graphically rich interface. In terms of the relative effect of PU and PE on satisfaction, we expect the same will happen at the initial-usage stage for iPad usage. In addition, we further argue that PE's stronger effect on satisfaction (as compared to PU's effect) will persist at the later-usage stage as well due to the special feature of satisfaction. Satisfaction is an individual's emotional state following IT usage experience (Bhattacherjee & Premkumar, 2004; Sun et al., 2012). Thus, satisfaction is a user's affective (vs. cognitive) reaction to the appraisal of a specific referent (Xu, Cenfetelli, & Aquino, 2016). Affect often accompanies judgments about whether an experience is enjoyable, and these judgments relate more closely to system 1 or intuitive processing (Kahneman, 2003) from which we argue that satisfaction, among other things, results. In contrast, assessing usefulness may require more complex and sophisticated information processing. Therefore, we expect PE to better predict outcome variables that are affective rather than cognitive for users. Our prediction is consistent with prior research when using satisfaction as a dependent variable. For example, Devaraj, Fan, and Kohli's (2002) findings support the contention because they found that, in using service quality (SERVQUAL) to predict satisfaction with online shopping channel, empathy (an affective predictor) was the significant determinant in explaining satisfaction while reliability (a cognitive predictor) was not. Thus, we hypothesize that:

[1] As we report in our study results, user's PE was higher than PU in all three usage stages.

H4a: PE(t_i) more strongly predicts satisfaction(t_{i+1}) than PU(t_i) at the initial-usage stage.

H4b: PE(t_i) more strongly predicts satisfaction(t_{i+1}) than PU(t_i) at the later-usage stage.

3.3 The Antecedents of Modified PU and PE

Regarding the change of belief from pre-usage to usage stage, EDT posits that disconfirmation is one of the two emergent constructs that drive such change (Oliver 1980). Specifically, later-stage belief is caused by both early-stage expectation and disconfirmation realized at the same later-stage. When users' actual experience deviates from their initial PU and PE expectation, disconfirmation occurs. As a result, users revise their initial PU and PE expectation and form an updated PU and PE belief.

At the initial-usage stage, users who actually experience an IT device downplay second-hand information that forms the initial expectation (Bhattacherjee & Premkumar, 2004). That is, initial PU and PE expectation (based on second-hand information) has less impact on how individuals form their updated PU and PE, while disconfirmation (based on direct experience providing real and crucial evidence) has more impact on how they form their updated PU and PE. In contrast, we expect that the relative effect of an initial PU and PE expectation and disconfirmation in determining updated PU and PE beliefs reverse at the later-usage stage. In other words, we expect that PU and PE expectation carries more weight than disconfirmation in influencing subsequent updated PU and PE beliefs. One can explain this expectation with EDT and cognitive dissonance theory, which maintain that users' beliefs tend to stabilize and become more accurate (due to more the interactions with the target IT) as dissonance (disconfirmation) effects wear off over time. In an empirical test of the BP model, Bhattacherjee and Premkumar (2004) found that disconfirmation was more critical in the formation of modified PU than prior PU at the initial-usage stage, but that disconfirmation had a smaller effect relative to PU in affecting updated PU at the later-usage stage. Given the importance of disconfirmation at the initial-usage stage and its attenuation at the later stage and given the opposite effect of PU and PE expectation (that they become more accurate over time), we hypothesize that:

H5a. Disconfirmation has a stronger effect on modified PU at the initial-usage stage than at the later-usage stage.

H5b. PU expectation has a weaker effect on modified PU at the initial-usage stage than at the later-usage stage.

H5c. Disconfirmation has a stronger effect on modified PE at the initial-usage stage than at the later-usage stage.

H5d. PE expectation has a weaker effect on modified PE at the initial-usage stage than at the later-usage stage[2].

4 Methodology

4.1 Study Setting and Data-collection Procedures

We tested the proposed extended BP model with the iPad, a technological device with hedonic elements. Given the iPad's significant potential in facilitating learning outcomes in the educational sector (Henderson & Yeow, 2012; Frommer, 2012; Murphy, 2011) and the fact that eight million iPads have been sold to the education market as of early 2013 (Etherington, 2013), which accounted for 95 percent of the education tablet market at the time (Robarts, 2014), we examined the role of iPad usage in solving problems in a classroom setting. As compared to lab experiments, students engaged in real problem-solving tasks in a naturalistic setting (i.e., classroom) increases a study's realism.

The study involved a three time-period (t1, t2, and t3) survey of iPad usage among undergraduate business students enrolled in a decision science class in a large public university in the US. At the beginning of the semester (t1), subjects completed a questionnaire that evaluated their pre-usage PU, PE, and attitude toward using an iPad in the classroom setting. Several weeks later, we asked subjects to use an iPad to solve two decision science problems that involved using an e-textbook in the CourseSmart app (allows e-notes, highlighting, etc.), a sketchbook app, and a calculator app. We chose this task because

[2] Other links in the proposed model (e.g., PU to disconfirmation) have already been established and justified in prior literature; as such, we do not repeat them here for the sake of brevity.

we expected it to provide a moderate level of PE when using the iPad as opposed to a creative task that might lead to a higher level of PE (Dahl & Moreau, 2007) that could inflate the PE when using the iPad.

After the subjects finished the first problem, they completed a second questionnaire (t2) that measured their disconfirmation and satisfaction with iPad usage and their modified PU, PE, attitude, and usage intention in the classroom setting. Then they proceeded to finish the second problem. After that, they completed a third questionnaire (t3) that reassessed their PU, PE, attitude, disconfirmation, satisfaction, and intention. We matched the responses from the three surveys to generate a single record for each subject. In total, we obtained 80 records[3].

4.2 Measurement Scales

We adapted existing validated scales whenever possible. We took the measures for PE from the well-established PE scale from Ghani, Supnick, and Rooney (1991) and Koufaris (2002). We adapted other items related to the BP model from Bhattacherjee and Premkumar (2004) and Bhattacherjee (2001). We measured PU, PE, and attitude at time points t1, t2, and t3 and the rest of the constructs at only t2 and t3. Unless noted otherwise, we based all measures on seven-point Likert scales ranging from 1 (strongly disagree) to 7 (strongly agree). Tables 3 and 4 list the measurement items for each construct. In addition, we also measured subjects' perceptions of task difficulty in regard to the two class problems[4], the degree to which they used the CourseSmart app (including the highlighting and notes features), and their perceptions of using the calculator app and sketchbook app[5].

