

SOFTWARE AS A SERVICE ADOPTION: IMPLICATIONS ON IT WORKERS AND ORGANISATION STRUCTURE

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Abstract

Software as a Service (SaaS) is based on IT capabilities in a utility model that enhances the reliability and scalability at relatively low costs as compared to on-premise IT systems. Consequently, organisations may decide to adopt SaaS based on these potential benefits. However, these benefits may have some implications on the roles of IT workers and organisational structure of IT department. There is a lack of research conducted on the implications of SaaS on organisational structure and associated human resource management. Thus, this research-in-progress seeks to fill this gap by examining how SaaS adoption may change IT workers' roles and tasks, and structure of IT department. Drawing on adaptive structuration theory, a modified framework is proposed to support the change dynamics from SaaS adoption. We explored sources of structures from advanced IT and the ways in which organisational and human interactions have an impact on how SaaS is appropriated and institutionalised into business processes, and brings about changes in an organisation. This study contributes to the theory by explaining the way emergent and new structures are formulated at the macro and group level of the organisation structure. Implications for researchers and practitioners are provided.

Keywords: Adaptive structuration theory, Cloud computing, Cloud strategy, IT outsourcing, IT workers, Organisational change, Software as a Service

1 INTRODUCTION

Software as a Service (SaaS) has the potential to transform the information technology (IT) industry, particularly on the way software is acquired and used. Through SaaS, customers no longer need to purchase software licenses. Instead they only need to subscribe and access to software via an Internet connection. As a result, SaaS adoption pushes software providers to change their business focus from product-based to on-demand service-based provision models (Carraro & Chong, 2006). SaaS model evolved from an application service provision (ASP) model. Examples of ASP include enterprise resource planning (ERP) packages from SAP, Oracle, and Great Plains. ASP models have three critical features. First, customers rented access to commercially customised software from a service provider; second, customers faced no up-front capital costs as the price was based upon usage; and third, a customer-specific instance of an application was located offsite and delivered over the network. However, customers could still customise their instance of the application on the vendor's server to some extent. A key issue surrounding ASP adoption became the degree of customisation desired by the customer and the resulting efficiency loss by the vendor. More recently, the failed ASP model was reinvented into the SaaS model, which relied on a different architecture (Carraro & Chong, 2006). The SaaS model has four important features. First, it constrains customers' options for customisation of the main functionality; second, it gives more control over future development to the service vendor; third, SaaS has the ability to support service oriented multi-tenancy; and fourth, SaaS allows for the separation of maintenance responsibilities between the SaaS service vendor and the customer. As a result, SaaS model no longer requires any customer-specific investment by the vendor. Examples of SaaS applications range from office and collaboration (for example, Google Apps, Microsoft Office 365) to customer relation management (such as e.Salesforce.com) and ERP, such as e.SAP's Business ByDesign (Wyld, 2010). In contrast to an on-premise IT system, SaaS offers a number of benefits to users including cost saving, better resource utilisation, application access scalability and global outsourcing possibility (Carraro & Chong, 2006). The on-premise IT system is referred as a "software service model in which customers purchase the permanent licenses of the commercially available software", and their IT workers maintain the application and the infrastructure associated with it. (Xin & Levina, 2008, p. 5). In addition, unlike with traditional on-premise IT systems that users purchase through a perpetual-use license, SaaS users buy a subscription from the SaaS service vendor. Therefore, the deployment of SaaS does not require a large upfront investment. In particular, organisations adopt SaaS based on these promised benefits. However, SaaS systems can be "disruptive technologies and may expose the organisation to additional cost, technical, security, human resource and organisational changes that are not normally associated with on-premise IT systems and infrastructure" (Keller & Hüsigg, 2009, p. 1047). These implications include changes in roles and tasks of IT workers, which may trigger associated changes in organisational structure of an IT department (Wyld, 2010). Researchers have called for empirical studies on these implications, and on associated human resource management issues (Ross, 2011; Wang, Rashid, & Huan-Ming, 2011). Thus, this study aims to fill this gap in literature by examining, how SaaS adoption in an organisation may change its IT-workers' roles and tasks, and the impact of this on IT department. We discuss the concept of cloud computing and review literature on IT outsourcing strategies that suggest a set of implications on IT adoption and organisational change (Loh & Venkatraman, 1992). This research draws from adaptive structuration theory (AST) to support theory development on cloud computing and IT organisational change (DeSanctis & Scott, 1994).

