ABSTRACT

Drawing upon the literature review and analysis of current published research, this paper identifies the issues in and highlights the importance of post-adoption stage. There has been a considerable amount of research undertaken which have studied different issues related to pre-adoption. The focus of majority of these studies generally lies in the exploration of research issues related to pre-adoption stage. Comparatively less attention has been given to understand the issues at post-adoption stage.

Exploring issues in Enterprise Information Systems Post-adoption Stage

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INTRODUCTION

The purpose of Enterprise Information Systems (EIS) is to connect and manage information flow within and across organizations. These systems allow managers to make decisions based on most up to date state of the business. EIS are integrated software applications that are implemented in an organization to automate complex transactions and improve overall organizational effectiveness (Davenport, 1998; Markus & Tanis, 2000). Historically these systems were installed to support back office tasks like integrating and automating complex transaction processes across company functions like finance and human resources (Davenport, 1998). Today, the functions of EIS have been greatly expanded to provide additional functionality such as customer relationship management, supply chain management, planning, performance management and advance analytics.

The research stream examining the adoption and use of EIS have evolved in to one of the most mature research streams in the Information Systems (IS) field (Jasperson, Carter, & Zmud, 2005; Venkatesh, Morris, Davis, & Davis, 2003). A great majority of the research efforts have been focused towards exploring pre-adoption behavioral and initial use factors. In recent years, EIS post-adoption behavioral studies have started to emerge in different IS publications but the main focus remains towards studying the same set of factors that lead to initial use and acceptance (Saeed & Abdinnour-Helm, 2008).

The purpose of this paper is to highlight the importance of post-adoption stage, identify research gaps in the literature, and explore academic as well as practitioner issues of this stage. An extensive literature review was conducted to describe the concept of post-adoption stag as perceived by previous research. This paper is an attempt to fill in the research gap and address practitioners concern by further exploring the area to better understand the issues associated with it. This paper assimilates knowledge from management and IS literature to fully describe and highlights issues in post-adoption stage.

This paper is organized as follow. First section includes literature review on post-adoption stage as perceived by previous research. Second section provides a detail on the conceptualization of post-adoption stage in EIS. Third section explains the issues related to post-adoption stage followed by further explanation on probable links between innovation and post-adoption activities.

LITERATURE REVIEW

Earlier studies have looked at the post-adoption stage from different perspectives. Some notable examples are from IS implementation literature that include IS implementation process model of incorporation (Kwon & Zmud, 1987) and routinization (Cooper & Zmud, 1990). These studies examine post-adoption behaviors at an individual level and establish its theoretical basis on the innovation diffusion theory. The innovation diffusion theory formulate on the basis that diffusion of innovation can be viewed as an ongoing process where features and output of early stages are different from later stages (Agarwal & Prasad, 1997). Furthermore, Roger (1995) explains that diffusion of innovation is a process whereby innovation is communicated to members of the social community through numerous channels over time. Similarly, IS implementation can be viewed as continuous effort to diffuse an implemented IS to members of the social community over time (Kwon & Zmud, 1987).

The first IS implementation process model consists of six stages: initiation, adoption, adaptation, acceptance, use and incorporation (Kwon & Zmud, 1987) as shown in Table 1. These stages are then revised by Cooper and Zmud in 1990. The new model eliminates the use stage and divide incorporation stage in two stages namely routinization and infusion.

IS Implementation Process Model (Kwon & Zmud, 1987)					
Initiation	Adoption	Adaptation	Acceptance	Use	Incorporation
IS implementation Process Model (Cooper & Zmud, 1990)					
Initiation	Adoption	Adaptation	Acceptance	Routinization	Infusion

Table 1: Two IS implementation Process Models

As shown in the Table 1, adoption and acceptance are two different stages in the implementation process. Adoption at an individual level implies a potential adopter's decision to whether to use or not to use IS. At an organizational level, this means organization's decision to designate and ensure resources needed for change. Also, at this stage, there is a possibility that a potential adopter may

have knowledge of the IS but do not have hands on experience in using any particular IS (Karahanna, Straub, & Chervany, 1999). The adaptation stage includes the process in which an individual or an organization goes through number of cycles to fully accustom with newly adopted IS. At this stage, users go through user training to fully understand the capability of the IS. The acceptance stage occurs after adaptation and entails an organization's devotion of efforts to persuade users to use implemented IS at work. At an individual level, this would mean increased productivity, work performance after adapting and accepting the new IS (Agarwal & Karahanna, 2000).

