Towards a Nuanced Explanation of Cloud ERP Adoption in SMES

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Abstract: This study presents a longitudinal model for investigating cloud ERP adoption. Previous work on technology adoption mostly has investigated adoption by looking at one specific phase of adoption. However, we argue that the cross-sectional research design does not sufficiently represent the complexity and the highly volatile process of adoption as a whole. Based on an archival analysis of eighty-seven firm level technology adoption studies, we identified 24 transition factors (TF) contributing to the adoption of information technology. Building on Rogers’ Diffusion of Innovations theory (1995) this research attempts to explore which transition factors are relevant in the distinct phases of cloud ERP adoption. In our model, we model the transition factors as “triggers”, where the desirable outcomes of the transition factor within a specific phase of adoption, will lead to the next stage adoption. The contribution of the paper is twofold. First, we make a context-specific contribution by extracting the different factors which have been studied in the context of cloud ERP systems and categorizing them according to the Diffusion of Innovations theory. Second, we also make a theoretical contribution by employing a longitudinal research design.

Keywords: Transition factors (TFs), technology adoption process, cloud ERP, SMEs

1. Introduction

Firms are moving towards the cloud-based platform that seizes the promise of substantial productivity change (AlBar & Hoque, 2019). Though cloud computing technology is becoming prominent among practitioners, its popularity is still lagging behind amongst the academic community (Yang & Tate, 2012). Thus, the movement towards cloud-based platform is hoping to broader space for researchers exploring this phenomenon. Cloud Enterprise Resource Planning (ERP) is a specific example of cloud computing technology where users rent the software rather than buy it (Hasan et al., 2019). A single definition of cloud ERP has yet to be achieved. For the purpose of understanding the meaning of cloud ERP, this paper is used the definition by Salim (2015) which define cloud ERP as a commercial software packages that enable the business processes and transaction-oriented data throughout the organisation using a model that enables ubiquitous, convenient, on-demand network access within minimal management effort or service provider reaction.

The benefits of cloud technology are accessible to Small and Medium Enterprises (SMEs), nevertheless, the percentage of SMEs who have adopted cloud ERP systems is still very low (Cheng, 2019). Our comprehensive review of the technology adoption literature suggests that a vast majority of existing studies have had a narrow focus and only pertained to the instantaneous act of technology adoption, for instance: factors that influence technology adoption (e.g., Hasan et al., 2019; Salim et al., 2018; Schuetz & Venkatesh, 2020; Venkatesh, 2019). Whilst there is a scarcity of literature pertaining to comprehending how the factors flow throughout the entire adoption process. In the case of organization-wide technology adoption such as cloud ERP, observing how trigger factors move across the adoption process is essential. SMEs substantially differ from their larger counterparts (Moh’d Anwer, 2019) and need convincing and assertive pushes to adopt new technology. The pushes come from all the players of the environment including vendors, consultants, government bodies and competitors. Every player has an important role, which may change according to the circumstances and time (Walther et al., 2018).

Rogers (1995) has enlightened the process of technology adoption through Diffusion of Innovations (DOI) theory. The process comprises of a sequence of five stages (Rogers, 1995): agenda setting, matching, redefining, clarifying and routinising. To understand the process of technology adoption, this research attempts to explore how the aforementioned phases will be triggered to move by transition factors. The transition factors have the responsibility of triggering the firm to move from one phase to another phase until the process of technology adoption is complete. This paper will contribute in many ways. First, it will help vendors and consultants to understand the holistic view of enterprise-wide technology adoption process and as a result help them strategize their marketing approach. Second, it helps clients to monitor time taken to complete the whole process of adoption. Thus, enabling all players in the environment to prioritize quality objectives, which are based upon the
customer segment that they are targeting at any point in time during the technology adoption process. Finally, it can increase the likelihood of cloud-based ERP adoption among SMEs.

This paper is organized as follows: it commences by explaining the theoretical concepts of technology adoption and transition factors, which are the central of this work. A discussion of the issues of perceived technology adoption as a single point follows. The discussion continues with introducing a conceptual model of the cloud ERP adoption process. Subsequently the paper concludes with areas for future work and the implications this research has on academics and practitioners.

