INTERROGATING USER EXPERIENCES WITH MOBILE PHONE TECHNOLOGIES:
A MULTI-METHOD QUALITATIVE STUDY OF USER EXPERIENCES WITH THE
iPhone

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Abstract

Interrogating User Experiences with Mobile Phone Technologies:

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This study sets out to analyze the technology acceptance decisions by the users of one smartphone (iPhone). Variations of the Technology Acceptance Model (TAM), after first proposed by Davis (1986), have been widely used in the field of information systems research. This paper proposes extensions to TAM from user experience perspective. Hassenzahl (2003), in his user experience model, finds product attributes as important in forming the character of the product and influencing the user's behavior. Using the extended version of TAM, I find that manipulation function of pragmatic attributes influences usefulness. I also find stimulation and identification functions of hedonic attributes to impact attitude and actual use. However, evocation has not been found important for either attitude or actual use. This research also develops an ethnographic decision tree model (EDTM) to predict the iPhone acceptance decisions for the sample and the model provides an acceptable success rate. Both the studies (extension of TAM and EDTM) utilize qualitative procedures as the research approach.

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1.0 Introduction

Consumer product technology in today's world is all about serving the individual consumers. Prahalad & Krishnan (2008) call this shift the 'N=1 principle' where the unit of focus is one single consumer. According to Prahalad & Krishnan (2008), consumers have become more concerned about the overall personal experience rather than separate products and services. As a result of this shift, there is a greater challenge on the organizations now to come up with innovations and products that are tailored to fulfill personalized needs. The market for the mobile phones is also following this change closely. Moreover, the usage dimensions of modern mobile phones have changed dramatically over the last couple of years. Therefore, there is a need to analyze the users' decisions about accepting or not accepting a mobile phone from different perspectives. In this research, I perform that analysis from the user experience perspective.

An analysis of the reviews posted by the users of smartphones on the internet reveals that the users are not always happy about the device as a basic phone. For example, the iPhone users complain about different aspects of the device in their reviews in many websites. Potential purchasers often use these online reviews to have an idea about the product features. Even if there are many complaints about these new generation mobile phones, people are still buying these in great numbers. For instance, by the end of the third quarter of 2008, Apple Inc. announced that it had already sold 1,000,000 3G iPhones. This new model was introduced only in July 11, 2008 (Muller, 2008). This variation in the consumers' reviews and the sales numbers press us to understand the technology acceptance from the user experience perspective in the new and different N = 1 world.

Even though a body of research is emerging in the area of technology acceptance by the users of the handheld interactive mobile devices, few studies attempt to analyze the technology acceptance specifically from the perspective of the user experience (Bruner II & Kumar, 2005). This is an important area for research since the designers of the products need to know how they can enhance the acceptance of their products by attending to the needs of the individual consumers. As Hassenzahl (2004_b) points out, it is becoming more challenging for the consumer electronics brands to predict the way their products will be used and experienced. In order to address this issue, in this paper, I examine how the instrumental and beyond instrumental qualities of an interactive product influence the acceptance of an interactive communication device – iPhone using an extended version of Technology Acceptance Model (TAM). As a second step, I also develop an ethnographic model of acceptance decision from the user responses.

1.1 Scope of the Research

This research contains two separate studies. Study 1 analyzes the influences of product attributes on individual technology acceptance and proposes an extension to the Technology Acceptance Model. Study 2 develops an ethnographic decision tree model to examine the individual decision making process. The focus of this research is confined to the secondary qualitative data - the user reviews posted in a website. However, both the studies provide quantitative results. It is to be noted that I analyze only one interactive product (iPhone) for the purpose of this research and therefore the scope is limited with respect to generalizing the results.

1.2 Research Perspective and Paradigm

This research has an ideographic perspective¹ since I analyze each review as a separate case. It is appropriate to take this perspective since my objective is to look into the technology acceptance from the individual user experience perspective. The ontological position of this research falls under interpretivist paradigm unlike most of the researches done on TAM which follow the positivist approach. This research analyzes the iPhone acceptance from individual user experience perspective utilizing the user reviews as the data source. The reality about the usage dimensions is viewed from the users' positions.

The epistemological orientation of this research also falls under interpretivist paradigm. Even though I remain separate from the reviewers, I seek to understand the acceptance behavior from their own perspectives. The 'hypotheses testing' in this research follows a qualitative procedure concentrating on the co-occurrences of particular concepts rather than statistical procedure followed under positivist paradigm. The comments made in the reviews are selected to represent the relevant concepts. In case of the Study 2 also (ethnographic decision tree modeling), the model construction is an interpretive process since the decision categories are selected from the reasons that the reviewers mention.

In terms of axiology, I classify this research under interpretivist paradigm. Under this paradigm, the researcher's values and experiences act as a part of the research process (Ponterotto, 2005). Even though I do not have any interpersonal contact with the reviewers, it should be noted that the coding of the reviews may be affected by the socially acceptable

¹ Ideographic perspective concentrates on understanding individual as unique entities (Ponterotto, 2005).

meanings associated to a particular construct and thus is not free from my values and expectations. In this sense, I classify this research as interpretivist.

1.3 Research Goals

The objective of this research is to conduct two separate studies, one from deductive approach and one from inductive approach in order to analyze the iPhone acceptance decisions. This multi-method approach provides triangulation and better understanding of a phenomenon. I set out two specific goals for this research in order to analyze the results more efficiently.

i) **Theoretical goal (Study 1):** *To generate a framework for technology acceptance that includes different product attributes.* The models that are generally used to analyze the technology acceptance mainly focus on the functionality aspects of a product. But, interactive products like smartphones have reached a new spectrum of usage. Therefore, it is important to analyze the acceptance of these new interactive products from the overall user experience perspective. The objective of this research is to investigate the impacts of pragmatic and hedonic² attributes on technology acceptance and to develop an integrated framework.

ii) **Methodological goal (Study 2):** *To apply an inductive research method and develop an ethnographic model to analyze qualitative data regarding user experience.* Most of the research in the areas of technology acceptance and user experience focus on quantitative research techniques for data collection as well as data analysis. One of the goals of this thesis is to generate a research method which focuses on qualitative data and analysis techniques.

² Hedonic attributes of an interactive product refer to the functionalities that are beyond the instrumental or merely task related.

1.4 Structure of the Thesis

The paper is structured in separate chapters. Chapter 2 provides a detail literature review for technology acceptance and user experience in two separate sub-sections. Chapter 3 focuses on research approach and strategy. Chapter 4 is dedicated to Study 1 – extension of Technology Acceptance Model (TAM) with user experience concepts. This chapter discusses the research model, data analysis techniques and findings pertaining to Study 1. Chapter 5 deals with Study 2 – Ethnographic Decision Tree Modeling (EDTM) and discusses the origin and methodology of EDTM, data analysis and findings. Chapter 6 concludes by revisiting the research goals, discusses implications of this research and provides directions for future research. Definitions of important terms are given in Appendix A. Appendix B and C provide summaries of the important research papers for technology acceptance and user experience literature respectively.

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2.0 Literature Review

2.1 Technology Acceptance

User acceptance of technology has long been an area of interest in the fields of human-computer interaction, psychology and consumer adoption. Within this broad horizon, there have been some specific streams of inquiry. One stream concentrates on individual's intention to use the technologies (e.g. Davis, 1989, Davis et al. 1989). Other streams are concerned with organizational acceptance focusing on task-technology fit (Venkatesh et al., 2003). In contrast, some studies (Dillon and Morris, 1997) focus on planned use of technology where user acceptance has been viewed as a comprehensible willingness of a user group to utilize an information technology for the task it is supposed to fulfill.

Acknowledging the important contributions of all of these research streams, I focus on the theories dealing with individual's intentions to use information technology. My objective is to understand how different attributes of an interactive product forming the *individual user experience* impact the users' acceptance decisions. Hence, the theoretical focus is appropriate since investigating individual's attitude and intention is important to understand individual user acceptance. First, I discuss the important theories that were developed and applied in the context of IS research, specifically to understand technology acceptance. Second, I draw the importance of user experience concepts and argue why it is important to include these concepts for understanding technology acceptance. I give a brief account of the user experience literature. In the next chapter, I develop the research model utilizing the concepts generated from both technology acceptance and user experience literature for study 1.

Researchers have long been focused on user behavior in their effort to understand individual user acceptance. The Theory of Reasoned Action (TRA) is one of the most dominant theories of human behavior (Venkatesh et al., 2003). TRA (Figure 1) assumes that people are rational and thus use the available information in systematic manners (Randall, 1989) while making a decision. The two main concepts of TRA are 'attitude toward behavior' and 'subjective norm'. Attitude consists of behavioral beliefs and outcome evaluation while subjective norm is formed by the actions of normative beliefs and motivation to comply with social standards. Ajzen & Fishbein (1980, p.6) define attitude toward a particular behavior as a "person's judgment that performing the behavior is good or bad, that is he is in favor of or against performing the behavior". Subjective norm has been defined as a person's "beliefs that specific individuals or groups think he should or should not perform the behavior and his motivation to comply with the specific referents" (Ajzen & Fishbein, 1980, p.8). Attitude and subjective norm impact the behavioral intention of a person which ultimately leads to the actual behavior. TRA has widely been applied to understand different types of behaviors (Vallerand, Deshaies, Cuerrier, Pelletier, & Mongeau, 1992) and Davis (1986) adapted it in the context of technology acceptance.

Later, TRA has been extended to develop the Theory of Planned Behavior (TPB). TPB (Figure 2) suggests that in addition to attitude and subjective norm, intention and behavior are also affected by 'perceived behavioral control'. Ajzen (1991, p.183) defines this additional concept as "people's perception of the ease or difficulty of performing the behavior of interest". Perceived behavioral control is assumed to be formed by control beliefs and perceived facilitation. TPB has also been used in understanding user behavior and technology acceptance by many research studies (e.g. Matheison, 1991; Taylor and Todd, 1995).

Figure 1: Theory of Reasoned Action (Ajzen & Fishbein, 1980)

Figure 2: Theory of Planned Behavior (Ajzen, 1991)

In 1986, Davis proposes Technology Acceptance Model (TAM) (Figure 3), which is an adaptation of the Theory of Reasoned Action (TRA). Since the adoption or acceptance of technology refers to a certain behavior of users, it was appropriate to analyze the technology acceptance through the lens of behavioral theory. The objective of TAM is to explain the

determinants of user acceptance while being “parsimonious and theoretically justified” (Davis, Bagozzi, & Warshaw, 1989, p. 985).

TAM has been applied to many studies of adoption behavior including computer and information technology and systems. One stream of research focuses on identifying the external variables that affect Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Another stream tries to incorporate new constructs in the model drawing knowledge from other frameworks, models and theories. The most recent and emerging stream is one where the researchers try to understand the adoption of internet based services through TAM. Appendix A presents a summary of the important research studies under these three streams. TAM is discussed in detail in research model section of study 1.

Figure 3: Technology Acceptance Model (Davis, 1986)

Apart from TRA and TPB, general motivation theory has also been widely used to understand user behavior (Venkatesh et al., 2003). In psychology, a distinction has been made between two types of motivation – intrinsic motivation and extrinsic motivation (Vallerand & Ratelle, 2002; Vallerand, 2000). Intrinsic motivation refers to the behaviors that are performed out of interest or enjoyment. In contrast, extrinsic motivation refers to the behavior which focuses on attaining particular outcomes under given constraints (Vallerand & Ratelle, 2002).

Davis, Bagozzi, & Warshaw (1992) apply these two types of motivation in the context of technology acceptance and use. They identify usefulness as extrinsic motivation and enjoyment as intrinsic motivation and find positive interaction between usefulness and enjoyment. According to their study, both usefulness and enjoyment have significant impacts on intentions and through these impacts, the two concepts indirectly influence user behavior. Together, usefulness and enjoyment explain more variance in user intentions than they do individually. Venkatesh (1999) also emphasizes the importance of intrinsic motivation in the form of 'playfulness' in order to create positive user perception about a technology. He argues to enhance the intrinsic motivation component in employee training to influence the technology acceptance through creating a positive user perception. As a next level, Venkatesh & Speier (1999) investigate how employee's mood influences his/her motivation in the initial training and thus his/her intention and actual behavior of accepting a technology. They argue in favor of positive mood oriented environment leading to higher intrinsic motivation. Higher intrinsic motivation creates a positive user perception and ultimately results in smooth transition from initial training to technology acceptance. Negative moods are found to have detrimental impact on intention to use, which in turn influence the actual behavior of acceptance.

The above mentioned researches mostly focus on applying Theory of Reasoned Action (TRA) in the context of technology acceptance. In contrast to this approach, Thompson, Higgins, & Howell (1991) adopt a competing theory of behavior proposed by Triandis (1977) and develop a model for PC utilization in IS context (Figure 4). Even though the model is particularly developed to predict PC utilization, its nature allows it to be used to predict the individual acceptance and use of other technologies (Venkatesh et al., 2003). This model is relevant in this discussion since it investigates PC utilization as a behavior. The main concepts in the models are

job-fit, complexity, long-term consequences, affect towards use, social factors and facilitating conditions which together influence the ultimate utilization of PC.

