Firms' continuance intention on SaaS use

an empirical study

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Firms continuance intention on SaaS Use – An empirical study

Abstract

Purpose - Although studies have investigated reasons for Software as a service (SaaS) adoption, it is unclear how firm-level SaaS use impacts future SaaS intentions. The study proposes a theoretical model that integrates the technology-organization-environment framework, institutional theory, diffusion-of-innovation theory, and the opportunity-risk framework to analyze the drivers of SaaS use and its continuance intention.

Methodology – We evaluated the direct, moderating, and mediating effects of determinants on SaaS continuance intentions using Structural Equation Modelling and data from 301 firms.

Findings - Results found that top management support and normative pressures influenced SaaS use. Cost saving and security concerns were direct predictors of perceived opportunities and perceived risks respectively. Perceived opportunities and risks, and actual SaaS use influenced SaaS continuance. Interestingly, perceived opportunities was found to be a negative moderator on the relationship between SaaS use and SaaS continuance.

Value - The results reveal insightful and controversial findings for SaaS research.

Keywords: Diffusion of innovation, Post-adoption, Software as a service, Continuance intention.

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1. Introduction

Software as a service (SaaS) offers consumers access to software at low costs, and allows providers to obtain economies of scale in supplying services to as many users as possible (Armbrust et al., 2010; Kim et al., 2012). Firms utilize SaaS, which is considered an innovation in software technology offering several advantages, to access core IT functions over the Internet (Kim et al., 2012). When the technology was first introduced, firms demonstrated willingness to move non-critical information systems (IT) functions to SaaS based solutions. Today many organizations are more receptive to moving core IT functions (Heart, 2010) such as enterprise resource planning (ERP), customer relationship management (CRM), human resource management (HRM), and financial management (Cho & Chan, 2013) to SaaS based platforms. As SaaS applications grow in the market place (Benlian & Hess, 2011), uncertainty remains about its use and organizations' continuance intentions toward SaaS in their businesses. Although several reasons have been identified for SaaS adoption (McHall, 2011), factors influencing the organization's continuing intentions to use SaaS are still unclear. In this study, we treat continuance intention similarly to a repurchase decision. Temporally, continuance intention follows the adoption decision and influenced by usage experience, which in turn, may reverse the initial adoption decision or extend further to other business areas of the organization (Bhattacherjee, 2001; Viswanath Venkatesh, Thong, Chan, Hu, & Brown, 2011).

A few studies have addressed SaaS diffusion at a firm level. They mainly focus on the early stage of the diffusion process, i.e., the initial stages of the adoption of SaaS (Benlian, Hess, & Buxmann, 2009; W.-W. Wu, Lan, & Lee, 2011; Xin & Levina, 2008). However, prior research acknowledges that technology use is not determined solely by the adoption stage (Jasperson, Carter, & Zmud, 2005). The long-term viability of the technology also depends on the usage experience, which leads to a continuance intention regarding the technology (Alamgir Hossain & Quaddus, 2011; Mirkovski, Jia, Liu, &, & 2018, n.d.; Viswanath Venkatesh et al., 2011). Post-adoption is therefore a key topic in information systems (IS) research that has not received the attention it deserves (Bhattacherjee, 2001; Bhattacherjee & Premkumar, 2004; Viswanath Venkatesh et al., 2011). Although the importance of SaaS in

today's global market cannot be ignored and few studies have assessed its use, no studies have addressed the strategic organizational intentions of continuing or extending SaaS use. To bring more clarity to the diffusion process, further research on post-adoption dynamics is necessary(K. Zhu, Dong, Xu, & Kraemer, 2006). In this study we address this important research gap.

