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The Impact of Task-Technology Fit in Technology Acceptance and Utilization Models

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ABSTRACT

In a recent paper, Venkatesh et al. (2003) examine a series of models that explain or predict user acceptance of information technology. These models included the Technology Acceptance Model (Davis et al., 1989), Computer Self Efficacy (Compeau and Higgins, 1995) and other models of user behavior, intention, or affect. Their study combined these models to form a Unified Model, which the authors call UTAUT.

The underlying models as well as the combined model fail to explicitly include task constructs. Typically, users intend to use an information technology if it meets their task requirements. A model that explicitly includes task characteristics is the Task-Technology Fit (TTF) model (Goodhue, 1995), which has been shown to add explanatory power to the Technology Acceptance Model (Dishaw and Strong, 1999). Our study adds TTF constructs to the UTAUT with the goal of determining whether this addition produces an improvement in explanatory power, similar to that reported by Dishaw and Strong (1999).

Keywords

Task-Technology Fit, Technology Acceptance, Utilization Models, TTF, UTAUT.

INTRODUCTION

In the MIS literature, there are several streams of research that converge on understanding information technology acceptance and utilization by end users. MIS researchers have developed and elaborated several independent models to explain acceptance and utilization. The most well-known and frequently studied models are the Technology Acceptance Model (TAM) (Davis, 1989; Davis et al., 1989), Computer Self-Efficacy (CSE) (Compeau & Higgins, 1995), and the Task-Technology Fit (TTF) Model (Goodhue, 1995; Goodhue and Thompson, 1995). Other models also exist which approach the utilization construct, e.g., (Thompson et al., 1991; 1994). There are also studies that integrate existing models such as TAM and TTF (Dishaw and Strong, 1999).

Recently an effort to integrate some of these models has led to the development of the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al., 2003). This model is developed by employing overlapping constructs from a series of eight models, the Theory of Reasoned Action (TRA), the TAM, the Motivational Model, the Theory of Planned Behavior (TPB), the combined TAM and TPB, the Model of PC Utilization (MPCU), Innovation Diffusion Theory, and the Social Cognitive Theory on which CSE is based (Venkatesh et al., 2003). While they acknowledged the relevance of the TTF model to understanding utilization, it was not included in the series of models used in developing UTAUT. Venkatesh et al. (2003) offer this as a limitation of the UTAUT model that merits future examination.

The specific purpose of this paper is to investigate the addition of the Task-Technology Fit constructs and measures to the UTAUT model. We first briefly describe Task-Technology Fit Models. We then present the UTAUT model and its limitations as a foundation for proposing a revised version. We present two approaches for including TTF constructs in UTAUT, and describe our method for testing the revised model. The revised model will be estimated using PLS, as was the UTAUT model, with data to be collected this spring. Results will be available for presentation at AMCIS.

TASK - TECHNOLOGY FIT MODELS

Task-Technology Fit (TTF) is a well-known construct in the MIS literature. The core thesis of TTF Models is that technology, e.g., software, will be used if, and only if, the functions available to the user support (fit) the activities of the user. A software function supports an activity if it facilitates that activity. Rational, experienced users will choose those tools and methods that enable them to complete the task with the greatest net benefit. Software that does not offer sufficient advantage will not be used. Figure 1 shows a basic TTF model. TTF represents a matching of the demands of the task with the software functionality at hand (Dishaw and Strong, 1999).

In earlier studies, the dependent variable in TTF models was performance, e.g., (Goodhue and Thompson, 1995). More recent studies, e.g., Dishaw & Strong (1998), however, focus on the performance antecedent, tool usage, as the dependent variable, which is most appropriate when the use of the tools is voluntary, as it was in their context. This allowed them to consider a dependent variable that is closer, from the perspective of the causal chain, to the independent variable fit. It also permits easier comparison to TAM and UTAUT.