Figure 4: Model for PC Utilization (Thompson, Higgins, & Howell, 1991)

Thompson, Higgins, & Howell (1991) use partial least squares method to test the model. They find social factors and three components of expected consequences (complexity of use, job-fit and long term consequences) to have strong influence on PC utilization. Therefore, according to this model, organizations need to enhance or modify these expectations in order to ensure acceptance of PC technology (Thompson et al., 1991). In a later study, Thompson, Higgins & Howell (1994) observe significant direct influence of 'experience' on PC utilization. Al-Khaldi & Wallace (1999) use a similar model, also adapted from Triandis (1977) to analyze PC utilization in Saudi Arabia. They find individual attitudes, personal characteristics (e.g. PC

experience), facilitating conditions (e.g. PC access) and social factors to have significant influence on individual PC utilization.

Another important theory is the Innovation Diffusion Theory, IDT (Rogers, 1995) which Moore and Benbasat adapted in the context of information systems to understand individual technology acceptance. Rogers (1995) identifies five characteristics of an innovation which have impacts on the diffusion rate of that innovation. These are relative advantage, compatibility, complexity, observability, and trialability. According to Moore & Benbasat (1991), Roger's concepts of 'relative advantage' and 'complexity' are similar to the 'perceived usefulness' and 'perceived ease of use' which are proposed by Davis (1986) in TAM. Moore & Benbasat (1991) test Roger's five characteristics and add two additional concepts which they argue to be important for individual technology acceptance. The additional concepts are 'image' and 'voluntariness of use'. They also separate the concept of observability into two distinct concepts – 'result demonstrability' and 'visibility'. They find support for the predictive validity of these seven important concepts in technology acceptance.

Agarwal & Prasad (1997) test all of these innovation characteristics in a voluntary use situation on current use and future use intentions. For current use, among the innovation characteristics, they find visibility, compatibility and trialability to be significant. In addition, they also find voluntariness to be significant for current use. Unlike most other empirical studies, they do not find 'relative advantage' to be significant for current use. However, for future use intentions, they find relative advantage along with result demonstrability to be significant among all the innovation characteristics. They do not find current usage as a strong predictor of future use intentions. Plouffe, Hulland, & Vandenbosch (2001) compared TAM with Perceived Characteristics of Innovating (PCI) introduced by Moore & Benbasat (1991). They find that PCI

can predict almost 12% more variances than TAM. PCI includes more constructs than TAM and therefore the debate remains in the form of richness versus parsimony.

Another important stream of research in understanding behavior focuses on the social cognitive theory (Bandura, 1986) which has been applied in the IS context by Compeau & Higgins (1995). Social cognitive theory (Bandura, 1986) assumes that a behavior is guided by two sets of cognitive forces. The first set is related to outcomes and according to Compeau & Higgins (1995), IS research has long been concentrating on this outcome of behavior. However, less emphasis has been given to the second set of cognitive forces which is concerned about the self-efficacy. Self-efficacy refers to the "belief that one has the capability to perform a particular behavior" (Compeau & Higgins, 1995, p. 189). They argue that more variables are needed to understand the technology acceptance behavior. As a result, they introduce the concept of self-efficacy in the context of IS research and identify dimensions of 'computer self efficacy' in the line of social cognitive theory. They find self-efficacy to be important in forming individual behavior. They also find that encouragement and others' use of computers impact an individual's behavior through its influence on self-efficacy and outcome expectations. In a later study, Compeau, Higgins & Huff (1999) propose a research model consisting self-efficacy and outcome expectations (performance and personal). In the model, self-efficacy influences affect and anxiety while outcome expectations influence affect and usage. After testing the model, they find self-efficacy to have significant influence on affect, anxiety and use. However, expectations outcome is found to have little impact on affect and negative impact on usage.

The above discussion regarding the theoretical models developed in the IS study about the individual acceptance reveals one important point. The theories mainly focus on the beliefs

of individual users about a technology and how those beliefs influence the actual behavior of acceptance. These set of beliefs include beliefs that the users hold about themselves and also beliefs about the product characteristics. It is also clear from the discussion that most of the product characteristics refer to the functional aspects of a product. Even though the PC utilization model by Thompson, Higgins, and Howell (1991) includes 'affect toward use' and 'social factors', these concepts have been analyzed from a distinct perspective where users are viewed as source of these factors. Therefore, the question that I set out in the beginning about the '*product's ability to influence the acceptance*' remains a less-focused area in terms of analyzing technology acceptance.

Mahlke (2002) analyzes impact of perceived hedonic qualities and perceived visual attractiveness of a website along with perceived usefulness and perceived ease of use on users' intention. He finds all of these factors to be significantly influencing the intention. Kulviwat et al. (2007) propose a unified theory of technology acceptance integrating pleasure, arousal and dominance from PAD theory of Mehrabian and Russell (1974). They find pleasure and arousal but not dominance to have significant influence on users' attitude toward a technology. Their unified model is able to explain 53% of the variance in behavioral intention in contrast to TAM's 38%. These results show that there is a need for extending the technology acceptance model in order to include the aspects that are beyond the functional aspects of a product. In this research, I intend to do exactly that. I extend the TAM with the concepts from the user experience perspective focusing on the product attributes. The user experience perspective is different from the PAD theory (Mehrabian & Russell, 1974) and therefore this research will make a different contribution than that of Kulviwat et al. (2007).

2.2 User Experience (UX)

Demir (2008) defines experience as a process of ‘doings’ and ‘undergoings’ until the self and the product or object reach a harmonious state. In the ‘doings’ stage of the process, the things or products are transformed with the context of the self and in the ‘undergoings’ stage, the self is transformed by these transformations. It is clear from this definition that experience is a two way process where the characteristics of users and attributes of products are equally important. Having realized this, the field of human computer interaction started to focus on the products as well as user emotions in an integrated manner which gives rise to the user experience (UX) literature.

Hassenzahl & Tractinsky (2006, p. 97) define UX as “a consequence of a user’s internal state (predispositions, expectations, needs, motivation, mood, etc.), the characteristics of the designed system (e.g. complexity, purpose, usability, functionality etc.), and the context (or the environment) within which the interaction occurs (e.g. organizational/social setting, meaningfulness of activity, voluntariness of use etc.).” Minge (2008) defines UX as a multidimensional concept which includes perceptions about different product qualities and related emotions. Jetter and Gerken (2006) view UX as a total experience which consists of traditional qualities such as reliability, functionality and also ‘novel and hard-to-grasp concepts’ as “attractiveness, stimulation, fun, coolness, sexiness or successful delivery of brand proposition” (Jetter & Gerken, 2006, p. 106-107).

User experience literature reveals three major perspectives – one stream deals with experience that lies beyond functionalities of a product; the second stream focuses on affective

and emotional responses toward products; and the third stream views experience as a process with definite beginning and end (Hassenzahl & Tractinsky, 2006).

2.2.1 User Experience and 'Beyond the instrumental' qualities of products

In the early stages of the Human-Computer Interaction research, the studies are mainly concerned with usability and task related aspects of products. However, researchers afterwards start to step out from this one dimensional approach. They try to incorporate different concepts that are beyond the traditional perceptions about product qualities.

'Beyond instrumental' or 'non-instrumental' qualities of any interactive product refer to the qualities which go beyond the mere functionality or instrumental-value (Mahlke, 2007_b). In their effort of including 'non-instrumental' qualities in the analysis of user experience, some researchers identify specific non-instrumental qualities while some others have offered systematic models of these qualities. For example, Alben (1996) identifies 'beauty' as an important concept in an effort to define user experience. Gaver & Martin (2000) identify surprise, intimacy and diversion as important non-instrumental qualities. Rafaeli & Vilnai-Yavetz (2004) propose a model with three distinct dimensions through which any artifact should be analyzed – instrumentality, aesthetics and symbolism. In the model, aesthetics and symbolism pertain to the 'non-instrumental qualities'. Aesthetics refer to the sensual experience that can be generated using an interactive product. Aesthetics is also related to how the experience with the product matches the intentions and goals of the user (Mahlke, 2007_a). Symbolism refers to the 'meanings and associations' that are generated from the use of the product (Mahlke, 2007_a).

Lavie & Tractinsky (2004) find two types of aesthetics while assessing various websites – ‘classical aesthetics’ and ‘expressive aesthetics’. Classical aesthetics are the designs that are generally expected to be present in an interactive product. Mahlke (2007_a) argues to associate this classical aesthetics with the concept of usability. Expressive aesthetics refer to the design that expresses the creativity and novelty of the design. Creusen & Schroomans (2005) also find aesthetics and symbolism as important non-instrumental qualities. They view aesthetics as the pleasure generated from seeing the product. In contrast, symbolism refers to how the appearance of the product conveys messages. As Mahlke (2007_a) explains, a product can be perceived as boring, interesting, expensive, fun or cool. In addition to these two widely researched dimensions, Mahlke (2007_b) mentions about a third dimension of non-instrumental qualities – motivational aspect. He defines motivational quality as the ability of a product to motivate the users. This third dimension probably draws from the body of user acceptance research that deals with the impact of intrinsic and extrinsic motivation on the acceptance of technology (Davis, Bagozzi, & Warshaw, 1992; Venkatesh, 1999; Venkatesh & Speier, 1999; Venkatesh et al, 2003).

Contributing to the same line of research, Hassenzahl (2001) proposes that distinctive product attributes form the character of an interactive product. He identifies two types of product attributes – pragmatic and hedonic. Pragmatic attributes are related to user’s behavioural goal. A product is perceived as pragmatic (or to possess pragmatic attributes) if it helps the user to achieve his/her goals efficiently and effectively (Hassenzahl, 2004_a). Hence, pragmatic attributes, similar to instrumental qualities are basically associated with the utility and usability of the product. Pragmatic attributes have also been termed as ‘ergonomic qualities’. Ergonomic quality refers to “the usability of the product, which addresses the underlying human need for

security and control". It focuses on goal related functions or design issues (Hassenzahl, 2001, p. 483).

In contrast, hedonic attributes are associated with the 'self' of the users (Hassenzahl, 2004_a). Hedonic attributes of a product "comprises the fulfillment of the need for novelty and change and the need to communicate and express oneself through objects" (Harbich & Auer, 2005, p.1129). It is a quality aspect "addressing human needs for novelty or change and social power (status)" (Hassenzahl, 2001, p.483). Hedonic qualities may include beauty (Alben, 1996), surprise, diversion, intimacy (Gaver and Martin, 2000), fun (Bruner II & Kumar, 2005) and so forth. Hassenzahl (2003) identifies stimulation, identification and evocation as hedonic aspects of interactive products.

According to Hassenzahl (2003), product attributes (both pragmatic and hedonic) develop the apparent product character. The users get involved with any product in the context of a particular situation and this involvement results in consequences like pleasure, appeal and satisfaction. This process is one part of Hassenzahl's user experience model which is termed as 'User perspective'. The other part, that is the 'Designer perspective', shows that the product features formulate the product characters intended by the designers. Therefore, the user experience is a process where the product characters intended by the designers are evaluated by the users in their own usage context forming the apparent product character.

These two perspectives proposed by Hassenzahl (2003) can also be seen as a communication between the designer and the users where the product acts as an instrument. Koca et al. (2008) study product design as parallel to language (Figure 5). This view has its

origin in semiotics³. In language study, language is viewed as a symbolic instrument for communication (Koca et al., 2008). Similarly, products can be seen as symbolic instrument of communication between the designer and user. Koca et al. (2008) analyze products in terms of syntax, semantics and pragmatics.

Figure 5: Products analyzed as parallel to language (Koca et al., 2008)

In the field of language, syntax is defined as the structure of language. Semantics refer to the literal meanings of the language and pragmatics refer to the meaning that is inferred from the language. Koca et al. (2008) use this understanding to analyze the product design. According to them, product syntax refers to the “design materials, structure/form and technology used in the product.” Product semantics refer to “symbolic literal meaning of the product in the world in terms of its (designer) defined ‘value propositions’.” Product pragmatics refer to the “specific ‘user experience’ of a user with the product in a certain physical, psychological, social, cultural etc. context. The product syntax can be seen as similar to Hassenzähl’s (2003) designer perspective and the associated ‘intended product character’ whereas the ‘pragmatics’ can be associated with the ‘user perspective’ of Hassenzähl’s (2003) model. However, it is to be noted

³ Studies of sign systems including language (Koca, et al., 2008)

that the word 'pragmatics' has been used by Koca to capture the overall user interaction with the product. This parallelism, along with other research studies in the field of human computer interaction and product design; suggests that there is something more in 'User experience' than the mere functionalities of the products. In other words, a product's value proposition is argued to be formed by both 'instrumental' and 'beyond instrumental' qualities.

2.2.2 User Experience as an 'Affective Process'

One stream of UX research concentrates on emotions and affect as consequences of technology use. Desmet & Hekkert (2007) view experience as an equivalent to affect which is generated by the interaction between user and product. They analyze product experience in three levels – aesthetic experience, experience of meaning and emotional experience. The aesthetic level deals with the affects generated by physical stimulations, the meaning level points to the affects generated by the expressive attributes of the products and the emotional level refers to the integration of affects in the previous two levels and the evaluation of the product.