2 LITERATURE REVIEW

2.1 Concept of cloud computing

Cloud computing is a "model for enabling ever-present, convenient, on-demand network access to a shared pool of configurable computing resources (such as networks, servers, storage, applications, and services) that can be rapidly accessed and released with minimal service provider interaction" (Mell & Grance, 2010, p. 6). There are two main cloud computing models- public and private, and four main cloud computing service levels. A public cloud is cloud computing service made available to the

general public. And a private cloud refers to proprietary internal data centres of an organisation and is not available to the general public (Wyld, 2010). See Table 1 below for definitions of cloud computing service levels.

Types of Cloud Computing Service Levels	Definition	Examples	Reference
Software as a Service (SaaS)	applications such as those that offer traditional desktop functionality are hosted and delivered online via a web browser	Google Docs, Gmail, MYOB and SAP	Carraro & Chong, 2006
Platform as a Service (PaaS)	Software platform for system deployment	Google App Engine, Salesforce.com	Wyld, 2010
Infrastructure as a Service (IaaS)	a set of virtualised computing resources, such as storage and computing capacity hosted in the cloud; customers deploy and run their own software stacks to obtain services	Amazon EC2, Salesforce.com	Wyld, 2010
Hardware as a Service (HaaS)	Cloud provides access to dedicated firmware via the Internet	XEN and virtual machine ware (VMware)	Carraro & Chong, 2006

Table 1: Definitions and examples of cloud computing service levels

When an organisation moves the on-premise IT system to the cloud service such as PaaS, IaaS or HaaS, it might still need some IT workers such as security specialists, hardware and software engineers to manage remote hardware and to install software applications. However, when an organisation opts for SaaS as its cloud strategy—that is a “set of decisions required to create and deploy a network-based IS delivery strategy that results in both cost saving and organisational agility” (Iyer & Henderson, 2010, p. 117), a number of IT responsibilities on hardware and software are shifted to the cloud service vendor. As a result, an organisation might need fewer IT workers mainly to configure user access rights in using the applications. Unlike PaaS and IaaS, SaaS will likely have greater implications on the roles and tasks of IT workers and may dictate changes in organisational structure of an IT department. Hence, SaaS can be viewed as an IT service innovation that involves external providers.

2.2 IT outsourcing and organisational change

An SaaS model involves outsourcing of the software application from the cloud service provider. IT outsourcing is “the significant contribution by external vendors of the physical and/or human resources associated with the entire or specific component of the IT infrastructure in the user organisation” (Loh & Venkatraman, 1992, p. 336). However, using literature of transaction costs economics (TCE), SaaS model may be viewed differently from traditional outsourcing strategies (Williamson, 1991). Traditional outsourcing strategies have been associated with downsizing (Kane, 1998). Downsizing is an intentionally instituted set of activities designed to improve organisational efficiency and performance which affect the size of the organisation’s workforce, costs and work processes (Farrell & Mavondo, 2005), and has a significant impact on human resources management (Kane, 1998). The benefits of downsizing include lower labour costs and overheads, less bureaucracy, faster decision making and increases in productivity. However, expected benefits of downsizing were often not achieved (Kane, 1998). TCE suggests organisations to take a strategic approach to downsizing based on the asset specificity of their employees. Asset specificity refers to “the degree to which an asset can be redeployed to alternative uses and by alternative users without sacrifice of productive value” (Williamson, 1991, p. 281). According to TCE, IT workers employed in the organisation’s core business processes, where IT system is their competitive functional system, such as research and development are less likely to have their work outsourced, as their work is linked to the organisation’s competitive advantage (Ross, 2011). In contrast, IT workers employed in generic support roles in large organisations, such as academic institutions, may face a higher risk of redundancy (Ross, 2011). Additionally, SaaS providers offer common solutions to multiple customers,

suggesting the negative impact of SaaS models on IT workers employed in generic support roles. However, despite these predications by TCE, there are a number of factors that may not lead to redundancies of IT workers in SaaS environment. This is because adoption of SaaS models by most organisations follows a gradual process, resulting in a hybrid combination of on-premise IT systems and SaaS services offered by external providers. This combination of systems creates a complex IT infrastructure that will require IT workers to offer supportive roles and manage service level agreements (SLAs) and security issues with SaaS service vendors. Thus, this will slow down their job losses at least for a short term.

