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Recommended Citation

Nah, Fiona Fui-Hoon; Tan, Xin; and Beethe, Monica, "End Users' Acceptance of Enterprise Resource Planning (ERP) Systems: An Investigation Using Grounded Theory Approach" (2005). *AMCIS 2005 Proceedings*. 169.

<http://aisel.aisnet.org/amcis2005/169>

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End-users' Acceptance of Enterprise Resource Planning (ERP) Systems: An Investigation Using Grounded Theory Approach

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ABSTRACT

The success of ERP implementation depends, to a large extent, on the intensity and nature of its use by end-users. Therefore, it is important to understand the phenomena underlying end-users' acceptance of ERP systems. This study was conducted at a large institution that implemented an ERP system. It uses the grounded theory approach to inductively develop a model that highlights key factors influencing end-users' acceptance of ERP systems.

Keywords

ERP, user acceptance, grounded theory.

INTRODUCTION

The implementation of Enterprise Resource Planning (ERP) systems and issues relating to their acceptance by end-users are important research topics in the information systems (IS) field. End-users' acceptance is a key success factor of an ERP implementation. While ERP adoption is an organizational decision, the consequences of ERP implementation depend largely on the intensity and nature of system use by end-users.

Some researchers have used the traditional Technology Acceptance Model (TAM) (Davis, 1989) to examine end-users' acceptance of ERP systems, on the ground that ERP is just another technological innovation. Other researchers, however, indicated that TAM needs to be extended or revised in order for it to be suitable for explaining end-users' acceptance of ERP systems.

The lack of a generally acceptable theoretical model to explain ERP user acceptance hinders advancement in ERP research. In this research, we attempt to fill the gap by developing a model of end-users' acceptance of ERP systems, which is grounded on empirical observations and systematic analysis. The grounded theory methodology (Strauss & Corbin, 1990) is an appropriate approach for the pursuit of this inquiry. We conducted this study in a large institution that implemented SAP R/3, a popular commercial ERP package.

USER ACCEPTANCE RESEARCH

Technology Acceptance Model

Many studies have examined the primary drivers of user intentions to adopt new information technologies. Among the established theories, the Technology Acceptance Model (TAM) (Davis, 1989) has emerged as a powerful and parsimonious way to represent the antecedents of system usage through beliefs about two factors: perceived ease of use and perceived usefulness of an information system. Figure 1 shows the original formulation of TAM.

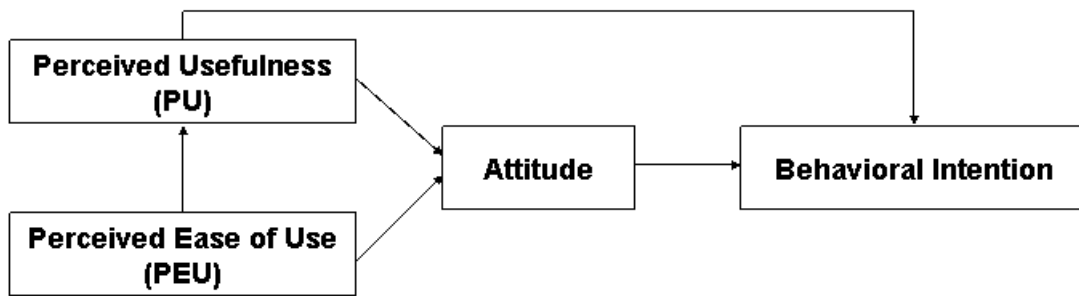


Figure 1. Original formulation of TAM

Specifically tailored for modeling user acceptance of information systems, TAM has great explanatory power. However, TAM by itself may not be suitable for explaining end-users' acceptance in ERP settings. The main criticisms against directly applying TAM in the ERP context include:

- The settings of ERP implementation: Several researchers have pointed out that TAM needs to be extended or revised in order to be suitable for explaining end-users' acceptance of complex and advanced information technology (IT) in organizational settings.
- Voluntary or mandatory use: An implicit assumption of TAM is that users of IT have a choice about the extent to which they use the technology. However, this is not the case in ERP settings. End-users generally do not have the choice/option of not using the ERP system, regardless of their attitude and mental acceptance of the system. A direct consequence is that the "behavioral intention" construct may not be appropriate to represent end-users' acceptance in mandatory usage contexts.