Jordan (2000) categorizes four types of pleasures as affective responses in the context of human-computer interaction – physio-pleasure, socio-pleasure, psycho-pleasure and ideo-pleasure. Physio-pleasure refers to pleasures generated from sensorial stimulations like touch and smell. Socio-pleasure is generated from the social contacts gained through using the product (social interaction and social recognition). Psycho pleasure is a result of fulfilling a task with the product. Ideo-pleasure is generated from the inherent values of a product that help the user to accomplish his/her aesthetic or ideological values.

Norman (2004) also focuses on affect and identifies three levels of cognitive involvement – visceral, behavioral and reflective. Visceral level involves affects generated from the automatic and universal responses such as pleasure originating from smoothness. Hence, it can be argued that visceral level is related with the physio-pleasures mentioned by Jordan. The behavioral level refers to the affects related to everyday activities such as completion of a task. This level is similar to Jordan's psycho-pleasure. The reflective level refers to the affects generated from the accomplishment of intellectual endeavors. This level can be viewed as similar to Jordan's ideopleasure.

The challenge that this stream of research faces is how to convert the affects into physical product and also how products can be used to generate specific emotional responses.

2.2.3 User Experience as a Context Related Phenomenon

User experience has also been viewed as a specific incident dependent on the context of usage or the situation. In this sense, users choose and evaluate pragmatic and hedonic products according to the situation in which they use the product (Hassenzahl, Schöbel, & Trautmann, 2008). Hence, it can be argued that the user experience with a particular product can vary in terms of the context under which it is used. Hartmann, Sutcliffe & Angeli (2007) find context dependency while analyzing the attractiveness of websites. They ask a number of students to choose among three websites either for summer internship or for PhD research. Some students mention that while they choose websites for internship, they mostly focus on the visual appearance and feel (hedonic). However, when they select website for PhD research, they look

for content (pragmatic). Hence, it can be said that their preferences change according to the contexts and as such their experiences can be different.

In another study, Hassenzahl, Kekez & Burmester (2002) ask two groups of people to evaluate websites. The group given tasks to accomplish shows strong correlation with overall evaluation. In contrast, the group told to have fun exhibits no apparent correlation with evaluation. This indicates that the context of usage has some impact on the user experience.

One school of thought views experience as an interaction with a technology with distinct beginning and end (Forlizzi & Batterbee, 2004). The experience is influenced by the product attributes as well as the internal and emotional state of the user. The context of use also plays a major role in shaping the experience. All these forces interact and ultimately result in the 'experience' (Hassenzahl & Tractinsky, 2006). More research is needed to know whether it is possible to design products that give specific experiences. Hassenzahl & Tractinsky point out that 'experience' and 'judgments about experience' are related but not same. Therefore, more detailed understanding is required about the 'experience' for incorporating it into the product design and overall technology acceptance.

For this research, I use the 'beyond instrumental' perspective of user experience literature. It is an appropriate stance since my purpose is to analyze how different product attributes influence the technology acceptance and to accomplish that purpose it is necessary to look beyond the mere instrumental qualities of a product.

3.0 Research Procedures

I use qualitative research approach for both the studies in this paper. It is an appropriate choice since qualitative research facilitates the analysis of a phenomenon without interfering the natural setting (Creswell, 2003). Qualitative research also acknowledges the emergent nature of a study. It allows the researcher to modify the research question and the focus during the data analysis stage if new information and new themes emerge (Rossman & Rallis, 1998). I use user reviews as the data source for this research. These reviews are self reports and therefore may not contain the specific concepts suggested by the research. However, there can be other important concepts grounded in these self reports that may reveal new perspectives. As a result, it is important to operate from a stance that allows accounting for the emerging themes. Furthermore, qualitative research acknowledges the role of 'interpretation' by the researcher (Rossman & Rallis, 1998). The specific nature of the data set, the paradigmatic orientation and the purpose of this paper together make interpretations by the researcher very important and hence this research procedure is appropriate.

I choose qualitative inquiry as the research strategy. Denzin & Lincoln (2005) mention that a strategy of inquiry consists of the assumptions and practices that a researcher utilizes while he/she moves from paradigm to empirical world. A qualitative inquiry allows a researcher to examine the actions of individuals or groups to understand their actions or behaviors in a meaningful way. Hence, qualitative inquiry is an appropriate research strategy which logically follows from the paradigm of this research.

3.1 Data Collection

The goal of this research is to understand how different attributes of an interactive product influence the technology acceptance of individual users. Therefore, it is necessary to examine the individual users who use a common device for identifying the generalizable themes about that product.

I collect secondary textual data from the reviews posted about iPhone on a website (<http://reviews.cnet.com>). The website maintains an archive of the user reviews. Using archival data in electronic format saves time and helps in data analysis stage. Moreover, user reviews can be a rich source of information since these are not mere comments. People post reviews about a product after they think about some aspects of the product or confront some problems. These reviews also provide “written evidence” (Creswell, 2003, p. 186) and gives the researcher an opportunity to capture the actual “language and the words” (Creswell, 2003, p. 186).

3.2 Research Methods

A qualitative research study utilizes different types of data and therefore, it is important to articulate the research methods. I use content analysis which is in line with the interpretivist research paradigm and qualitative research inquiry.

Content analysis refers to a “research technique for making replicable and valid inferences from texts to the contexts of their use” (Krippendorff, 2004, p.18). This technique offers the researcher new insights and understandings about particular phenomena (Krippendorff,

2004). The main assumption in content analysis is that analysis of text allows researcher to understand “other people’s cognitive schemas” (Duriau, Reger, & Pfarrer, 2007, p. 6). Hence, it is an appropriate technique for this research since my objective is to understand how the attributes of iPhone influence its acceptance to its users. Also as a data analysis technique, content analysis is suitable since it is an unobtrusive technique, can handle large volume of unstructured data (user reviews), and is context sensitive (Krippendorff, 2004).

I utilize Krippendorff’s (2004) content analysis framework (Figure 6) as a guide for data analysis in order to ensure the reliability of the research method.

Figure 6: Conceptual Framework of Content Analysis (Krippendorff, 2004)

For Study 1 (Extending TAM with user experience concepts), I start with the reviews. Next, I look at the reviews through the lens of the context – the attributes of an interactive

product for this paper. Then I identify the analytical constructs which lead to the analysis of the text. Use of these constructs allow me to focus on the text from the context I am interested to operate from and provides me with the inferences that can help answer my research question. These analytical constructs are my hypotheses which I state in the form of 'If- then' statements. As it is clear from the framework that the answers found by a researcher are scrutinized by "many worlds of other" (Krippendorff, 2004); I provide detail description of the data analysis procedures and evidences in the following sections. For study 2 (Ethnographic Decision Tree Modeling) also, I use content analysis. However, this part mostly draws from the iterative method of decision tree modeling proposed by Gladwin (1989). The content analysis is relevant here since in the model development process, the concepts emerge from the texts as suggested in the ethnographic content analysis advocated by Altheide (1987).

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4.0 Study 1: Extending TAM with User Experience Concepts

4.1. Theoretical Framework

My objective in this research is to understand whether pragmatic and hedonic attributes of an interactive product influence the individual acceptance of that product. I choose TAM over other user acceptance models for several reasons. First, TAM has been tested numerous times and has been established as a robust and parsimonious model for technology acceptance. Second, TAM includes attitude as an affective response. In prior research studies, attitude has been considered as an outcome of individual's belief about product characteristics (Agarwal & Prasad, 1997). Hence, it makes sense to choose a framework that includes attitude when the research goal is to understand impact of product characteristics on individual acceptance. Even though Plouffe, Hulland, & Vanderbosch (2001) show in a study that Moore & Benbasat's (1991) 'Perceived Characteristics of Innovation' (PCI) has more predictive ability than TAM, PCI does not contain any component for affective response toward product characteristics. Therefore, it is appropriate to choose TAM as a theoretical framework that can be extended with the concepts from user experience literature.

4.1.1 Technology Acceptance Model (TAM)

Technology Acceptance Model (TAM), developed by Davis (1986), is the most widely used model in understanding computer usage behavior. It is adapted from the Theory of Reasoned Action (TRA) developed by Fishbein and Ajzen (1980). The objective of TAM is to explain the determinants of user acceptance of computer technologies while being "parsimonious and theoretically justified" (Davis, Bagozzi, & Warshaw, 1989, p. 985).

Figure 7: Technology Acceptance Model (TAM)

Figure 7 shows TAM with its main constructs and relationships. Perceived Usefulness (PU) refers to the extent to which a person believes that using a system will enhance his or her job performance or increase his or her productivity (Venkatesh, 2000; Venkatesh & Davis, 2000). Perceived Ease of Use (PEOU) is “the extent to which a person believes that using the system will be free of effort” (Venkatesh & Davis, 2000, p. 187). TAM assumes that different external variables influence the PU and PEOU of a prospective user of a particular technology.

These two constructs (PU and PEOU) influence the attitude toward usage. Attitude refers to the “user’s desirability of his or her using the system” (Mathieson, 1991, p. 175; Malhotra & Galletta, 1999, p.1). Lu et al. (2003, p. 208) define attitude as the “mediating affective response between usefulness and ease of use beliefs and intentions to use”. According to Davis (1989), user’s overall attitude toward using a system is an antecedent to intentions to adopt.

Attitude toward usage (A) and perceived usefulness (PU) influence behavioral intention for using a particular technology. Behavioral intention can be defined as “a measure of the strength of one’s intention to perform a specific behavior” (Fishbein and Ajzen, 1975, p. 288). In

the literature of philosophy, intention has been associated with action (Bratman, 1990). Cohen and Levesque (1990) define intention as a “choice with commitment”. Probably following the same reasoning, intention to usage ultimately influences the actual usage (AU) of a technology in TAM.

It is clear that TAM deals only with the instrumental qualities of a technology. It incorporates perceived usefulness and perceived ease of use as important constructs that influence attitude and intention. Many research studies relate these two concepts with utility and usability. However, only few studies add product attributes that are beyond the instrumental or functional aspects. Some studies introduce perceived relative enjoyment and perceived entertainment as concepts influencing attitude, intention and use (Al-Gathani & King, 1999; Heijden, 2003; Kim & Forsythe, 2008; Ha & Stoel, 2009). Hossain & Silva (2009) test influence of strong and weak social ties on attitude, intention and usage. Kulviwat et. al. (2007) add the concepts of Mehrabian & Russell's (1974) PAD theory (Pleasure, Arousal & Dominance) with TAM concepts to obtain a unified theory of consumer acceptance. Mahlke (2002) includes perceived hedonic quality and perceived visual attractiveness in TAM while examining website usage. Even though these studies include some product qualities which are beyond instrumental, more research is needed to obtain an integrated theory of acceptance consisting both instrumental and non-instrumental product qualities. The purpose of this study is to extend TAM and understand user technology acceptance through the lens of user experience concepts regarding products' pragmatic and hedonic attributes. I use Hassenzahl's (2003) user experience model as the guideline.

4.1.2 User Experience (UX) Model

Marc Hassenzahl (2003) proposes a user experience model including two perspectives – designer’s perspective and users’ perspective. A product designer conceptualizes the features of the product that she/he intends to design. This intended product character can be perceived differently by a user when he/she first sees the product. Each individual user forms personalized product character which Hassenzahl (2003) identifies as ‘apparent product character’. Apparent product character includes pragmatic and hedonic attributes. Apparent product character, depending on specific situations, leads to different consequences such as judgment (the product is good or bad), emotional consequences (pleasure, satisfaction) and behavioural consequences (prolonged use of the product).

For the purpose of this study, I concentrate on the pragmatic and hedonic attributes of the products. I analyze whether these attributes, through their functions, influence attitude and actual usage by the users and in turn form the individualized ‘apparent product character’ leading to the behavioral consequence of accepting a product.

Figure 8 presents the users’ perspective of Hassenzahl’s (2003) user experience model.

Figure 8: User Perspective of User Experience Model (Hassenzahl, 2003)

Hassenzahl (2003) categorizes product attributes (pragmatic attributes and hedonic attributes) based on the major functions of a product. Pragmatic attributes can also be termed as 'ergonomic qualities' mentioned by Hassenzahl (2001) in his earlier studies. Pragmatic attributes refer to "traditional usability aspects, i.e. efficiency, effectiveness and learnability" (Schrepp, Held, & Laugwitz, 2006, p. 1057). The major function of the pragmatic attributes is manipulation of environment. According to Hassenzahl (2003), manipulation requires "relevant functionality (that is utility) and ways to access that functionality (that is usability)". Pragmatic attributes are instrumental and thus help to achieve the task related goals of the users.

Hedonic attributes refer to "quality dimensions with no obvious – or at least second order – relation to task-related goals.... It is a quality aspect addressing human needs for novelty or change and social power (status)" (Hassenzahl, 2001, p. 483). Hedonic attributes of a product are often associated with the extent to which that product is enjoyable or pleasant (Hassenzahl, Platz, Burmester, & Lehner, 2000). Hedonic attributes are non-instrumental aspects of a product since these attributes do not show a correlation with the perceived effort to complete a task (Schrepp, Held, & Laugwitz, 2006).

Hassenzahl (2003) categorizes functions of the hedonic attributes in three sub-categories – stimulation, identification and evocation. This study focuses on this subdivision of hedonic attributes and relates these functions to the technology acceptance by individual users.