2. Key Concepts: Technology Adoption and Transition Factors

This section provides an overview of the relevant key concepts used in this research. Since there is an abundant amount of prior technology adoption studies, it is emphasized that the focus of this research is on firm level technology adoption, and predominantly examines factors that trigger different stages of the adoption process. Professor Everett M Rogers, in his Diffusion of Innovations book (1995) believes innovation or technology adoption is an idea, practice, or object that is perceived as new by an individual or other unit of adoption. There are a number of innovative scholars (e.g., Pfeffer, 1982; Van de Ven, 1986) who believe that technology adoption should be comprised of two main activities; (1) how the new technology is being spread to target adopters and (2) how the process of adoption decision occurs. In addition, following the idea of Rogers in his DOI theory, to ensure people understand the technological innovation; technology adoption should be disseminated to bring awareness to the existence of the adopted technology. By understanding the present state of technology adoption studies, it grounds us to believe technology adoption should be looked at closely so that each of the elements in the process can be monitored and observed accordingly. Among the important elements contained in the process of technology adoption are the transition factors.

A transition factor (TF) is an element which, if addressed, significantly improves the process of technology adoption. We shall define TF as the intermediary for the firm to move from one segment to another segment until the completion of the technology adoption process. In the context of cloud ERP adoption, this TF has a specific scope for Small and Medium Enterprises (SMEs) as this product was introduced to meet the needs of SMEs. Whilst the term “transition factor” has not been commonly used in prior technology adoption literature, we emphasize the term is necessary and was initiated after a thorough examination of the literature revealed that the factors that influence adoption were lumped together into a singular stage, rather than considering the factors to be flowing throughout the entire process stages.

3. Identifying Technology Adoption Factors

Validity of a research requires certain standards and processes. The selection of prior studies for analysis is based on the approach of Webster and Watson (2002) as well as guidelines used by few prior exploratory studies (e.g., Claver et al., 2000; Gable, 2010; Palvia et al., 2004). In order to ascertain the relevant literature pertaining to technology adoption factors, a search was performed on the following journals: EJIS, ISJ, ISR, JAIS, JMIS, JSIS, JIT, IM, AMJ and MISQ¹. The ICIS, AMCIS and ECIS² conferences were also examined as they could potentially provide specific discussion related to our research topic. Our search strings consisted of the following terms “ERP adoption”, “ERP innovation”, “organization innovation”, “firm innovation”, “technology innovation”, IT adoption, IS adoption, firm adoption and “innovation adoption”. Furthermore, the results were constrained between 2001 and 2012, with theoretical and conceptual studies being excluded. The search resulted in 87 relevant firm level technology adoption studies and yielded 24 transition factors (TFs). These 24 factors that were extracted from the literature are abstract in nature, thus they were expanded into 31 specific TFs, which are relevant for cloud ERP and SMEs. The definitions and the number of publications the TFs appeared in are depicted in Table 1.

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4. Transition Factors into Firm Innovation Phases

Adopting complex technology requires more than just listing factors that influence adoption, as factors can, be temporal. For example: once the system is being used, other transition factors such as training support, system upgrading, and system maintenance become more important. Therefore, there is a need to understand how the importance of these factors change throughout the entire process of adoption.

Several technology adoption studies have emphasized the importance of phases and related activities during ERP project (Somers & Nelson, 2004; Themistocleous et al., 2011). The project needs to be monitored on a phased basis as it involves the handling of complex processes to handle. Firms evolve through several innovation stages.

For instance, Kwon and Zmud (1987) suggested firms experience the stages of adoption, adaptation, acceptance, routinisation and infusion while Rogers (1995) proposed five stages: agenda setting, matching, redefining, clarifying and routinising. As the focus of this research is on the adoption process stages, Rogers’ DOI (1995) theory was selected as the theoretical underpinning. We also observe that the thirty-one specific TFs (as listed in Table 1) can be mapped accordingly into one or more of Roger’s five innovation process phases.

5. A Road Map for Successful Cloud ERP Adoption

It is our intention to explain how transition factors flow throughout the entire technology adoption process for the specific context of cloud ERP in SMEs therefore only transition factors from Specific Concept column of table 1 will be used to map into Rogers’ five innovation process stages. Furthermore, the terms ‘new technology adoption’ and ‘adoption innovation’ are synonymous and have thus been used interchangeably.

