

# **THE EFFECT OF PERSONAL INNOVATIVENESS IN THE DOMAIN OF INFORMATION TECHNOLOGY ON THE ACCEPTANCE AND USE OF TECHNOLOGY: A WORKING PAPER**

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## **ABSTRACT**

PIIT is defined as the willingness of an individual to try out any new information technology. Surprisingly, this stable-trait has not been used in many studies of technology acceptance. In this study, PIIT will be used as a main-effect variable to help explain behavioral intentions. The effect of PIIT on technology acceptance and use will be tested using the Unified Theory of Acceptance and Use of Technology (UTAUT) model as the framework. It is hypothesized that the inclusion of PIIT in the research model will better explain the process of individual level adoption and use. Keywords: **personal innovativeness, technology acceptance**

## **INTRODUCTION**

Individual level technology acceptance is one of the most researched areas in the field of information systems (IS). A recent review of the Technology Acceptance Model (TAM), just one of the many available models used to predict individual acceptance of technology, cited over 100 TAM studies during the last 17 years [13]. Furthermore, this article only cited TAM studies from the leading IS journals and conferences.

Individual level technology acceptance is an oft-studied phenomenon, since lack of acceptance of new technology on the part of employees can cause information technology (IT) projects to fail. A KPMG report of European companies found that over half of the 134 companies surveyed experienced IT project failures, and the average cost of these projects was over 14 million dollars [5]. Obviously, if these failures can be reduced, companies will be more willing to invest in technology projects, which will help achieve their goal of enhancing company profitability.

In a recent study, eight competing models (Theory of Reasoned Action, TAM, Motivational Model, Theory of Planned Behavior, Combined TAM and TPB, Model of PC Utilization, Innovation Diffusion Theory, and Social Cognitive Theory) of IT acceptance were consolidated, and the most important factors leading to both the acceptance and use of technology were identified [21]. This study's goal was to improve upon the predictive ability of the individual models by identifying commonalities and capitalizing on the best aspects of each model. This research led to the creation of the Unified Theory of Acceptance and Use of Technology (UTAUT) model.

The individual scale items from each of the eight models were factor loaded and the four highest loading items for each factor were retained. For example, the factor labeled performance expectancy takes items from the perceived usefulness construct of TAM, the relative advantage construct of innovation diffusion theory, and the performance outcome expectations of social cognitive theory. This same process was repeated for all of the factors.

The analysis identified four major factors leading to the creation of behavioral intentions, labeled performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy is the perception of gains on the job attained by using the system. Effort expectancy is the perception of ease associated with using the system. Social influence is defined as “the degree to which an individual perceives that important others believe he or she should use the system” [21]. Finally, facilitating conditions are “the degree to which an individual believes that an organizational and technical infrastructure existing to support the use of the system” [21]. To predict actual usage, a three-item behavioral intention scale was also included in the model.

The model was tested with and without four moderator variables, age, gender, experience with the technology, and voluntariness of use of the technology. It was found that the four moderator variables improved the predictive ability of the UTAUT model, so the moderators were included in the final research model.

In [21], the UTAUT model outperformed any of the eight existing ones and explained about 70 percent of the variance in intention to use technology. The UTAUT model seems vastly superior compared to the other eight, which only explained between 17 and 42 percent of the variance.

One of the strong points of the TAM model is its simplicity. TAM is very intuitive, is easy to test, and has been applied to many forms of technology including communications tools, office applications, groupware, decision support systems, and specialized business systems [13] [17]. While not as concise as TAM, the UTAUT model explains user acceptance in a more realistic manner than the two-construct TAM model. Therefore, by consolidating and improving upon existing IT acceptance models, the UTAUT model should now serve as a benchmark against which all future models will be compared, much like TAM did over the past 15 years.

As the popularity of TAM grew, additional studies were performed that explained possible antecedents of perceived ease of use and perceived usefulness. The goal of these studies was to broaden the scope and generalizability of TAM, and to improve the amount of variance explained in the dependent variable.

Similarly, then, the proposed study will seek to extend the UTAUT model. Also, as the UTAUT model is relatively new, this study will also attempt to replicate the findings of [21], similar to replication studies in the early years of TAM research [1].

The planned study will augment the UTAUT model by utilizing the individual innovativeness. First introduced in 1998, the construct of Personal Innovativeness in the Domain of Information Technology (PIIT) is designed to measure “the willingness of an individual to try out any new information technology” [3]. While the

UTAUT model measures the constructs of effort expectancy (similar to ease of use), performance expectancy (similar to usefulness), social influence, and facilitating conditions, it fails to measure individual traits, such as innovativeness, that might help explain the acceptance and use of technology.