Stimulation refers to the function of an interactive product that is concerned with supporting the human need for personal development. Personal development may include the need for new knowledge and skills (Hassenzahl, 2003; Schrepp et al., 2006). A product can also

be stimulating if it supports this need by providing new functionalities or presentation methods. According to Hassenzahl (2003, p.5), a stimulating product can provide “new impressions, opportunities, and insights”. Stimulation is categorized as hedonic since it is related to the future opportunities of fulfilling personal development goals, not current task related goals. Therefore, the new and exciting functionality, content presentation, and interaction style of an interactive product can be stimulating and thus be a part of the product’s hedonic attributes.

Identification refers to the desire of an individual to be seen as important by the significant others in the society (Hassenzahl, 2003). A person tries to express his/her personality through a product (Schreep et al., 2006). An interactive product has to possess identification function in order to be accepted by a user with higher social recognition need. Identification is the perceived ability of a product to make a favorable statement about the user to a significant other in the society (Hassenzahl, 2004_a). It can also be referred to the product’s ability to convey a positive image of its user. This image plays an important role in social communication through mirroring the user’s personality (Evrard & Aurier, 1996). This distinct ‘personality’ can be expressed through either being expert in something that other people are unable to do or possessing something that others are unable to afford but strongly desire (Hassenzahl, Beu, & Burmester, 2001). Hassenzahl (2004_a) also suggests ‘beauty’ as an important antecedent in forming identity aspect of a particular product.

Evocation refers to the ability of a product to stir up memories (Hassenzahl, 2003). Prentice (1987) suggests that a product can be representative of past events, relationship or thoughts. In this respect, evocation can be associated with the symbolism aspect of the non-instrumental qualities discussed earlier. It can be argued that a product possessing evocation

function can stir up the memories through meanings and association with symbols. Brand loyalty can act as an evocating aspect in the selection of a product.

4.1.3 Hypotheses & Research Model

This section presents the hypotheses and the research model that I use for Study 1.

Pragmatic Attributes and Perceived Usefulness & Perceived Ease of Use

Pragmatic attributes are instrumental and as such are associated with the task related qualities of a product. A number of studies in the area of technology acceptance show that completing a given task through a technology depends on how the users perceive the usefulness of the product. Task completion also depends on how the users perceive the amount of effort they need to put in to accomplish the task with a new technology. However, most of the studies either concentrate on the use of a technology in an organizational setting (Adams, Nelson, & Todd, 1992; Davis, 1986; Davis, 1989; Igbaria, Guimaraes, & Davis, 1995; Hu, Chau, Sheng, & Tam, 1999; Venkatesh & Davis, 2000) or see the usage as a choice made by the individual preferences (Agarwal & Prasad, 1999; Agarwal & Prasad, 1997; Al-gahtani & King, 1999; Gefen & Straub, 1997; Kulviwat, Bruner II, Kumar, Nasco, & Clark, 2007; Lin, Shih, & Sher, 2007; Malhotra & Galletta, 1999; Pavlo, 2003; Venkatesh, 2000; Yi & Hwang, 2003). The different aspects of the particular tasks have also been analyzed (Dishaw & Strong, 1999; Kloppping & McKinney, 2004; Nasco, Kulviwat, Kumar, & Bruner II, 2008). In contrast, less emphasis has been given to the *product's ability to influence the PU and the PEOU*.

Many research studies relate PU and PEOU with utility and usability respectively. Utility and usability are basically concerned with the task accomplishment activities and hence can be logically related to pragmatic attributes of a product. Since pragmatic attributes refer to the ability of a product to manipulate the environment and thus creating the situation where the user can accomplish the external and internal behavioral goals, it can be argued that the pragmatic attributes of a product through its manipulation function affect the 'perceived usefulness' (PU) and 'perceived ease of use' (PEOU) by user. Even though pragmatic attributes play its part in developing the apparent product character perceived by the users (Hassenzahl, 2003), it is expected to do so through PU and PEOU. In this respect, I propose following hypothesis –

H1: Pragmatic attributes of a product positively influence the perceived usefulness and perceived ease of use.

I divide H1 in two separate parts for analyzing the impact of manipulation on PU and PEOU separately. I propose following two hypotheses under H1.

H1_A: Manipulation has a positive relationship with perceived usefulness.

H1_B: Manipulation has a positive relationship with perceived ease of use.

Figure 9: Hypotheses for Pragmatic Attributes

Hedonic Attributes and Attitude

Attitude is the desirability of the user to use a particular system (Mathieson, 1991; Malhotra & Galletta, 1999). Research studies on user acceptance show that a user often accepts a technology not only for the task related purposes but also for social influence and personal goals (Agarwal & Prasad, 1999; Agarwal & Prasad, 1997; Al-gahtani & King, 1999; Malhotra & Galletta, 1999). Hence, it can be argued that the desirability to use a product is related to the non-instrumental qualities or the hedonic attributes of the product. Therefore, I propose that the hedonic attributes of an interactive product affect the user's attitude towards a product through functions of hedonic attributes – stimulation, identification and evocation.

H2: Hedonic qualities of interactive products positively influence users' attitude toward usage.

H2_A: Stimulation has a positive relationship with the users' attitude toward usage.

H2_B: Identification has a positive relationship with the users' attitude toward usage.

H2_C: Evocation has a positive relationship with the users' attitude toward usage.

Figure 10: Hypotheses for Hedonic Attributes and attitude

Hedonic attributes and actual usage

Actual usage refers to the approach or avoidance by the user toward a product. The functions of the hedonic qualities – stimulation, identification and evocation act on developing the apparent product character by influencing the perception of the users about the features of the products. Apparent product character then moves through situations and results in behavioral consequences. Hence, it can be argued that since the hedonic attributes play a part in developing the apparent product character, they affect the actual usage (approach or avoidance) by the user.

In this respect, I propose the following hypothesis –

H3: Hedonic qualities of interactive products positively influence actual usage.

H3_A: Stimulation has a positive relationship with the actual usage.

H3_B: Identification has a positive relationship with the actual usage.

H3_C: Evocation has a positive relationship with the actual usage.

The research model after adding the pragmatic and hedonic attributes to the original TAM appears as depicted in Figure 11.

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Figure 11: Research Model

4.2 Data Analysis

I use content analysis to analyze the data for Study 1. I provide a detail and rich description of the research methodology so that the study is evaluated from the perspective I intend to operate from.

4.2.1 Data set

The data set contains 457 reviews about iPhone 16GB posted on a website. The reviews posted before 11 July, 2008 (the release date of iPhone 16GB) are not included in the dataset. I select this date since people posting reviews before the release date may not have a fair idea about the product and its functionality.

My motivation behind using these reviews to investigate the research question is that they present a rich context regarding the use or non-use. These reviews also contain the languages of the reviewers themselves and thus allow the researcher to be unobtrusive. The limitation with time and scope also act as important factors.

4.2.2 Data Analysis Procedure

I use ‘HyperRESEARCH’ software for analyzing the data. First, I identify the concepts from the hypotheses that I need to test. These concepts (Table 1) originate from two theoretical frameworks that I use in this research – Technology Acceptance Model (TAM) and User Experience model (Hassenzahl, 2003).

Table 1: Concepts for hypothesis testing

Theoretical Framework	Concepts
Technology Acceptance Model (TAM)	— Usefulness
	— Ease of Use
	— Attitude
	— Actual Usage
User Experience (UX) model	— Manipulation
	— Stimulation
	— Identification
	— Evocation

One of the important decisions in content analysis is to select the ‘unit of analysis’ (Graneheim & Lundman, 2004; Krippendorff, 2004; Neuendorf, 2002). I have a dataset of 457 reviews about iPhone 16GB. For the purpose of hypotheses testing, I need to consider each review separately as a single case under one study. In this way, the software is able to run the

given rules for the hypotheses testing on each case separately. As a result, I can have the information regarding how many of the reviews support a particular hypothesis.

To test the hypotheses, I establish some primary codes associated to the concepts to be tested. This coding helps to establish software compatible ‘If-Then’ statements. The list of primary codes that I use for each of the concepts is presented below in Table 2. For selecting the primary codes, I examine each case carefully to identify the common themes or words. Then I categorize the common themes under each concept of my interest. Since this is an interpretive process, I am providing detail and rich description of my data analysis procedure to ensure the reliability.

Table 2: Concepts and Primary Codes

Concepts	Primary codes for HyperRESEARCH	Explanation
Manipulation	<ul style="list-style-type: none"> — Mentions about using applications — Internet browsing — Technology integration 	Manipulation refers to using a product’s functionality to have an impact on user’s environment. The use of applications, internet and other technologies from one device are interpreted as to have significant impact on how users maintain their surrounding environment.
Usefulness	<ul style="list-style-type: none"> — Fulfils user’s needs — Does not fulfil user’s needs — Different functions 	Comments about fulfilling/not fulfilling the users’ needs through different functions are selected as primary codes for ‘Usefulness’.
Ease of Use	<ul style="list-style-type: none"> — Easy to use — Better than other phones to use 	Direct comments about the ease of use of this phone or comparisons with other phones in terms of user friendliness are selected as primary codes under ‘Ease of Use’ concept.
Stimulation	<ul style="list-style-type: none"> — New experience — Enjoyable device — New kind of Touchscreen — New user interface — Novel design — Personal development — Personal entertainment 	Stimulation refers to the ability of a product to support human need for personal development (Hassenzahl, 2003). A product can also be stimulating if it supports new functionalities or creative presentation methods (Schrep et al., 2006). Therefore, I select the texts pertaining to the newness of the product’s functionalities and personal improvement as primary codes under stimulation.

Concepts	Primary codes for HyperRESEARCH	Explanation
Identification	<ul style="list-style-type: none"> — Popular and stylish phone — Talks about beauty of the product 	Identification refers to the ability of an interactive product to fulfil the users' need of being important in the eyes of others in the society (Hassenzahl, 2003). It also refers to users' desire to express their personality through a product (Schrep et al., 2006). In this respect, people often associate the 'coolness' or 'beauty' of the product as important factors in their reviews. Therefore, I select the texts concerning the popularity, style and beauty of the product as primary codes under identification.
Evocation	<ul style="list-style-type: none"> — Brand loyalty — The phone is addictive 	Evocation refers to the ability of an interactive product to stir up memories (Hassenzahl, 2003). In this respect, I identify comments about the past relationship with Apple products as reasons to use the product. In other instances, people mention the addictive ability of the product. This addiction can also be interpreted as evocation since addiction to any particular thing can be argued to result from a good feeling about it in the past. Hence, I select these two concepts from text as the primary codes under evocation.
Attitude	<ul style="list-style-type: none"> — Assigns a score equal to or greater than 3 — Assigns a score less than 3 	The rankings given by the reviewers are used as proxies for attitude. The scale is 0-5 where 5 implies the strongest preference. I categorize a review to contain 'positive attitude' when the reviewer assigns iPhone a score equal to or greater than 3. Reviews are categorized under 'negative attitude' when the reviewer assigns iPhone a score less than 3.
Actual use	<ul style="list-style-type: none"> — Uses the product — Does not use or has returned 	The reviews as a whole are coded as 'Actually uses the product' or 'Does not use or has returned' based on the overall comments of the reviewers.

Next, in each review I identify the comments that can be associated with relevant concepts and can be coded using the software. The examples of comments that are coded under each concept are presented in the Table 3.

