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Technology Adoption at the Consumer Level: Focus on Internet Based Communication Technology

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ABSTRACT

Technology adoption has been a very important area of interest in IS research. However, much of this research has been limited to the organizational and household contexts. There is a need to examine adoption at the consumer level as we believe that factors affecting adoption decisions in the contexts somewhat different from those affecting individual adoption situations. The purpose of this paper, as research in progress, is to propose a technology adoption model at the consumer level based on the well established attribution theory and product attribute model. We are focusing on Internet based communication tools and in particular Instant Messengers (IMs). Our model has five variables, perceptions of product attributes, interpersonal influence on adopter, inherent innovativeness, vicarious innovativeness, and adoptive innovativeness. This paper provides a logical framework for a future empirical study that would investigate and test the hypotheses proposed in this paper.

Keywords: *Technology adoption, consumer, vicarious innovativeness, adoptive innovativeness, product attributes, interpersonal influence, instant messengers.*

Introduction

Consumers experience various technologies in their everyday lives while being constantly bombarded with newer and supposedly ‘better’ alternatives. Faced with such a myriad of choices, consumers tend to adopt technologies selectively.

Technology adoption has been studied in various disciplines and in various contexts. For example, economists have studied adoption or diffusion of software in a societal context. Economic studies, based on stochastic models, have shown the process of diffusion of software in a society but portray little about adoption at the individual consumer level (e.g. Dekimpe et al., 2000). Researchers in the Marketing discipline have also studied adoption theories but mostly in product categories like clothing and household products. Similarly, in the Information Systems (IS) field, starting with Davis (1989), models like Technology Acceptance Model (TAM) have been employed in many studies focusing on the workplace. Many of the studies in MIS area have been based on organizational context, and the unit of analysis was employees in an organization or an organization as a user (a user group). More recently Venkatesh et al. (2003) provided a unified view to understand technology adoption in the organizational context. Jeyaraj et al.’s (2006) study shows that most of the studies about IT adoption focused on the organizational level and among them, had a staggering 135 independent variables, 8 dependent variables, and 505 relationships! Venkatesh and Brown (2001) and Brown and Venkatesh (2005) studied technology (computer) adoption at the household level while putting forth a contention that household adoption situations may be different from adoption situations at the organizational level. However, these studies have limited applicability at the consumer level as the household studies deal with decision making where more than one person is involved.

We believe that there has been a lack of focus on the individual decision making as a consumer and that factors affecting adoption decisions in the contexts mentioned above maybe somewhat different from those affecting individual adoption situations as a user in at least three ways: First, individuals as consumers have more autonomy to make adoption decisions while individuals within organizations tend to have limited say when it comes to such adoption decisions. Second, consumers in general have multiple alternatives available for consideration while individuals in the organizational context are seldom given any. For example, individual workers in an organization may hardly have alternatives even though they do not like a particular type of information systems. Additionally, post-adoption behaviors of an employee as a user can be somewhat more constrained due to the relative lack of alternatives whereas a consumer can behave differently such as discarding a product in the same type of technology. Third, studies at the household level are different from those at the consumer level. At the household level, decisions for adoption may generally be made by heads of the family or a group of family members. These decisions may usually involve a variety of factors that cater to the optimal adoption decision for the whole family. However, at the individual level, decisions are likely to be made based on individual needs.