The goal of this study will be to determine the effect of the inclusion of the PIIT construct in the UTAUT model framework. It is expected that by adding PIIT, the amount of variance explained in both intention to use and use of new technology should increase. So by including PIIT, a more realistic picture of individual level IT acceptance and use can be shown. This goal will be accomplished by analyzing the collected data twice: once with the original UTAUT variables, and once with PIIT plus the original variables. Conducting the data analysis twice shows how the model performs in its original form (replication) and with the inclusion of the new variable (extension).

## **PIIT LITERATURE**

There are a few studies that have previously used PIIT as a construct in their research model. PIIT has been used as an antecedent to other variables, as a consequent of other variables, and as moderator between variables. PIIT has been proposed as an antecedent to computer self-efficacy [4] [12] [20], computer anxiety [20], relative advantage [11], perceived ease of use and perceived usefulness [12] [14] [16]. As a moderator, PIIT has been proposed to better explain the relationship between perceived ease of use and intention to use, and between perceived usefulness and intention to use [3]. Finally as a consequent, the variables that have been modeled to influence PIIT are disposition to trust [18], and playful behaviors and flow state [22].

While PIIT was first introduced as a moderator, the moderation effect between perceptions and intentions to use technology was found to be insignificant in two of the three relationships tested [3]. Up to this point, the direct effects of PIIT on Behavioral Intention (BI) have not been directly tested in any studies.

The theoretical justification for testing this concept comes from the statement that “Individuals with high PIIT are likely to be impulsive by nature and may not think through the reasons and implications for their actions. In other words, they may “dive in” and try the technology due to their curious and risk-taking nature, and not necessarily base their decision on the concrete advantages for doing so” [2]. This would seem to suggest that PIIT as a construct is as important as relative advantage (performance expectancy) and other perceptions (effort expectancy) in directly predicting behavioral intentions.

In the field of marketing, Eastlick and Lotz empirically tested a link between personal innovativeness and electronic shopping, finding that those who were more innovative were more likely to intend to purchase than those who were less innovative [8]. Another empirical study found support for the link between personal innovativeness and intention to purchase over the Internet using a research model that was an extension of the Theory of Planned Behavior [15]. Goldsmith, one of the authors that introduced the concept of Domain Specific Innovativeness (DSI), or innovativeness in a particular field, did a number of studies linking innovativeness to both intentions to purchase and actual purchase behavior [9] [10]. Goldsmith’s studies are very

relevant to this study since PIIT is just DSI applied to the field of information technology. Finally, another marketing study that used DSI as the measure of innovativeness showed a direct link between DSI and Internet shopping behavior [7].

The research model in this study will test the proposed link between PIIT and behavioral intentions, and PIIT and usage, without considering the effects of the four moderator variables, for reasons explained next.

The relationship between innovativeness and age has not been proven. “About half of the many diffusion studies on this subject show no relationship, a few found that earlier adopters are younger, and some indicate they are older” [19]. The relationship between gender and PIIT was tested in a recent study on culture and information overload, and found to be non-significant. Since both gender and age do not seem to be correlated with PIIT, their effects as moderators between PIIT and BI will not be tested.

The theoretical background for the constructs of performance expectancy, effort expectancy, social influence, and facilitating conditions is presented in the UTAUT study in great detail [21]. This study will assume that the theoretical backing for those constructs is sound, and use them as presented. The revised UTAUT model for this study is shown in Figure 1.

## **RESEARCH HYPOTHESES**

Since this study is both a replication and extension of an existing study, some of the hypotheses (H3-H8) used in [21] will be repeated in this study. The arguments for testing H1 & H2 have been made in the previous section, and a list of the replicated hypotheses is also included below:

H1: PIIT will have a significant positive influence on behavioral intention to use technology.

H2: PIIT will have a significant positive influence on usage.

H3: The influence of performance expectancy on BI will be moderated by gender and age, such that the effect will be stronger for men and particularly younger men.

H4: The influence of effort expectancy will be moderated by gender and age, such that the effect will be stronger for women, particularly younger women.