At the acceptance stage, users commit themselves to use IS and to gain experiences. Some variables like attitude toward use, and intention to use, can be employed to form the measurement of IS acceptance. Even though adoption and acceptance are two different stages in the IS Implementation Process Model, several theories that explain these stages do not provide clear differentiation. Some of the popular theories include theory of the reasoned action (Davis, 1989; Karahanna, et al., 1999), theory of planned behavior (Taylor & Todd, 1995), technology acceptance (Davis, 1989; Kim & Malhotra, 2005) and unified theory of acceptance and use of technology (Venkatesh, et al., 2003) .

Several studies including Bhattacherjee (2001), Bhattacherjee and Premkumar(2004) and Jasperson et al. (2005) suggest that an initial adoption and acceptance stages are very important, but true value and return on the investment can only be measured at the later stages namely routinization and infusion. According to Saga and Zmud(1994), routinization is a permanent change in the organization's governing system to accommodate for the newly installed IS. At the individual level, this routinization implies a standardized usage behavior that is treated as normal. In last stage of infusion, organization integrate IS at its fullest potential into management and operational processes (Jones, Sundaram, & Chin, 2002). This implies applying advanced and more features of IS to further enhance a more comprehensive set of tasks at the workplace (Saga & Zmud, 1994).

In summary, first three stages of IS implementation refers to activities at an organization or departmental level, and last three stages illustrate activities both at micro (e.g., an individual) as well as macro level. In particular, last two stages of the IS implementation

can be envisioned as post-acceptance stage (Hsieh & Wang, 2007). Furthermore all the stages identified in Table 1 do not necessarily mean that these stages have to come in sequential way. These stages of IS implementation can occur in parallel as well (Saga & Zmud, 1994). Furthermore, different terms like post adoption / acceptance / implementation are used interchangeably in these studies.

Although previous section has explained post-adoption stage using IS implementation process model, it is important to understand this stage in EIS. The following section explains the concept of post-adoption in EIS followed by discussion on issues in this stage.

CONCEPTUALIZATION OF THE POST-ADOPTION STAGE IN ENTERPRISE INFORMATION SYSTEMS

The concept of post-adoption stage in the EIS was presented by Markus and Tanis (2000) in 2000 . They used a process theory approach to divide the EIS pre-adoption and post-adoption experience lifecycle into four phases (Markus & Tanis, 2000). The process theory argues that sequences of events leads to certain output stages, following a set of process. These four phases are shown in the Figure 1:
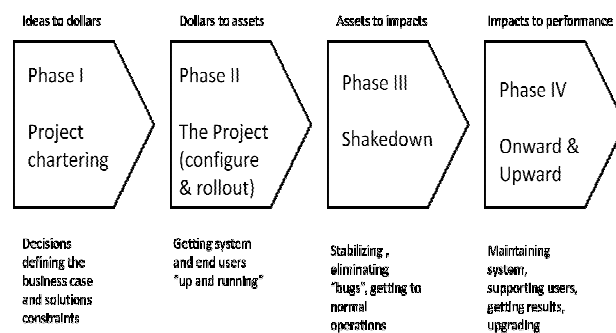

Figure 1: Enterprise Information Systems Experience Cycle (Markus & Tanis, 2000)

The project chartering phase consists of key decisions leading to funding of EIS. They suggest that some of the key actors of this phase include company executives, vendors, consultants, and IT specialists. Key activities include initiation of idea to adopt EIS, and identification and assignment of tasks to project champions. Additional activities

include the identification and selection of software and project scheduling and planning.

In the system configuration and rollout phase of a project, all activities are focused towards getting a system up and running in different organization units. Some of the key actors include project team members from different organization units, functional managers, vendors, IT specialists and consultants. All partners that are selected in the implementation of the project work closely with the project team to ensure that a project achieves the organizational goal of EIS implementation.

The shakedown phase refers to the period of time from when a system goes live until normal operation has been achieved. Some of the important key activities include errors or bug fixing, fine tuning the system, retraining additional staff members, and increasing staffing to handle the normal or temporary inefficiencies. In this phase, inefficiencies are realized to improve productivity (Markus & Tanis, 2000).