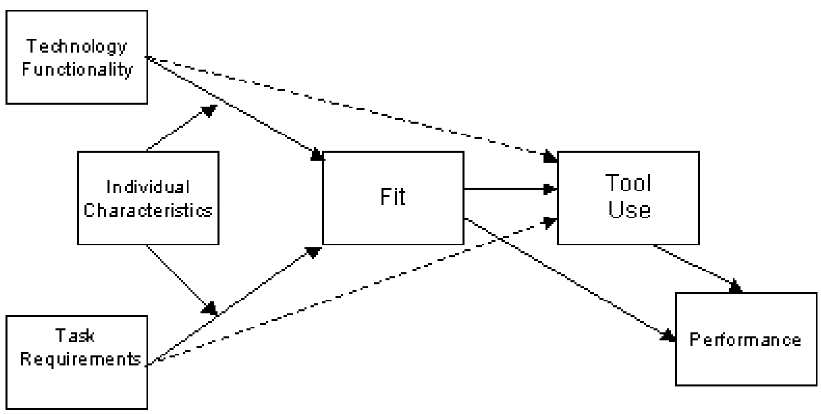

Figure 1: TASK/Technology Fit Model

The TTF construct has been assessed directly using twelve variables to measure fit, without assessing task needs or available technology functionality (Goodhue, 1988; 1995). A second, more recently developed method of assessing TTF uses a definition of TTF conceptually similar to that of Goodhue (1988), but measures task requirements and technology functionality, and uses these data to derive a resulting fit measure (Dishaw & Strong, 1998) using an interaction, a differences, or a latent variable approach. These methods have been tested in several contexts, and provide explanatory power equivalent to that of TAM (Davis, 1989). The derived fit approach, however, does require models of the task and technology on which to base questionnaire items. Fortunately, a relatively general set of questionnaire items for measuring task characteristics and technology functionality has been developed and tested (Dishaw et al., 1999). These items apply to tasks that involve problem-solving including planning, knowledge building, diagnosis, and modification activities and to technologies that involve functionality for representing the problem in the system, analyzing and computing based on that representation, and making changes to that representation.

The group decision support systems literature uses a third method of determining fit, the profile method (Zigurs & Buckland, 1998; Zigurs et al., 1999; Dennis et al., 2001). Using this approach, a researcher develops profiles of the task characteristics, profiles of technology functionality, and then determines whether each combination of a task profile and a technology profile represent a fit or not, i.e., fit is a binary variable. Fit as profile is one of several methods of conceptualizing fit; fit as matching is another (Venkatraman, 1989). We use the fit as matching approach followed in the TTF literature, which measures the extent of fit (or misfit) along a scale (Goodhue and Thompson, 1995; Dishaw and Strong, 1998). Rather than Goodhue's (1995) method of measuring fit directly, we use the Dishaw and Strong (1998) approach of measuring task characteristics and technology functionality and computing a measure of the extent of fit from them.

UTAUT MODEL

The UTAUT model of Venkatesh et al. (2003) pulls together a series of models from disparate research streams. Davis' TAM model (Davis, 1989; Davis et al., 1989), and closely related TRA and TPB models (Ajzen & Fishbein, 1980; Ajzen

1985), form a significant part of UTAUT as does the motivational model and the Innovational Diffusion Theory. The model that results from this integration is shown in Figure 2.

The unified model is formed by examining constructs within existing models and generalizing them into four broad constructs. *Performance expectancy* is "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al., 2003, p.447) and is based on perceived usefulness, extrinsic motivation, job-fit, relative advantage, and outcome expectation constructs from existing models. *Effort expectancy* is "the degree of ease associated with the use of the system" (Venkatesh et al., 2003, p.450) and is based on perceived ease of use, complexity, and ease of use constructs. *Social influence* is "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003, p.451) and is based on subjective norm, social factors, image, and social norms constructs. *Facilitating conditions* are "the degree to which an individual believes that an organizational and technical infrastructures exists to support use of the system" (Venkatesh et al., 2003, p.453) and is based on perceived behavioral control, facilitating conditions, and compatibility constructs.

