December 2002

ENTERPRISE SYSTEMS EXTENDED USE

Rui Sousa
University of Georgia

ENTERPRISE SYSTEMS EXTENDED USE

Rui Dinis Sousa
University of Georgia
rsousa@uga.edu

Abstract

This research looks at the individual acceptance of an Enterprise System (ES) in terms of extended use. "Extended use" is intended to capture the situations when the users go beyond the basic use to discover through their own exploration new ways of utilizing the system. Building from the theoretical framework of the Technology Acceptance Model (TAM), this research seeks to identify what factors under managerial influence are most likely to predict extended use. The model suggests that extended use will be predicted by perceptions of usefulness of extended use and ease of extended use. These will be predicted by four factors: user participation, knowledge transfer from consultants, training, and situated learning. A survey of key users will be conducted to test the model. From an academic perspective, this empirical study seeks to contribute to: a) an emergent research area where case studies are still predominant and empirical studies are scarce, and b) the understanding of a stage of the ES project not as well addressed as the implementation stage. From a practitioner perspective, this research intends to call the attention of management to a set of factors that could help the organization get the most out of an ES by promoting its extended use.

Keywords: ERP, ES, Extended Use, TAM

Introduction

An Enterprise Resource Planning (ERP) system also known as Enterprise System (ES) is a powerful system that may lead to significant gains of productivity by enabling the integration of the business processes throughout the organization, and by providing integrated planning and reporting capabilities. However, the broad organizational scope, the variety of functionalities provided and the tight integration among components of the ES make this system a very complex one that is difficult to understand. When users are not fully aware of the ripple effects when entering their transactions, they may work under the fear of making mistakes. Therefore, they tend to stick to an initial learned set of commands without trying to find better ways or to explore new functionalities to improve their job performance. As a result many systems remain used at the basic transaction level (Ross and Vitale, 2000). To realize the potential offered by an ES, the system has to be used not only at the basic level but also at the decision-making level taking advantage of the planning, tracking and reporting capabilities offered by the system.

Despite some reported failures in the trade press, the ERP market is still growing (Reuters, 2002). Among other reasons for this growth, perhaps managers find it hard to ignore the benefits that come from the integration of business processes. The question for many managers is no longer whether to implement an ES or not, but how to get the most out of such systems, something that may be achieved through extended use. Therefore, this study will seek to answer the following research question: What factors under managerial influence are more likely to promote the extended use of an Enterprise System?

Theoretical Development and Model

"Use", one of the most common measures for IS success, is a broad concept that subsumes a multiplicity of user-ES interactions. Basic use (when users enter the basic required transactions) is quite different from extended use (when users explore the system to discover new ways of improving their job performance). Significant business benefits are expected when extended use takes place (Lassila and Brancheau, 1999; Agarwal, 2000). Extended use has been operationalized as a way of exhibiting IT infusion (Saga, 1994). Through extended use, the organization may achieve the infusion state, when the ES can be utilized to its maximal

value. The users feel confident exploring and finding new ways to support their tasks and increase their job performance. So far ES research has been mainly focused on the implementation stage (Esteves and Pastor, 2001). Little research (mostly case based) addresses ES usage (Holland and Light, 2001).

Predicting Perceived Extended Use

Drawing upon the Theory of Reasoned Action, the Technology Acceptance Model (TAM) (Davis, et al., 1989) specifically identifies two especially critical beliefs in predicting information technology use: perceived usefulness and perceived ease of use. TAM, a parsimonious model well supported by several studies, is the starting point for the research model presented in Figure 1. Thus,

