

The Influence of User Involvement and Personal Innovativeness on User Behavior

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Abstract—The search for factors that influence user behavior has remained an important theme for both the academic and practitioner Information Systems Communities. In this paper we examine relevant user behaviors in the phase after adoption and investigate two factors that are expected to influence such behaviors, namely User Involvement (UI) and Personal Innovativeness in IT (PIIT). We conduct a field study to examine how these factors influence post-adoption behavior and how they are interrelated. Building on theoretical premises and prior empirical findings, we propose and test two alternative models of the relationship between these factors. Our results reveal that the best explanation of post-adoption behavior is provided by the model where UI and PIIT independently influence post-adoption behavior. Our findings have important implications for research and practice. To that end, we offer directions for future research.

Keywords—User involvement, personal innovativeness in IT, use of systems, user support, post-adoption behavior.

I. INTRODUCTION

ALTHOUGH personal computers have been an integral part of organizational work environment for more almost three decades now, we are still faced with the question of what types of behaviors information systems users are engaged in or for that matter should be engaged in especially in the phase after adoption. For example, Jaspersen et al. [25] assert that although users should engage in task-related extensions of available information technology features, they rarely do so. When it comes to supporting end users, Govindarajulu [7] points out that several users still prefer informal support, typically provided by their own coworkers, even though a lot of firms have made considerable investment in centralized support. That such concerns regarding users post-adoption behavior are raised even now, after a variety of guidelines have been recommended in the relatively substantial literature, and implemented in practice, leads us to believe that there remains a need to explore and unearth factors that influence users post-adoption behavior.

An important challenge, for both IS research and practice is to find ways of influencing users to initiate and engage in purposeful behavior. One approach to manage such behavior is to identify users who are more enthusiastic about IT than their colleagues and then use these individuals as advocates of potential extensions and afterwards as change agents [2, 12]. Such users can also be important as first line help providers

[30], which users seem to prefer [18]. When such help providers assist their coworkers, they may teach them appropriate utilization and also facilitate task-related extensions on continuous basis. The question then, is how can we identify users who are enthusiastic about IT and who have a potential to fulfill the role as change agents and/or first line help providers? What are the attributes of such individuals?

We propose two factors that can help identify such individuals. The first is a psychological state, “*user involvement*”, and the second is a personal trait named “*personal innovativeness in IT*” (PIIT). We suggest further that both these factors are associated with particular types of user behaviors in the post-adoption phase, namely “*tool utilization*” and “*support behavior*”. In other words, we expect enthusiastic users of IT to be more occupied with tool utilization and support (e.g. assist coworkers) than the average user. We will elaborate on the relevance of these two post-adoption behaviors below.

The utilization of a system is a prerequisite for achieving success with the system according to any IS success model [13]. Hence, utilization is obviously an inevitable part of post-adoption behavior. In keeping with this, we call the most appropriate behavior among users in the post-adoption phase “*tool utilization*”. The challenge for IS research and practice in connection with tool utilization is not simply how to influence users to engage in it, but also how to sustain and eventually extend such behavior. Bostrom et al. [7] proposed that efficacious training is not enough, it must be backed up by user support.

We therefore propose “*support behavior*” as another key behavior in the post-adoption phase. This behavior refers to the end-users’ need for help or assistance in such situations as solving a software problem or the need for information about software functions or facilities. Support behavior has two aspects: support seeking and support providing.

Consequently, the main objective of this paper is to investigate how PIIT and UI influence three forms of post-adoption behavior: support seeking, support providing and tool utilization.

II. FACTORS THAT INFLUENCE POST-ADOPTION BEHAVIOR

As we stated above, two concepts are especially germane when we want to identify characteristics of enthusiastic users who can fill the role as change agents or first line help providers: user involvement (UI) and personal innovativeness

in IT (PIIT). The next two sections elaborate on these two concepts.

A. User Involvement

In one of the first studies on involvement within the IS field, Barki and Hartwick [3] defined UI as a matter of *importance* and *personal relevance* that users attach to a given system. However, in the psychology and marketing literatures subsequent to Barki and Hartwick's [3] seminal paper, it has been argued that *importance* is the central aspect in the conceptualization of involvement [28, 35]. There are substantial arguments in this literature for replacing the two aspects "*importance and personal relevance*" in Barki and Hartwick's conceptualization with only one of these aspects, namely "*personal importance*". The main argument goes like this: several things can be personally relevant, without being personally important [28]. We, therefore, regard relevance as a more general experience compared to importance, and, as a consequence, less germane for conceptualizing UI. Consequently, in this paper, UI relates to the perceived personal importance of using a computer.

