Understanding Changes in Post-Adoption Use of Information Systems

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Abstract

As organisations continue to invest heavily in IS to support business processes, the under-utilization of such IS is a key concern that challenges efforts to exploit its benefits. What is most desirable is for users to engage in forms of deep use that effectively leverage the features of the IS for work tasks. But, too often users engage in surface-level use, minimizing their interactions with the IS. Yet how they use an IS often changes over time to become progressively deeper as the IS is embedded more in the performance of various tasks. To understand how post adoption use changes over time, this research will draw on insights from theories of change and a series of case study interviews to derive a model of change in IS use.

Keywords
Post-Adoption Use, Change, triggers, enablers, inhibitors

Introduction

As organizations continue to invest heavily in Information Systems (IS), there is the anticipation that the use of IS will provide benefits such as increased productivity (Jain & Kanungo, 2005). However under-utilization (Jasperson et al, 2005) is a major issue challenging efforts to exploit its benefits. Individual use of IS ranges from limited interactions (to the minimum extent possible) to leveraging more fully, the features of an IS to support work tasks (Loraas & Diaz, 2009). However, given that IS are often under-utilized it is important to understand post-adoption use of an IS and how this changes over time, in order to achieve more effective use of the IS (Saeed & Abdinnour-Helm, 2008).

The current study assumes that IS ‘use’ as a behavior can change, hence, how an IS is used today may not be the same as how it was used ‘yesterday’ or how it will (or can) be used in the future, with use being shaped by elements such as change in user goals, environmental conditions, and the technology (Beaudry & Pinsonneault, 2005). Failure to examine what actually happens during the use of an IS may result in researchers and practitioners overlooking key insights into how users interact with the IS and the resulting outcomes (Orlikowski, 2000). To obtain a deeper understanding of IS use, it is critical to understand the evolving nature of individuals’ IS use behaviors (Kim & Malhotra, 2005).

This research utilizes an evolutionary framework to understand and explain observations of changes in use in a case study of how the use of a Learning Management System (LMS) changed over time.

Research Background

Changes in Post-Adoption Use

Post-adoption use of Information Systems (IS) can vary from surface-level use to deeper levels of use that exhibit value-added engagement with the system (Agarwal, 2000). Over time, as users change the way in which they use a system, it is expected that ultimately, such changes in a rational context, would be aimed at developing more deeply ingrained use behaviours that improve individual performance (Agarwal, 2000; Chin & Marcolin, 2001). Prior research identifies a number of IS use types that encapsulate this idea of a deeper engagement with or ‘deeper use’ of an IS, for example, deep structure usage (Burton-Jones & Straub, 2006), and infusion (Cooper & Zmud, 1990; Saga & Zmud, 1994).
While findings on these use types are instrumental in advancing our understanding, they tend to focus on taxonomies of use types as opposed to how features are utilized, some of which may be unused, misunderstood or undiscovered by users (Al-Natour & Benbasat, 2009). Also, there is much emphasis on ‘what factors’ are important (Shaw & Jarvenpaa, 1997) as opposed to understanding “how” they shape outcomes (Newman & Zhao, 2008).

In this study the focus is on process that is, changes in use that shape movement towards deeper and more effective use of an IS. The study is therefore not concerned with a particular end-point (e.g. ‘full use’) or with a particular use type (e.g. extended use) but rather the process by which IS use changes over time. A change focus is valuable as the features used by individuals change over time, and it is the “specific features in use at any point in time that influence and determine work outcomes” (Jasperson et al., 2005, p.529). Understanding change in use, that is, how individuals revise their use of the IS features, is paramount in advancing the post-adoption agenda (Sun, 2012).

Model of Change

“Change is a phenomenon of time”; it is reflected in the way people talk about an event “in which something appears to become, or turn into, something else, where the ‘something else’ is seen as a result or outcome” (Ford & Ford, 1994, p. 759). This study adopts Van de Ven and Poole’s (1995) definition of change as the observation of differences in the way in which an IS is used (i.e. routines). To understand and explain changes in post-adoption use, i.e. how individuals’ use of IS changes, we will apply a theory of change, that is evolutionary change.