Based on the limitations from the prior studies and drawing from adoption related literature mainly across the MIS, marketing, and psychology areas, this paper attempts to incorporate three research purposes. First, we wish to propose a technology adoption model at the consumer level in the context outside an organization. There are conflicting views about the need for different adoption models across different product categories. For example, according to Rogers (2003) technology adoption has been categorized into hardware and software adoptions and Midgley and Dowling (1978) asserted that adoption of a new product is a “function of... product category involvement.” On the contrary, Bearden et al. (1989) argued that adoption related studies are not product and/or situation specific. In this study, we assume that different contexts should have different models to describe behavioral adoption even though such adoption models can share the same latent variables. Second, as an exploratory study, in this paper we try to explore the types of features of a technology that consumers perceive to be relevant during adoption. A deeper understanding of such perceptions may identify with or expand Roger (2003)’s five factors and Davis (1989)’s TAM model. Third, this paper attempts to expand technology adoption into consumers’ purchasing behavior because technology adoption can be carried out by purchasing specific products from among various alternatives. In other words, this paper may help understand the following questions: Why consumers select a specific product among the alternatives even though products show similar levels of ease of use and usefulness? Are there any hierarchies of the features perceived by consumers that influence the consumers’ decision making for a particular product?

Based on the above rationale, this study makes an initial attempt to develop an adoption model at the consumer level focusing on Internet based communication tools and is based on the well established

attribution theory and product attribute model (Brechan, 2006). We are focusing on Internet based communication tools and in particular Instant Messengers (IMs). Our model has five variables, perceptions of product attributes, interpersonal influence on adopter, inherent innovativeness, vicarious innovativeness, and adoptive innovativeness.

Theoretical Framework

Actualized and Inherent Innovativeness

Midgley and Dowling (1978) identified innovativeness as “the degree to which an individual is receptive to new ideas and makes innovation decisions independently of the communicated experience of other” (p.236). However, according to Hirschman (1980), Midgley and Dowling (1978) distinguished between generalized or inherent innovativeness and actualized innovativeness. Actualized innovativeness “deals with product adoption (measurable behavior) (Hirschman, 1980, Emphasis Added)” and inherent innovativeness is considered to be a trait and is the tendency of individuals to be attracted to the new and different. Based on similar prior literature, Agarwal and Prasad (1998) and Flynn and Goldsmith (1993) also differentiated global innovativeness, which refers to personality traits from domain specific innovativeness which affect adoption behavior within a particular domain.

According to Hirschman (1980)¹, actualized innovativeness has two components viz. vicarious innovativeness and adoptive innovativeness. He referred to vicarious innovativeness as “the acquisition of information regarding a new product” and to adoptive innovativeness as “the actual adoption of a new product at the relative early stage of the life cycle.” In this paper we followed Hirschman (1980)’s definitions discussed above. This conceptualization was also employed in Ridgway and Price’s (1994) study of innovativeness. More recently, Hartman et al. (2003, 2006)² empirically identified the two distinct types of innovativeness and demonstrated that the two types of innovativeness would affect consumptions and are highly related to consumers’ purchasing decision. In this paper, actualized innovativeness which is composed of vicarious innovativeness and adoptive innovativeness is employed as a surrogate of adoption behavior.

Attribution Theory

Attribution theory is widely accepted in the psychology area for the study of human behavior. It explains a person’s behavior in terms of situational factors and dispositional factors (Gilbert, 1995; Medcof, 1990). This theory has generally been demonstrated using the two stage model by Trope (1986) and the three stage model by Gilbert et al. (1988). Although the two models differ in certain ways, both are similar in that they elucidate ‘what happens’ and ‘why it happens’ in terms of three variables - situation, disposition, and behavior. In this study, we identified technology adoption as behavior, product attributes and interpersonal influence on adopter as situational factors, and inherent innovativeness of consumers as disposition. Use of this theory can enable us to focus on situational and dispositional factors as the dominant antecedents leading to adoption behavior. These constructs have been highly emphasized to understand human behavior in the management area, even though this analogy seems to be distal. For example, Hackman (2002) argued that we have to understand the objective environment (the properties of the job in Hackman’s paper), characteristics of the group (informational cues from others), and characteristics of the person (readiness to accept). Further he (p.223) contented “to look at only one of these

¹ In addition to the two types of innovativeness, Hirschman (1980) demonstrated ‘use innovativeness’ as individuals’ seeking variety in usage and new features in an existing product. But, in this paper, we thought it is more close to adaptive behavior so that it was not employed in further process.