B. Personal Innovativeness in IT

The conceptualization of personal innovativeness has changed radically since the concept was originally defined by Rogers and Shoemaker [33]. These authors define innovativeness as an observable phenomenon anchored at the point in time of adoption. Agarwal and Prasad's [2] reconceptualization of innovativeness as a personal trait represents therefore a considerable contrast to Rogers and Shoemaker [33]. Agarwal and Prasad describe personal innovativeness as a trait that leads to innovative behavior in the context of microcomputer interactions, expressed as "the willingness of an individual to try out any new information technology" [2, p. 206]. The assumption is that individuals with high PIIT would be more likely to take advantage of a new technology [1, 41].

III. POST-ADOPTION BEHAVIOR

As we indicated in the Introduction, we posit *tool utilization* and *support behavior* to constitute the core activities of end-users. Thus, end-users use a tool and either seek support and/or provide support. The next two sections elaborate on these concepts.

A. Tool Utilization

In their review of IS-success measures, DeLone and McLean [13] conclude that the use of an information system will continue to be a core variable in IS research. However, they also state that the problem to date has been a too simplistic definition of this complex variable. Building on Boffo and Barki [5], we propose that their conceptualization of utilization as task accomplishment is most suitable for the purpose of our study. In the remainder of this paper we term this "*task related IT usage*".

B. Support Behavior

When a need for assistance arises within the context of use, the role of the end-user can be twofold. He/she either *seeks*

support and/or *provides support*.

Research has shown that end-users seek support from a number of internal and external sources [19]. However, as Harris [198] and Speier and Brown [38] have pointed out, the predominant sources of support are internal [see also 9]. Consequently, in our study we limit the scope to internal support sources.

End-users potentially have access to a number of internal support sources such as co-workers, instruction manuals, help screens, and computer center staff [8]. When a software problem emerges, the users have to choose among these available sources. We believe that *direction* of search (i.e. types of source(s) utilized) represents the most suitable conceptualization in connection with UI and PIIT as predictors of seeking support. Consequently, we operationalize seeking support in terms of *direction*, which is a matter of choosing source(s). These potential sources fall into two broad categories: human (e.g., co-workers) or technology-related (e.g., visit help screens, search for information).

The informal role of support providers in the context of usage is well known within IS research [198]. Research has demonstrated that most end-users prefer informal support from colleagues who are known to be more knowledgeable than the rest [18, 19]. This behavior has in fact been used effectively in managerial initiatives that use functional unit personnel for "first line support" and even training [30].

Based on prior research and theoretical premises, we develop two alternate conceptual models of the relationship between PIIT, UI and the behavioral factors that we have conceptualized here in the next section.

IV. ALTERNATIVE CONCEPTUAL MODELS

A. The Independent Antecedents Model

The simplest model we propose is for PIIT and UI to independently and directly influence post-adoption behavior (cf. Fig. 1 in Results section). In this model PIIT and UI are not allowed to mediate any of the other relationships.

We base this model primarily on prior empirical work. The literature is rich in studies that consider PIIT and UI to be independent variables directly influencing outcomes. Examples include PIIT and adoption of sales technology [34] and intentions to shop online [27]. UI examples include studying the effect of UI on the use and success of EUC [4] and IS implementation success [26]. In addition to these IS studies, that investigate PIIT and UI separately, studies in marketing have examined the direct effect of both personal innovativeness and involvement on consumer behavior [e.g. 32, 23]. The latter studies provide empirical support for the proposed relationship in Fig. 1.

B. The UI Mediates PIIT Model

An alternative postulation is that PIIT exerts an indirect influence on end users post-adoption behavior, through the intervening variable of UI. First, this mediation implies that a

trait (i.e. PIIT) forms a belief (i.e. UI), and second that this belief structure influences post-adoption behavior. We term this “The UI mediates PIIT model” (cf. Fig. 2 in Results section).