Theories of evolutionary change entail a continuous cycle of variation, selection and retention among entities in a designated population (Van de Ven & Poole, 1995). Variation is often dubbed the raw material for evolution (Mayr, 1991). Variation can be defined as any “departure from routine” (Aldrich, 1999, p. 22). Aldrich(1999) argues that “forces that differentially select or selectively eliminate certain types of variations” constitute selection, and is not limited to the environment. Retention is the third phase in the evolution process. In retention “selected variants are preserved, duplicated, or otherwise produced” (Aldrich, 1999). It can therefore be argued that change is reflected in retention.

Scholars have recognized the value of using evolutionary theory to guide their work (Goetz & Shackelford, 2006), with the theory being used to describe more than 95% of organizational changes (Burke, 2010). An evolutionary framework that incorporates the tripartite processes of variation, selection, and retention processes have also been effectively used by other researchers to examine voluntary behaviors such as creativity (Campbell 1960; Ford, 1996). This perspective is particularly relevant in this study, as change in use often involves new uses as well as the voluntary extension of one’s use of an IS. To understand the process and factors that underpin such change, this study uses evolutionary theory as a conceptual lens to examine how IS use changes over time.

Methodology

Case Site

The case study was conducted in a large university, Omega, which offers over 1000 undergraduate and postgraduate courses, and has a community of over 16,000 students and 1800 staff. Omega had been using Learning Management Systems (LMS) since 2001. In 2008, the decision was made to replace the current system with an Open Source Learning Management System (OpenLMS), with full rollout completed by early 2010. OpenLMS has many features including file upload and download, discussion forums, assignment submission, instant messaging, online news and announcements, calendaring, quizzes, and wikis. OpenLMS can thus be used as an informational site or as a complete online learning environment. Use of the system is largely voluntary, although many departments actively encourage faculty to use the OpenLMS. This study focuses on changes in use among academic staff.

Research Method

Data was collected primarily through semi-structured interviews; supporting materials (e.g. training and process documents) were also reviewed. Users of an IS often include basic, intermediate and advanced users, and differ in the way they use the features of an IS (Munro, et al., 1997). To ensure a good cross-
section of user types, 10 faculty members (ranging from basic to advanced users) were interviewed. The interviews applied Critical Incident Technique (CIT) (Flanagan, 1954). CIT is a qualitative interview procedure, which facilitates the investigation of significant occurrences (e.g. events, incidents, processes) identified by the respondent, the way they are managed, and the outcomes (Chell, 1998). CIT was used to gain insights into changes in use and associated triggers, enablers, inhibitors and outcomes.

Findings
The findings below are reported and discussed in light of the evolutionary change lens.

Variation
Variation is defined as change from current routines (Aldrich, 1999). Variation, in this context introduces alternatives in how the IS can be used to accomplish work tasks. Variations-in-use therefore represent a departure from how one currently performs a routine (i.e. actions) using the IS. Variations (actions) included using formerly unused features, applying previously used features in an improved or more sophisticated manner, and finding novel or innovative uses of OpenLMS.

Using formerly unused features. In moving to new levels of use, change occurred incrementally or rapidly as individuals began to use OpenLMS for purposes other than as a file repository and began delving into features that were formerly unused. These included use of video clips, discussion forums, online quizzes, news, calendaring, and online assessment. As one user reported “I’ve really changed the way I used OpenLMS. So instead of being just a delivery system, a way of kind of posting files with lecture notes, I started to use it for examination purpose... to deliver regular information, news about the course...the discussion and group function.[for] interaction with students”

Applying previously used features in an improved or more sophisticated manner. As users learned more about the system, for some their use of the system matured over time as features were used in an improved way to achieve one’s work goals. This came as a result of “discovering what works” and “using the features a bit better”. One respondent noted “I became better at making the videos...I was making short ones initially and then I started to make longer ones, so the students, instead of 10 clips, can then see the whole thing in 4 clips. I just learnt how to...think of better ways to do that”

Finding novel or innovative uses of OpenLMS. As a result of “thinking beyond the square” or “playing around”, some users (typically, advanced users) suggested new ways to use the OpenLMS. For example, one user added a time log to track student hours in an internship program. In another example, a user extended the statistical capabilities of the OpenLMS to track student activities (e.g. recent log-in time, length of stay, popular areas of the site).