Numerous studies have looked into IT outsourcing strategies and organisational change (Farrell & Mavondo, 2005; Loh & Venkatraman, 1992; Ross, 2011). One strand of research dealing with IT and organisational change is adaptive structuration theory (AST), posited by DeSanctis and Poole (1994). AST is useful because it provides dynamic explanations of how IT influences socio-technical changes in organisations (Furumo & Melcher, 2006; Goh, Gao, & Agarwal, 2011). Furthermore, AST provides a dynamic model that helps us understand the change process in technology adoption and organisation change. This paper extends the underlying arguments from AST to theorise the implications of the change from on-premise IT systems to an SaaS environment on IT-workers' roles and tasks, and the subsequent impact on IT department.

3 ADAPTIVE STRUCTURATION MODEL

AST is an "approach for studying the role of advanced IT in organisation change" (DeSanctis & Scott, 1994, p. 121). DeSanctis and Scott (1994) examined change process from two perspectives: (1) the type of structures (which are specific types of rules and resources that serve as templates for planning and achieving tasks) that are applied through the application of advanced IT (AIT) and (2) the structures that emerges in human action as people interact with this technology. In their study of group decision support systems (GDSS), DeSanctis and Scott (1994) found that people's interactions with technology led to changes in the rules, process and procedures that were used in GDSS's social interactions. Their research, however, focused on a snapshot of a meeting in which GDSS were used to study interaction at an individual level rather than at the institutional level. From their definition, AST can be applied to study changes from a longitudinal perspective (Furumo & Melcher, 2006; Goh et al., 2011) rather than just an instance in time. For example, Furumo and Melcher (2006) analysed a failed transition process from the mainframe legacy system environment to the distributed ERP environment. They found that the failure was not the result of a poor ERP product but rather related to the organisation's social structures. Similarly, Goh et al., (2011) studied the interplay between Health IT (HIT) and patterns of clinical work embodied in work routines. They found that the key to successful implementation of HIT into work routines is to manage the emerging processes between routines and HIT.

The central concepts of AST, structuration and appropriation, provide a dynamic picture of the process by which people incorporate AIT into their work practices. Structuration is the process by which people create and maintain a social system through the application of rules, tasks, organisational culture, and group norms (DeSanctis & Scott, 1994). Appropriation refers to the manner in which structures are adapted by a decision making team for use through the structuration process. The appropriation of both technological and organisational structures into business processes and tasks could bring about emergent structures. The new structures are formed after the emergent structures are institutionalised into the system (DeSanctis & Scott, 1994). Thus adaptive structuration process includes some recursive processes in which the organisation continues to adjust between technological and social structures as well as structural changes until all emergent structures are fully integrated into tasks and business processes to form a stable socio-technical system (Furumo & Melcher, 2006). Unlike unidirectional forms of AST's constructs (DeSanctis & Scott, 1994), we propose bi-directional links to incorporate the recursive and cyclic nature of technology application process, thereby providing a dynamic longitudinal perspective of the technology application process. This recursive nature happens when there are misalignments between emergent structures or tasks with business processes (Loh & Venkatraman, 1992; Lyytinen & Newman, 2008; Swanson, 1994). The proposed model is presented in Figure 1.

3.1 Applying AST into SaaS adoption process

In this paper, we use AST to provide a theoretical analysis of ensuing changes from moving a current on-premise IT (e.g., a client-server emailing system) to the SaaS model (e.g., Google Apps). Normally, organisations follow a series of stages to implement such a transition. In the first stage, top management works with a decision making team, including IT managers, to determine their SaaS goals and then to develop a strategy of moving on-premise IT system to an SaaS environment. The second stage is to create the SaaS delivery model, including a search for a suitable SaaS provider. The third stage is to negotiate the SaaS contract with the chosen provider. The fourth stage is to identify needed service level agreements with the provider. The fifth stage is to arrange and manage the transition in an IT department. The sixth stage is to assign a project manager to work with the SaaS service vendor to maximise the value of IT investment and maintain the harmony of working relationships. The final stage is to assess the outcome of a SaaS project by measuring key performance indicators of the project. These measures can be used to determine whether the firm will continue with the current contract (Chou & Chou, 2007).