Empirical Studies on End-users' Acceptance of ERP Systems

Among studies that empirically investigated end-users' acceptance of ERP systems, some directly applied TAM to test the model in the ERP context (Brown et al., 2002; Rawstorne et al., 2000). Amoako-Gyampah and Salam (2004) extended TAM by examining the influence of antecedent variables on TAM constructs of PU and PEU. Another study (Nah et al., 2004) revised and extended TAM for investigating end-users' acceptance of ERP systems. Finally, one study (Bagchi et al., 2003) has drawn extensively on an adapted model of the Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1980), on which TAM is based.

A theme emerges from the above empirical investigations on end-users' acceptance of ERP systems, which is that the traditional TAM cannot fully explain adoption by users in the ERP context.

Research Motivations

While it is plausible to derive new models based on the theoretical deduction approach, a generally acceptable model is hard to identify and agree upon because researchers may choose various theoretical foundations in such theoretical deductive endeavors.

In scientific discourse, empirical induction is a more viable approach for developing new models (Kaplan & Duchon, 1988). Our study uses the inductive approach to develop a model grounded on the interpretation of the reflections and opinions of actual ERP end-users. The grounded theory research methodology (Strauss & Corbin, 1990) is used for this study.

RESEARCH METHODOLOGY

Applicability of Grounded Theory

The intent of the grounded theory approach is to generate or discover a theory that is grounded in data systematically gathered and analyzed (Creswell, 1998). Therefore, the grounded theory approach fits the purpose of this study, which is to develop a theoretical model of end-users' acceptance of ERP systems. Furthermore, grounded theory is suitable because it could incorporate the complexities of an organizational context (Martin & Turner, 1986), which are not sufficiently addressed in traditional parsimonious theories, such as TRA and TAM, but are important in ERP settings.

We chose the Straussian version of the ground theory methodology (Strauss & Corbin, 1990) because it allows for the flexibility of taking into account relevant prior theory, literature, and professional experiences to help researchers gain insights into the data. In our case, traditional theories, such as TRA and TAM, may serve as the general frame of reference for understanding end-users' acceptance of ERP systems. Other studies in the IS literature on the adoption and use of IT in organizations may also provide valuable lenses through which we may insightfully interpret the phenomenon and induce a theory about it.

Research Procedures

Research site

Before the turn of the new millennium, a Midwest public institution undertook a multimillion-dollar project that implemented SAP R/3, a popular commercial ERP package. The SAP R/3 system went live in July 1999 to support the administrative functions of the institution.

Data collection

Around the end of 2000, a survey was sent to SAP end-users in the institution. The end-users were encouraged to offer qualitative comments about their feelings toward the system and any problems or concerns they faced following the system implementation. The end-users were also requested to participate in follow-up interviews.

Based on analysis of the data collected from over two hundred respondents, we developed a preliminary interview guide to probe the nature of user acceptance and the factors influencing user acceptance. After six initial interviews, the interview guide was revised further to clarify some questions and to improve the flow of the issues covered in the interviews. Furthermore, following the first few interviews, additional literature was sought out to better understand the concepts that emerged from the interviews.

Data collection and data analysis proceeded iteratively, as suggested by Glaser and Strauss (1967) and as demonstrated in other grounded theory studies. The specific coding and analysis procedures will be presented in the following section where we report our preliminary findings. The iteration between data collection and analysis ended when all relevant categories and associated concepts had been identified, a situation Glaser and Strauss (1967) refer to as "theoretical saturation."

In total, 22 SAP users were interviewed. Each interview lasted from 20 to 65 minutes, and was conducted within the users' work environments. The interviews were audio recorded for data analysis. The following table provides the basic demographic information of our interviewees. The interviewees held positions throughout several levels of hierarchy in the institution. These characteristics suggest that in spite of the relatively small sample size, a diverse group of end-users were interviewed. Diversity in the sample is recommended in qualitative studies (Creswell, 1998) such as in grounded theory studies (Strauss & Corbin, 1990).

	Mean	Min.	Max.
Tenure in the institution (years)	15	2	33
Experience in using SAP R/3 (years)	2.6	1.5	4
Age (years)	46	30	62
Gender:			
Female (%)	73	-	-
Male (%)	27		

Table 1: Descriptive statistics of interviewees

PRELIMINARY FINDINGS

Our data analysis follows the three types of coding suggested by Strauss and Corbin (1990): (a) open coding, (b) axial coding, and (c) selective coding.