5 Data Analysis

5.1 Sample

Males accounted for 57.50 percent of the 80 participants. The participants' average age was 23.7 (SD: 4.3). Only 12 percent of the participants owned an iPad at the time of the study. However, 59 percent of subjects had used an iPad before. On average, participants reported being comfortable with Internet usage (6.53/7; SD: 0.78) and were quite experienced in using a touchscreen (5.93/7; SD: 1.44). The average reported knowledge level[6] of the iPad was 4.11/7 (SD: 1.52). Regarding users' perception of the difficulty of the two problems, the participants did not report a difference between the first and the second problem (M= 3.66/7; SD: 1.95), which was not significantly different from the 4.00 midpoint ($p > 0.05$). Table 5 indicates that users' PE was always higher than PU at all three different time periods, which supports that the iPad is more of an entertainment product with a higher level of hedonic elements.

5.2 Test of the Research Model

Consistent with the modeling method adopted in the BP model, we tested the proposed ITM using partial least squares (PLS) with PLS-Graph 3.0 (Ringle, Wende, & Will, 2005). Following Kim's (2009) recent practice, we integrate the initial-stage model (t1-t2) and later-stage model (t2-t3) into one research model (Figure 3). We modeled all indicators as being reflective of their respective constructs.

[3] The sample size had reasonable statistical power to test the proposed model for two reasons. First, we followed the suggestions from Ringle, Sarstedt, and Straub (2012) and Chin (2010) to use the power tables for multiple regressions (e.g., Cohen, 1992) to calculate the required samples size. Assuming a medium effect size (0.15) with alpha of 0.05, it would need a sample size of 84 to obtain a power of 0.80 (Cohen, 1992). Second, our sample size far exceeded the commonly recommended rule of ten (Chin, 1998; Hair, Ringle, & Sarstedt, 2011; Subramani, 2004; Zhang, Agarwal, & Lucas, 2011). The rule of thumb is 10 cases per predictor, whereby the overall sample size is 10 times the largest of two possibilities: 1) the largest number of indicators used to measure one construct (i.e., largest measurement equation) or 2) the dependent variable with the largest number of independent variables impacting it (i.e., the largest structural equation). In our model, the two possibilities were five and four, respectively, which means the minimum sample size requirement was 50 to test the model.

[4] We measured perceived task difficulty by asking the subjects the following questions: 1) as compared to the first class problem, the second class problem is easier to solve using the iPad; 2) I think I performed better in using the iPad to solve the second problem than the first problem.

[5] We counted how much each subject used the highlights and notes features in the Coursesmart app. We measured how much they perceived that they used the perceived calculator app by asking the subjects "I used the calculator app a lot to solve the class problem"; we measured how much they perceived that they used the sketchbook app by asking the subjects "I used the sketchbook app a lot to solve the class problem".

[6] We assessed participants' knowledge of the iPad by asking the following three questions: 1) I know a lot about the iPad; 2) I feel very knowledgeable about the iPad; and 3) when it comes to the iPad, I really do know a lot (Mitchell & Dacin, 1996).

5.2.1 Validation of the Measurement Scales

Assessments of measurement models should examine: 1) individual item reliability, 2) internal consistency, and 3) discriminant validity (Barclay, Higgins, & Thompson, 1995). A general method for supporting individual item reliability includes checking whether individual item loadings are above 0.70 (Barclay et al., 1995; Chin, 1998). The measurement items in the model used in the present study generally loaded heavily on their respective constructs (see Table 6) with loadings above 0.70; as such, they had adequate reliability. As for the second criterion of internal consistency, Table 7 reports the composite reliability and Cronbach's alpha scores. Because all reliability scores were above 0.70 (Hair, Anderson, Tatham, & Black, 1998), the internal consistency criterion was met. The third step to assess the measurement model involves examining its discriminant validity. The diagonal elements in Table 7 represent the square roots of the average variance extracted (AVE) of latent variables, while the off-diagonal elements are the correlations between latent variables. For adequate discriminant validity, the square root of the AVE of any latent variable should be greater than the correlation between this particular latent variable and other latent variables (Barclay et al., 1995; Fornell & Larcker, 1981). All construct pairs in Table 7 met this requirement.

Discriminant validity is further confirmed when the loadings for the items on its targeted construct are higher than loadings on other constructs in the model (Chin, 1998). Gefen and Straub (2005) provide a restrictive guideline in stating that the minimum difference between item loadings and cross-loadings should be .10 in order to establish discriminant validity in addition to the AVE analysis shown above. As Gefen and Straub (2005, p. 93-94) illustrate: "If one of the measurement items loads with a .70 coefficient on its latent construct, then the loadings of all the measurement items on any latent construct but their own should be below .60". The IS literature has widely adopted this restrictive guideline to assess discriminant validity (Gefen & Straub, 2005; Wixom & Todd, 2005; Zhang & Sun, 2009). Table 6 contains the loadings and cross-loadings for items used in this study; all items in each of the three periods (t1, t2, t3) loaded higher on their constructs than they load on any other constructs measured at the same time, and, in all 650 cross loadings except two cases, the differences were greater than 0.10. These results, therefore, support discriminant validity.

Table 3. Measurement Items for the Constructs (t_1)

	Instructions: for the questions below, please check the one item that is closest to your personal opinion or experience. For questions related to the iPad, they refer to the usage of the iPad in the classroom setting. The scale would be like this: 1 = Strongly disagree; 2 = Disagree; 3 = Mildly disagree; 4 = Neither agree or disagree; 5 = Mildly agree; 6 = Agree; 7 = Strongly agree
Perceived usefulness (t_1)	I would find the iPad in the classroom useful. Using the iPad in the classroom would enable me to accomplish tasks more quickly. Using the iPad in the classroom would increase my productivity*. Using the iPad in the classroom would improve my performance.
Perceived enjoyment (t_1)	Using the iPad in the classroom would be enjoyable. Using the iPad in the classroom would be exciting. Using the iPad in the classroom would be pleasant*. Using the iPad in the classroom would be interesting. Using the iPad in the classroom would be fun.
Attitude (t_1)	All things considered, using the iPad in the classroom would be a: Bad idea 1 2 3 4 5 6 7 Good idea Foolish move 1 2 3 4 5 6 7 Wise move Negative step 1 2 3 4 5 6 7 Positive step Ineffective idea 1 2 3 4 5 6 7 Effective Idea
Note: * we dropped the item.	