Table 3: Concepts and Comments Coded Under Each Concept

Concept	Definition	Examples of comments coded under concepts using primary codes
Manipulation	Manipulation refers to using a product's functionality to have an impact on user's environment (Hassenzahl, 2003).	<p>— “The applications are amazing. With this phone you can do almost anything.”</p> <p>— “All in one phone, web browser, app launcher game device with the most intuitive touchscreen still to date.”</p> <p>— “In what other device can you have a phone, send/receive email, send/receive texts, browse the real internet and not the "Mobile Net" garbage, listen to music, watch full length movies and use GPS?”</p>
Perceived Usefulness	Perceived Usefulness (PU) has been defined as the extent to which a person believes that using a system will enhance his or her job performance or increase his or her productivity (Venkatesh, 2000; Venkatesh & Davis, 2000).	<p>— “That really is a rip off, but not enough for me to give up on the fact that the phone met all of my basic needs when none of the others out there did. It really is about what your individual needs are. This phone met mine.”</p> <p>— “Everyone is going to have a different opinion about this phone depending on their own personal needs. I was looking for the following: Good browser, relatively fast internet (faster than T-Mobile), ability to sync with my Outlook Calendar, good music player, good call quality, speaker phone, touch pad, bluetooth, compact enough to fit comfortably in a pants pocket, descent user interface, full keyboard, good design. The phone met all of those criteria.”</p>
Perceived Ease of Use	Perceived Ease of Use (PEOU) has been defined as “the extent to which a person believes that using the system will be free of effort” (Venkatesh & Davis, 2000, p. 187).	<p>— “Amazing ease of use”</p> <p>— “For the pros, this is by far the most user friendly interface and web browser I have ever seen. It's easy to scroll, move icons, and navigate in general”</p>
Stimulation	Stimulation refers to the ability of a product to support human need for personal development (Hassenzahl, 2003). A product can also be stimulating if it supports new functionalities or creative presentation methods (Schrep et al., 2006).	<p>— “I bought the 16GB original iPhone earlier this year, and upgraded to the 3G phone the day it came out. Both phones are light years ahead of the Blackberry Pearl that I had (talk about a bad web-surfing experience!)”</p> <p>— “In my opinion, this is the best phone I ever purchased.”</p> <p>— “This platform will grow and develop more options over time. For now, awesome!”</p>

Concept	Definition	Examples of comments coded under concepts using primary codes
		<p>— “There has never been a product like the iphone that does so much in such a small and elegant package.”</p> <p>— “It is an amazing device that is simply a generation or two ahead of anything else on the market.”</p>
Identification	<i>Identification</i> refers to the desire of an individual to be seen important by the significant others in the society (Hassenzahl, 2003). A person also tries to express his/her personality through a product (Schreep et al., 2006). Hassenzahl (2004) also suggests ‘beauty’ as an important antecedent in forming identity aspect of a particular product.	<p>— “Apple has hit a home run in delivering a great product for the money with a lot of totally cool factors in.”</p> <p>— “White also is only available for the pricier 16GB, so it also tells people you spent the extra money.”</p> <p>— “Attracts a lot of attention; Took a friend to an appointment and had it out in the waiting room, and everyone was like "ooooooo, ahhhhhhh!" very satisfying.”</p>
Evocation	<i>Evocation</i> refers to the ability of a product to stir up memories (Hassenzahl, 2003). Prentice (1987) suggests that a product can be representative of past events, relationship or thoughts.	<p>— “I did say I was an Apple fanboy and there is lots to love about the phone.”</p> <p>— “I love Apple products and with this one they have done a wonderful job.”</p> <p>— “Can’t live without it”</p> <p>— “Too addictive!”</p>

After primary coding, I use these codes to establish the ‘If – Then’ statements so that I can test my hypotheses in HyperRESEARCH. This software uses primary codes to form the rules and then it needs the researcher to insert a goal. Then the software runs the ‘Hypothesis rule’ on every case under one study and gives a report mentioning the cases that support the hypothesis. The overall data analysis procedure that I follow can be presented as in Figure 12:

Figure 12: Data Analysis Procedure for Hypotheses Testing

Figure 13 below provides an example of data analysis procedure.

Figure 13: An Example of Data Analysis Procedure

4.3 Findings

The purpose of hypotheses testing in this research is to find the association of attributes of iPhone with the particular concepts from TAM. It is to be noted that I do not use statistical tests since my data set contains textual self reports. My objective is to find out whether attributes of an interactive product are associated with the particular concepts in TAM as I conjecture. Therefore, I look for co-occurrences of relevant concepts in the texts. This procedure is in line with content analysis, the technique I use for data analysis. Duriau, Reger, & Pfarrer (2007, p.6) point out that “content analysis assumes that groups of words reveal underlying themes, and that for instance, co-occurrences of keywords can be interpreted as reflecting association between underlying concepts”.

The coding of the texts (Figure 14) reveals that reviewers consider mentioning about the product attributes as important while reviewing iPhone. It is clear from the figure that pragmatic and hedonic attributes of iPhone is grounded in the texts. (The pragmatic attributes are identified with ‘P’ and hedonic attributes with ‘H’).

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Figure 14: Frequency of Primary Codes about Product Attributes in the Reviews

Claim 1: Pragmatic attributes influence the Perceived Usefulness and Perceived Ease of Use of the product.

Hassenzahl (2003) proposes two distinct product attributes – pragmatic attributes and hedonic attributes. Pragmatic attributes are related to the achievement of behavioral goals and this achievement requires utility and usability (Hassenzahl, 2004; Hassenzahl, Schobel, & Trautmann, 2008). According to Nielsen (1993), a product has utility if it can perform the functions what it is supposed to do where a product has usability when the users can use those functions well.

TAM has two dimensions of instrumental qualities – perceived usefulness (PU) and perceived ease of use (PEOU). PU is related to the utility of a system while PEOU is related to the usability of the system (Mahlke, 2007_b). Therefore, it can be argued that pragmatic attributes of a product influence the users' perceptions about how useful the product is and how easy the product is to use.

Hassenzahl (2003) identifies 'Manipulation' (the ability of a product that allows the users to use its functionality to have an impact on his/her environment) as the function forming pragmatic attributes. Therefore, it can be claimed that pragmatic attributes of iPhone influence the PU and PEOU through manipulation.

H1A: Manipulation has a positive relationship with Usefulness.

Manipulation refers to the use of product's functionalities to have an impact on the user's environment. Many studies examining TAM find positive relationship of usefulness with product's task related functionalities. Hence, I conjecture that if manipulation is positive, then usefulness is expected to be positive.

257 out of 457 reviews (about 56%) support this hypothesis. The full data set contains reviews for both actual use and non-use. 361 reviews mention that the reviewers actually use the product. Considering only actual use, about 71% of the reviews have co-occurrence of codes for manipulation and usefulness.

H1B: Manipulation has a positive relationship with Ease of Use.

Since manipulation refers to how users utilize the functionalities of an interactive product, I conjecture that if manipulation is positive, then ease of use is expected to be positive.

182 out of 457 reviews (about 40%) support this hypothesis. Considering only reviews that mention actual use of the product (361 reviews), about 50% of the reviews have co-occurrence of codes for manipulation and ease of use.

Claim 2: Hedonic attributes of a product influence the user's attitude towards that product.

Jetter and Gerken (2006) refer today's world as an 'experience economy' where consumers select or accept any technological products not only on the basis of utility or usability

but also for other important reasons. Hassenzahl (2003) argues that 'beyond usability' experiences result from the hedonic attributes of products which are formed from the important product functions – stimulation, identification and evocation. Batra and Ahtola (1990) find two separate dimensions on consumer attitude – hedonic and utilitarian. Hence, it can be argued that product's functions forming the hedonic attributes (stimulation, identification, evocation) influence users' attitudes toward iPhone.

H2_A: Stimulation has positive relationship with the user's attitude.

Stimulation refers to the ability of a product to fulfill the users' needs of personal development and novelty (Hassenzahl, 2003). Fulfilment of any need can result in a positive feeling. Therefore, I conjecture that if iPhone has stimulation ability, then attitude toward the phone can be expected to be positive.

244 out of 457 reviews (about 53%) support this hypothesis. Considering only positive reviews where reviewers assign iPhone a score equal to greater than 3 (313 reviews), about 78% of the reviews have co-occurrence of stimulation related codes with high rankings.

H2_B: Identification has positive relationship with the user's attitude.

Identification refers to the ability of an interactive product supporting the user's need of expressing him/herself through a product or the need of being recognized in the eyes of other significant members in relevant social settings (Hassenzahl, 2003). Therefore, if iPhone has the identification ability, then the attitude towards it is expected to be positive.

245 out of 457 reviews (about 54%) support this hypothesis. Considering only positive reviews where reviewers assign iPhone a score equal to greater than 3 (313 reviews), about 78% of the reviews have co-occurrence of identification related codes and positive attitude.

H2C: Evocation has positive relationship with the user's attitude.

Evocation refers to the ability of an interactive product to stir up good memories in its users (Hassenzahl, 2003). Brand loyalty and addictive ability may be able to stir up past good memories and thus form a positive feeling about a product. Therefore, I conjecture that if iPhone has evocation ability, then the attitude towards it will be positive.

74 out of 457 reviews (about 16%) support this hypothesis. Considering only positive reviews where reviewers assign iPhone a score equal to greater than 3 (313 reviews), about 24% of the reviews have co-occurrence of stimulation related codes and positive attitude.

Claim 3: Hedonic attributes of the product influence the actual usage of that product.

The value of an interactive product is related to the context of use which Hassenzahl, Schobel, & Trautman (2008) refer as 'motivational orientation'. People have different needs and different reasons for using a product. One person may use a product for work while another may use it for socialization and entertainment. Hassenzahl, Schobel & Trautman (2008) point out that hedonic attributes along with the pragmatic attributes (utility and usability) are important to form the appeal of the product. The overall appeal of the product is very important to influence the

usage of the product. Hence, I conjecture that the product functions that form the hedonic attributes of iPhone influence its actual usage.

H3_A: Stimulation has positive relationship with Actual Usage.

I conjecture that stimulation positively influences the actual use of iPhone. 261 out of 457 reviews (about 57%) support this hypothesis. Out of 361 reviews where the reviewers mention that they actually use the phone, 72% have comments coded under stimulation.

H3_B: Identification has positive relationship with Actual Usage.

I hypothesize that identification ability of iPhone positively influences its actual use. 270 out of 457 reviews (about 59%) support this hypothesis. Out of 361 reviews where the reviewers mention that they actually use the phone, 75% have comments coded under identification.

H3_C: Evocation has positive relationship with Actual Usage.

I hypothesize that iPhone's evocation ability (if any) positively influences its actual use. 82 out of 457 reviews (about 18%) support this hypothesis. Out of 361 reviews where the reviewers mention that they actually use the phone, 23% have comments coded under evocation.

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4.3.1 Summary of Findings from Hypotheses Testing

This study follows a qualitative procedure and therefore it is necessary to decide a threshold level to analyze how the hypotheses are supported by the data. I take 'more than 50% of all the reviews' as an acceptable level of support. One may argue that a relationship is possible even when less than 50% of the cases support the hypotheses. It is true; however, selecting a threshold that is above average gives more strength to the claims. This selection also makes it easier to compare and analyze the results derived from different hypotheses. The findings from hypotheses testing are summarized in the table 4.

Table 4: Findings from Hypotheses Testing

Claims	Hypothesis	Findings	Support
Claim 1: Pragmatic attributes of the product influence the Perceived Usefulness and Perceived Ease of Use of that product.	H1 _A : Manipulation has positive relationship with Usefulness.	About 56% of all the reviews and about 71% of reviews mentioning actual use support this hypothesis.	Supported by the data
	H1 _B : Manipulation has positive relationship with Ease of Use.	About 40% of all the reviews and about 50% of reviews mentioning actual use support this hypothesis.	Not supported by the data
Claim 2: Hedonic attributes of a product influences the user's attitude towards that product.	H2 _A : Stimulation has positive relationship with user's attitude.	About 53% of all the reviews and about 78% of reviews mentioning positive attitude support this hypothesis.	Supported by the data
	H2 _B : Identification has positive relationship with user's attitude.	About 54% of all the reviews and about 78% of reviews mentioning positive attitude support this hypothesis.	Supported by the data
	H2 _C : Evocation has positive relationship with user's attitude.	About 16% of all the reviews and about 24% of reviews mentioning positive attitude support this hypothesis.	Not supported by the data
Claim 3: Hedonic attributes of the product influences the actual usage of that product.	H3 _A : Stimulation has positive relationship with Actual Usage.	About 57% of all the reviews and about 72% of reviews mentioning actual usage support this hypothesis.	Supported by the data
	H3 _B : Identification has positive relationship with Actual Usage.	About 59% of all the reviews and about 75% of reviews mentioning actual usage support this hypothesis	Supported by the data
	H3 _C : Evocation has positive relationship with Actual Usage.	About 18% of all the reviews and about 23% of reviews mentioning actual usage support this hypothesis	Not supported by the data

The research model after adding the supported constructs and relationships can be presented as in figure 15.

Figure 15: Research Model with Supported Relationships

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4.4 Discussion

This is one of the very few known qualitative studies to incorporate functions of hedonic attributes in TAM. It provides an important insight in understanding the iPhone acceptance from the perspective of user experience.

The findings of Study 1 show that iPhone's pragmatic attributes that allow the users to manipulate the usage and surrounding environment do have significant co-occurrences with how useful the users find the phone. In other words, it can be argued that reviewers in the sample find iPhone more useful when they can manipulate the environment with it. In contrast, co-occurrence of manipulation and ease of use is not supported by the data at an acceptable level. This finding is unexpected since many research studies on technology acceptance conceptualize 'ease of use' as usability – an instrumental quality. However, it is to be noted that some studies (Al-Gathani & King, 1999; Bruner II & Kumar, 2005) find ease of use as related to enjoyment or fun. Hence, it can be argued that there is an interaction between ease of use and hedonic attributes. This interaction, if so exists, could be a reason for not finding ease of use significantly co-occurring with manipulation function. Further research is needed to obtain a detail understanding in this respect.

Another important finding of this paper is that it analyzes the influence of hedonic attributes through its specific functions. It does not merely state that hedonic attributes of iPhone influence users' attitude and actual use. It analyzes the functions (stimulation, identification and evocation) which may generate the influence. These findings suggest that the new features,

applications and overall enjoyment of using iPhone are important in forming a positive attitude. The same is true for the unique personality that users think they can portray through iPhone. The beauty aspect of the product also plays an important role. However, brand loyalty as an evocative function does not occur frequently in the data as conjectured. The availability of information about similar products and their functionalities offer users with more options and this enhanced accessibility in turn may influence the evocative ability of brand loyalty. This finding about the brand loyalty varies from the results of Qi et al. (2009) where they find brand experience of mobile data services in China having significant influence on attitude. However, it is important to note that mobile data services and smartphones are different products and thus may be judged by the users differently.