Triggers, Enablers and Inhibitors
Despite the usefulness of an evolutionary framework for describing change, it fails to account for the processes that lead to the introduction of variations (Ford, 1996). Therefore, a comprehensive description of changes in use should also consider triggers, enablers and inhibitors of changes in use.

Triggers
With triggers, users recognize that existing modes or routines of use needed to change. In this study, rapid change was triggered by a critical event or “shock to the system” and slower incremental change came in response to management directives and new learning.

Critical event. An earthquake in 2011 served as a catalyst for individuals to rapidly and radically change their routines of IS use applying many previously unused features to their work tasks. The faculty was faced with significantly different circumstances including limited physical teaching spaces and infrastructure. OpenLMS became the only available and capable tool to deliver courses and support alternative modes of teaching and learning. The situation therefore created a sense of “compulsion”, that is, “change through necessity”. Illustrating this point, one user observed, “The earthquake has kind of pushed me into do more online teaching, so OpenLMS became more important... [it] was also a tremendous impetus to do things differently. There were many many things that I used to do in my courses that I simply couldn’t do after the earthquake...And my decision was that I had to maintain
Directives from management were also triggering factors. Although use of OpenLMS was voluntary, some departments issued directives for use of particular features, or general directives for greater use of OpenLMS in teaching. For example, one respondent mentioned that a “catalyst for change was when our departments decided to now use Turnitin...quality changes that are made at the department level is also another catalyst for change...I would have to do it to maintain the policy of the department”

Learning was another trigger, which derived from two sources: (i) Peers and (ii) On-the-job learning

(i) Learning from peers served as a key trigger for change, as it informed users of features used by others: “[it] gives you ideas... and [you are] aware of what’s out there”. Based on discussions with peers, it encouraged thinking about feature(s) of the OpenLMS that were not currently being used, and in some cases, this thinking lead to action and change: For example, “We would just talk over lunch ... [e.g.] somebody from astrology talked about what she was doing with her stuff and it was interesting. at least you get thinking... You walk away thinking, I wonder if I can try this.”

(ii) On-the-job learning also played a role in creating variation. As users learnt more about an effective pedagogy this encouraged them to seek new ways to use OpenLMS: ‘I’ve studied education techniques. So it’s part of a wish to do something different and maybe get students to engage more.. so I’ll see something and think - oh, maybe I can do that and then play around...and see if I can achieve it”

Enablers

In facilitating movement from current use to a new mode of use, a number of supporting factors were identified by interviewees, including learning from peers, IS support, and intrinsic motivation.

Learning from Peers. Social learning through peer-to-peer networks facilitated an environment where users interacted with and learnt from colleagues about different aspects and uses of the OpenLMS. Peer learning both triggered and enabled changes in use. Knowledge sharing among peers promoted a relaxed learning environment, that helped users identify, apply and use previously unused features to support their work tasks or to use existing features better. As one respondent related “There is so much stuff there that to find it actually takes longer than going and asking someone who has done it before, and you can get it right away...Most of what I learnt is through other people talking about them, talking to other people, other academics, other departments”

IS Support. Besides colleagues, the availability of the OpenLMS administrators and trainers as a support mechanism was a key enabler in extending the use of system features. They were described as ‘responsive’, ‘helpful’, and ‘exceptional’. The OpenLMS team provided one-on-one consultation and group training to help faculty use the system features. Other resources include regular updates, hot tips and tutorials posted on the OpenLMS site. For example, “I sat down with [the] Flexible Learning advisors. I very very quickly...learnt more about the system than I had known at any point previously. And I use that information to recreate my courses”

Intrinsic Motivation. Intrinsic motivation is defined as the “doing of an activity for inherent satisfaction rather than for some separable consequence (Ryan & Deci, 2000 p. 56). The results suggest that individuals who were intrinsically motivated were more resourceful and self-driven, and willing to address challenges in their use of the IS. Coupled with a sense of curiosity and a desire to learn and experiment with new features, these users tended to use their own initiative to expand and modify their use of the OpenLMS. As one respondent noted, “[I’ve] always been experimental, the day I am kind of satisfied, I think that’s the day they should probably fire me. ...I guess I always think that there is something that can be done better. That’s my kind of philosophy. I’m a perfectionist.”