Table 4. Measurement Items for the Constructs (t_2 and t_3)

Instructions for the first problem (t_2)	**Instructions:** The following questions ask about your perceptions towards using the iPad to solve the class problem**.** The term iPad refers to a paperless approach to solving class problems on the iPad that may involve using the eBook on a CourseSmart app (allows e-notes, highlighting, etc.), sketchbook app, and a calculator app. Please circle one number (only) to indicate to what extent you agree with the following statements. The scale would be like this: 1 Strongly disagree – 2 Disagree – 3 Mildly disagree – 4 Neither agree or disagree – 5 Mildly agree – 6 Agree – 7 Strongly agree
Instructions for the second problem (t_3)	**Instructions:** The following questions ask about your OVERALL perceptions towards using the iPad to solve the TWO class problems. The term iPad refers to a paperless approach to solving class problems on the iPad that may involve using the eBook on a CourseSmart app (allows e-notes, highlighting etc.), sketchbook app, and a calculator app. Please circle one number (only) to indicate to what extent you agree with the following statements. The scale would be like this: 1 Strongly disagree – 2 Disagree – 3 Mildly disagree – 4 Neither agree or disagree – 5 Mildly agree – 6 Agree – 7 Strongly agree
Perceived usefulness (t_2 and t_3)	I found the iPad useful for the class problem. Using the iPad enabled me to complete the class problem quickly. Using the iPad increased my productivity for the class problem*. Using the iPad improved my performance on the class problem.
Perceived enjoyment (t_2 and t_3)	Using the iPad for the class problem was enjoyable. Using the iPad for the class problem was exciting. Using the iPad for the class problem was pleasant*. Using the iPad for the class problem was interesting. Using the iPad for the class problem was fun.
Attitude (t_2 and t_3)	All things considered, using the iPad for the class problem is a Bad idea 1 2 3 4 5 6 7 Good idea Foolish move 1 2 3 4 5 6 7 Wise move Negative step 1 2 3 4 5 6 7 Positive step Ineffective idea 1 2 3 4 5 6 7 Effective Idea
Satisfaction (t_2 and t_3)	How do you feel about your overall experience of using the iPad for the class problem? Very dissatisfied 1 2 3 4 5 6 7 Very satisfied. Very displeased 1 2 3 4 5 6 7 Very pleased. Very frustrated 1 2 3 4 5 6 7 Very contented. Absolutely terrible 1 2 3 4 5 6 7 Absolutely delighted
Disconfirmation (t_2 and t_3)	My experience with using the iPad for the class problem was better than what I expected. Using the iPad for the class problem was better than what I expected. Overall, most of my expectations from using the iPad for the class problem were confirmed.
Note: * we dropped the item.	

Table 5. Means (Standard Deviations)

	Usefulness	Enjoyment	Attitude	Disconfirmation	Intention	Satisfaction
Time 1	4.92 (1.24)	5.82 (1.05)	5.37 (1.37)	N/A	N/A	N/A
Time 2	3.81(1.58)	4.89 (1.59)	4.58 (1.70)	4.62 (1.50)	4.19(1.76)	4.36(1.60)
Time 3	3.51(1.60)	4.52 (1.72)	4.53 (1.82)	4.24 (1.56)	3.98 (1.73)	4.32(1.62)