² Harman et al. (2006) also employed three types of innovativeness, e.g. vicarious, adoptive, and use innovativeness and two types of consumptions e.g. hedonic and utilitarian consumptions.

three factors is to badly misconstrue...” Similarly, the three factors, we believe, can robustly explicate adoption behaviors in MIS context.

Product Attributes Models

The concept of product attributes has been discussed in many articles on product differentiation. A Product attribute model was first proposed by Levitt (1980). The model has a hierarchy which has four attributes, generic product, expected product, augmented product, and potential product. Similarly, Kotler and Armstrong (2004) proposed a product attribute model which has three attributes, problem solving benefits, actual product, and augmented product. Brechan (2006) highlighted that although these two models may seem similar, they have some differences. One important distinction is that, in Levitt’s (1980) model, the physical or generic product forms the core product whereas in Kotler and Armstrong’s (2004) model, problem solving benefits form the core product and the physical product is placed in the second layer of the total product. However, Brechan (2006) argued that since it is the customer that eventually decides on which products to purchase, what constitutes the core product should depend on the customer’s perceptions of the problem solving nature of the product. Subsequently, Brechan (2006) proposed the hierarchy of product attributes model. Similar to Kotler and Armstrong’s (2004) and Brechan’s (2006) discussions, in MIS area, Jasperson et al. (2005) also differentiated the core features, which represent the identities of a technology from the other features which refer to optional features.

Perceptions of product attributes are consumers’ perceptions of the problem solving nature of a product (Brechan, 2006) and are categorized in a hierarchy of primary, secondary, and tertiary attributes. According to Brechan (2006), the primary attributes refer to essential problem solving features of a product, the secondary attributes are the non-essential, anticipated problem solving features, and tertiary attributes are the non-essential, unanticipated features.

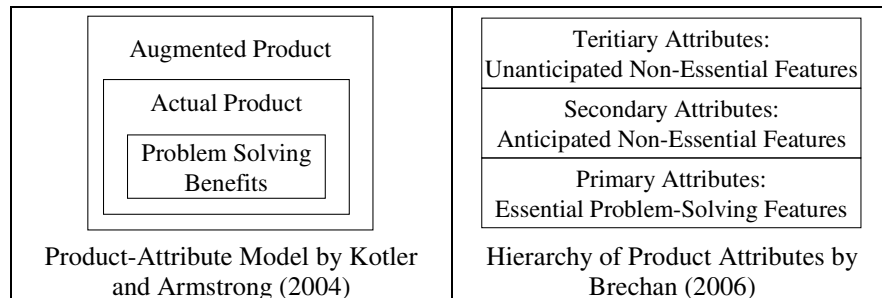


Figure 1: Product Attribute Models

Hypothesis

The research model in this paper is shown in Figure 2. The model has five variables (perceptions of product attributes, interpersonal influence on adopter, inherent innovativeness, vicarious innovativeness, and adoptive innovativeness) under three groups, situations, dispositions and behaviors. Two variables, perceptions of product attributes and interpersonal influence on adopter, fall under the situations group. Perceptions of product attributes are defined as those perceptions that relate to the problem solving nature of a technology as held by an adopter. Interpersonal influence is considered as inward word of mouth influence directed from a sender to an adopter. Word of mouth is said to progress through interpersonal channels which are based on shared interests and/or friendship (Arndt, 1967). Under the dispositions group, we have inherent innovativeness which refers to a person’s “tendency to be attracted to new and different stimuli (Ridgeway and Price, 1994).” The behaviors group consists of vicarious innovativeness and

adoptive innovativeness as the two components of actualized innovativeness. Vicarious innovativeness refers to consumer’s behavior toward acquiring information about a new technology and adoptive innovativeness is the actual adoption behavior (Ridgeway and Price, 1994; Hirschman, 1980). The relationships among these variables are explained below:

