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Refining a model for sustained usage of agile methodologies

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ABSTRACT

This paper refines a model of Sustained Agile Usage to present a comprehensive understanding of the key factors that are pertinent to the sustained usage of agile methodologies. It describes our qualitative study which involves: (i) a focus group with twenty-nine software industry agile practitioners, and (ii) semi-structured interviews with twenty agile practitioners from five different organizational backgrounds. Data from both methods is used to develop the refined model of Sustained Agile Usage. The refined Sustained Agile Usage Model includes the following three categories: Agile Team Factors, Technological Factors, and Organizational Factors. These revisions are discussed in this research. Finally, we see implications for research: the study offers a useful complement to the few studies that have examined the long-term acceptance of agile methods. The refined model can be used as a reference model to guide future studies to understand sustained usage in different agile domains (e.g. Kanban). Additionally, implications for practice include valuable insights that can help agile teams and others (e.g. top management) to better understand and benchmark how agile methods can be effectively sustained in organizations.

1. Introduction

In recent years, the use of agile method(s) (AM) in information systems development (ISD) has gained significant momentum and is now generally considered a viable approach both in academic and practitioner settings. However, while AMs continue to evolve with newer ones emerging (Williams, 2012), there is a need for better understanding their actual use beyond the adoption stage (Abrahamsson et al., 2009). Prior studies on AMs have focused on their adoption or adaptation in organizational environments, paying more attention to examining factors that drive organizations to initially adopt AMs rather than on those that influence their sustained use (Overhage & Schlauderer, 2012a). In a recent study that maps a landscape of the current challenges practitioners face, Gregory et al., (2016, p. 104) show that "practitioners are less concerned about adopting agile and more concerned about sustaining agile. The sustainability of agile has not been widely researched". Though there is an increasing number of empirical studies on AMs in real-world contexts, the research on AMs in practice is yet to yield significant systematic and insightful knowledge that can provide credible advice to organizations for maintaining AM use and guide future research (Wang et al., 2012). Two issues represent the main challenges to this branch of research:

(i) Because agile systems development research is primarily practitioner driven (Goh et al., 2013), a key challenge has been to use a sound theoretical basis to understand the continued and effective use of AMs by exploring the degree or extent of agile practice use (Wang et al., 2012), and
(ii) Superficial judgement of agile method use as used or not used is assessed without evaluating the effectiveness of their actual implementation (Conboy and Fitzgerald, 2010).

In an attempt to address these gaps in the literature, Senapathi and Srinivasan (2012) developed an initial model of Sustained Agile Usage to explore the key factors that influence the sustained usage of AMs. The model draws from well-established theories such as innovation assimilation, implementation models, and systems development methodology literature. The initial model is a useful lens for illustrating the factors that are critical to sustained agile usage. However, as it is one of the earliest models to conceptualize the phenomenon of sustained agile usage, it was deemed important that the initial model be further refined using empirical analyses. Moreover, given the growing popularity of AMs and their use in many more contexts than initially expected, the aim of this research is to refine the model with a broader set

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of practitioners to ensure we have identified the key factors impacting sustained agile usage. Therefore, the purpose of the current study is to use a multi-method approach to refine the constructs, including the categories and corresponding factors of each category, developed in the initial model in order to gain a deeper understanding of sustained use of AMs. It is believed that such constant comparison across different types of evidence and literature has the ability to generate less biased theory (Eisenhardt, 1989).

Building and extending on Senapathi and Srinivasan (2012)'s study, this current research describes how we refine the initial model as we report on the development of a refined theoretical model of Sustained Agile Usage. The primary objective of this research is to gain a deeper understanding of the factors that influence sustained agile usage. As such we have focused our efforts towards this objective. Other elements of the model (e.g. sustained agile usage factors) have been previously refined in the earlier phases of this research (Senapathi et al., 2011; Senapathi and Srinivasan, 2012). We describe how we used two methods, a focus group and semi-structured interviews, to further explore and gain insights on the adequacy and nature of the theoretically developed factors that influence sustained agile usage.

The structure of the paper is as follows. In the next section we discuss the related literature and basic terminology to distinguish the related concepts of factors that impact the later stages of innovation use. In our case, these later stages refer to sustained agile usage. We then present the initial sustained agile usage model (SAUM). Following this, we discuss our research method and discuss the analysis and findings. We explain the subsequent modifications made to the SAUM and present a summary of the refined factors and the refined SAUM. The overall conclusions and implications are presented. We also present limitations of the study and discuss areas of future research.