Table 6. Loading and Cross Loading of the Measures

	T1-ATT	T1-PU	T1-ENJ	T2-ATT	T2-PU	T2-ENJ	T2-CONF	T2-SAT	T3-ATT	T3-PU	T3-ENJ	T3-CONF	T3-SAT	T3-INT
1-ATT1	0.97	0.75	0.78	0.47	0.35	0.35	0.17	0.36	0.39	0.21	0.23	0.03	0.32	0.28
T1-ATT2	0.93	0.72	0.69	0.47	0.32	0.37	0.22	0.36	0.42	0.21	0.22	0.08	0.34	0.28
T1-ATT3	0.97	0.72	0.82	0.50	0.34	0.40	0.22	0.39	0.42	0.24	0.27	0.10	0.36	0.34
T1-ATT4	0.94	0.71	0.77	0.35	0.20	0.24	0.04	0.22	0.29	0.14	0.17	-0.03	0.29	0.18
T1-PU1	0.69	0.93	0.68	0.37	0.38	0.31	0.20	0.28	0.35	0.28	0.23	0.11	0.36	0.31
T1-PU2	0.66	0.91	0.65	0.36	0.37	0.32	0.23	0.28	0.32	0.29	0.21	0.12	0.36	0.24
T1-PU3	0.70	0.84	0.75	0.29	0.24	0.25	0.09	0.24	0.24	0.19	0.19	0.07	0.29	0.26
T1-ENJ1	0.74	0.73	0.90	0.43	0.45	0.39	0.29	0.42	0.34	0.33	0.24	0.18	0.40	0.37
T1-ENJ2	0.76	0.73	0.89	0.34	0.24	0.29	0.10	0.27	0.31	0.19	0.18	-0.01	0.28	0.23
T1-ENJ3	0.73	0.66	0.93	0.39	0.34	0.35	0.14	0.33	0.33	0.27	0.21	0.07	0.33	0.31
T1-ENJ4	0.69	0.68	0.90	0.40	0.38	0.40	0.20	0.37	0.35	0.28	0.25	0.15	0.37	0.36
T2-ATT1	0.48	0.46	0.48	0.93	0.70	0.79	0.74	0.87	0.88	0.64	0.70	0.59	0.76	0.72
T2-ATT2	0.49	0.39	0.42	0.96	0.72	0.79	0.69	0.86	0.86	0.66	0.70	0.57	0.77	0.71
T2-ATT3	0.45	0.33	0.43	0.96	0.70	0.83	0.74	0.85	0.87	0.62	0.75	0.61	0.76	0.68
T2-ATT4	0.35	0.23	0.31	0.92	0.71	0.77	0.73	0.79	0.81	0.63	0.68	0.58	0.71	0.66
T2-PU1	0.28	0.35	0.33	0.67	0.94	0.71	0.72	0.73	0.62	0.74	0.63	0.65	0.68	0.68
T2-PU2	0.40	0.42	0.44	0.73	0.94	0.75	0.72	0.76	0.70	0.79	0.65	0.65	0.72	0.76
T2-PU3	0.21	0.24	0.30	0.67	0.89	0.60	0.74	0.75	0.62	0.75	0.54	0.65	0.68	0.66
T2-ENJ1	0.14	0.13	0.18	0.65	0.53	0.82	0.64	0.59	0.60	0.48	0.66	0.56	0.56	0.53
T2-ENJ2	0.37	0.35	0.43	0.81	0.76	0.94	0.83	0.83	0.77	0.70	0.85	0.76	0.80	0.75
T2-ENJ3	0.42	0.39	0.44	0.82	0.68	0.96	0.76	0.81	0.81	0.67	0.84	0.70	0.81	0.70
T2-ENJ4	0.35	0.30	0.37	0.80	0.72	0.95	0.79	0.82	0.79	0.68	0.84	0.69	0.79	0.72
T2-CONF1	0.26	0.24	0.24	0.76	0.73	0.78	0.93	0.80	0.71	0.59	0.69	0.76	0.71	0.59
T2-CONF2	-0.10	-0.05	0.01	0.47	0.45	0.57	0.71	0.55	0.46	0.47	0.55	0.65	0.53	0.48
T2-CONF3	0.22	0.24	0.23	0.73	0.80	0.76	0.93	0.83	0.70	0.68	0.66	0.79	0.74	0.66
T2-SAT1	0.31	0.27	0.37	0.86	0.78	0.83	0.84	0.97	0.82	0.71	0.75	0.73	0.83	0.81
T2-SAT2	0.40	0.33	0.40	0.90	0.79	0.84	0.84	0.97	0.84	0.71	0.77	0.72	0.85	0.77
T2-SAT3	0.35	0.36	0.41	0.82	0.81	0.76	0.83	0.96	0.76	0.70	0.69	0.70	0.83	0.73
T2-SAT4	0.28	0.19	0.30	0.85	0.73	0.77	0.76	0.95	0.83	0.67	0.71	0.66	0.77	0.73
T3-ATT1	0.39	0.33	0.38	0.88	0.66	0.82	0.71	0.83	0.97	0.72	0.81	0.64	0.83	0.79
T3-ATT2	0.38	0.29	0.33	0.86	0.63	0.77	0.67	0.82	0.96	0.70	0.73	0.60	0.78	0.76
T3-ATT3	0.42	0.36	0.41	0.90	0.67	0.77	0.71	0.81	0.96	0.68	0.74	0.62	0.77	0.71
T3-ATT4	0.36	0.33	0.31	0.87	0.73	0.77	0.73	0.81	0.96	0.72	0.72	0.65	0.80	0.76
T3-PU1	0.25	0.28	0.33	0.70	0.83	0.73	0.69	0.74	0.74	0.96	0.71	0.75	0.76	0.81
T3-PU2	0.23	0.32	0.31	0.63	0.77	0.67	0.62	0.67	0.69	0.96	0.72	0.75	0.77	0.70
T3-PU3	0.12	0.20	0.19	0.59	0.73	0.59	0.60	0.66	0.66	0.93	0.64	0.73	0.72	0.76
T3-ENJ1	0.11	0.05	0.12	0.65	0.52	0.78	0.64	0.59	0.66	0.62	0.90	0.72	0.69	0.56
T3-ENJ2	0.25	0.29	0.27	0.70	0.68	0.83	0.72	0.76	0.74	0.74	0.96	0.81	0.85	0.67
T3-ENJ3	0.33	0.30	0.30	0.76	0.60	0.86	0.69	0.74	0.81	0.66	0.94	0.71	0.82	0.70
T3-ENJ4	0.20	0.24	0.22	0.70	0.67	0.82	0.71	0.75	0.72	0.73	0.96	0.81	0.83	0.66
T3-CONF1	0.14	0.20	0.15	0.62	0.73	0.77	0.81	0.71	0.67	0.80	0.82	0.96	0.81	0.66
T3-CONF2	-0.09	-0.05	-0.01	0.48	0.51	0.57	0.71	0.58	0.44	0.57	0.65	0.85	0.62	0.48
T3-CONF3	0.05	0.13	0.14	0.60	0.68	0.69	0.81	0.73	0.66	0.77	0.75	0.95	0.80	0.63

Table 6. Loading and Cross Loading of the Measures

T3-SAT1	0.37	0.40	0.39	0.77	0.73	0.80	0.75	0.80	0.80	0.77	0.82	0.79	0.97	0.73
T3-SAT2	0.35	0.38	0.38	0.78	0.72	0.81	0.74	0.82	0.81	0.79	0.84	0.80	0.98	0.76
T3-SAT3	0.31	0.37	0.39	0.73	0.72	0.74	0.74	0.83	0.74	0.75	0.78	0.77	0.96	0.70
T3-SAT4	0.31	0.31	0.33	0.80	0.73	0.81	0.77	0.87	0.84	0.75	0.85	0.79	0.96	0.77
T3-INT1	0.27	0.29	0.34	0.74	0.76	0.75	0.68	0.80	0.78	0.81	0.71	0.67	0.78	0.96
T3-INT2	0.27	0.28	0.34	0.71	0.72	0.71	0.67	0.76	0.75	0.76	0.65	0.63	0.73	0.98
T3-INT3	0.30	0.30	0.35	0.71	0.73	0.70	0.62	0.75	0.75	0.77	0.64	0.58	0.72	0.99

Note: T1-ATT: attitude at t1; T2-ATT: attitude at t2, T3-ATT: attitude at t3; T2-CONF: disconfirmation at t2; T3-CONF: disconfirmation at t3; T1-PE: enjoyment at t1; T2-PE: enjoyment at t2; T3-PE: enjoyment at t3; T3-INT3: intention at t3; T1-PU: usefulness at t1; T2-PU: usefulness at t2; T3-PU: usefulness at t3; T2-SAT: satisfaction at t2; T3-SAT: satisfaction at t3.