In this paper, we analyse these stages, including involvement of the decision making team in evaluating Request for Proposals (RFPs) or Tender Bids from vendors.

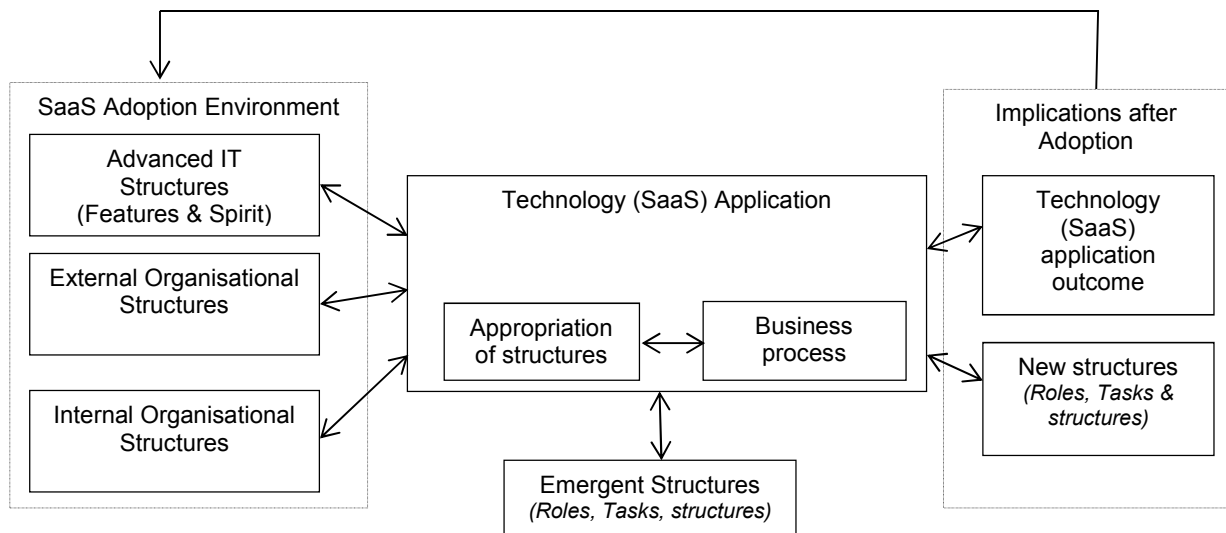


Figure 1: Proposed Research Model -Adapted from AST (DeSanctis & Scott, 1994)

We next discuss how sources of structures from current on-premise advanced IT; organisational and human interactions have an impact on development of a strategy of moving on-premise IT system to an SaaS environment, the evaluation of the RFPs and how SaaS is appropriated and institutionalised into business processes, and bring about organisational change.

3.1.1 Advanced information technology

Decision making team will be influenced by social structures from AIT. AIT is defined as tools, techniques, and knowledge that enable multiparty participation in organisational and inter-organisational activities through sophisticated collection, processing, management, retrieval, transmission, and display of data and knowledge (DeSanctis & Scott, 1994). Examples of AIT include; e-mail systems, GDSS, HIT and ERP. AIT brings social structures which enable and constrain interaction of people at the workplace. AIT social structures are described by structural features and spirit. Structural features are the specific capabilities offered by the system defined by two elements; technology’s comprehensiveness and the level of complexity (See examples in Table 2). These

features govern how computing resources are accessed, distributed, and controlled (DeSanctis & Scott, 1994). Examples of structural features of an on-premise client-server emailing system include installation of client software on a computer to access database on the organisation’s email server within the organisation’s network, with limited web-enabled features. The client-server setup is a structural feature that employs secure access to the organisation’s database of sending and receiving emails. On the contrary, SaaS is a web based system which allows accessibility to resources at anytime, anywhere and on any device. Thus, structural features from both systems constrain and control users differently on how the system is accessed. The spirit of AIT defines appropriate behaviours in using the technology (DeSanctis & Scott, 1994). Examples of features and spirit are summarised in the Table 2.