Figure 1 illustrates the overall picture of the cloud ERP adoption process by proposing five important phases with a key transition factor between each phase. This diagram demonstrates the important triggers that are required in enable an SME to move from one stage to the next of the cloud ERP adoption process. Rogers DOI theory has been applied to explain the five stages of the adoption process.

Adoption Process

According to the DOI theory, adopting new technology commences with the agenda-setting phase. In this phase, the organization’s problem is defined and the company needs are identified (Rogers, 1995). Furthermore, firm requirements need to be specified carefully in order to drive the next step of innovation. Five TFs were identified as important in this phase which are: relative pressure, operational need, observability, top management support and possessing knowledge on the technology to be adopted. The key TF that triggers firms to move beyond the agenda-setting phase to the matching phase is the ‘performance gap’. It is the critical TF as organisations need to be completely aware of the gap between how they are currently performing to how they wish to perform, which will enable solutions to be identified.

Once the problem is clearly defined by the organization the matching phase commences. This phase involves fitting the organisations agenda to the new technology being adopted. Planning and designing activities are also performed during this stage. The TFs apparent during this phase are scalability, cost of implementation, compatibility, consultants’ demonstration, resource availability and top management support. ‘Feasibility’ is the critical trigger for the firm to move to the third phase of innovation which is redefining phase, as it is necessary for the system to meet the requirements of the organization.
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In **redefining/restructuring** phase the organization starts adapting the technology to the firm environment. It is noted that cloud ERP is not a one size fits all system. However, the minimal need for customization required by cloud ERP will encourage SMEs to adopt the system. Eight TFs are categorised in this phase: project team support, package selection, functional benefits, change management strategies, the firm structure, knowledge on technical aspects and vendor support. The ‘project champion’ is the key TF which triggers the clarifying phase, the project champion is necessary to support the project, through a positive viewpoint and to liaise with the vendor.

**Figure 1. Cloud ERP**
The fourth phase of innovation process is **clarifying**. In this phase the adopted technology is put into widespread use. During the clarifying phase everyone is aware of the new technology. The TFs relevant to this phase are training support, trialability, ease of use, operational and managerial staff involvement and support from vendor to facilitate the dissemination works. The TF that triggers the final phase is participation as without employees actively using the system the system would be meaningless.

The innovation process concludes with the **routinising phase**. This phase occurs when the innovation has become incorporated into the regular activities of the organization and no longer possesses a separate identity.
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During this phase where the firm decides whether to continue using the system or change to another module or vendor. TFs recognized to be relevant at this stage are maintaining and upgrading support, the quality of service provided by vendor and consultant and system sustainability.

There are few TFs such as firm size, industry type, firm strategy and past experience that do not belong to any singular phase of Rogers’ model but can be considered as the moderator of the cloud ERP adoption process. The rationale behind classifying these TFs as moderator is because these factors can either have a positive or negative effect. For instance, the size of firm is no longer an issue with the emergence of cloud technology.

6. Future Work and Conclusion

This paper explores the transition factors (TFs) that lead to cloud ERP adoption in SMEs, and discusses the preliminary findings of research, with the objective of identifying and categorizing each of the factors into at least one of the five phases of Rogers’ (1995) technology innovation process. The mapping of the factors could potentially be different in other scenarios; however, our goal is to derive a robust, valid, simple yet applicable model of cloud ERP adoption by the SME market. The term transition factor was introduced after identifying the need to understand the factors that influence complex technology flowing throughout the entire process stages, as opposed to being lumped into a singular stage.

We acknowledge that there are limitations apparent in this research. First, the priori model presented in this paper is conceptual. Hence, future research will include two further steps. First, to assure content validity of the categorization, we will apply the Q-Sorting procedure. Inter-rater reliabilities will give further evidence whether the categorization of the transition factors is appropriate. Second, we will conduct surveys with IT decision makers to assess the general relevance of each factor.

This paper not only consolidates and extends the literature on the technology adoption process for a complex organization-wide technology (focusing on cloud-based ERP and SMEs). It also helps researchers to better understand the state-of-the-art research on adoption of innovation. For practitioner, this study will help ERP vendors and consultants to prioritize quality objectives which are based on the customers segment that are targeting at any point in time during the adoption process. Further, it will increase the likelihood of cloud-based ERP adoption among SMEs. For Cloud ERP clients it provides buying strategies.

7. Acknowledgement

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References