Table 7. Construct Reliability and Discriminant Validity (t_1 - t_2 - t_3)

	CR	CA	ATT1	ATT2	ATT3	DIS3	DIS2	PE1	PE2	PE3	INT3	PU1	PU2	PU3	SAT2	SAT3
ATT1	0.97	0.96	0.95													
ATT2	0.97	0.96	0.47	0.94												
ATT3	0.98	0.97	0.40	0.91	0.96											
DIS3	0.94	0.91	0.05	0.62	0.65	0.92										
DIS2	0.90	0.83	0.17	0.77	0.73	0.85	0.86									
PE1	0.95	0.93	0.81	0.43	0.37	0.11	0.20	0.91								
PE2	0.96	0.94	0.36	0.84	0.81	0.74	0.82	0.40	0.92							
PE3	0.97	0.96	0.24	0.75	0.78	0.81	0.74	0.24	0.87	0.94						
INT3	0.98	0.97	0.29	0.74	0.79	0.65	0.67	0.35	0.74	0.69	0.97					
PU1	0.92	0.88	0.77	0.38	0.34	0.11	0.19	0.77	0.33	0.24	0.30	0.90				
PU2	0.95	0.92	0.32	0.75	0.70	0.70	0.79	0.39	0.74	0.66	0.76	0.37	0.93			
PU3	0.96	0.94	0.21	0.68	0.73	0.78	0.68	0.29	0.70	0.73	0.80	0.28	0.82	0.95		
SAT2	0.98	0.97	0.35	0.89	0.85	0.73	0.85	0.39	0.84	0.76	0.79	0.30	0.81	0.73	0.96	
SAT3	0.98	0.98	0.35	0.79	0.82	0.81	0.77	0.38	0.82	0.85	0.76	0.38	0.75	0.79	0.85	0.97

CR: composite reliability; CA: Cronbach's alpha; ATT1: attitude at t1; ATT2: attitude at t2, ATT3: attitude at t3; DIS2: disconfirmation at t2; DIS3: disconfirmation at t3; PE1: enjoyment at t1; PE2: enjoyment at t2; PE3: enjoyment at t3; INT3: intention at t3; PU1: usefulness at t1; PU2: usefulness at t2; PU3: usefulness at t3; SAT2: satisfaction at t2; SAT3: satisfaction at t3.
*Diagonal elements represent the square root of AVE for that construct.

5.2.2 Assessment of Common Method Variance (CMV)

We used data collected over time (i.e., three times). Therefore, compared with other studies that rely completely on a single survey for data collection, this current study is less susceptible to common method variance (CMV) (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Still, one cannot rule out the occurrence of CMV in survey data collected at the same point in time. To address the potential concern for CMV, we performed two tests. First, we tested for multicollinearity among the constructs. To formally test for the presence of collinearity, we calculated the variable inflation factor (VIF) for the constructs in the model at t1, t2, and t3. The results indicated that all of the VIFs were lower than 10, with the average less than 5. Tabachnick and Fidell (1996) and Thatcher and Perrewé (2002) suggest that, when VIFs exceed 10, collinearity biases the result. Because no VIFs exceeded 10, our analysis indicated that collinearity did not substantially influence the results.

Second, we followed the marker-variable technique that Lindell and Whitney (2001), Malhotra, Kim, and Patil (2006), and Pavlou, Liang, and Xue (2007) suggest estimating the extent of CMV from factor correlations. They propose that one should use a theoretically unrelated construct (termed a marker variable) to adjust the correlations among the principal constructs. In our case, we identified perceived usage of sketchpad in the iPad, a theoretically unrelated construct. High correlations among any of the items of the study's 14 principal constructs (see Figure 2) and sketchpad usage would indicate common method bias because the construct of sketchpad usage should be weakly related to our study's principal constructs. Since the average correlation among the perceived sketchpad usage and the principal constructs was r = .045 (average p-value = 0.71), there was minimal evidence of common method bias. These results are highly consistent with Malhotra et al.'s (2006) finding that, in IS research, the inflated correlation resulting from CMV is typically in the order of 0.10 or less.