The onward and upward phase continues from normal operation until EIS is replaced with an improved, upgraded or a completely different new system. This is a stage when an organization discovers the true benefit of its EIS investment. Important people in this phase include end users, support personnel, and operational managers. Internal and external consultants and vendors may be also involved if upgrades are considered. Some of the key activities include the post implementation audits, benefit assessment and upgrading to new software releases.

Furthermore, Deloitte (1999) divides EIS implementation phases into three phases namely stabilize, synthesize and synergize. These three phases are also referred to as "second wave" implementation phase. In the first phase, organizations adopt a system and changes that occur due to this implementation. The second phase includes discovery of business benefits by the implementation of improved business processes and training of people to support new changes. The last phase, referred to as post-adoption stage, is where process optimization is achieved that results in business transformation.

The phases identified in Markus and Tanis's (2000) EIS cycle model are aligned with the stages of traditional systems development lifecycle (Nah, Lau,

& Kuang, 2001) and IS implementation process models (Cooper & Zmud, 1990; Kwon & Zmud, 1987).

This study considers the post-adoption stage to be the same as the onward and upward phase and synergize phase as conceptualize in the case of EIS. The following section identifies research gaps related to post-adoption stage.

ISSUES AT THE POST-ADOPTION STAGE

There are several activities at the post-adoption stage to ensure that EIS continues to meet the business demand. Some suggest that these activities are complex in nature because of their dual nature of doing and managing character (Chapin, Hale, Khan, Ramil, & Tan, 2001). Nordstorm and Welander(2005) suggest two categories of these activities to capture the scope of post-adoption work. First category includes the activities that deal with the planning, managing and execution of change request. For example, a request to change, upgrade or fix a system by the customer. Second category includes all the activities that deal with providing the support. Some examples of these activities include providing support to users in problem situations, and, supporting the technology through which services are accessed. These activities are referred to as system support and maintenance (SSM) in IS literature.

SSM involves complex activities, both of the "doing" and the "managing" character (Chapin, et al., 2001). Khan & Zheng(2005) suggest that there is a need for "defined formalism describing various tasks, tools and methods are required" (pp. 7). Activities at the post- adoption phase are not only superficial operation work but could potentially link to the business pulses, i.e., the change of business environment or market climate via data maintenance in the decision support systems (Wang, Pauleen, & Ho, 2011). Some scholars suggest to explore the post-adoption stage and investigate the probable links with innovation (McElheran, 2011).

INNOVATION AND POST-ADOPTION USAGE BEHAVIOR

Prior IS literature suggests the degree of innovation depends upon level of IS usage at the post-adoption stage. Several studies including Schwarz (2003) and Sundaram et al. (2007) argue that level of innovation and learning increases with the utilization of IS in the organization. Here utilization refers to an extent at which the users integrate IS to support their work tasks. This study assimilates previous IS literature and identify key literature based on the type of IS usage and level of innovation. Table 2 presents empirical studies identified based on previous IS literature

IS usage level	Key Literature	Level of Innovativeness & Learning
Minimum	Routine/Standardize Use (Saga & Zmud, 1994; Schwarz, 2003; Sundaram, et al., 2007)	Low
Moderate	Extended/Deep structure Use (Burton-Jones & Straub, 2006; Schwarz, 2003; Swanson, 1994)	Medium
Maximum	Emergent/exploration Use (Agarwal & Karahanna, 2000; Ahuja & Thatcher, 2005; Jasperson, et al., 2005; Nambisan, Agarwal, & Tanniru, 1999; Nambisan & Baron, 2007; Wang & Hsieh, 2006)	High

Table 2: Post adoption IS Usage Behavior

In the table 2, minimum IS usage refers to the user's utilization of IS in a standardized or routine manner that is compatible with standard work processes. Different terms like standard use (Schwarz, 2003; Sundaram, et al., 2007), routine use or normal use (Saga & Zmud, 1994) emerge in the IS literature for this concept. The key characteristic inherent in this type of IS usage includes common expectations from a user once IS implementation has reached to post-adoption stage. This expectation include but not limited to knowing how predefined set of rules, policy or regulations related to IS use, so that it can facilitate the integration between IS use and work processes (Saga & Zmud, 1994).