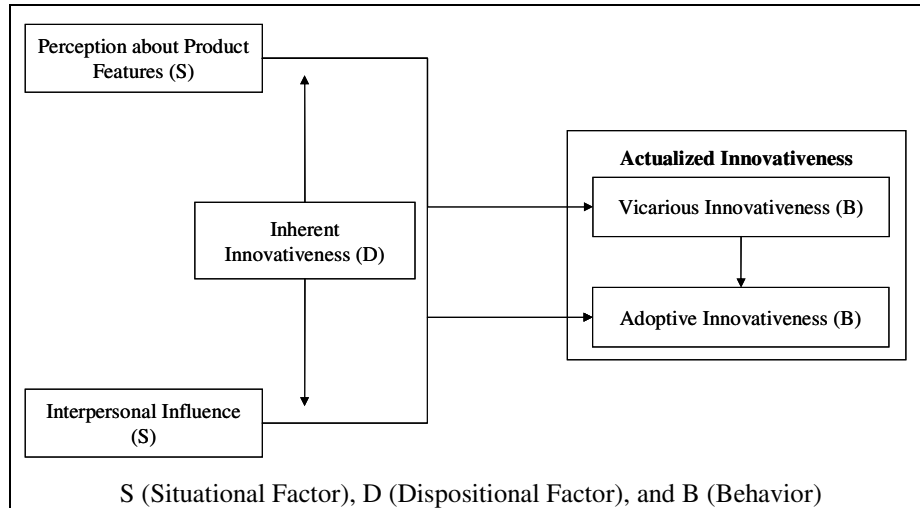


Figure 2: Research Model

The effects of product attributes have been studied in prior research. For example, Chakravarty et al., (2006) investigated the effects of various product quality attributes on price which ultimately affects new software diffusion. Rogers (1962) explicated factors like observability, trialability, and complexity as perceived innovation attributes of new technology. Ostlund (1974) empirically studied the effect of Rogers’ attributes and concluded that “perceived innovation attributes are strong predictors of new product purchase.” Similarly, Horsky (1990) identified the effect of product benefits in durable products, such as VCRs, dishwashers and microwaves, during diffusion. In MIS area, the attributes of a technology have been the focus of prior research. As mentioned earlier, after Davis’s (1989) initial work (ease of use and usefulness), numerous attributes to affect adoption in an organizational context have been examined. Similarly, feature centric view of technology³ has been highlighted in post-adoption related research (e.g. Griffith, 1999 and Jasperson et al., 2005). Griffith (1999) suggested a model which has the relationships between product features and their outcomes (e.g. individual sensemaking and adaptive structuration). Similarly, Jasperson et al. (2005) in their conceptual paper proposed a model that the perception of the features of the technology would influence usage of the technology after the initial decision of adoptions.

In light of Brechan’s (2006) product attribute model, when consumers have fulfilled their primary needs through the essential problem solving features of a product and potentially experience enhanced satisfaction levels based on other product attributes, they may develop positive perceptions of the attributes. We hypothesize that such perceptions of product attributes would lead to new technology adoption. In this hypothesis, we didn’t confine the product attributes (e.g. ease of use, usefulness, compatibility, observability, etc.) based on prior studies due to our research strategy (an exploratory study).

H1: Perceptions of product attributes would positively affect actualized innovativeness.

³ The term feature(s) and attribute(s) in prior literatures seemed to be used interchangeably. For example, Rogers (2003) and Davis (1989) identified complexity, triability, compatibility, relative advantage, and observability as perceived *attributes* of innovations to affect innovation decision, whereas Griffith (1999) and Jasperson et al. (2005) designated technology *features* to influence post-adoptive usage. Therefore, in this paper, we thought, those nomenclatures can be used interchangeably, and kept them into a term *attribute(s)* consistently. Additionally, the boundary between adoption and post-adoption in this paper may be arguable based on prior research such that both behaviors can come out after the exposure to new technology. However, addressing this issue may be beyond the research scope of this paper.

H1-1: Perceptions of product attributes would positively affect vicarious innovativeness.