Overall, the findings of this research suggest that stimulation and identification abilities of iPhone do influence the attitude and actual use. It is interesting to note that in this sample of 457 reviews, only one review mentions about network externality. This aspect of mobile phones has probably been diffused properly and no longer considered as a factor worth mentioning. In contrast, the new abilities in terms of applications and technology integration emerge as particularly important. Therefore, this research gives a new insight in the mobile acceptance behavior. It is to be noted that this research focuses only on one product and hence the results cannot be generalized for other interactive products until additional research is done.

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5.0 Study 2: Ethnographic Decision Tree Modeling for Analyzing

iPhone Acceptance (EDTM)

5.1. Background

Ethnographic decision tree modeling (EDTM) is a qualitative research method. EDTM focuses on developing and verifying a formal model of choice in order to make a particular decision (Beck, 2005). This method gathers the decision criteria from the decision makers themselves through ethnographic interviews and then forms “a decision tree, table, flow chart, or set of ‘if-then rules’ or ‘expert systems’ which can be programmed on the computer” (Gladwin, 1989, p.8). Then the model is tested on a separate but similar sample from the same population which provides a success or error rate for the model. EDTM, therefore, is grounded in both qualitative and quantitative approaches (Beck, 2005).

Beck (2005) analyzes EDTM using research paradigms outlined by Ponterotto (2005). Beck puts EDTM in the postpositivist paradigm noting that EDTM also has elements of constructivism during the model formation stage. Beck argues that the criteria which are generated in the model building stage are socially constructed and the meanings of those criteria are also influenced by the interaction between the researcher and the participant. But the output of this model is based on specific and verified decision rules and thus falls in the postpositivist paradigm.

5.1.1 History of EDTM

Gladwin & Peterson (2002) provide an interesting account of EDTM's origin. They start by quoting Chambers where he rejects the scientific method, quantification and hypotheses testing. In his opinion, numbers cannot predict complex and diverse reality. Gladwin & Peterson (2002) refute Chamber's argument. In their opinion, throwing away quantification and hypotheses testing leaves the researchers with more danger. Since science is based on 'hypotheses testing', without this procedure the researchers may not be able to perform a "reality check" (Gladwin & Peterson, 2002, p. 526). Gladwin and Peterson (2002) propose that building models that are able to predict individual's behavior in complex and dynamic environment is the solution to this debate. These models are subset of cognitive science models.

Cognitive science models were developed in the 1960s and 1970 during the cognitive revolution and influenced the studies of artificial intelligence, anthropology, linguistics, neuroscience, psychology and philosophy (Gladwin & Peterson, 2002). Psychologist George Miller changed the idea of human cognition through his revolutionary book, "The Magic Number Seven, Plus or Minus Two". In his opinion, human mind cannot use more than five to seven categories while making decisions. Unlike computers, which use mathematical operations of many variables, people use logic while they choose among alternatives. According to Miller, these logics are hierarchically organized and therefore, the decision making is a hierarchical process. (Gladwin & Peterson, 2002).

Linguist Noam Chomsky took up this idea of hierarchy to present grammatical rules in 'trees'. Cognitive scientists also started to use Miller's view while writing programs by imitating

the way humans think. In Psychology, the theory of expected utility was abandoned by the theories of 'elimination-by-aspects' or 'preference trees'. This view also gave birth to cognitive anthropology which focused on understanding the meaning of 'native' words through different new methods and one of these new methods is 'Ethnographic Decision Tree Modeling (EDTM).

EDTM has been mostly used by the anthropologists to predict individual behavior in a particular cultural context. Formerly, this model has been used to study agricultural decisions such as farmers' cropping decisions, land use patterns in Costa Rica and choice of illness treatment by the farm families (Beck, 2005). In recent times, researchers have been using this method in diverse fields of studies such as social, medical, and psychology. Ryan & Bernard (2006) use EDTM to predict the decision to recycle beverage cans; Beck (2005) use EDTM as a research method for counseling psychology; Johnson & Williams (1993) use it to study the needle sharing behavior of injection drug users; and Gladwin, Gladwin & Peacock (2001) study hurricane evacuations using EDTM. The examples indicate that EDTM is a research method that has the ability to be applied in diverse and complex situations.

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5.2 EDTM Methodology

EDTM views decision making as a two stage process – i) Pre-attentive elimination and ii) Maximization subject to constraints. In the pre-attentive elimination stage, the decision makers instinctively eliminate some options that may have any negative aspects and arrive at a smaller and manageable set of alternatives. This stage passes very quickly and almost without conscious involvement. Next, during the maximization stage, the decision makers consciously analyze the alternatives, one at a time. They judge the advantages and disadvantages of each alternative and then move forward in the decision tree eliminating alternatives that do not fulfill their specific needs. (Gladwin, 1989; Gladwin & Peterson, 2002; Beck, 2005)

5.2.1 EDTM Phases

Gladwin (1989) advises to conduct EDTM in two separate stages – model building and model testing. In this section, I briefly list the steps that one needs to follow in each phase.

i) Model Building: Gladwin (1989) mentions eight basic steps for model building phase. The steps are –

1. Decide which decision to study.
2. Decide on the set of alternatives in the decision.
3. Conduct the first interview remembering the conversational nature of first ethnographic interview.

- a. In this study, I use user reviews about iPhone posted on a website in the place of interviews.
4. Do some participant observation in addition to ethnographic interviews.
 - a. The participant observation is not relevant in case of this study since I use archival data.
5. Decide on the sample of decision makers to use to build the model.
6. Select the decision criteria or constraints actually considered by the decision makers to use in the model. Build some preliminary decision trees for each informant.
7. Build a composite decision model for the group from the individual decision trees.
8. Combine the individual decision trees in a logical manner while maintaining the ethnographic validity of each individual decision model.

ii) Model Testing: Gladwin (1989) proposes seven basic steps for model testing phase –

1. Build a formal list of questions to test the composite model using each decision criterion as a separate question.
2. Decide on the sample to use to test the model.
3. If possible, gather quantitative data about what the informant is actually doing before moving forward by asking why he/she is doing it.
 - a. This step is not possible in this study since I use user reviews, a form of electronic archival data.

4. Identify when the model is failing while testing the model during the interview (or analysis of the interview) and record those instances as errors in the model.
5. Calculate the success rate or error rate of the model.
6. Analyze the errors and decide if the model needs any modification.
7. Test the alternative model and compare the results from both models.

5.2.2 Strengths and Limitations of EDTM as a Research Method

As a research method, EDTM has several valuable strengths. The qualitative analysis process of EDTM requires continuous interaction between data analysis and model building. This interaction allows the researcher to develop a deep insight about the decision making process under scrutiny. This process also enables to build convincing decision criteria for the model (Beck, 2005) since these criteria are based on the decision makers' own judgments rather than any external framework (Gladwin, 1989). EDTM involves both positive and negative cases in model building and verification stages. According to Beck (2005), this inclusion of both positive and negative cases is a unique feature which also helps in valid classification of decision criteria (Beck, 2005).

Nevertheless, EDTM suffers from some limitations. First, the sequential and iterative nature of the model building and testing make the process a time consuming practice. Second, If the researcher does not use 'emic'⁴ categories as suggested by Gladwin (1989), the model may become too broad and overshadow the individual and personal categories in the decision making process.

⁴ Emic refers to a unit that can exist in contrast to other units in language or other system of behavior. In the case of EDTM, the decision criteria described by individual cases are referred to as 'emic' categories.

5.3 Data Analysis

In this study, I intend to build an EDTM to analyze the decision making process that a person follows while deciding about iPhone acceptance or non-acceptance. I use the iterative method recommended by Gladwin (1989). The data set contains 457 reviews on iPhone posted on a website. In the model building stage, I use 50 reviews selected using the random number table.

Beck (2005) points out that while building an EDTM, it is difficult to define what an acceptable sample size is. However, Ryan & Bernard (2006) show a method for selecting a minimum sample size. I follow their procedure in selecting the sample size. After analyzing the reviews, I identify that people mention at least three or four reasons for accepting or not accepting the phone. Therefore, my intention is to build a model which has at least five layers. I want to have at least one reviewer for each end point. I use the formula proposed by Ryan & Bernard (2006) for calculating the minimum sample size:

$$\text{Minimum sample size} = \text{Minimum cases at each end point} * 2^{(\# \text{ of levels})}$$

Under this formula, the minimum sample size for this research should be $(1*2^5) = 32$. It is important to note that perfect bifurcation is rare in case of ethnographic models and therefore, having a safety stock is necessary (Ryan & Bernard, 2006). As such I choose 50 reviews, almost one and a half times greater than the minimum requirement.

From those 50 reviews, I first identify the causes people listed as reasons for using or not using the phone. Some of the reasons mentioned by the users are given in Table 5 –

Table 5: Reasons given in the reviews for using or not using the iPhone

Reasons for using	Reasons for not using
1. Lots of applications and app store	1. Can't send picture messages
2. Internet browsing	2. Can't attach picture to text messages
3. Communication device that goes far beyond a phone	3. It freezes
4. Technology integration	4. It is expensive
5. Enjoyable to use	5. Very poor battery life
6. Easy to use	6. No MMS, no video recording
7. Intuitive interface	7. Not a good basic phone
8. Amazing Touch-screen	8. Lacks many essential features
9. Functionality with design, fun and class	9. Not reliable
10. Synergy of features and functionality	10. Camera is the biggest disappointment for me
11. Can get the information I need	11. Apple controls the apps
12. GPS	12. Limited functionality
13. 3G	13. No copy and paste
14. It's cool to have one	14. Fragile
15. Fun	15. Bad reception
16. Music player	16. No voice dial
17. It's beautiful/cute/pretty	17. It has bugs
18. Customization	18. It drops calls frequently
19. Interesting games	19. No sliding keyboard
20. Best web experience	
21. Synchronization	
22. Design	
23. I want the newest product in the market	

Next, I group these reasons into decision criteria. I use the indirect method of model building recommended by Gladwin (1989). According to Ryan & Bernard (2006), this iterative procedure is comparatively less formal and follows principles of analytic induction. Figure 16 shows how one branch of decision paths is developed through indirect method. First, one simple preliminary model (Model 1 in figure 16) is built from one review. Then new decision points are added to the preliminary model whenever the reviews under investigation do not meet a criterion (Model 2, 3 and 4 in figure 16). It has been assumed that the people who post reviews on a website are more proficient with new technologies and that is why the model starts with 'tech savvy' criterion. Finally, all the alternative decision points are combined into a complete model.

Figure 16: Indirect method of Model Building

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The figure 17 shows the model that I develop using the 50 reviews.

Figure 17: Decision Tree Model (Sample: 50)

Figure 1: As a next step, I built a list of questions (Table 6) to test the model on the full data set of 457 reviews.

Table 6: List of Questions for testing EDTM

A) Factual Question		
1) Is the reviewer actually using the iPhone	Yes _____	No _____
B) Decision Criteria		
1) Is the reviewer a tech savvy user?	Yes _____	No _____
2) Is the phone useful as a basic phone?	Yes _____	No _____
3) Does the phone lack other essential features?	Yes _____	No _____
4) Is the reviewer bothered by the battery life?	Yes _____	No _____
5) Does the reviewer consider iPhone applications as important?	Yes _____	No _____
6) Is the phone more functional?	Yes _____	No _____
7) Is the phone easier to use?	Yes _____	No _____
8) Is the phone being considered as a personal symbol?	Yes _____	No _____
9) Is the phone enjoyable to use?	Yes _____	No _____

It is important to define the concepts in order to operationalize the model. The operational definitions of the concepts in each decision criterion and verbatim justifications from the reviews are presented in Table 7:

Table 7: Concepts used in EDTM and verbatim justifications

Concepts	Operational Definitions	Verbatim Justifications through Examples of Comments	
		Yes	No
1. Tech Savvy user	'Tech savvy' generally refers to individuals or groups who are proficient in using new technologies. Therefore, the reviewers who mention about their frequent use of new products, new applications and/ or explicitly identify themselves as technologically advanced individual are categorized as tech savvy user.	"I've owned countless smartphones, but my 3G iPhone is by far the best, there's really no comparison with older attempts at handheld computers with robust communication capabilities."	"I'm not a very technical minded person."
2. Useful as a basic phone	It refers to the ability of the phone to deliver the basic services that are expected from any cellular phone such as good call and sound quality, good connection to the network etc.	"The ultimate balance of media player and phone."	"Very good as a blackberry alternative, but seriously bad as a phone."

Concepts	Operational Definitions	Verbatim Justifications through Examples of Comments	
		Yes	No
3. Lacks other essential features	It refers to the ability of a cellular phone to deliver the features that the users find essential after the phone satisfies its basic functions.	"How can you not be able to send a picture message? With my old Motorola flip phone with Primeco 10 years ago I could send pictures messages. The screen cracks for no reason. This is not a very functional phone. The phone freezes."	"Great features and ability to add-on features through apps"
4. Bothered by battery life	It refers to the problem with the battery life that the reviewers find as an obstacle toward acceptance.	"First the battery was bad really bad. After 2 hours of on & off usage you're in trouble."	"Battery life is manageable if you can charge it nightly or turn off features not being used."
5. Applications are important	It refers to whether the reviewers find the iPhone applications external to basic phone services as important for acceptance.	"The range of applications available for free or very little money is awesome. Such a concept! I will never again think of my iPhone as just a phone."	"App store is good, but not many useful applications compared to my previous smartphones"
6. More functional	It refers to the conception that the reviewers hold about the functionality of iPhone compared to other phones they have used in the past or that they use as a requirement of their profession.	"This phone is incredibly easy to use with most functions one touch away. I can sync my contacts, photos, calendars, and have mail pushed to the phone and yes there is microsoft exchange support."	"I'll keep it as a toy nothing more. Does not have the right attitude to be in business."
7. Easier to use	It refers to whether the reviewers find or expect to find iPhone as easier to use compared to other phones they have used in the past or those they use as a requirement of their profession.	"Other smart phones don't compare. Email wise, easy to use, quick typing, beautiful."	"Forget about user friendly."