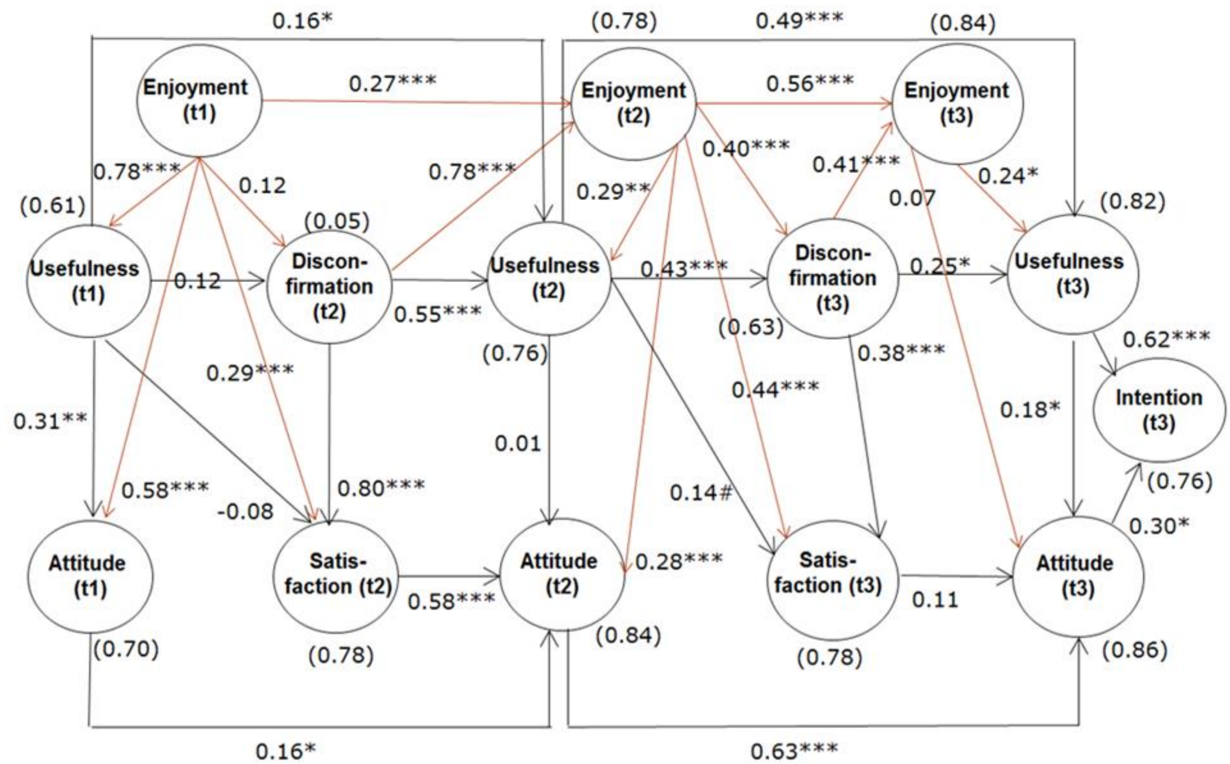
5.2.3 Test of the Structural Model

Figure 3 (t1 - t2 - t3) shows the results of the structural model testing. To test the hypotheses, we follow Chin (2000) in using the t-test procedure to assess statistical differences in path coefficients for each pair of paths (e.g., Ahuja & Thatcher, 2005; Hsieh, Rai, & Keil, 2008; Setterstrom et al., 2013). Table 8 summarizes the results we obtained from testing the hypotheses. Our results support or do not reject all 15 hypotheses except H1c. H1c hypothesizes that PE has a stronger effect on PU at the initial-usage stage than that at the later-usage stage, but we did not find a significant difference between these two usage stages. However, the path coefficients between PU and PE was higher at the initial-usage stage than that at the later stage (0.29 vs. 0.24), and p values for the path coefficients were more significant at the initial (vs. later) stage (0.01 vs. 0.05), which is consistent with our predicted direction.

Table 8. Hypothesis-testing Results

	Hypotheses	Path comparison	P value	Supported?
1	H1a. PE→PU (pre-usage>initial-usage stage)	0.78 (0.04)*** > 0.29(0.11)**	< 0.001	Yes
2	H1b. PE→PU (pre-usage>later-usage stage)	0.78 (0.04)*** > 0.24 (0.10)*	< 0.001	Yes
3	H1c. PE→PU (initial usage>later-usage stage)	0.29 (0.11)** = 0.24(0.10)*	> 0.05	No
4	H2a. PU→disconfirmation (later-usage>initial-usage stage)	0.43 (0.11)*** > 0.12(0.09) n.s.	< 0.01	Yes
5	H2b. PE→disconfirmation (later-usage>initial-usage stage)	0.40 (0.09)*** > 0.12(0.08) n.s.	< 0.05	Yes
6	H3a. PE > PU on attitude at the pre-usage stage	0.58 (0.10)*** > 0.31(0.10)**	< 0.05	Yes
7	H3b. PE > PU on attitude at the initial-usage stage	0.28 (0.11)** > 0.01(0.08) n.s.	< 0.05	Yes
8	H3c. PU→attitude (later-usage>initial -usage stage)	0.18(0.08)* > 0.01(0.06) n.s	< 0.05, one-tailed	Yes
9	H3d. PE = PU on attitude at the later-usage stage	0.07 (0.11)n.s. = 0.18(0.08)*	> 0.05	Not rejected
10	H4a. PE > PU on satisfaction at the initial-usage stage	0.29 (0.08)*** > -0.08(0.07)n.s.	< 0.001	Yes
11	H4b. PE > PU on satisfaction at the later-usage stage	0.44 (0.10)*** > 0.14(0.07)#	< 0.05	Yes
12	H5a. Disconfirmation → modified PU (initial-usage > later-usage stage)	0.55 (0.10)*** > 0.25(0.10)*	< 0.05	Yes
13	H5b. PU expectation → modified PU (initial-usage < later-usage stage)	0.16 (0.05)* < 0.49 (0.07)***	< 0.001	Yes
14	H5c. Disconfirmation → modified PE (initial-usage > later-usage stage)	0.78 (0.06)*** > 0.41(0.11)***	< 0.01	Yes
15	H5d. PE expectation → modified PE (initial-usage < later-usage stage)	0.27 (0.07)*** < 0.56(0.11)***	< 0.05	Yes

Note: 1) Path significance: ***p < 0.001; **p < 0.01; *p < 0.05; # p < 0.1; n.s.: not significant.
2) Numbers in parentheses are the standard errors.



Path significance: *** p < .001; ** p < .01; * p < .05;

Parentheses indicate R^2 values

Figure 3. Results of the Proposed ITM Model (t1- t2 - t3)

5.3 Supplementary Analyses about Possible Alternative Explanations

We focused on the iPad in this study. We instructed subjects to consider the iPad as a paperless approach to solving class problems when answering the survey questions (See Table 4). The paperless-approach definition collectively included the iPad, using the e-book on a CourseSmart app (allows e-notes, highlighting, etc.), sketchbook app, and a calculator app. Although this approach to evaluate iPad use is consistent with previous IS research to evaluate other information systems as a whole (e.g., Bhattacherjee & Premkumar, 2004; Limayem, Hirt, & Cheung, 2007), it will be interesting to investigate whether the apps installed on iPad have an impact on users' formation of PU and PE of the iPad.

To explore this possibility, we conducted several analyses. We evaluated the extent of subjects' usage of the e-notes, highlighting features, sketchbook app, and calculator app on PU and PE. The correlation between PE and usage of the calculator and sketchpad was 0.15 ($p > 0.05$) and -0.08 ($p > 0.05$), respectively, and the correlation between PE and usage of highlights and notes in e-book was 0.18 ($p > 0.05$) and 0.01 ($p > 0.05$), respectively. Similarly, PU was not significantly correlated with the usage of the calculator ($r = 0.06$, $p > 0.05$) and sketchpad ($r = 0.01$, $p > 0.05$), as neither is significantly correlated with the usage of highlights ($r = 0.07$, $p > 0.05$) and notes ($r = -0.01$, $p > 0.05$). Given the non-significant relationship found, we can infer that the sketchbook app and the calculator app installed on the iPad and the highlighting and notes features in the e-book contributed little to the formation of PU and PE. Instead, users' PU and PE came more from using the iPad itself.

The students likely found the act of receiving the iPad enjoyable, which may have crossed over to how they felt about using the iPad for the exercises. To examine if this was the case, we performed several analyses. First, if the act of receiving the iPad increased PE, then subjects without prior iPad usage experience would have a higher level of PE expectation and initial-usage PE. We performed a t-test between subjects with prior iPad usage experience (59% of the subjects) and those without (41%), which revealed that no significant difference existed between them in terms of PE expectation ($p > 0.05$) and initial-usage PE ($p > 0.05$). In fact, subjects who had no prior experience with iPad had a lower mean in both PE expectation (mean difference = -0.47) and initial-usage PE (mean difference = -0.65) than those with iPad experience before. Thus, it appears that the act of receiving the iPad did not make the subjects enjoy the iPad more. Second, if the act of receiving the iPad increased enjoyment, the gap between users' PE expectation and initial-usage PE should be greater for subjects without prior iPad usage experience than those with. However, their mean difference was very small (only 0.19 out of 7.00). In summary, we infer that the act of receiving the iPad did not have a major influence on the enjoyment measured in this study.