H1-2: Perceptions of product attributes would positively affect adoptive innovativeness.

Interpersonal influence has been considered as an antecedent to technology adoption (Mourali et al., 2005; Mittal, 2004) because influence from social network is one of the main informational sources for consumers (Wiedmann et al., 2001; Midgley and Dowling, 1993). Studies related to consumer decision making have shown interpersonal communication to be more important than other sources in transmitting information and in shifting opinions (Gilly et al., 1998). Consequently, word-of-mouth sources have shown to influence adoption of innovations (Gilly et al., 1998). On the contrary, Horsky (1990) asserted that word of mouth has weak effects on consumer's adoption, and the amount of impact is different and depends on product categories. However, we, unlike Horsky, believe that interpersonal influence would be a predictor of new technology adoption. Other than social network and interpersonal communication research, network externality research has also alluded to interpersonal influence indirectly. Recently, because many technology products are based on network base, people can be constrained while they are selecting their network based products (Kauffman et al., 2000). Similarly, Katz and Shapiro (1986) averred that the advantages from the network product are likely to be congruent with the number of users who adopt the product. In communication technology contexts, we believe membership or group homogeneity which users can feel while using the technology can be critical factors for users to start adopting new communication technology. Therefore, interpersonal influence during adoption can affect adoption decisions of consumers. One application of this context is many mobile communication firms promoting their mobile phones for new customers by grouping users into family members and/or friends.

H2: Interpersonal influence would positively affect actualized innovativeness.

H2-1: Interpersonal influence would positively affect vicarious innovativeness.

H2-2: Interpersonal influence would positively affect adoptive innovativeness.

Information influences consumer's decision making to accept or reject technologies with credence. This is realized through internalization which means people tend to assimilate new technologies because their content fits into people's value systems (Kelman, 1958; Bearden, 1989). Prior studies have proposed that innovativeness, considered as personal characteristics (Ridgeway and Price, 1994), predisposition (Hansen, 1976), novelty (Manning et al., 1995), and inherent innovativeness (Ridgeway and Price, 1994), of consumers would affect adoption. Even though innovativeness tends to play a critical role to explain technology adoption, there has been little effort toward identifying it in technology adoption area (Agarwal and Prasad, 1998). But recently, Yi et al. (2006) identified the partial moderation of personal innovativeness in the relationships between behavioral intention and innovation characteristics as well as the direct influence of personal innovativeness on behavioral intention. Even though a consumer perceived the same product features, his/her innovativeness can be realized differently due to the difference of his/her nature, inherent innovativeness. In similar vein, a consumer can behave differently even if his/her colleagues recommend adopting a new technology. We hypothesize that if consumers have the same level of influence from perceptions of product attributes and interpersonal influence, the higher the inherent innovativeness the higher the level of adoption.

H3: Inherent innovativeness of consumers would moderate the relationship between the two situational factors and actualized innovativeness.

H3-1: Inherent innovativeness of consumers would moderate the relationship between perceptions of product attributes and vicarious innovativeness.

H3-2: Inherent innovativeness of consumers would moderate the relationship between perceptions of product attributes and adoptive innovativeness.

H3-3: Inherent innovativeness of consumers would moderate the relationship between interpersonal influence and vicarious innovativeness.

H3-4: Inherent innovativeness of consumers would moderate the relationship between interpersonal influence and adoptive innovativeness.