The theoretical premise behind the UI mediate PIIT model is a closer examination of the nature of PIIT and UI. First, we follow Hartwick & Barki’s [20] conceptualization of UI as a cognitive belief, which is built upon Fishbein and Ajzen’s [14] view of a belief. The challenge then is to identify antecedents of belief formation. Following Agarwal and Prasad [2], we propose PIIT as a trait that can influence the formation of belief structures. The argument behind the proposed relationship is that willingness to try out new IT (i.e. a trait) shape users’ perceptions of how personally important the use of IT in general is for them (i.e. a belief structure).

Based on our characterization of UI as a belief structure, and findings from previous theoretical and empirical research which suggest that traits influence information system usage via their effect on beliefs [39], we hypothesize that UI is an intermediate variable between PIIT and users post-adoption behavior. The remaining relationships between UI and behavioral outcomes in the model are based on the same premises as in the independent antecedents’ model.

V. THE STUDY

To test the proposed models and compare them, we conducted a field study, which we describe below.

A. Method

The site was a large oil company with approximately 17 000 employees located in a Scandinavian country. By selecting one organization, we sought to control for the potential impact of organizational factors, and thus, improve both internal validity and statistical power.

Using a simple random sampling procedure, we selected a sample of 500 administrative workers. We excluded both IS professionals and managers from the sample set. IS professionals were left out because they are not real end-users by definition. Managers were left out because we did not feel that they are representative of “normal” end users.

To collect the data, we developed a questionnaire based wherever possible on established and widely used instruments in the literature. Prior to administering the questionnaire, we tested and refined the measurement instruments through a subsequent pre-test among ten end-users in the company. The pre-test led to some minor adjustments of the measurement items.

Questionnaire distribution and returns were by ordinary mail. Out of 500 surveys sent out, a total of 328 usable questionnaires were returned, for a response rate of 66 percent.

B. Measures of UI and PIIT

To measure UI we adapted a consumer involvement instrument from Marketing developed by Schneider and Rodgers [70] and substituted consumer involvement with UI. The instrument contained seven items that stressed personal

importance through statements such as “Without any doubt I will state that the use of a Personal Computer in my work gives me a feeling of performing something important”.

To measure PIIT, we used Agarwal and Prasad’s [2] instrument which consisted of four items. All these items describe prototypical behaviors in the context of IT usage, e.g. “If I heard about a new information technology, I would look for ways to experiment with it”.

C. Measures of Behavioral Outcomes

To measure Tool Utilization, we used an instrument developed by Igbaria and Iivari [24]. The measure consists of four dimensions: actual daily use (time), frequency of use, use of different software packages, and use for different business tasks. The last dimension consists of eleven items and was consistent with the conceptualization of Tool Utilization.

We developed a two-dimensional instrument to measure users use of support, the first dimension being problem-related (technical vs. software) and the second dimension being support source related (IT expert vs. the help menu in the software). Semi-structured interviews with end-users, together with interviews with IS staff, revealed quite a few common support problems within the company. In addition, the interviews identified four common support sources: help desk, colleagues, help menus and “trial and error”. Based on these insights, we developed the measurement instrument.

To measure assistance provided to coworkers we adopted a measurement instrument from research on opinion seekers [15] and adapted it to the end-user context.

In all the instruments, except “Support Usage”, we used a 7-point Likert scale with the anchors being “Completely Inaccurate Description” (1) and “Completely Accurate Description” (7). These anchors were adopted from marketing research and have previously been used by Heide [21] and Carson et al. [11] among others. To measure “Support Usage”, respondents were asked what they did when they needed help when specific problems arose. The alternatives were *get in touch with the help-desk*, *get in touch with a coworker*, *utilize the help facility in the actual software*, *experiment on a solution*. We transformed the responses to this instrument before the data analysis. Since this categorical dependent variable violate regression assumptions, we transformed it to a continuous variable where the alternatives *utilize the help facility in the actual software* and *experiment on a solution* was counted.

VI. RESULTS

We used LISREL to examine the reliability and validity of the measures, and to analyze the proposed models.

A. Measurement Model Results

To first establish convergent and discriminant validities, we conducted a confirmatory factor analysis.

Eight out of twenty-seven items were dropped depending on reported standardized residuals. We further decided to apply a cut-off value of 0.6 on factor loadings. The result was that one item had to be dropped from the task related IT usage

instrument. All retained items had loadings of at least 0.60.

An assessment of convergent validity or internal consistency of the constructs resulted in the following coefficients: 0.74, 0.75, 0.89 and 0.82. As we can see, all the constructs have internal consistency values that exceed the threshold value of 0.70 recommended by Nunnally [31].