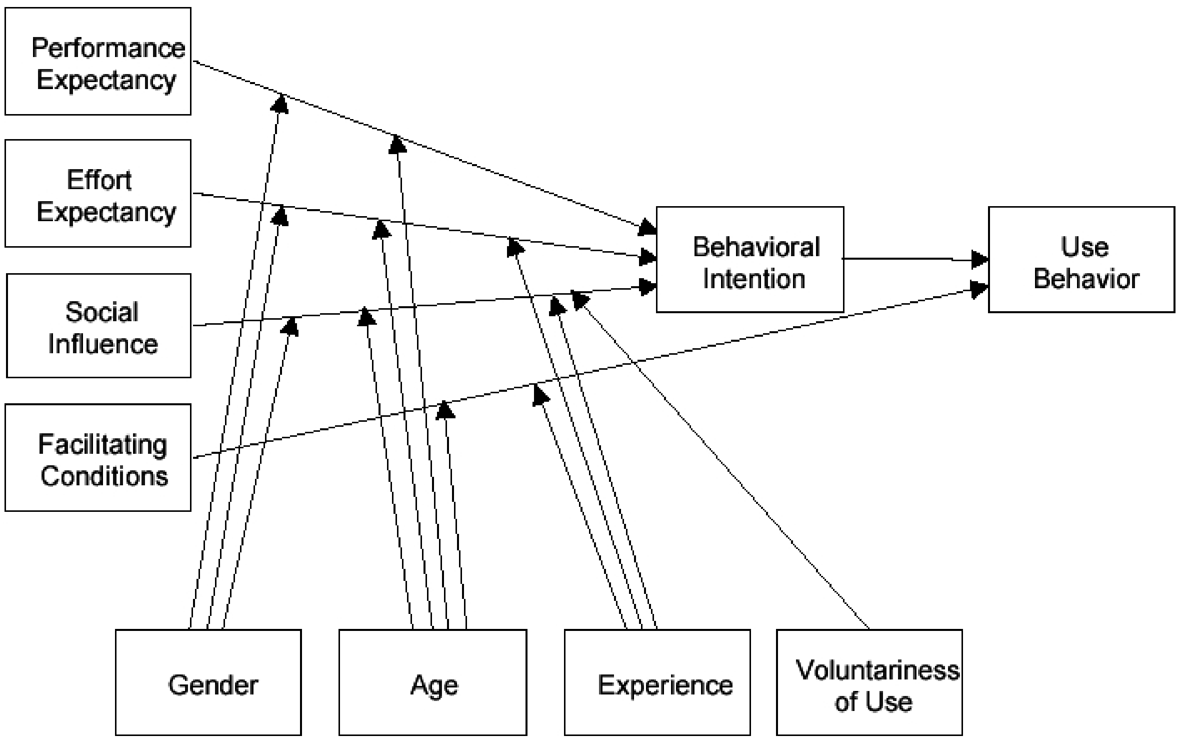

Figure 2**: UTAUT Research Model (from Venkatesh et al.(2003))**

Despite testing the eight existing models and the unified model with the same data and then the unified model with a new set of data, the development of UTAUT has a number of limitations. Two limitations listed in Venkatesh et al. (2003) are of interest to us. First, they note that the TTF model is a relevant model for studying acceptance and use, but it was not included as one of the eight models investigated. Second, the new constructs were measured using the statistically best four items from the existing constructs and thus may not provide adequate coverage of the concept. Of particular relevance for us is that none of the items from the job-fit construct (in the MPCU), were included in the measure for performance expectancy. As a result of these two limitations, UTAUT is missing measures related to fit of the technology to users' tasks. Noticing a similar weakness in TAM, Dishaw and Strong (1999) added TTF constructs to TAM producing a combined model with better explanatory power than either TAM or TTF alone.

COMBINED TTF - UTAUT MODEL

The absence of explicit TTF constructs or related measures presents us with a point of departure for elaborating UTAUT. While the UTAUT performance expectancy variable has a definition that is conceptually similar to Goodhue's (1995) definition of TTF, its operational definition is quite different. Examination of the items for UTAUT performance expectancy also suggests that there may be important elements missing from this operationalization.

One notable component of the conceptual development of performance expectancy, job-fit, is conceptually similar to TTF. Its absence from the final operational definition of performance expectancy leads us to strongly suspect that the addition of TTF, as a matching of task and technology, will significantly improve the explanatory power of the UTAUT in the manner similar to the improvement reported by Dishaw & Strong (1999) in their elaboration of the TAM model.

While the TTF construct and the performance expectancy construct cover similar concepts, there are important differences. Performance expectancy is defined as an individual belief whereas TTF explicitly focuses on the objective, rational basis for this belief, i.e., the matching of a technology function with a task demand.

As a result of these similarities and differences between the TTF construct and the performance expectancy construct in terms of both their conceptual and operational definitions, we propose two possible approaches to combining the TTF and UTAUT models. One follows the approach of Dishaw and Strong (1999) and uses the constructs in the TTF model to augment and explain the UTAUT constructs, as shown in Figure 3. This assumes that the performance expectancy construct and the TTF construct are sufficiently different, both conceptually and operationally, to warrant the inclusion of both in the combined model. It also has the advantage of testing the potential direct effects of task and technology characteristics on utilization.