In studying mechanics of human belief, Gilbert (1991) asserted that human beings tend to comprehend before adopting or accepting a proposition, and search for confirmatory information about such an idea or a concept. If there is no contradiction between their prior comprehension and confirmatory information,

people finally accept the hence so far unaccepted. Bandura (1986), based on a social cognitive view of behavior, asserted that people tend to enhance their self-efficacy to do a certain behavior through vicarious experience. In similar vein, people tend to try to experience before they start actual usage, and such an experience may help them confirm their adoption/rejection behaviors. Hirschman (1980) and Ridgeway and Price (1994) distinguished adoptive innovativeness from vicarious innovativeness. Rogers (2003, p.171) in his discussion of the five stages model of innovation-decision process suggested that ‘persuasion’ occurs before ‘decision’ (stages 2 and 3 respectively). He states that in the ‘persuasion’ stage, an individual actively seeks information about a new idea, sifts through the information for credibility and decides on how he/she will interpret such information. Very often, we may experience in our daily life that a friend’s exemplary behavior or information through different ways makes us believe that we can behave in a like manner. In the decision stage that particular new idea is adopted or rejected. In congruence with the above understanding, we hypothesize that the vicarious innovativeness would affect adoptive innovativeness.

H4: Vicarious innovativeness would positively affect adoptive innovativeness.

Methods

This study aims at providing a technology adoption model at the consumer level and is focused on the context of IMs. Figure 3 represents the overall research process involved in this study. First, field interviews will be conducted in order to delineate product features that are perceived by users to be important in the problem solving capabilities of the product. Such a tactic was also employed in Venkatesh and Brown (2001) “to obtain factors that were not constrained by a priori identification of constructs as in traditional survey research (p.78).” Second, Q-sorting techniques will be used to group the product features identified during the interviews into primary, secondary and tertiary features. Q-sorting is used to examine opinions and attitudes and would benefit 1) in-depth study of small number of populations and 2) help in exploratory research with a methodology like field interviews (Thomas and Watson, 2002). Third, a Web based survey will be used for data collection. Fourth, path analysis with exploratory factor analysis will be conducted to identify perceptions of product attributes, interpersonal influence, inherent innovativeness, vicarious innovativeness and adoptive innovativeness and to examine the relationships among these variables. Validity concerns and fitness of model issues will also be addressed in this stage.

Perceptions of product attributes will be measured based on scales generated with the help of Q-sorting procedures during the second stage. Scales developed by Gilly et al., (1998) will be used to examine interpersonal influence and Hartman et al.’s, (2004) scales will be employed for measuring vicarious innovativeness and adoptive innovativeness. Inherent innovativeness will be measured based on scales developed by Hurt et al. (1977). Seven-point Likert-type questions will be used and the scales above will need to be slightly modified to fit our research context.

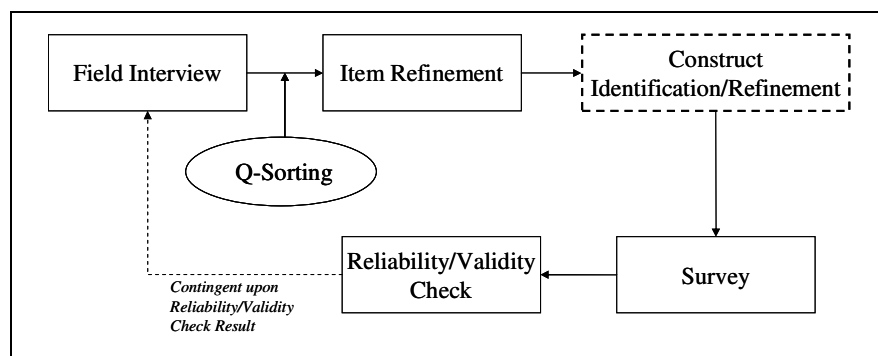


Figure 3: Research Process

Conclusion

Technology adoption has been a very important area of interest in IS research. However, much of this research has been limited to the organizational context as a user. There is a need to examine adoption at the consumer level. This study focuses on instant messenger technology. This paper as research in progress provides a logical framework that would help understand technology adoption at the consumer level. Currently, data to identify product features have been gathered, and following the research process in figure 3 we have started analyzing data. For example, the product features have been identified based on the Web-based interviews with 123 students. We have begun the second phase of data collection for examining the relationships among the variables. We believe the final results would be of interest to IS researchers as well as practitioners for a better understanding of the underlying nuances of technology adoption at the consumer level.

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