Dimension	Structural features		Spirit	
	SaaS	Client-Server	SaaS	Client -Server
Comprehensiveness	On-demand service and elasticity	Licensed with limited capabilities	Turned-up or down as a utility	Rigid and hard to customise
Complexity	Anywhere, any device and anytime through the Internet	Limited use on the web	Readily available services	Complex and require a lot of training

Table 2: Examples of structural features and spirit provided by SaaS & Client-Server Systems

Thus, AIT social structures might influence decision makers in implementing the transition. The aforementioned assumptions imply the proposition below:

P1: SaaS adoption environment provides social structures that can be described in terms of structural features and spirit. The spirit and structural feature sets may influence the decision making team in formulating SaaS delivery model and evaluating the RFPs.

3.1.2 Organisational structures

A decision making team will be influenced by both external and internal social structures of the organisation. External sources of structures consist of inter-organisational relationships and influence, competitive influence, governmental influence, and influence from vendors. For example, external sources of structures in tertiary institutions may come from students and government policies. Students demand real-time collaborative tools and easily accessible online resources from multiple devices, at anytime and anywhere via the Internet. Similarly, the governments demand tertiary institutions to reduce expenses on non-core systems and do more with fewer resources. Internal sources of structure have two parts, structural and cultural. Structural sources examine specialisation (diversity of specialists) and centralisation (concentration of decision-making activity) aspects within an organisation (Furumo & Melcher, 2006). For example, team members’ speciality, such as Chief IT Officer (CIO) and Chief Financial Officer (CFO) may influence the team differently. CIO may prefer a system on which IT department has more control. CFO, on the other hand, might prefer a more cost-effective system. Cultural sources of structure consist of education, experience and interaction styles of people within an organisation (Schwieger, Melcher, Ranganathan, & Wen, 2004). Members of the decision making team may be influenced by education, knowledge and experience with Client-Server and SaaS technologies, including actual, perceived and shared experiences among them. Thus, in this example, influences from external and internal structures may force organisations in tertiary institutions to adopt SaaS-based systems. These assumptions imply the following proposition;

P2. The manner in which SaaS will be selected by decision making team will be influenced by the external and internal organisational structures.

3.2 Implications after SaaS adoption

Implications after SaaS adoption are examined by structures of the new system (SaaS System), new social structure and emergent structures.

3.2.1 *SaaS system*

Technology application is the means by which the SaaS system is formulated. It has two interacting variables, appropriation of structures and application of these structures to business processes. Appropriation of structures is the degree to which members agree on which SaaS structures will be appropriated and used. Greater agreement on appropriation of structures can lead to more consistency in the system's selection patterns (DeSanctis & Scott, 1994). For example during RFP evaluation, the use of decision making tools and anonymous voting system may help the decision making members to manage conflict and enhance consistency in the selection process of the preferred SaaS system. Business processes determine how SaaS can be implemented within the organisation based on its cloud strategy. For example cloud strategy may include selection of a type of SaaS service to adopt either ad-hoc, defined, managed or a strategic SaaS type (Carraro & Chong, 2006). Therefore, members appropriate aspects of structures from advanced IT, and organisational external and internal structures, to business process, and in so doing, create emergent structures and ultimately new social structures. Once emergent structures (that is SaaS structural features and new organisational structures) are used and accepted, they become institutionalised in the organisation (DeSanctis & Scott, 1994). SaaS structural features are described by comprehensiveness, complexity and support properties of the system. The comprehensiveness describes the features and capabilities of the SaaS system offered to users, including configurability, multi-tenancy, scalability, location independence, and rapid elasticity of a SaaS system. The complexity explains the ease of use, accessibility of the application and ease of learning through help tools. We argue that most SaaS systems are relatively easy to use via web browsers and have friendly graphic user interface, including online help screens and documentations. Support explains the customer service and support features provided by an SaaS system. An SaaS system provides customer service and support through online help centres; videos and system knowledge base provided on the system dashboard (Carraro & Chong, 2006). These assumptions describe the following proposition:

P3: SaaS system emerges when technology has been appropriated to business processes. Appropriation of structures by members is influenced by existing environment of AIT, external and internal social structures.