Proposition 1: Perceived Usefulness of Extended Use and Ease of Extended Use lead to Perceived Extended Use of an Enterprise System.
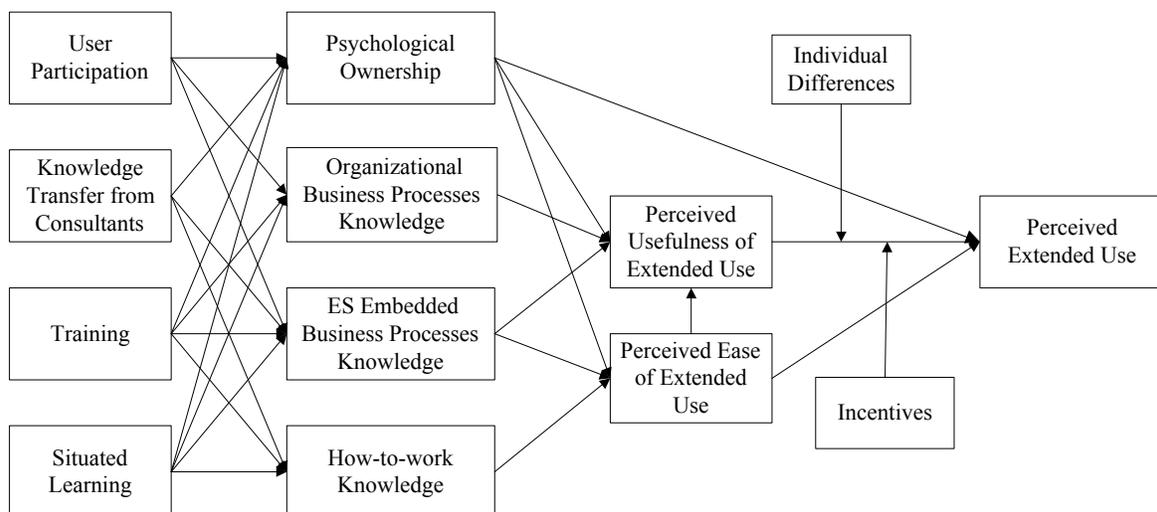

Figure 1. Enterprise System Extended Use

Besides usefulness of extended use and ease of extended use, "psychological ownership" is expected to have a direct impact on extended use. Psychological ownership has been theorized to be associated with high levels of motivation including the performance of extra role behaviors (not formally rewarded by the organization). The link between psychological ownership and extra role behaviors (constructive work efforts individuals make to go beyond the required work activities) has been empirically confirmed (Vandewalle, et al., 1995). Hence, users who develop psychological ownership of an ES will be willing to spend some time exploiting the potential of the system, investing the self into the ES through extended use. Thus,

Proposition 2: Psychological Ownership leads to Perceived Extended Use of an Enterprise System.

Predicting Perceived Usefulness of Extended Use and Perceived Ease of Extended Use

It seems reasonable to assume that individuals with a strong sense of psychological ownership of an ES would also tend to have a more positive assessment of a system's usefulness and ease of use. Thus,

Proposition 3: Psychological Ownership leads to Perceived Usefulness of Extended Use and Perceived Ease of Extended Use.

A positive assessment of a system's usefulness and ease of extended use is also expected when the users get the appropriate knowledge to explore the system. Several knowledge levels are considered. First, more "Organizational Business Processes

Knowledge," by giving the users a global and thorough view of the business practices, allows users to identify opportunities to increase job performance. Thus,

Proposition 4: Organizational Business Process Knowledge leads to Perceived Usefulness of Extended Use.

Second, more "ES Embedded Business Processes Knowledge," by giving the users a comprehensive view of the ES business processes and the way those processes are mapped, allows users not only to better realize the potential of the tool but also to easily navigate through it. Thus,

Proposition 5: ES Embedded Business Processes Knowledge leads to Perceived Usefulness and Ease of Extended Use.

Third, more "How-to-work Knowledge," by giving users the knowledge of how to efficiently use the menus and commands available and how to interpret the system messages, makes the exploitation of the potential of the Enterprise System less difficult. Thus,

Proposition 6: How-to-work Knowledge leads to Perceived Ease of Extended Use.

Factors under Managerial Influence

Management cannot directly manipulate the mechanisms of psychological ownership, organizational business processes knowledge, ES embedded business processes knowledge and how-to-work knowledge. However, four factors under managerial influence are expected to affect these four mechanisms and thus to promote the ES extended use: user participation, knowledge transfer from consultants, training and situated learning.