Open Coding

In open coding, data were initially examined to identify and name concepts that were related to the phenomenon being studied. Similar concepts were then grouped together to form a category. Each category was further explored to reveal its properties and dimensions. The properties describe the basic nature of the category while the dimensions refer to the range

within which a particular property can be placed (Strauss & Corbin, 1990). Taking “perceived technology characteristics” as a category, user-friendliness (ranging from user-friendly to hard to explore), relative advantage (ranging from superior to inferior), and compatibility (ranging from compatible to incompatible) can be identified as its properties (dimensions). So far, we have completed open coding, which resulted in numerous categories, namely, end-user acceptance, personal factors, perceived technology characteristics, training and support, social influence, and changes in job (see Table 2).

Category	Properties	Dimensions
End-user acceptance	User satisfaction	Satisfied ... dissatisfied
	User attitude	Positive ... negative
Personal characteristics	Innovativeness in technology	Innovative in technology ... conservative
	Open-mindedness	Open-minded ... resistant to changes
	Computer self-efficacy	High ... low
Perceived technology characteristics	User-friendliness	User-friendly ... hard to explore
	Compatibility	Compatible ... incompatible with routine tasks
	Flexibility	Flexible ... inflexible
	Relative advantage	Superior ... inferior to other systems
Training and support	Training	Effective ... ineffective
	Technical support	Good ... poor
	Group/peer support	Effective ... ineffective
Social influence	Management attitude	Supportive ... unsupportive
	Peers attitude	Positive ... negative
Changes in job	Shift in responsibility	Increased ... decreased
	Shift in data ownership	Increased ... decreased

Table 2: Summary of the open coding

Axial Coding

At the time of writing this research-in-progress, we were still in the stage of axial coding. The main purpose of axial coding is to establish the relations between the categories obtained during open coding, in terms of causal conditions, context, intervening factors, action and interaction strategies and consequences (Strauss & Corbin, 1990). We followed Strauss and Corbin's advice to derive hypotheses on how the concepts were related (Strauss & Corbin, 1990). Examples of such hypotheses include the following:

H1. End-users who perceive the system as user-friendly, flexible, superior to legacy systems, and compatible with routine tasks are more likely to have positive attitudes toward using the system and higher levels of satisfaction.

H2. Increases in responsibility due to the SAP implementation may be treated by end-users as either user empowerment, which is likely to result in positive attitudes toward the system, or extra burden, which may lead to negative attitudes.

The hypotheses were verified and further elaborated through continued comparisons of data from incident to incident (Strauss & Corbin, 1990). Such validations continued until the hypotheses were well refined and stabilized.

Selective Coding

We have not yet carried out selective coding. Selective coding is the process of integrating and refining the theory (Strauss & Corbin, 1990). In other words, the purpose of selective coding is to bind relevant categories together to form a grounded theory. The first step in selective coding is deciding on a central category, representing the main theme of the research. The next task is to link other (subsidiary) categories to the central category. In this study, the central category will be end-user acceptance of ERP systems. Other categories that were deemed to influence the central category will be integrated as its

antecedents or intervening factors. The result of the first two tasks will be an overarching theoretical scheme, which is subject to further refinement and validation.

DISCUSSION AND CONCLUSION

Among the preliminary findings of this study, we could identify some concepts and hypotheses that are similar to existing theories. For example, the first hypothesis example (H1) in section 4.2 (axial coding) is more or less similar to Rogers' theory of Diffusion of Innovation (1983) and TAM (Davis, 1989). Based on the data analysis, we think "relative advantage" is more accurate, compared to "perceived usefulness" in TAM, in representing end-users' beliefs about the instrumentality of the ERP system. While both "complexity" in (Rogers, 1983) and "perceived ease of use" in TAM (Davis, 1989) refer to the extent to which a user believes that using the system will be free of effort, they fail to differentiate some underlying characteristics related to users' effort expectancy. The two concepts identified in our study – "User-friendliness" and "flexibility" – distinguish the interface of the system from its functionality when users are concerned about the efforts to operate the system.

The expected influence of "changes in job" category echoes Markus' (1983) political view of MIS implementation, which is often neglected in IT acceptance research. Some properties, such as open-mindedness in "personal characteristics" category and group/peer support in "training/support" category, have not been extensively examined in the IS literature. The continued coding and the review of related literature will provide a clearer picture about how these concepts are related.

Upon the completion of this research, we expect to derive a comprehensive model of end-users' acceptance of ERP systems. We believe that such an empirically and inductively derived model will help to explain users' acceptance and resistance of ERP systems.

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