SaaS continuance describes the continuous usage behavior that can extend the use of SaaS in other business areas of the firm (Benlian, Koufaris, & Hess, 2011). It includes the continuance intention and the continuous use of a technology (Bhattacherjee, 2001; Li & Liu, 2014). For the investigation of post-adoption research, IS literature suggests the need for a theoretical model to analyze the technological, organizational, and environmental constructs (K. Zhu & Kraemer, 2005). They are well recognized as the contexts that affect technology use within an organization (K. Zhu, Dong, et al., 2006). The technology-organization-environment (TOE) framework (Tornatzky & Fleischer, 1990) encompasses these contextual elements, and serves as a useful baseline for the post-adoption study of technology (K. Zhu & Kraemer, 2005). The TOE framework has received ample empirical support (Chong & Chan, 2012; Yoon & George, 2013; K. Zhu & Kraemer, 2005), and has enabled researchers to explore the technology diffusion phenomenon (Bose & Luo, 2011).

In the broader context of studying the diffusion of emerging technologies, researchers have found that combining the TOE framework with other theories such as the institutional theory (INT) (DiMaggio & Powell, 1983), and the diffusion of innovation (DOI) theory (Rogers, 2010), enhances the explanatory power of research models (Oliveira & Martins, 2011; Oliveira, Thomas, & Espadanal, 2014; Picoto, Bélanger, & Palma-dos-Reis, 2014; Viswanath Venkatesh & Bala, 2012; K. Zhu, Dong, et al., 2006). For example, studies have shown that INT provides additional theoretical strength to the environmental context of the TOE framework (Oliveira & Martins, 2011; Soares-Aguiar & Palma-dos-Reis, 2008; Viswanath Venkatesh & Bala, 2012; Yoon & George, 2013). The factors included in INT widely embrace the environmental institutional constraints that may influence the post-adoption phenomenon. Similarly, researchers have found it useful to combine the TOE framework with the DOI theory (Oliveira & Martins, 2011; K. Zhu, Dong, et al., 2006). The DOI theory establishes the dynamic process in the diffusion of technology, including the stages of post-adoption (i.e., use and continuance intention). Moreover, earlier studies have reported that the intention to continue using a technology is influenced by the opportunities and risks within

(Benlian & Hess, 2011; Gewald & Dibbern, 2009). Decision makers are more willing to put effort in the continuance intention of a technology if they perceive high levels of benefit, and low levels of risk. Although earlier studies have explored the direct effect of opportunities and risks, few recent studies report the moderating effect of the risks in the continuance intention of the technology (Chiu, Wang, Fang, & Huang, 2014). Thus, additional research is needed to theorize these effects better. To advance our understanding of factors that influence an organization's use of SaaS, and its continuance intention, we propose a research model that links the TOE framework (Tornatzky & Fleischer, 1990), INT (DiMaggio & Powell, 1983), DOI (Rogers, 2010), and the opportunity-risk framework (Benlian & Hess, 2011; Gewald & Dibbern, 2009).

This study makes three significant contributions. First, the research addresses the gap in SaaS diffusion literature by focusing on the post-adoption stages of SaaS. Second, we integrate four popular adoption theories and frameworks from IS literature to construct a research model with greater explanatory strength. Finally, our analysis of the moderation and mediation effects not only enhances the underlying theory base, but also makes the findings relevant to practitioners. The paper is organized as follows. We review the background of SaaS, TOE framework, INT, DOI theory, the opportunity-risk model, and post-adoption literature. We then describe the research model and the hypotheses and present the research methodology and results. Next, we provide a discussion of the findings, followed by implications for practice and theory. We conclude by summarizing the limitations and directions for future research.