Concepts	Operational Definitions	Verbatim Justifications through Examples of Comments	
		Yes	No
8. A personal symbol	It refers to whether the reviewers consider iPhone more as a personal symbol rather than a mere communication device.	"It's what's on style and it's a step up for me."	"this is just a toy, not for me"
9. Enjoyable to use	It refers to whether the reviewers find iPhone as 'fun' to use compared to other phones they have used in the past or those they use as a requirement of their profession.	"I've had more fun with this device than any other I have bought this year. It's just a joy to use. I don't miss T-mobile one bit."	"If you want a toy this is great but if you want business and function this is not fun for you."

It is important to formulate the operational definitions since my objective is to test the ethnographic model on the full data set of 457 reviews. These definitions provide me a guideline regarding which review to categorize under what concept. Articulating operational definitions and providing verbatim justification for each concept also help the reader to better understand the data analysis process. This detail and rich description is also important and appropriate for ensuring the reliability of the research procedure.

5.4 Findings

In this section, I discuss the results from testing the EDTM about the iPhone acceptance. After building a preliminary model from 50 reviews initially selected, I test the accuracy rate of model on the same sample. I get an accuracy rate of 82.14% (Figure 18). It means that the model can accurately predict the decisions made in 82.14% of the total 50 reviews. Since the accuracy rate of the initial model has been relatively high; I decide to test the model on the full data set of 457 reviews without further modifications. I explain the detail testing procedure only once to avoid repetition.

Figure 18: Test Results of Decision Tree Model (50 reviews)

As a next step, I test the model on 457 reviews. The results of the test are presented in Figure 19.

I start with the 1st question in the decision criteria questionnaire. Out of 457 reviews, 289 are found to 'tech savvy' persons while 168 are 'not tech savvy' persons. Thus, guessing that everyone who is 'tech savvy' accepts the phone and that everyone 'not tech savvy' does not accept the phone produces 72 errors (25% of the 289 cases) on the left hand branch and 83 errors (49% of the 168 cases) on the right hand branch of the model, for a total of 155 errors and an accuracy rate of 302 out of 457 cases or 66%.

On the right hand branch of the model, assuming that nobody accepts if he/she is not tech savvy produces 85 correct answers out of 168, thus producing only 51% correct answers. This improves to 91.7% after asking the 2nd and 3rd questions. The question regarding whether the reviewer thought the iPhone as a useful basic phone (2nd decision criterion) produces 29 errors (26% of the 111 cases) on the left hand branch and 1 error (1.8% of the 57 cases) on the right hand branch, for a total of 30 errors and an accuracy rate of 138 out of 168 cases or 82%.

Adding the 3rd decision criterion about the essential features of the phone produces 4 errors (17% of the 23 cases) on the left hand branch and 9 errors (10% of the 88 cases) on the right hand branch, for a total of 13 errors and an accuracy rate of 98 out of 111 cases or 88%. Overall, adding two more decision criteria results in just 14 errors out of 168 cases, or an accuracy rate of 91.7%.

On the left hand branch of the model, adding the 4th decision criterion, that is asking whether the tech savvy users are bothered by the battery life produces 5 errors (22% of the 23 cases) on the left hand branch and 55 errors (21% of the 266 cases) on the right hand branch, for a total of 60 errors and an accuracy rate of 229 out of 289 cases or 79%.

The 5th decision criterion about the importance of applications produces 41 errors (19% of 213 cases) on the left hand branch and 38 errors (72% of 53) on the right hand branch. This criterion produces a total of 79 errors and an accuracy rate of 187 out of 266 cases or 70%.

The 6th decision criterion regarding the functionality of the phone produces 1 error (0.86% of the 116 cases) on the left hand branch and 58 errors (60% of the 97 cases) on the right hand branch, for a total of 59 errors and an accuracy rate of 154 out of 213 cases or 72%.

The 7th question asks whether the reviewer found the phone to be easier to use. It produces 5 errors (11% of the 44 cases) on the left hand branch and 17 errors (32% of the 53 cases) on the right hand branch, for a total of 22 errors and an accuracy rate of 75 out of 97 cases or 77%.

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Figure 19: Test Results of Decision Tree Model (457 reviews)

The 8th criterion asks whether the reviewer considered the phone as a personal symbol. It produces 4 errors (12% of 34 cases) on the left hand branch and 71 errors (51% of the 139 cases) on the right hand branch, for a total of 75 errors and an accuracy rate of 98 out of 173 cases or 57%.

The 9th question asks whether the reviewer found the phone as enjoyable to use. It produces 10 errors (15% of 65 cases) on the left hand branch and 18 errors (24% of the 74 cases) on the right hand branch, for a total of 28 errors and an accuracy rate of 111 out of 139 cases or 80%.

Overall, the left hand branch of the model, after adding the decision criteria questions, produces 60 errors leading to a success rate of 79%. With only one branch (tech savvy) model the success rate was 75%. Even though the addition of the decision criteria improves the success rate of the left hand side only by 4%, I cannot discard the extensions since these decision criteria give important insights about the decision making process.

The complete model with both left and right hand branches has 503 correct answers out of 577 cases (the number of cases is more than 457 since the 8th decision criterion about the personal symbol is affected by 3 paths). Therefore, the success rate is about 87.18%. It means that the model can successfully predict 87.18% of the decisions made in the reviews. The success rate increases by 5.04% (from 82.14% to 87.18%) after testing the model on full data set rather than on 50 randomly selected reviews. Gladwin (1989, p.49) mentions that "if the decision model successfully predicts 85%-90% of the choices of the individuals in a group, it is assumed

to be an adequate model of the individual decision process for that group of individuals.” and this model meets the requirement.

5.5 Discussion

Hassenzahl (2004_a, p.384) argues that for fulfilling creative design goals, designers need “rich, inspiring, qualitative data, which may not even be data in the scientific sense”. In this respect, ethnographic decision tree modeling can be an interesting and effective way to analyze qualitative data in the context of technology acceptance. EDTM has the ability to give new perspectives to the designers since the model is developed using the criteria mentioned by the people personally involved in the decision making process.

Study 2 reveals some important decision points about accepting or not accepting iPhone. It is interesting to note that most of the decision criteria in the decision tree model relate to the product attributes containing both pragmatic and hedonic attributes. For example, the categories about the basic phone and greater functionality can be referred to as pragmatic attributes whereas criteria about personal symbol and enjoyment can be related to hedonic attributes. The model with these product attributes criteria has a success rate of 87.18% which means that the model is able to predict 87.18% of the decisions made in the sample. Hence, it can be argued that people decides about a technology not only for the pragmatic attributes of a product they think about ‘beyond instrumental’ or hedonic aspects as well. In other words, technology acceptance is not only influenced by the character of the person but also affected by the character of the product. It

has become particularly important how the product expresses its own personality to potential buyers.

The distinction between the 'tech savvy' and 'not tech savvy' users in the model reveals one important point. People who are not tech savvy basically want a cell phone for its mobility and other general aspects like sms, to-do list, organizer etc. The error rate under this branch is relatively low which suggests that if these people do not get basic functions they are not likely to accept the phone. It could be interesting to examine whether it is necessary to provide highly sophisticated capabilities in all iPhones even though some of the users may never use those features. Now the question is whether it is feasible to segregate the market along that dimension. No one can deny that the consumers in today's competitive world are becoming more and more powerful as individuals and therefore it might be a good time to start working on them separately. This distinction may also help the companies to target the potential buyers easily for any additional products or upgrades. Nevertheless, it is also important for designers to keep in mind that people often buy products with higher capabilities than they need or use. It is due to the secure feeling that is generated from having the options available if needed.

The results of the EDTM also suggest that users consider the ability to manipulate or influence the usage dimensions through new and useful iPhone applications as particularly important. However, it is interesting to note that a large number of reviews which either do not contain any comment about using new iPhone applications or mention that the users are not particularly fond of the applications have positive comments either on personal symbol criterion or enjoyment criterion. The same is true for the reviews mentioning that the users find iPhone as

lacking in essential features. The error rates for those criteria are 12% (personal symbol –yes), and 15% (enjoyable to use – yes). These relatively low numbers indicate that a person who does not find the applications important or thinks that iPhone lacks essential features may still accept the phone if he/she perceives the phone as a personal symbol or enjoyable. Therefore, it can be argued that it is not just the functionalities of iPhone that influence the acceptance. The hedonic aspects of the product like the identification ability (personal symbol) and stimulation (enjoyment) do play an important role. The relatively high error rate of 24% in the negative branch of ‘enjoyment’ criterion also suggests that there is something more that we need to comprehend. It is to be noted that the reviews that reach the negative branch of ‘enjoyment’ criterion contain negative or no comments about applications, personal symbol and enjoyment. Therefore, it seems logical to perceive that these people are highly unlikely to accept the phone. In contrast, the high error rate (24%) suggests that for about one fourth of total 74 reviews under ‘enjoyment –no’ branch, the reviewers actually accept the product where the model predicts them as non-acceptors. Therefore, it might be useful for future studies to include some other criteria to address this contradiction.

Overall, the EDTM results are in the same line with the Study 1 results. Both the studies find the hedonic aspects of iPhone as important in the acceptance decisions.

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6.0 Conclusion

An assessment of the research goals is important to understand the contributions of a research study. I outline specific goals for this study and after analyzing the results, it can be said that this research has been able to reach those goals for the given data set.

This research had two theoretical goals. First, the extension of TAM with product's pragmatic and hedonic attributes from user experience perspective in Study 1. Second, the development of an ethnographic decision tree model to predict iPhone acceptance decisions in Study 2. The findings of Study 1 suggest that the functions of pragmatic and hedonic attributes of iPhone have meaningful influences on the attitude and ultimate acceptance of the phone. Even though many research studies test and validate TAM constructs and extend TAM with constructs from other theories, only few studies try to incorporate the hedonic attributes of the products in the mainstream analysis. This study sheds light on this gap and contributes from the user experience perspective. Furthermore, most of the research studies about hedonic qualities focus on web pages and games (Schrepp et al., 2006). This research, therefore, also makes a different contribution by focusing on iPhone, a portable communication device.

The ethnographic decision tree model in Study 2 has also been able to predict decisions at an acceptable level. The ethnographic decision model, though widely used in qualitative research, has rarely been used in the field of information systems and human computer interaction. The new usage spectrum of interactive products makes the incorporation of qualitative approaches necessary in these fields. This research attempts to contribute toward

filling that gap through developing and testing an ethnographic decision tree model to analyze iPhone acceptance decision.

With respect to the methodological goal, the research has been able to demonstrate a qualitative approach in analyzing user experience data which are different in nature and content from the quantitative data. Only one known study by Rafaeli & Vilnai-Yavetz (2006) utilizes qualitative data for analyzing the emotional responses to physical artifact. Emotional responses are different from 'beyond instrumental' perspective taken in this research. Hence, this paper makes a different contribution.

This research also has important implications for designers and manufacturers of mobile phones. The findings of both the studies suggest that consumers while accepting a phone not only think about the functionality aspects but also consider other hedonic aspects. Designers and manufactures should invest appropriate resources to address this challenge. They should also consider promoting their product's hedonic abilities in order to achieve higher sales numbers. Before designing a product, designers may share their ideas with focus groups to get preliminary feedback regarding the pragmatic and hedonic aspects of the products. This attempt will help in designing product features valued by the consumers.

This research has some limitations worth mentioning. Both the studies focus on qualitative inquiries about one specific smartphone. Therefore, the results cannot be generalized to other interactive products without further research. It is also important to note that reviews posted on a website have the possibility to be generated from a specific group of people who are proficient with using new technologies. This issue may reduce the generalizability of the

findings. In case of ethnographic decision tree modeling, the model is built from the reasons that people mentioned in their reviews about iPhone. Hence, the criteria are specifically related to iPhone. The use of reviews instead of interviews may also have some impact on the criteria selected for the model.

Future research studies may analyze the extended technology acceptance framework with more than one product. The ethnographic decision model may be tested for other sample of different products. An interview process may also be done for adding important insights into the decision tree model. A mixed method approach combining quantitative and qualitative analysis may be utilized to enhance the generalizability of the results. A survey may produce different types of information which have not been discovered from user reviews. Future research conducted from purely subjective paradigm may also be able to identify some important concepts not covered in this research. This research also does not focus on the interrelation between the pragmatic and hedonic attributes of the product which can be an important direction for future research. It can be interesting to see how this interaction, if any, influences the technology acceptance decisions.