There is empirical support for the link between system use and user participation, but only "overall responsibility" (user activities and assignments reflecting leadership or accountability) has emerged as a key dimension of user participation (Hartwick and Barki, 1994). User perception of control over a newly developed information system, argued as similar to overall responsibility, was later empirically correlated to user performance (Hunton and Beeler, 1997) suggesting that a participation strategy that develops a sense of overall responsibility and system ownership is a key IS success factor. These findings point to a relationship between user participation and psychological ownership. In addition, when the users participate in extensive process analysis, they get a better understanding of the organizational and ES embedded business processes. Thus,

Proposition 7: User Participation (Overall Responsibility, Extensive Process Analysis) leads to Psychological Ownership, Organizational Business Processes Knowledge and ES Embedded Business Processes Knowledge.

Knowledge transfer from consultants is believed to increase users' ability to explore the system (Davenport, 2000). Although that transfer may occur in an unstructured way, if senior management carefully controls the ES implementation to assure that crucial knowledge is transferred, users are expected to increase their sense of possession and control over the ES (psychological ownership), and their understanding of the ES at the tool conceptual (embedded business processes) and at skilled (how-to-work) knowledge levels. Thus,

Proposition 8: Knowledge Transfer from Consultants leads to Psychological Ownership, ES Embedded Business Processes Knowledge and How-to-work Knowledge.

Training has been pointed out as the responsible for the 10% to 15% of ES implementations that had a smooth implementation delivering the expected benefits (Wheatley, 2000). Particularly with an integrated package such as an ES, training should be more "conceptual" than "skill-focused," but both types of training are needed. In fact, a training strategy framework proposed by Sein, Bostrom and Olfman (1999) includes several levels of knowledge as desirable training outcomes. Moreover, through training, users can develop a sense of control over the ES and therefore increase their psychological ownership. Thus,

Proposition 9: Training leads to Psychological Ownership, Organizational Business Processes Knowledge, ES Embedded Processes Knowledge and How-to-work Knowledge.

To compensate for the limitations of the initial formal training in ES, case study research has shown that users may engage in the practice of situated learning (Boudreau, 2000). Transaction processing activities are easily codified and passed on as explicit knowledge. However, tacit knowledge related to previous experiences, such as how to work around or suppress errors in an ES, cannot so easily be transferred. The development of a community of practice where situated learning takes place may constitute an important vehicle to share and disseminate critical tacit knowledge about the ES. The better the knowledge an user has about an ES, the deeper the relationship with an ES and, therefore, the stronger the feeling of ownership toward it (Pierce, et al., 2001). Positive relationships from situated learning to psychological ownership and to the different levels of knowledge are expected.

> **Proposition 10:** Situated Learning leads to Psychological Ownership, Organizational Business Processes Knowledge, ES Embedded Business Processes Knowledge and How-to-work Knowledge.

Controlling for Individual Differences and Incentives

Personal innovativeness in the domain of information technology (PIIT) was found to be an important individual difference variable that moderates the relationship between beliefs and usage intentions (Agarwal and Prasad, 1998). Defined as "the willingness of an individual to try out any new information technology (p. 206)," PIIT seems a good candidate to be used as a control variable for ES extended use.

"Incentives" is another control variable to take in account. This study will not try to control for all the possible inhibitory factors to extended use or even measure some of them. Instead, this study will control for the incentives that are expected to overcome those inhibitory factors in order to get extended use.

Research Methodology

A survey method will be used to investigate the relationships proposed in the model. The unit of analysis is the ES user. An ES user may comprise several types of users such as the ones defined by SAP, a ERP market's leader: a transactional user (a user who will use the system to carry out specific transactions), a casual user (a user who will use the ES to retrieve information) and a power user (a user who has strong knowledge of the system and can act as an interface between the ES project team and the users). Extended Use is more likely to happen with the latter two types of users. A convenience sample will be used, obtained mainly through personal contacts with organizations that have recently implemented an ES. A few semi-structured telephone interviews have already been conducted with some users in order to get useful information for the development of an instrument. The instrument is now under development to be tested before it is administered. Table 1 presents an item example for each one of the constructs.

A structural equation modeling technique will be used to assess the relationships proposed in the model.

