Determinants of professionally autonomous end user acceptance in an enterprise resource planning system environment

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ABSTRACT

To fully exploit the capabilities of complex technologies, businesses must deliberately foster technology acceptance by end users. This deliberate activity must recognize the complexity of factors that influence individuals' perceptions, intentions, and usage of information technology. This study surveyed 66 professionally autonomous end users and gathered information on their perceptions related to several technology acceptance factors for a newly installed enterprise resource planning (ERP) system component. Study analyses focused on end user perceptions of ERP component usefulness, their intention to use the system, and self-reported usage of a system component. Valuable insights into the perceptions of professional end users toward a component of a complex technology were gained. Recommendations based upon the results of this study include: (a) clearly describe, early in the implementation process, an overall picture of the ERP system flow and visually show end users how the components they use "fit" into the whole system; (b) convert ERP-related "tech talk" to common end user language by either clear explanation of unique terms or associations of new terms to ones commonly understood by end users, and (c) provide adequate resources (financial, physical, human, etc.) to ensure that end users have access to timely support.

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1. Introduction

Technology's ever-present grasp continues to influence individuals' and societies' interactions, just as it has for decades. For businesses, the ever-expanding amount of information that has to be managed leads to an increase in system integration and complexity. This leads ultimately to a redefinition of skills required of proficient end users and the variables that influence user acceptance of information systems.

One of the issues in information management is getting the right information to the right person at the right time and in a usable form (Robertson, 2005). Without technology acceptance users might only use the system superficially to enter/store data but not to explore its full potential; i.e. to analyse the information to gain a competitive advantage.

The pervasive use of technology, particularly in business contexts, and the need for individuals to accept and use it, continues to fuel research of technology acceptance. Moon and Kim (2001, p. 1) posits that technology acceptance varies with technology, target users, and context. Prediction of system use in mandatory adoption contexts of complex systems that span multiple functional units and organizations, such as enterprise resource planning (ERP) system implementations, is an important issue in technology acceptance. Equally important to the prediction of technology usage is the question of can we discover what perceptions end users have about the usefulness of specific systems and their components. Professionally autonomous (Lin, 2004, p. 14) end users, i.e. individuals possessing considerable latitude in both how they allocate their work time and what technology they use to complete work assignments, represent a significant number of complex business technology end users. Specifically, academic end users have significant professional autonomy which translates to a spectrum of technology usage levels and unique perspectives regarding acceptance of complex technology.

For decades, information technology (IT) researchers have studied human–computer interactions and the measurement of technology acceptance, the result of which has been the extensive testing of Davis's (1989) technology acceptance model (TAM). TAM and other technology acceptance models and theories measure technology acceptance as use of the system; consequently acceptance and usage terms are used interchangeably (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989; Mathieson, 1991; Morris & Venkatesh,

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2000; Taylor & Todd, 1995; Venkatesh & Davis, 2000; Venkatesh, Morris, Davis, & Davis, 2003).

This study examines technology acceptance variables for highly educated, professionally autonomous end users of an ERP component to understand significant variables' correlation and predictive effects on perceived usefulness and usage constructs.

The rest of the paper is structured as follows: Section 2 gives a brief literature review of ERP and TAM papers related to our study. Section 3 describes the research model and hypotheses, followed by details of the methodology in Section 4. Section 5 shows the results of the study, and finally, Section 6 provides a discussion of the findings and conclusions.

2. Literature review

The review is divided into three parts. The first part gives a short overview of ERP and literature related to ERP implementation, the second part reviews the original technology acceptance model and discusses TAM extensions, and the third part discusses TAM studies applied to ERP system implementations.

2.1. Enterprise resource planning

The term ERP refers to popular business management systems that (a) integrate multiple business facets; (b) use client/server applications; and (c) allow the sharing of organizational information across departmental, subsidiary, and corporate delineations to achieve enterprises' competitive goals (Axam & Jerome, 2003; Dunlap, 2005; Nah, Tan, & Teh, 2004). According to Axam and Jerome (2003), ERP is "the de facto backbone of business intelligence" (p. 1); yet in 2004, the Gartner Group indicated that enterprises deploying ERP solutions not only significantly exceeded implementation cost and time estimates but also failed spectacularly "due to unplanned or underplanned implementation projects" (Axam & Jerome, 2003, p. 1). ERP systems "require significant organizational resources and their implementation is inherently risky due to large investments required. Thus, ERP systems represent a completely different class of IT application compared with traditional and simple IT systems" (Amoako-Gyampah & Salam, 2004, p. 732) examined by previous research.