Moderate level of IS usage refers to user's utilization of more IS functions or features to support work task performance. Extant literature suggests that similar concepts that explain this level of IS usage include but not limited to deep use (Saga & Zmud, 1994), extant function or feature use (Burton-Jones & Straub, 2006). The key characteristic of this level of IS usage is that it includes utilization of IS features or functionalities to accommodate additional work task. This level comes during the post-adoption stage where user become more familiar with IS functions due to extended use. Empirical evidence suggest that this level further increase the user capability and enable them to perform their tasks in more efficient and effective way (Hsieh & Wang, 2007).

Maximum level of IS usage refers to a stage where level of innovativeness and learning is at highest level through the utilization of IS. Previous studies identify different terms like emergent use (Agarwal & Karahanna, 2000), exploration use (Nambisan, et al., 1999) , or innovation IT use (Ahuja & Thatcher, 2005) to explain this stage. The key characteristic of this stage include the utilization of IS in a fashion that go beyond the way that imparted by original implementer or designer (Jasperson, et al., 2005). Furthermore, this stage includes users utilization at maximum level where intention to explore, or try to innovate with IT is at highest level.

Although previous research has shown link between post-adoption and innovation (Agarwal & Karahanna, 2000; Ahuja & Thatcher, 2005; Jasperson, et al., 2005; Nambisan, et al., 1999; Nambisan & Baron, 2007; Wang & Hsieh, 2006), there is little information available on the factors that influence innovation at post-adoption stage of EIS. Hence is important to explore this area and conduct additional research.

CONCLUSION

Previous empirical studies indicate that a post-adoption activity like SSM is often left to students, entry level workers or inexperienced personnel (Khan & Zheng, 2005; Polo, et al., 2003). SSM is not well regarded and a high staff turnover rate is common in support departments (Chapin, et al., 2001). The people who carry out this work may have few or no performance incentives attached to their work.

This paper explains the issues in post-adoption stage and highlights the importance of this stage. This area is considered important since it has the ability to provide a disruption-free environment and

the potential to support innovation in the organization. An extensive research is needed in future to further examine the potential effects and the role of post-adoption activities on innovation.

REFERENCES

i. Agarwal, R., & Karahanna, E. (2000). Time Flies When You're Having Fun: Cognitive Absorption and Beliefs about Information Technology Usage. MIS Quarterly, 24(4), 665-694.

ii. Agarwal, R., & Prasad, J. (1997). The Role of Innovation Characteristics and Perceived Voluntariness in the. Acceptance of Information Technologies. Decision Science, 28(3), 557-582.

iii. Ahuja, M. K., & Thatcher, J. B. (2005). Moving Byound Intentions and Toward the Theory of Trying: Effects of Work Environment and Gender on Post Adoption Information Technology Use. MIS Quarterly, 29(3), 427-459.

iv. Bhattacherjee, A. (2001). Understanding Information Systems Continuance: An Expectation-Confirmation Model. MIS Quarterly, 25(3), 351-370.

v. Bhattacherjee, A., & Premkumar, G. (2004). Understanding Changes in Belief and Attitude toward Information Technology Usage: A theoretical Model and Longitudinal Test. MIS Quarterly, 28(2), 229-254.

vi. Burton-Jones, A., & Straub, D. W. (2006). Reconceptualizing System Usage: An approach and Empirical Test. Information Systems Journal, 17(3), 228-246.

vii. Chapin, N., Hale, J. E., Khan, K. M., Ramil, J. F., & Tan, W. G. (2001). Types of software evolution and maintenance. Journal of Software Maintenance and Evolution, 13(1), 3-30.

viii. Cooper, R. B., & Zmud, R. W. (1990). Information Technology Implementation Research: A Technological Diffusion Approach. Management Science, 36(2), 123-139.

ix. Davenport, T. H. (1998). Putting the enterprise into the enterprise system. Harvard Business Review, 76(4), 121-131.

x. Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. MIS Quarterly, 13(3), 319-339.

xi. Deloitte. (1999). ERPs Second Wave: Deloitte Consulting.

xii. Hsieh, J., & Wang, W. (2007). Explaining Employees Extended Use of Complex Information Systems. European Journal of Information Systems, 16(3), 216-227.

xiii. Jasperson, J., Carter, P., & Zmud, R. (2005). A Comprehensive Conceptualization of Post Adoptive Behaviors associated with Information Technology Enabled Work Systems MIS Quarterly(29), 3.