3.2.2 *New social structures*

When social structures of the SaaS system are brought into action, they may take on new forms of organisational social structures. The major sources of structure after SaaS adoption include the SaaS system itself, as well as its outputs, the content and constraints of a given task, and the new organisational environment. For example, when an on-premise system is deployed to the cloud, the IT application may now be accessed through an Internet browser at any time and from anywhere, with relatively low operating costs (Wyld, 2010). As a result the content and constraints of a given task may change, such as the level of support and maintenance by IT workers would drop as IT infrastructure is moved to the cloud. More specifically, in SaaS organisational environment, CIOs and IT workers will assume new role of liaisons to monitor SLA and support business units to meet their goals. This is described by the following proposition;

P4: New social structure emerges as SaaS social structures are applied into business processes. These structures influence prior on-premise technological and organisational structures, and are influenced by SaaS environmental structures.

3.2.3 *Emergent structures*

As technology and social structures are applied during SaaS implementation process; some of their outputs become emergent sources of structure. Once emergent structures are used and accepted, they

may become institutionalised and stabilised in the organisation (DeSanctis & Scott, 1994). The change may result in new roles of IT workers and emergent organisational structures in the IT department. In the past, the nature of software deployment put CIOs and their IT workers into the role of gatekeepers who could exercise a veto over any proposed software deployment by simply declaring that they would not host it in the server room. Within SaaS environment, control of the server room does not necessarily equal control over the entire organisation-computing environment. As a result, these gatekeepers may develop fear of a loss of control (Carraro & Chong, 2006). More specifically, when on-premise system is moved to the SaaS model, new structures emerge. These include a lower need in some technical skill areas and an increasing in need for monitoring cloud providers, liaison and subcontractor project management skills. Thus, the old structures, tasks and responsibilities, such as server room infrastructure, server hardware routine maintenance and updates may become obsolete (Ross, 2011). These assumptions imply the following proposition:

P5: Emergent sources of structure develop as technology, external and internal social structures are applied during SaaS application; and new structures are formed when emergent structures are institutionalised and stabilised into the system.

The model presented in Figure 1 summarises the relationships discussed in preceding sections. Major implications of P1 through P5 are predictions about how structures of IT and social structures may be appropriated during SaaS adoption process, resulting in new emerging structures. After the new and emergent structures are institutionalised and stabilised, the shifting of the roles of IT workers and the impact on structure of IT-department may follow, as described in the following proposition:

P6: Appropriation and institutionalisation of social structures from the SaaS system will lead to changes in IT workers roles and this might trigger changes in the organisational structure of an IT-department

4 CONCLUSION

An increasing number of organisations has adopted or considered adopting SaaS applications to replace on-premise systems. According to Gartner, sales of SaaS applications were over \$14.5 billion in 2012, an increase of 17.9% from 2011 (Cronin, Pauli, & Ham, 2012). Thus, there is a need for research that examines the implications of the SaaS adoption on organisational structure and associated human resource management. This paper proposes a research model to explain how SaaS adoption may change IT workers' roles and tasks, and structure of IT department. Unlike past IT outsourcing practices, SaaS systems offer a different kind of inter-organisational arrangements. SaaS systems may expose an organisation to additional costs, technical, security, human resource and organisational changes that are not normally associated with the traditional IT outsourcing practices (Keller & Hüsig, 2009). This research-in-progress provides a preliminary theoretical model to further empirically investigate the dynamic of changes through case study. Our future case study research will analyse organisational structural changes after the implementation of SaaS applications into business operations to replace the existing on-premise IT system. This research builds on the work of DeSanctis and Poole and extends adaptive structuration theory to the study of SaaS implications (DeSanctis & Scott, 1994). Empirical findings from this future research will contribute new knowledge to better understand SaaS adoption and its implications to organisation's structure and human resource issues. In addition, the findings will inform managers on potential opportunities, risks and changes to an organisation, so they can prepare appropriate resources to address them.

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