Contemporary research has chronicled global advances in technological innovations, such as ERP, across many disciplines. IS research, while dominated by the topic of information technology usage/operation, is also focused on technology transfer, which includes innovation, acceptance, adoption, and diffusion (Glass, Ramesh, & Vessey, 2004). Given the fact that ERP implementations' failure rates exceed 50 percent (Barker & Frolick, 2003; Brown, 2004; Scheer & Habermann, 2000) and that this innovative technology has received little academic IS research attention (Amoako-Gyampah & Salam, 2004; Brown & Vessey, 1999; Gallivan, 2001; Nah et al., 2004), research into variables that influence why ERP implementations succeed or fail is of great interest to a wide variety of stakeholders.

2.2. Technology acceptance models

Researchers in the IS field are said to "consider TAM one of the information systems fields' own theories" (Lee, Kozar, & Larsen, 2003, p. 753) and have incorporated and extended TAM's original constructs to research covering a variety of systems and contexts (Davis, 1989; Davis et al., 1989; Mathieson, 1991; Taylor & Todd, 1995; Venkatesh et al., 2003). However, Hwang (2005) states that, "there is an increased need for studies that examine and extend TAM in a complex IT setting" (p. 152). Lee et al. (2003) also note that several leading IS researchers (Taylor & Todd, 1995; Venkatesh,

2000; Venkatesh & Davis, 2000) call for further studies in mandatory settings. The following paragraph will briefly discuss the original TAM, and an extension of TAM by Venkatesh and Davis (2000) called TAM2.

Since the original development of TAM by Davis (1989), a wide variety of studies were conducted that used that instrument and meta-analysis studies on TAM research. Since 1990, researchers have studied several combinations of TAM with other well-tested models, attempting to extend this robust technology acceptance model. Venkatesh et al. (2003) posit a new Unified Theory of Acceptance and Use of Technology (UTAUT) model which integrates elements from eight previously validated models into a "Unified" causal model. Venkatesh et al. (2003) hypothesize and empirically support UTAUT, a model which includes "three direct determinants of intention to use (performance expectancy, effort expectancy, and social influence) and two direct determinants of usage behavior (intention and facilitating conditions)" (p. 466). To date, empirical testing of this new UTAUT model is limited.

Venkatesh and Davis (2000) extend the original TAM by incorporating three social influence processes (subjective norm, voluntariness, and image) and four cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use) relative to the original TAM perceived usefulness construct. A second article by Venkatesh (2000) also extends TAM for the perceived ease of use construct; however, the usefulness construct is the focus of the current study. Thus, references to TAM2 in this study represent the Venkatesh and Davis (2000) model extending the perceived usefulness exclusively. Venkatesh and Davis' TAM2 model research not only extended the model but also resulted in the validation of an expanded instrument to measure technology acceptance.

2.3. TAM and enterprise resource planning systems

Gallivan (2001) establishes the theoretical framework for his longitudinal study by combining organizational-level knowledge gained from technology implementation research and conceptual-level insight of constructs related to Rogers (1976), and Prescott and Conger's (1995) traditional innovation adoption models. The author melds the implementation events and the factors that influence them from his study's IT department participants into a complex process/variance model divided into two stages of assimilation, early and later. Ultimately, the primary result of Gallivan's (2001) longitudinal study was the creation of themes and cause-and-effect relationships of factors on assimilation. Gallivan offers these contributions, the culmination of his case study, and summarizes his study "as propositions for future examination and empirical validation" (Gallivan, 2001, p. 78).

Another ERP related cross-sectional study, which used a TAM2-based survey, was conducted in an on-line analytical processing (OLAP) environment. Hart and Porter (2004) surveyed 65 companies in South Africa licensed to use an industry top-ranked OLAP product. The TAM2 model used in Hart and Porter's study included only the independent variables collectively referred to as cognitive instrumental processes (CIP) (Venkatesh & Davis, 2000). Hart and Porter (2004) found that the variables perceived ease of use, result demonstrability, output quality, and job relevance are positively associated to the dependent variable, perceived usefulness. Therefore they conclude, "the TAM2 extension improves understanding of the effect of users' cognitive processes on perceived usefulness of a technology" (p. 54).

Nah et al. (2004) conducted a single-site survey of 229 end users of a Midwestern U.S. public institution approximately 1-year post SAP R/3 implementation. The research model used for the study incorporated the original TAM constructs, perceived usefulness