6 Discussion, Contributions, and Conclusions

6.1 Discussion

In this study, we first examine PE's effect on PU from a temporal perspective. The results support our theorization that PE's effect on PU fades over time (from the pre- to initial-usage stage to the initial- to later-usage stage) when using iPad for utilitarian purpose in a classroom setting. Given PE's diverse effects at different usage stages, one needs to include PE when studying IT with hedonic elements from a dynamic perspective.

When we used PU and PE to predict attitude at both pre-usage and initial-usage stages, PE had a stronger influence on attitude than PU. In addition, PE was also a stronger predictor than PU in shaping satisfaction at both initial-usage and post-usage stage. In other words, PU lost its predominant predictive value in favor of PE, which supports our theorization that the BP model might not be complete or valid when applying it to IT with hedonic elements.

Although PE was a stronger predictor than PU of attitude at iPad's pre-usage and initial-usage stages, it was not the case at the later-usage stage. While PE had a stronger effect on attitude at the initial usage stage, it mattered less at the later-usage stage. In contrast, while PU's effect on attitude was weaker at the initial-usage stage, its effects were stronger at the later-usage stage. We found that PU and not PE significantly influenced attitude at the later-usage stage. These findings are consistent with EDT and the BP model, which conclude that user beliefs regarding IT usage do indeed change with time. However, prior studies have not revealed how the relative effect of PU and PE change over time. The fluctuation of users' PU and PE in determining their attitudes illustrates the necessity to investigate IT usage from a temporal perspective by including both PU and PE.

We also found that the effect of PU and PE expectation on disconfirmation was stronger at the later-usage than the initial-usage stage. As such, users' PU and PE change as they gain first-hand experience in using an iPad and that PU and PE expectation and level of disconfirmation seem to stabilize over time, which leads to a stronger relationship between these factors at the later stage. This stabilization effect is congruent with habit literature that indicates that cognitive process takes on a habitualized (automatic) nature as a result of learning in the IS continuance behavior (Limayem, Hirt, & Chin, 2001; Limayem et al., 2007).

We also found that disconfirmation played a more important role in forming the modified PU and PE at the initial (vs. later) usage stage. This finding is consistent with EDT, which recognizes disconfirmation as one emergent construct that drives subsequent belief change, but the effects of disconfirmation decrease over time. In contrast, our findings show that PU and PE expectation play a more critical part in shaping the modified PU and PE at the later (vs. initial) usage stage. These findings are also aligned with EDT's predicting that one's beliefs tend to stabilize and become more accurate based on the interactions with the target IT (Bhattacherjee & Premkumar, 2004; Szajna & Scamell, 1993) and that, subsequently, these beliefs have a stronger relationship with beliefs in the later-usage stage. Taken together, we extend the EDT and BP model by showing that the effect of users' PU and PE expectation and disconfirmation regarding IT usage also changes with time.

6.2 Theoretical Contributions

With this study, we make several theoretical contributions to the literature. First, we contribute to the literature by including both PU and PE in one study and comparing their relative effect in influencing attitude at pre-usage, initial-usage, and later-usage stages. We advance theory by proposing and testing a structural model that depicts the antecedents and consequents of the two emergent constructs (disconfirmation and satisfaction) that drive temporal changes in user beliefs and attitudes. While a handful of studies have examined the effects of PU and PE on satisfaction, to our knowledge, no study has yet fully conceptualized and empirically tested the temporal relationships among PE, satisfaction, and disconfirmation. We compared the effectiveness of PU and PE on shaping disconfirmation and improving satisfaction. Our findings provide some guidance as to the importance of achieving a more satisfied user experience.

Second, by examining relationships among these constructs from a process point of view, we contribute to the IT adoption literature by providing a more enlightened understanding of how PU and PE change in varying usage stages. We reveal that the rates of belief changes for PU and PE differ greatly when it comes to using iPad for a utilitarian purpose. PE loses its impact on attitude at the later-usage stage but plays an important part in influencing attitude at the pre-usage and initial-usage stages. In contrast, PU's role in influencing attitude becomes stronger at later (vs. initial)-usage stage but has less effect than PE in determining attitude at both pre-usage and initial-usage stages. Through a temporal perspective, we provide and add to the IS body of knowledge a revealing view of how usefulness and enjoyment beliefs change in using iPad.

Third, we propose ITM, which theorizes that PE is an overlooked belief that one needs to consider in IT adoption and continuance. For example, Lankton and McKnight (2012) studied PU at both pre-usage and initial-usage stages but overlooked PE. PE, and not just PU, is important as consumer technology becomes increasingly prevalent in our daily life (Norman 2007). Our study contributes to the literature by adding PE to the BP model.

In addition, given the theoretical importance of examining the temporal change of user belief and attitude with IT usage (e.g., Bhattacherjee & Premkumar, 2004; Venkatesh & Sandeep, 2010; Lankton & McKnight, 2012), we examine PE's effect on PU from a temporal perspective. Although previous research has recognized the importance of PE, research has not yet examined how PE's effect on PU changes from initial-usage stage to post-usage stage. For example, Bruner and Kumar (2005), Van der Heijden (2004), Kamis et al. (2010), and Parboteeah et al. (2009) studied the effect of PE only during users' initial usage of IT. Our findings reveal the different effects of PE at the different stages of IT usage, which corroborates the theoretical foundation for studying the IT usage from a dynamic perspective.

Finally, we explore the hedonic aspect of IT by using the iPad. In less than three years' release of the iPad, its sales and press reports have indicated the benefits of tablet computing in many domains including education (Henderson & Yeow, 2012). However, some scholars have expressed skepticism (Robinson, 2012). At present, research on the iPad is in its infancy. In particular, little research has focused on understanding how users' initial beliefs of PU and PE in regard to the iPad fluctuate with time. By studying whether users' initial perceptions of the iPad are disconfirmed and how these perceptions change over time, this study contributes to the emerging literature on the iPad and the large literature on tablet and mobile computing.