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Appendix A: Definition of Terms

Attitude: The extent to which a person believes that using a system will enhance his or her job performance or increase his or her productivity (Venkatesh, 2000; Venkatesh & Davis, 2000).

Affect towards use: Affect toward use is “feeling of joy, elation, or pleasure, or depression, disgust, displeasure or hate associated by an individual with a particular act” (Thompson et al., 1991, p. 127).

Compatibility: “Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters (Rogers, 1995, p. 224).

Complexity: “The degree to which an innovation is perceived as relatively difficult to understand and use” (Rogers, 1995, p.242).

Ergonomic Quality: Ergonomic quality refers to “the usability of the product, which addresses the underlying human need for security and control....EQ focuses on goal related functions or design issues (Hassenzahl, 2001).

Facilitating conditions: “Objective factors in the environment that observers agree make an act easy to accomplish” (Venkatesh et al., 2003). In an IS context, “provision of support for users of PCs may be one type of facilitating condition that can influence system utilization” (Thompson et al., 1991, p.129).

Hedonic Attributes: Hedonic quality refers to “quality dimensions with no obvious – or at least second order – relation to task-related goals such as originality, innovativeness, and so forth. HQ is a quality aspect addressing human needs for novelty or change and social power (status)” (Hassenzahl, 2001).

Image: “the degree to which use of an innovation is perceived to enhance one's image or status in one's social system” (Moore & Benbasat, 1991, p.195).

Intention: Intention can be defined as the “choice with commitment” (Cohen & Levesque, 1990).

Job-Fit: “The extent to which an individual believes that using [a technology] can enhance the performance of his or her job” (Thompson et al., 1991, p.128).

Long term consequences: “Outcomes that have a pay-off in the future” (Thompson et al., 1991, p.129).

Observability: “Observability is the degree to which the results of an innovation are visible to others” (Rogers, 1995, p. 244).

Perceived Usefulness: Perceived Usefulness (PU) has been defined as the extent to which a person believes that using a system will enhance his or her job performance or increase his or her productivity (Venkatesh, 2000; Venkatesh & Davis, 2000).

Perceived Ease of Use: Perceived Ease of Use (PEOU) has been defined as “the extent to which a person believes that using the system will be free of effort” (Venkatesh & Davis, 2000, p. 187).

Pragmatic attributes: See Ergonomic qualities

Relative advantage: “Relative advantage is the degree to which an innovation is perceived as being better than the idea it supersedes” (Rogers, 1995, p. 212).

Result demonstrability: Result demonstrability can be defined as “the tangibility of the results of using and innovation” (Moore & Benbasat, 1991, p.203).

Self efficacy: Self efficacy can be defined as “people's judgments of their capabilities to organize and execute courses of action required to attain designated types of performances. It is

concerned not with the skills one has but with judgments of what one can do with whatever skills one possesses (Bandura, 1986, p. 391).

Social factors: Social factors are “the individual’s internalization of the reference group’s subjective culture, and specific interpersonal agreements that the individual has made with others, in specific social situations” (Thompson et al., 1991, p.126).

Trialability: “Trialability is the degree to which an innovation may be experimented with on a limited basis” (Rogers, 1995, p. 243).

Visibility: Visibility can be defined as “the extent to which potential adopters see the innovation as being visible in the adoption context” (Agarwal & Prasad, 1997, p. 562).

Voluntariness of use: Voluntariness of use can be defined as “the degree to which use of the innovation is perceived as being voluntary or of free will” (Moore & Benbasat, 1991, p.195).

Facilitating conditions: “Objective factors in the environment that make the use of a system easier or more likely to be used” (Venkatesh & Davis, 2000, p. 187).

Perceived ease of use: “The degree to which an individual believes that using a system will enhance his or her job performance” (Davis, 1989, p. 312).

Relative advantage: “The degree to which an innovation is perceived as being better than the idea it supersedes” (Rogers, 1995, p. 212).

Result demonstrability: “The degree to which the results of using an innovation can be demonstrated to others” (Moore & Benbasat, 1991, p. 203).

Self-efficacy: “The degree to which an individual believes in his or her capability to use a system” (Bandura, 1986, p. 391).

Appendix B: Important Research Studies on TAM

Research stream on TAM	Author	Objective	Sample	Result
Focuses on external variables affecting original constructs or test the original model	Davis (1989)	Developing and testing the constructs of the model	152 users of four application programs	Both PU and PEOU were significant and affected use
	Adams, Nelson, & Todd (1992)	Tries to replicate TAM	Study 1: 118 respondents from 10 organizations; Study 2: 73 undergraduate and MBA students	Overall consistent results with original TAM. However, in study 2, a negative relationship was found between PEOU and usage.
	Igbaria, Guimaraes, & Davis (1995)	Test the model with determinants such as user training, experience, organizational support, end user support, system quality	214 MBA part time students	Individual, organizational and system characteristics had significant effects on PU and PU
	Agarwal & Prasad (1997)	Tests the relationship between innovation characteristics and perceived voluntariness and technology acceptance	73 MBA students	Innovation characteristics found to have influence on adoption. Ease of use did not appear to an important determinant of current use.
	Agarwal & Prasad (1999)	Relates individual differences with technology acceptance	230 users of IT products	Level of education, prior experience with the technology have significant effects on TAM's constructs
	Hu, Chau, Sheng, & Tam (1999)	Tests TAM's constructs for telemedicine technology	421 physicians	PU had significant effect on attitude and intention though PEOU had not.
	Venkatesh (2000)	Looks for determinants of PEOU such as control, intrinsic	Study 1: 70 employees; study 2: 160 employees	Was able to explain 60% of the variance with the constructs and implies that it has enhanced current

Research stream on TAM	Author	Objective	Sample	Result
		motivation and emotion		understanding
	Venkatesh & Davis (2000)	Looks for determinants of PU such as image, job relevance, subjective norms and so forth	Study 1: 48 floor supervisors; study 2: 50 financial service personnel; study 3: 51 employees; study 4: 51 employees from bank	Subjective norm had a direct relationship with intention when the use was mandatory. However, for voluntary use no direct relationship was found.
Focuses on extension of TAM	Davis, Bagozzi and Warshaw (1989)	Adds subjective norm as a construct	107 full-time MBA students	PEOU and PU had significant effects on intention
	Mathieson (1991)	Compares TAM and Theory of Planned Behavior (TPB)	163 students	Both could predict intention to use. TPB might be helpful to get better information for developers
	Taylor & Todd (1995)	Test the constructs of TAM and TPB	786 students	All the constructs from TAM and TPB had good result. The decomposed TPB offers better explanation
	Gefen & Straub (1997)	Adds gender as one of the constructs in TAM	A set of knowledge workers from North America, Asia and Europe	Found gender to have an impact on IT diffusion process
	Al-gahtani & King (1999)	Tests support, image, enjoyment, system rating and so forth	329 students in UK	TAM can be used to predict satisfaction, attitudes, and usage
	Malhotra & Galletta (1999)	Extends TAM with social influence constructs	208 potential users of IT application	Psychological attachment was found to be influencing attitude toward usage (A) while no direct relationship was found with intention.
	Dishaw & Strong (1999)	Tries to extend with Task-technology fit (TTF) constructs	Programmers in three Fortune 50 firms	TAM alone explains 36% and TTF alone explains 41% of the variance while the integrated model explains

Research stream on TAM	Author	Objective	Sample	Result
				51% of the variance.
	Lin, Shih, & Sher (2007)	Incorporates technology readiness (TR) as an antecedent to PU and PEOU	406 respondents from online investment discussion forum	Integrated model was found to be more effective in applicability and explaining ability compared to prior two models
	Kulviwat, Bruner II, Kumar, Nasco, & Clark (2007)	Extends TAM incorporating pleasure, arousal and dominance (PAD theory) to generate a unified theory Consumer Acceptance of Technology (CAT)	260 undergraduate students	Pleasure and arousal were found to be significant predictors of attitude while dominance was not found to be significant. Integrated model was able to explain over 50% of the variance in adoption intention which is more than most of the previous studies.
	Nasco, Kulviwat, Kumar, & Bruner II (2008)	Incorporates social influence in terms of dominance	230 students	Including hedonic tasks that is affective components along with utilitarian tasks complements the process of predicting attitude. Interaction between dominance and ease of use was found to have a direct impact on adoption attitude.
Focuses on internet based services and TAM	Gefen & Straub, (2000)	Examines the importance of PEOU in e-commerce adoption	217 MBA students	The direct impact of PEOU on use intention depends on the 'task' or 'type' of intended use
	Koufaris (2002)	Uses TAM and flow theory to analyze online consumer behavior	280 new customers from an online bookstore	Shopping enjoyment was statistically significant.
	Pavlo (2003)	Incorporates trust as antecedents of PU and PEOU and risk as antecedent of intention	Study 1: 36, 41 and 25 students respectively on three different websites; study 2: 155 respondents from an online survey	Trust and perceived risk was found to have direct relationship with intention to use.

Research stream on TAM	Author	Objective	Sample	Result
	Lu, Yu, Liu, & Yao (2003)	Proposes additional determinants for the TAM constructs for wireless internet such as trust environment, system complexity, individual differences		
	Yi & Hwang (2003)	Tries to predict the use of web based IS adding self-efficacy, enjoyment, and goal orientation to TAM	109 students from an introductory IS course	Enjoyment, learning goal orientation, and application specific self-efficacy was found to be positively influencing decision to use web based technology and actual use
	Klopping & McKinney (2004)	Tests TAM constructs and TTF for consumer e-commerce	263 undergraduate students	Finds strong support for using modified TAM in e-commerce. Combine model explain more variance of the intention to use
	Bruner II & Kumar (2005)	Explains consumer acceptance of handheld internet devices adding fun as a construct	212 undergraduate students	Fun was found to be a more powerful determinant of attitude compared to PU in a 'other than workplace' context.
	Saade & Bahli (2005)	Tries to understand online learning adding cognitive absorption as external variable for PU and PEOU	102 students, 52% female and 48% male	Cognitive absorption was found to be an important antecedent of PU but less important for PEOU
	Wang, Lo, & Fang (2008)	Examines the impact of network externalities on PU	165 respondents from professional societies	Technology specific value and network externality significantly influence PU

Appendix C: Important Research Studies on User Experience (UX)

Author	Objective	Sample	Product	Results
Bruner II & Kumar (2005)	Analyzing ease of use and fun in consumer acceptance of handheld internet devices	212 undergraduate students	Desktop PC, wireless phone simulation, PDA	Find 'fun' – a hedonic attribute to be contributing more than perceived usefulness in the acceptance decisions.
Demir (2008)	Discusses about the concepts, current issues, arguments and research tools in emotion & design field			
Desmet & Hekkert (2007)	Proposes a framework of affective product experience including aesthetic, meaning and emotional level			
Hassenzahl (2001)	To analyze the impact of hedonic quality on product appeal	Fifteen individuals (6 women and 9 men)	Three visual screens	Find hedonic qualities as important in forming judgments about product's appeal
Hassenzahl, Beu, & Burmester (2001)	Analyzes the importance of enjoyment in user experience and proposes systematic methods to engineering joy into products			
Hassenzahl (2003)	Proposes a user experience framework including designer and user perspective. The framework introduces the concepts of pragmatic and hedonic attributes of products			
Hassenzahl (2004_a)	To analyze the interactions of pragmatic attributes, hedonic attributes, beauty and goodness of interactive products.	Study 1: 33 individuals Study 2: 10 individuals	4 different MP3 players screens	Finds beauty to be related with self-oriented hedonic attributes rather than pragmatic attributes.
Hassenzahl & Tractinsky (2006)	Distinguishes three dominating perspectives in user experience research and provides guidelines for future research			
Hassenzahl, Schöbe, &	To analyze the impact of impact of motivational orientation in	133 online respondents	MP3 player skins	Finds that the choice of product

Author	Objective	Sample	Product	Results
Trautmann (2008)	evaluation of pragmatic and hedonic attributes			and its appeal is context dependent.
Jetter & Gerken (2006)	Proposes a unified user experience model which includes components from user, products and organization			
Koca et al. (2006)	Analyzes products from the perspective of language and parts of language			
Mahlke (2007_a)	Analyzes symbolic and aesthetic aspects of non-instrumental quality	30 individuals (15 men and 15 women)	4 digital audio players	Find both as important aspects of non-instrumental qualities
Minge (2008)	Proposes and test a dynamic user experience model including appraisal of the system, components of user experience and interaction characteristics	60 volunteers from university (24 women, 36 men)	Simulation of one portable digital audio player	Finds hedonic aspects (attractiveness) to overshadow the pragmatic aspects. Finds emotion to be related with usability but not with attractiveness
Rafaeli & Vilnai-Yavetz (2004)	Develops a model of the relationship between physical artifacts and emotions	Qualitative data gathered from 3 groups of experts through interviews	Green color of a public transportation bus	Finds that the emotional response to a physical artifact is generated by hygiene, sensory and associative process respectively related to instrumentality, aesthetics and symbolism.
Schrepp, Held, & Laugwitz (2006)	To find out the impact of hedonic aspects of a product on its attractiveness	85 participants from university	3 interfaces of business management software	Finds that pragmatic and hedonic aspects influence the attractiveness of a product

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