xiv. Jones, E., Sundaram, S., & Chin, W. (2002). Factors leading to Sales force automatic use: A longtitudinal Analysis. Journal of Personal Selling and Sales Management, 3(1), 145-156.

xv. Karahanna, E., Straub, D. W., & Chervany, N. L. (1999). Information Technology Adoption Across Time: A Cross-Sectional Comparison of Pre-Adoption and Post-Adoption Beliefs. MIS Quarterly, 23(2), 183-213.

xvi. Khan, K., & Zheng, Y. (2005). Managing Corporate Information Systems Evolution and Maintenance. Hershey, PA: Idea Group Publishing.

xvii. Kim, S. S., & Malhotra, N. K. (2005). Predicting System Usage from Intention and Past Use: Scale Issues in the Predictors. Decision Science, 36(1), 187-196.

xviii. Kwon, T. H., & Zmud, R. W. (1987). Unifying the Fragmented Models of Information Systems Implementation. In R. J. Boland & R. A. Hirschheim (Eds.), Critical Issues in Information Systems Research (pp. 227-251). New York: John Wiley & Sons.

xix. Markus, M., & Tanis, C. (2000). The Enterprise Systems Experience - From Adoption to Success. In R. W. Zmud (Ed.), Framing the Domains of IT Research Glimpsing the Future Through the Past (pp. 173-207). Cincinnati: Pinnaflex Educational Resources.

xx. McElheran, K. S. (2011). Do Market Leaders Lead in Business Process Innovation: The Case(s) of E-business Adoption. Harvard Business Review.

xxi. Nah, F. F., Lau, J. L., & Kuang, J. (2001). Critical factors for successful implementation of enterprise systems. Business Process Management Journal, 7(3), 285 - 296.

xxii. Nambisan, S., Agarwal, R., & Tanniru, M. (1999). Organizational Mechanisms for Enhancing User Innovation in Information Technology. MIS Quarterly, 23(3), 365-395.

xxiii. Nambisan, S., & Baron, R. A. (2007). Interactions in virtual customer environments: Implications for product support and customer relationship management. Journal of Interactive Marketing, 21(2), 42-62.

xxiv. Nordström, M., & Welander, T. (2005). Business oriented maintenance management - A reference model for (system) maintenance. In K. M. Khan & Y. Zhang (Eds.), Managing Corporate

Information Systems Evolution and Maintenance (Vol. 1, pp. 334). Stockholm, Swedish: Idea Group Publishing.

xxv. Rogers, E. M. (1995). Diffusion of Innovations (4th ed.). New York: The Free Press.

xxvi. Saeed, K. A., & Abdinnour-Helm, S. (2008). Examining the effects of information system characteristics and perceived usefulness on post adoption usage of information systems. Information & Management, 45(6), 376-386.

xxvii. Saga, V. L., & Zmud, R. W. (1994). The Nature and Determinants of IT Acceptance, Routinization, and Infusion. In L. Levine (Ed.), Diffusion, transfer and implementation of information technology (pp. 67-86). North-Holland, Amsterdam.

xxviii. Schwarz, A. (2003). Defining Information Technology Acceptance: A Human Centered Management Oriented Perspective. Houston, TX: University of Houston Press.

xxix. Sundaram, S., Schwarz, A., Jones, E., & Chin, W. W. (2007). Technology Use on the Front line: How information technology enhances individual performance. Journal of Academy of Marketing Science, 35(1), 101-112.

xxx. Swanson, E. B. (1994). Information Systems Innovation among Organizations. Management Science, 40(9), 1069-1092.

xxxi. Taylor, S., & Todd, P. A. (1995). Understandig Information Technology Usage: A Test of Competing Models. Information Systems Reseaerch, 6(2), 144-176.

xxxii. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View. MIS Quarterly, 27(3), 425-478.

xxxiii. Wang, W., & Hsieh, J. P. (2006). Symbolic Adoption, Extended Use, and Emergent Use of Complex Information Systems in the Mandatory Organizational Context. Paper presented at the 27th International Conference on Information Systems (ICIS), Milwaukee.

xxxiv. Wang, W. Y. C., Pauleen, D., & Ho, M. S. C. (2011). IT Governance for Systems Support and Maintenance - Views from CIO's in Multinational Enterprises. Paper presented at the The 11th International Conference on Electronic Business (ICEB 2011), Bangkok.