To assess discriminant validity among the constructs, Fornell and Larcker [16] suggest the use of average variance extracted (AVE). As Table I shows, the AVE values are consistently greater than the off-diagonal squared correlations, suggesting discriminant validity at the construct level.

TABLE I
AVERAGE VARIANCE EXTRACTED & SQUARED CORRELATIONS AMONG CONSTRUCTS

Construct	1	2	3	4
1. PIIT	.7			
2. User Involvement	.4	.7		
3. Task related IT usage	.3	.3	.5	
4. Assistance provided to coworkers	.6	.3	.4	.8

B. Structural Model Results

Figs. 1 and 2 respectively summarize the results from the test of the two structural models.

1) Test of the independent antecedents model:

The direct effect of PIIT and UI on post-adoption behavior is represented by the path coefficients followed by respective t-values in parenthesis in Fig. 1. Four out of six path coefficients have significant t-values and their range is from weak (0.10) to strong magnitude (0.61). Whereas all the paths from PIIT are statistically significant and substantive, only one out of three paths from UI can be characterized in the same manner.

The model explain 17% of the variance in task related IT usage, 32% of the variance in utilization of technology related sources, and 44% of the variance in assistance to coworkers.

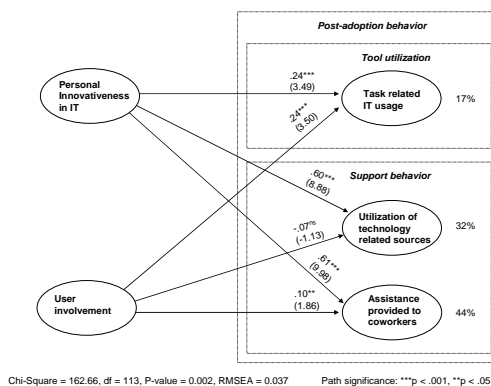


Fig. 1 The independent antecedents model result

2) Test of the UI mediate PIIT model

An examination of the path coefficients in Fig. 2 shows that

all four paths have significant t-values and all are in the medium range (0.27 to 0.52). All four paths are statistically significant and substantive. The direct effects of UI on post-adoption behavior are respectively 0.39, 0.27 and 0.45, which are higher than the direct effects in the independent antecedents model test. However, the indirect effects of PIIT on post-adoption behavior are respectively 0.20, 0.14 and 0.23, which in general are considerably lower than the direct effects in the independent antecedents model test.

The model explain 15% of the variance in task related IT usage, 7% of the variance in utilization of technology related sources, and 20% of the variance in assistance to coworkers.

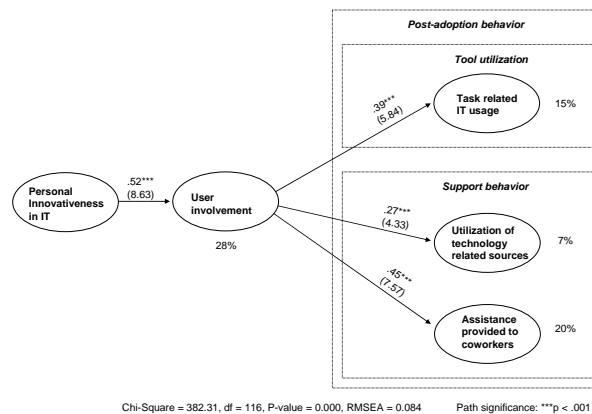


Fig. 2 The UI mediate PIIT model results

C. Comparing the Models

To determine which of the two models best represents the relationships between the variables, we compared the fit index values (cf. Table II) and explanatory powers of the models (cf. Fig. 1 and 2). Our conclusion from comparing the models is that the independent antecedents model explains most variance in the criterion variables and also represents the model with most adequate fit index values. Our interpretation of the results in the next section is based on the independent antecedents model.

TABLE II
LISREL FIT INDICES FOR THE TWO ALTERNATIVE MODELS

Comparison criteria:	The independent antecedents model	The mediate model	UI PIIT model
χ^2	162.66, df = 113, p < .001	382.31, df = 116, p < .000	
χ^2/df	1.44	3.30	
GFI	0.94	0.88	
IFI	0.99	0.97	
CFI	0.99	0.97	
RMSEA	0.037	0.084	

VII. INTERPRETATION OF RESULTS

We had two related but logically distinct objectives in this paper. The first was to investigate whether UI and PIIT

influence post-adoption behavior. The second was to investigate the relationship between UI, PIIT and post-adoption behavior. We addressed these objectives by testing two alternate models.