2. Theoretical background

Sustained usage refers to the continued use of an innovation, which focuses on the extent and intensity of use beyond the simplistic binary perspective of initial adoption when something is either adopted or not. Emphasizing the significance of continued usage over initial usage, it is argued that the ultimate success of an innovation can only be derived from its sustained usage (Bhattacherjee, 2001). In other words, in order to fully derive the desired benefits and improvements in systems development outcomes, their use needs to be institutionalized as part of the user's regular work behaviours. More recently, research into post-adoptive usage has been receiving greater attention (Jasperson et al., 2005), including agile methods (Mangalaraj et al., 2009; Wang et al., 2012). This current study seeks to contribute to this emerging body of post-adoptive usage literature.

2.1. Sustained or continued use of innovations

The use of systems development methodology (SDM)s in general is a versatile concept (Iivari and Huisman, 2007). Given the lack of strong theoretical and conceptual bases in agile research, the initial SAUM (Senapathi and Srinivasan, 2012) draws from traditional innovation diffusion models (e.g. diffusion of innovations, information system implementation), which have been tested extensively in the information systems (IS) literature (Cooper and Zmud, 1990; Gallivan, 2001; Kwon and Zmud, 1987). Recently, they have generated interest in the agile research community (Schlauderer and Overhage, 2013; Schlauderer et al., 2015; Wang et al., 2012).

The six stages in the traditional innovation models are *initiation, adoption, adaptation, acceptance, routinization*, and *infusion* phases (Kwon and Zmud, 1987). While the initial three phases (*initiation, adoption, adaptation*) relate to adoptive behavior of an innovation, the last three phases *(acceptance, routinization, infusion*) relate to post-adoptive, or sustained, usage of an innovation. *Acceptance* refers to the commitment of use, while *routinization* is when the usage of the innovation is encouraged as a normal activity. *Infusion* refers to the innovation penetrating deeply into an organization, which is further described using three facets: 1) extensive use: extent of use of an innovation to accommodate a more comprehensive set of work tasks; 2) integrated use: using the innovation to establish or enhance work flow linkages among work tasks; and 3) emergent use: using the innovation beyond its original intended scope (Hsieh and Zmud, 2006; Saga and Zmud, 1994). Adapting it to the context of agile practice assimilation, Wang et al. added two additional indicators, i.e. intensive use and deeply customized use (Wang et al., 2012). While intensive use refers to the use of an agile practice beyond that suggested by the textbook, deeply customized use is the deep adaptation of an agile practice that reflects the needs of the adopting unit/team. For example, an agile team adapting the forty-hour week to align with client working hours (clients work to a split-shift rota) and alternating between 6 and 10 h days, or 4 and 12 h shifts, instead of the recommended 8 hours per day (Wang et al., 2012).

Drawing from the theoretical concepts described above, Senapathi and Srinivasan (2012) define *Sustained Agile Usage* as the combination of *vertical usage* and *horizontal usage. Vertical usage* refers to the depth and intensity of use of agile practices of a specific agile method, incorporating one or more combinations of usage behaviours specified in the three infusion facets described above. *Horizontal usage* is concerned with the use of the innovation across the organization, such as percentage of projects and number of teams using the innovation. This includes, for example, the spread of the use of Scrum practices from one team/project to multiple teams/projects, from one region to many regions within an organization, and to other departments (e.g. business, finance). As both the vertical and horizontal usage constructs have been previously refined in the earlier phases of this research related to the development of the SAUM (Senapathi et al., 2011; Senapathi and Srinivasan, 2012), the focus of this study are the categories and the factors that influence sustained agile usage.

2.2. Success factors of the later stages of agile use

Studies that have focused on identifying success factors related to the use of AMs include those conducted by Chan and Thong (2009), Misra et al. (2009), and Chow and Cao (2008). While Chow and Cao (2008) and Misra et al. (2009) focus on success factors relating to agile adoption, Chan and Thong (2009) develop a framework for agile acceptance from a knowledge management perspective. However, the use of the term *acceptance* in Chan and Thong (2009) implies more of an adoption perspective and does not differentiate between adoptive and post-adoptive stages of diffusion.

Few studies (e.g. Mangalaraj et al., (2009) and Wang et al., (2012)) have focused on later stages of agile assimilation: Wang et al. (2012) focused on the assimilation of XP/Scrum practices using three case studies, and Mangalaraj et al. (2009) investigated the acceptance of XP practices across different teams within the same organization. Wang et al. (2012) focused on the later post-adoptive stages, i.e. acceptance, routinization and infusion, contending the need to examine AMs at the practice level. However, Mangalaraj et al. (2009) examined agile acceptance at the method level in a broad sense without differentiating it from the other two post-stages, i.e. routinization, and in-