6.3 Practical Contributions

Our proposed ITM can help iPad marketers in managing users' initial expectations and delivering products that fulfill users' expectations. ITM also provides a mechanism for understanding and assessing how initial PU and PE beliefs influence subsequent beliefs and what relative influence PU and PE have on attitude at different usage stages. This mechanism can provide important guidance to designers and marketers of the iPad, tablet computers, and IT with both utilitarian and hedonic elements. The results from this study also have implications for using the iPad in the education domain. Research has considered the iPad to be both an effective learning tool (Henderson & Yeow, 2012; Frommer, 2012; Murphy, 2011) and a disruptive computing technology that will replace laptops (Frommer, 2012; Cortimiglia, Frank, & Seben, 2013). However, few studies have empirically examined iPad use in the classroom setting, although IS researchers have called for developing better ways to engage students in learning (Ferratt & Hall, 2009). One exception is Henderson and Yeow's (2012) study, but its scale is relatively small with three subjects. Our proposed model allows educators to assess how the iPad could become another means to engage students in learning. In this section, we draw from our findings to provide a set of guidelines for practitioners.

First, we found that both PU and PE were salient in shaping users' attitudes toward using the iPad at different usage stages. Thus, iPad designers should design more features that are not only useful but also enjoyable; iPad marketers should promote the enjoyable and useful features to potentials users, and educators should highlight these two dimensions to cause students to form an initial positive attitude about the iPad. Doing so could eventually help students make better decisions on whether to buy an iPad or a computer as they enter college.

Second, given that disconfirmation most strongly predicted both PU and PE at t2, we can see a need to narrow the gap between pre-usage expectations and the initial-usage PU and PE. Thus, marketers need to manage user expectation and deliver services that are consistent with users' expectations and, subsequently, reduce disconfirmation. Specifically, we advise marketers (educators) to measure the strength of potential users' PU and PE expectation before they market (use) the iPad in a specific area (e.g., a certain school district). In instances of high expectations, one should arrange a training program to provide a realistic picture of the PU and PE of iPad usage to avoid overhype. Doing so would then allow students to positively disconfirm their initial expectations and should also positively affect later satisfaction during later usage of the iPad. When they find low expectations, marketers (educators) need to promote more about the features of using an iPad to encourage users to adopt the iPad.

Third, disconfirmation occurs when there is a gap between users' expectations and actual experience. Thus, in addition to managing users' expectation, one should also manage users' actual experiences with iPads to be consistent with their expectations. For example, in a classroom setting, instructors should reiterate the advantages of using an iPad, demonstrate the key features that could affect users' PU and PE, and prepare to troubleshoot any problems that might occur. Doing so can increase the chance that users will have a positive actual experience and minimize the disconfirmation.

Fourth, sometimes disconfirmation still occurs despite one's best attempt to manage users' expectation and create positive actual experiences. Thus, in a classroom context, we suggest instructors quiz students about their PU and PE evaluation after their initial usage to determine whether they need to intervene (e.g., tutoring service) to prevent the problem from lingering too long. This intervention is necessary and important since one's PU and PE beliefs tend to stabilize over time. Once negative PU and PE beliefs stabilize, one will incur a significant cost to reverse users' beliefs. The importance of early intervention not only applies to evaluating initial beliefs after usage but also to investing in determining users' initial expectation and creating a positive actual experience in the first place.

Finally, this study's results support the relative importance of both PU and PE at different use stages. Given that we found PE's effect on attitude attenuated over time relative to PU, we suggest that instructors constantly (particularly at the later-usage stage) promote new features on the iPad that are enjoyable. Research has shown that even trivial changes can have an effect on PE. For example, people find copying text more enjoyable if they are able to use different handwriting styles (Sansone, Charlene, Lora, & Carolyn, 1992). In addition, because PE had a greater effect than PU on attitude in the initial (vs. later)-usage stage, instructors should emphasize iPad features that are useful at the initial-usage stage in order to improve users' overall attitude toward the device.

6.4 Limitation and Future Research

As with many other studies, this study has its limitations. We focused only on the classroom usage of the iPad, and most apps were utilitarian oriented. Thus, the results apply to the educational usage of utilitarian-based IT and might not hold for other purposes such as entertainment. Further, because the iPad contains a significant amount of hedonic components, readers should exercise caution in generalizing our results to utilitarian-based IT, such as ERP systems in the organizational contexts. Future research will benefit from studying workplace systems and examining whether they change the significance of the relationships found in this study. Another limitation is that we measured subjects' iPad usage at only three different points in time (one before usage and two after usage). When users use the iPad three or more times, users' PE of using the iPad might further reduce while PU maintains the same. We need future research to further examine the relative importance of PU and PE on post-adoption perceptions with more repeated usage. Finally, we did not link disconfirmation (t2) to disconfirmation (t3) or satisfaction (t2) to satisfaction (t3) in our proposed model in order to be faithful to the BP model so that we could ascertain the additional effect of PE on these two outcomes. However, disconfirmation and satisfaction at the initial-usage stage likely have an influence on those constructs at the later-usage stage. We advise future studies to evaluate these relationships. Another potential stream of research would be to use the proposed ITM as a framework to explore how one could augment the model with possible moderators, such as habit (Limayem et al., 2007), users' product knowledge (Xu, Benbasat, & Cenfetelli, 2009, 2011), culture, and other apps and tasks (Xu, 2016), to examine whether the relationships among the constructs in the model might change. In addition, with the common usage of social networking websites, one may need to add more socially oriented variables to the model (Argyris & Xu, 2016). These variables may help to explain why users use certain social networking websites frequently at the beginning, and gradually stabilize and even discontinue their usage at a later stage. We call for future research to explore this important opportunity.

6.5 Conclusion

Based on the theoretical importance of examining users' belief and attitude change during the course of using their IT, we extend the BP model by proposing ITM that explains and predicts the temporal changes in users' comparative beliefs of PU and PE toward usage of IT with hedonic elements. ITM identifies the key component of initial user beliefs (i.e., PU and PE) that shapes the initial attitude, disconfirmation, and satisfaction across different usage stages. We also found that PE affected pre-usage attitude, initial-usage attitude, and satisfaction significantly more than PU, which indicates the importance of examining PE in studying the adoption of IT with hedonic elements. Yet, it does not mean that one can exclude PU from the equation because PU has a great influence on attitude at the later-usage stage. These results reveal the necessity of studying the comparative effect of PU and PE together from a temporal perspective, a literature gap that we have filled with our work. Overall, by developing and testing ITM incorporating PE, this research contributes to an emerging body of knowledge that investigates the temporal change of beliefs and attitudes in IT adoption and usage.

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