Results of the study support our first contention. The direct influence of PIIT and UI on tool utilization was of equal strength ($b = .24$ in both cases) and both were statistically significant. This is consistent with recent findings about how system use is influenced by PIIT [37] and UI [22]. Thus, it appears from our results that PIIT and UI influences directly on their decision to utilize IT in solving business tasks.

The direct path from PIIT to use of technology related sources in connection with support was both statistically and substantively significant ($b = .60$), while the corresponding path from UI was non-significant. The explanation for these observed results may be that utilization of technology related sources deal with a type of IT behavior where the purpose is to work out something that is unknown and where the outcome is uncertain; implying taking a risk. In the conceptualization of PIIT, the core of the trait is precisely that it epitomizes risk-taking behavior [2, 6]. This may explain why PIIT has a strong influence on use of technology related sources, while UI has no influence at all.

There was a strong and significant path between PIIT and assistance provided to coworkers ($b = 0.61$), while the corresponding path from UI was significant but weak ($b = 0.10$). This result demonstrates that it is PIIT that drives users' willingness to provide others with assistance on problems. It is possible that end users with relatively high PIIT become known as those who are the first to try new solutions and therefore appear to be up to date on new technology.

Taken together, the results from the independent antecedent model lead to the following conclusion: While PIIT is an important overall predictor of user behavior per se, UI is only a predictor of task related IT usage and assistance provided to coworkers.

VIII. DISCUSSION

Several important and interesting implications emerge from our study.

A. Implications for Practice

Given the findings from the independent antecedents model, we can argue that both PIIT and UI represent characteristics that drive "desired" end-user behavior. It is therefore tempting to recommend that ways be found to increase users' enthusiasm in IT by affecting these characteristics amongst end-users. How this can be done is an interesting challenge for both IS-researchers and managers.

A few caveats are in order. The question of whether the behavioral outcomes are desirable is best answered by the stakeholder who is evaluating them [36]. As an example, IS managers may look at the effect of enthusiasm in IT on help provider behavior as an opportunity to lower the burden on help-desks. There are innovative practices that harness this resource – appointing "super users" as first line help providers

[30]. However, these practices have had mixed results. Line managers often look at end-users who take the role of support provider to coworkers as ineffective since the time taken away may be from their professional tasks. Moreover, it is possible that in the cases where such practices have failed, the end-users who were help providers did not have high enthusiasm in IT.

We further caution managers not to look at PIIT and UI as necessarily positive aspects in all circumstances. There is the danger that users with a high level of enthusiasm may act very opportunistically, especially when they have to decide between "doing the job" or "using IT". The latter choice may be regarded as dysfunctional under particular circumstances.

B. Implications for Research

Our findings are in line with prior findings, both in IS [e.g. 27, 4] and marketing [32, 23] on the effects of PIIT and UI on usage. However, these findings must be considered in the light of the limitations of our study, which also suggest avenues for future research. One limitation lies in possible misspecification of the model, i.e., omission of relevant variables. For example, the relationships in the hypothesized model may be moderated by variables such as end-user competence [29], and the type of software with which the users are working [7]. For example, novice end users with high PIIT may not have the adequate level of competence to provide their coworkers with assistance. End-user competence may therefore be a moderator between PIIT and assistance provided to coworkers. Future research should extend our research and focus on variables that can moderate, or hence, intervene between relationships in the proposed model.

Another fruitful research direction may be to identify variables that have a potential to explain different levels of enthusiasm in IT. Barki and Hartwick [3] indicate that variables such as user participation, system quality, top management support and peer behavior may represent potential antecedents of UI. However, very few antecedents apart from participation in computer training and system development have been empirically tested so far. The limited research on antecedents can be attributed to the fact that nearly all studies on PIIT and UI have been concerned with the implementation phase, where participation is assumed to play an important role. Hence, future studies should aim at identifying potential antecedents in the post-implementation phase. Examples of such variables include *cognitive traits* such as learning style and locus of control [7], *descriptive traits* such as gender and computer experience [40], and *situational traits* such as end-user computing structure and quality of information center services [10].

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