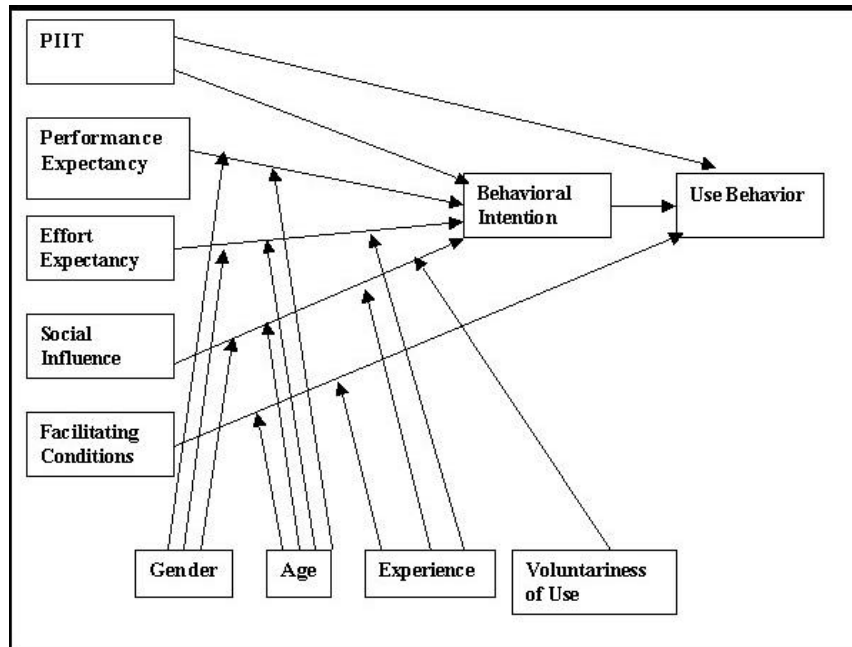
H5: The influence of social influence on behavioral intention will be moderated by gender and age, such that the effect will be stronger for women, particularly older women.

H6: Facilitating conditions will not have a significant influence on behavioral intention.

H7: The influence of facilitating conditions on usage will be moderated by age, such that the effect will be stronger for older students.

H8: BI will have a significant positive influence on usage.

**Figure 1. Proposed Research Model**



## METHODOLOGY

### Sample

The sample that will be used to test the proposed hypotheses consists of students enrolled in a production and operations management course in the business school of a large public university in the Southwestern United States. Since this class is required of all business students, there will be respondents with the following majors: accounting, economics, finance, international business, management, management information systems (MIS), and marketing. This particular class is being sampled for the purpose of obtaining wide variability in the interest in, current use of, and willingness to try new technologies expected because of the diverse background of the students enrolled. Participation in this study will be voluntary, and the pool of participants will be drawn from the approximately 500 students who enrolled in the course during the Fall 2004 semester.

### Survey Instrument

Because this study uses a revised-UTAUT model as its framework, the items that will appear on the survey will be identical to the ones in [21]. Performance expectancy (four items), effort expectancy (four items), social influence (four items), facilitating conditions (four items), and behavioral intention (three items) will be measured on a 7-point scale, with 1 being the negative end of the scale and 7 being the positive end of the scale. The moderator age will be treated as a continuous variable, while gender will be 0/1 dummy-coded as in [21]. PIIT will be measured

using the four-item scale proposed by Agarwal and Prasad [3]. To measure actual use, the students will be given a mandatory homework assignment with the option of completing it either by hand or by using the software. If they use the software to complete the assignment, they will be required to hand in the printouts with their answers to receive credit. This computer printout will then be evidence of actual use of the software.

## **Technology**

The new technology to be introduced to these students is DS for Windows, 2/E. This software package is listed as an optional reading for the course, and is installed on every computer in the business school computer lab. It is unlikely that students will have used it previously; hence, it can be considered a new technology. The software will be introduced using a short tutorial, and the survey will be administered during class time a week after the tutorial.

## **Timing of Data Collection**

During the second week of the course, a one-page survey will be administered in order to capture information about the moderator variables (age, gender, and experience) of each participant. Also included in this initial survey will be the four-item PIIT scale, designed to capture information innovativeness, which has been assumed to be relatively stable across time. A couple of weeks later, students will be given a homework assignment that must be completed by hand. Sometime after the completion of the first homework, the software package, DS for Windows, 2/E will be introduced to the class in a live demonstration. The reason for introducing the software after the completion of the first assignment by hand is to gauge the level of relative advantage that each participant might perceive of using the software versus completing the assignment by hand. After the tutorial, participants will be told that they have the option of using the software for the completion of the next assignment. One week after the tutorial, but before the second assignment is due, participants will be given a second survey, which contains questions about the performance expectancy, effort expectancy, social influence, facilitating conditions, and behavioral intention constructs. PIIT will also be measured during this second survey to test if it remains relatively stable over time, as theorized by Agarwal [3]. Finally, once the homework assignment has been completed, the researcher will be able to determine whether the software has been used or not by verifying which participants handed in the computer printouts.

## **Data Analysis**

Unlike the original UTAUT study, which measured use as a continuous variable of time spent with the system, the measurement of use in this study will be a dichotomous categorical variable. Because the dependent variable is categorical (use or non-use), the application of SEM is not possible [6]. When analyzing the effects of the main effect variables on use, therefore, logistic regression will be employed. When analyzing the effects of the predictor variables on behavioral intentions, hierarchical regression will be employed. Both main and interaction effects (with the moderator variables) will be reported.

**See <http://cba.okstate.edu/~rosenp/dsi2004.pdf> for the complete paper with references.**

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