Expected Contributions

From an academic perspective, this empirical study seeks to contribute to:

(a) An emergent research area where case studies are still predominant and empirical studies are scarce, and

(b) A better understanding of ES usage not as well addressed as ES implementation

From a practitioner perspective, this research intends to call the attention of management to a set of factors that could help the organization get the most out of an ES by promoting its extended use.

Table 1. Instrument: An Item Example for Each Construct

Construct (in alphabetical order)	Item Example
Ease of Extended Use	To what extent do you think it is easy to explore the enterprise system?
ES Embedded Business Processes Knowledge	To what extent are you aware of what you can do with the tool?
How-to-work Knowledge	To what extent do you get the enterprise system to do what you want it to do?
Incentives	To what extent are you encouraged to find new ways of using the enterprise system?
Individual Differences	In general, to what extent are you the first among your peers to try out new information technologies?
Knowledge Transfer from Consultants	To what extent did the consultants impart to you sufficient knowledge to perform your tasks?
Organizational Business Processes Knowledge	To what extent are you aware of the ways in which changes to your use of the ES can impact other's tasks?
Perceived Extended Use	To what extend have you found new ways to use the enterprise system?
Psychological Ownership	To what extent do you identify with the enterprise system as "your system"?
Situated Learning	To what extent do you have colleagues you can rely on to help you when facing problems while using the system?
Training	Was there adequate time spent on training you how to carry out the basic tasks associated with your job?
Usefulness of Extended Use	To what extent do you think exploring the enterprise system would improve your job performance?
User Participation	To what extent did you have an active role (i.e. group leader or providing critical input or making decisions at any level) in the implementation of the enterprise system?

References

Agarwal, R. "Individual Acceptance of Information Technologies," In *Framing the Domains of IT Management*, R. W. Zmud (Ed.), Pinnaflex, Cincinnati, Ohio, 2000, pp. 85-104.

Agarwal, R. and Prasad, J. "A Conceptual and Operational Definition of Personnal Innovativeness in the Domain of Information Technology," *Information Systems Research* (9:2), 1998, pp. 204-215.

Boudreau, M.-C. "Exploring the Transition to Enterprise Resource Planning: A Longitudinal Study of IT-Related Change," unpublished Doctoral Dissertation, Georgia State University, 2000.

Davenport, T. *Mission Critical: Realizing the Promise of Enterprise Systems*, Harvard Business School Press, Boston, MA, 2000.

Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. "User Acceptance of Computer Technology," *Management Science* (35:8), 1989, pp. 982-1003.

Esteves, J. and Pastor, J. "Enterprise Resource Planning Systems Research: An Annotated Bibliography," *Communications of the Association for Information Systems* (7:8), 2001, pp. 52.

Hartwick, J. and Barki, H. "Explaining the Role of User Participation in Information System Use," *Management Science* (40:4), 1994, pp. 440-465.

Holland, C.P. and Light, B. "A Stage Maturity Model for Enterprise Resource Planning Systems Use," *The DATA BASE for Advances in Information Systems* (32:2), 2001, pp. 34-45.

Hunton, J.E. and Beeler, J.D. "Effects of User Participation in Systems Development: a Longitudinal Field Experiment," *MIS Quarterly* (21:4), 1997, pp. 359-388.

Pierce, J.L., Kostova, T. and Dirks, K.T. "Toward a theory of psychological ownership in organizations," *Academy of Management* (26:2), 2001, pp. 298-310.

Ross, J.W. and Vitale, M.R. "The ERP Revolution: Surviving vs. Thriving," *Information Systems Frontiers* (2:2), 2000, pp. 233-241.

Saga, V.L. "The Nature and Determinants of Information Technology Infusion: An Organizational Level of Analysis," unpublished Doctoral Dissertation, The Florida State University, 1994.

Sein, M.K., Bostrom, R.P. and Olfman, L. "Rethinking end-user training strategy: Applying a hierarchical knowledge-level model," *Journal of End User Computing* (11:1), 1999, pp. 32-39.

Vandewalle, D., Dyne, L.V. and Kostova, T. "Psychological Ownership: An Empirical Examination of Its Consequences," *Group & Organization Management* (20:2), 1995, pp. 210-226.

Wheatley, M. "ERP training stinks," *CIO*, (13:16), Jun 1 2000, pp. 86-96.