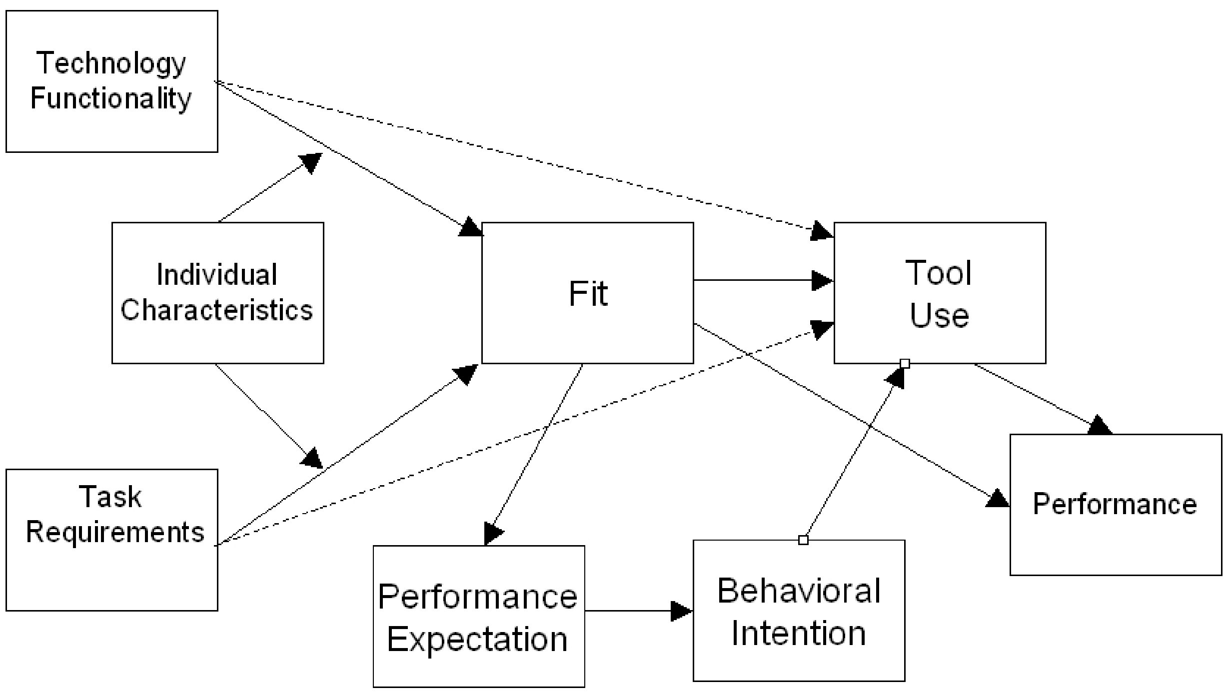

Figure **3: TTF-UTAUT Combined Model (Simplified)**

The second approach substitutes the TTF construct measurement for the performance expectancy measurement. This assumes that while the constructs are conceptually similar, the two measures that operationalize them differ. Using this approach, we compare the UTAUT model with these two different measures. The basis for considering this approach is the results from tests of the UTAUT model over time (Venkatesh et al., 2003). When the UTAUT model is tested after training but before use, social, effort, and facilitating factors are important. Even as soon as one month after implementation, the significant factors are the instrumental performance-related ones, with the other factors becoming not significant (Venkatesh et al., 2003). Thus, a more instrumental form of measurement may be a better way to operationalize the performance expectancy construct in the UTAUT model.

RESEARCH METHOD

Item and Scale Development. All items for the UTAUT model and the TTF model are already developed and tested (Dishaw et al., 1999; Venkatesh et al., 2003).

Data Collection. A questionnaire combining the UTAUT and TTF items will be administered to undergraduate management students from several classes in Marketing Research, Systems Analysis, Programming, and Operation Management. The instrument will be administered after completion of an ordinary modeling assignment. Data collection is planned for April. We note the obvious limitations associated with the use of novices, or students in a contrived setting. The original studies by Venkatesh et al. (2003) and Dishaw and Strong (1999) used professionals. Comparisons can be made, but generalizations based on such comparisons must be made with caution.

Data analysis. We plan to test the two approaches for combining TTF and UTAUT separately. For the first approach, we will test the UTAUT model, the TTF model, and then the combined model in Figure 3. The expected result is that the combined model will provide better explanatory power than either the TTF or the UTAUT model alone. We will also check the similarity between the fit measure and the performance expectancy measure by comparing the correlations between them to the correlations between other measures in the model.

For the second approach, we will compare the UTAUT model with the performance expectancy measure to the UTAUT model with the TTF measure. If these are similar measures, the likely result is a non-significant difference. The performance expectancy measure, however, may perform better since it was developed by selecting the statistically best four items from a set of 24 possible items.

The models will be tested using PLS (Chin et al., 1996; Chin 1998) in a manner similar to that by which the UTAUT model was tested. Results will be available for presentation at AMCIS.

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