Inhibitors

Inhibitors can prevent or delay variation in use; the case study identified two inhibitors - insufficient training and poor user interface design.
Insufficient Training. While training can function as an enabler, inadequate training was a key inhibitor. For example, some were critical describing the training as ‘too basic’, ‘unfocused’, ‘very long’, and ‘waste of time’. One respondent noted, “They [trainers] would sort of say it can do these other stuff ... but not really tell you how you can use it in your teaching”

User Interface Design. The poor user interface design also inhibited use of the system, particularly for basic users. Criticisms concerned issues related to user-friendliness and clarity of instructions. For example: “OpenLMS itself is a problematic tool, it is not intuitive which makes it difficult to learn ... So I think that that is a fundamental problem with it... it’s probably not in itself the best possible tool.”

Action(s) Selection
Once variations (actions) are introduced users evaluated the value of those actions and whether the variations were ‘useful’ or ‘ineffective’ in performing a task. These evaluations were then used to guide selection; thus users selectively applied features they considered more likely to yield desired benefits and intended outcomes. As one respondent related, “... I started using screen cast..., which has this little embedded photograph of me talking. ... [b]ecause videoing takes lots of broadband width...what you can do in a lecture of an hour, you can do in a screen cast of 20 minutes.” Another user noted, “It makes things like emailing the class easier and I put resources up, lecture slides and other readings... I do find it really useful to help me organize my interaction with students.”

Retention
For Omega, whether it was the crisis that hastened adoption and use of particular features, or other factors that triggered or enabled the application of new features, there was a common theme in users’ decision making process on whether to incorporate a particular feature in their routines. Users retained changes in their routines of use if they believed it resulted in greater efficiencies and better support of pedagogical goals. Satisfaction with new use routines therefore had a strong stabilizing effect on helping to sustain change. In retaining features in use, individuals echoed keywords that point to improved effectiveness and efficiencies, for example: “it’s really about efficiency, doing things quickly”, “I can see that it has some benefits for me”, “Much more effective, efficient and student participation.”

DISCUSSION AND CONCLUSION
The aim of this research is to provide a comprehensive yet parsimonious explanation of how post-adoption IS use changes over time leading to greater use, using an evolutionary framework. The pace of change took two forms: incremental (slow) change and radical (rapid) change, the latter being spurred by a critical event that catapulted individuals into new ways of using the IS. The earthquake was therefore the main catalyst for rapid change, especially for basic users. What could not be achieved in 10+ years of voluntary use was realized in 5 weeks. ‘Standing on a burning platform’ (Bjorn-Andersen, 2011) shifted priorities as deeper levels of IS use were no longer optional but necessary for survival. Disruption through targeted stimuli such as novel situations (opportunities or challenges) or clear directives, can bring about changes in patterns of action thereby promoting change (Pentland et al, 2012). When set apart from the critical event, triggers such as management directives, learning through peer and on-the-job learning also facilitated changes.

Consistent with prior research (Zhou & Li, 2011), the findings showed that change is encouraged when enablers are maximized and inhibitors are minimized. Learning from peers, IS support and intrinsic motivation enabled variations in use. Intrinsic motivation was particularly salient. While external motivators such as organizational directives can enable change, they may not promote as readily, the type of voluntary user-driven engagement that is needed to encourage deeper uses of the IS. Inhibitors though important, had a lesser impact on constraining use for advanced users than for basic users. Finally, the findings showed that perceived usefulness of a variant (features) combined with satisfaction derived from such use determined selection and retention respectively.

In summary, this study showed that IS use changes over time and given the right mix of triggers, enablers, and stabilizers, change towards deeper use is likely to occur as users ‘turn a variation into part of their story’ about how they perform their work routines (Feldman & Pentland, 2003).
References