2. Literature review

2.1. Software as a service

SaaS is a form of an outsourcing arrangement that enables firms to access software applications (Goode, Lin, Tsai, & Jiang, 2015). Firms remotely access a software that is hosted in an off-premise location via the Internet (Espadas et al., 2013), where the responsibility for the regular development and software maintenance lies with the service provider (Cho & Chan, 2013). It allows providers to offer on-demand access to several software products in a multi-tenant architecture (Benlian & Hess, 2011). Generally SaaS applications are characterized as being easy to access, feature rich, and having good consumer

adaptation (Zorrilla & García-Saiz, 2013). Compared to on-premise installation software, SaaS has lower implementation costs, a higher rate of improvement in software quality, and faster delivery of new features (Choudhary, 2007). Based on a service model that delivers, maintains, and supports software functions via the Internet, SaaS is mostly used in conjunction with business software to conduct value chain activities (such as customer relationships, human resources, sales, and online transaction management), rather than implemented as direct consumer software (Zorrilla & García-Saiz, 2013). Due to the nature of its inherent architecture, SaaS is transforming IT resources into a ubiquitous service (Susarla, Barua, & Whinston, 2010).

Considered a cloud service, SaaS shares the coined cloud computing concept with other service models, such as: infrastructure as a service (IaaS), and platform as a service (PaaS). Several studies had been conducted within the cloud computing concept. Oliveira, Thomas & Espadanal (2014) suggest that cloud computing adoption in manufacturing and services industries are influenced by the relative advantage, complexity, readiness and management support using the TOE framework and DOI theory. Their study is only focused in two industries and does not analyze the moderator effects. Abdollahzadehgan et al. (2013) proposed using the TOE framework for the study of cloud computing adoption in SMEs. Kshetri (2013) analyzed the influence of institutional factors in the context of cloud computing. However, their studies do not offer empirical validation and assessment. Other studies, such as El- Gazzar et al. (2016) and Low et al. (2011) mainly focused on factors that should be taken into consideration in the initial stages of cloud computing diffusion (Fahmideh & Beydoun, 2018). Priayadarshinee et al. (2017) used the TOE framework and included the perceived risks to study cloud computing adoption and business performance. However, their study only evaluates the direct effects of the variables without assessing the moderator effects. Also, some of the variables chosen for the different contexts of the TOE framework lack empirical and theoretical support. More related to continuance intention, Park et al. (2016) analyzed the factors affecting the cloud computing at individual level. The results show the impact of the security factors on the continuance use of cloud computing. Gupta et al. (2013) focused their analysis on SMEs, including other benefits derived from cloud computing beyond the security factor. They suggest that ease of use and security factors impact the adoption of cloud computing. Both studies focused mainly on the security risks

and on cloud computing advantages without considering the diversified contextual factors that affect the continuance intention which are essential for the effective understanding of the topic. Al-Sharafi et al. (2017) gathered elements from the literature that affect cloud computing adoption.

Although studies related to cloud services adoption are useful for adoption literature, IT literature suggest that there is significant distinction between the sourcing models that integrate it. For example, according to Schneider (2014), the determinant factors for SaaS may considerably differ from the ones to source IaaS or PaaS solutions due to their nature. Even though the majority of studies addressed the current state and development trends of cloud computing as a global concept (W.-W. Wu, 2011b), few studies have discussed SaaS decision at a firm level. Xin and Levina (2008) draw on an economic and strategic management model to study the factors affecting SaaS adoption. They argued that the maturity of a firm's IT plays an important role on SaaS adoption. Benlian et al. (2009) examined the drivers that influence SaaS adoption for different types of applications. Based on the transaction cost theory (TCT), resource-based view (RBV), and the theory of planned behaviour (TBP), their study suggested that the social determinants are main influencers for SaaS adoption. Benlian and Hess (2011) analyzed the opportunities and risks associated with increasing SaaS adoption based on an opportunity-risk model. They proposed that security threats and cost advantages are the dominant factors for SaaS adoption. Wu (2011a) developed and empirically tested a research model to examine important factors that influence SaaS adoption. The study combines the diffusion of innovation theory with the technology acceptance model (TAM), which is suitable for analysis at an individual level. The inquiry was limited to the telecommunication industry and may not sufficiently extend to other industries. Using a case study method involving the decision making trial and evaluation laboratory (DEMATEL) approach, Wu (2011b) explored the perceived risks and benefits of adopting SaaS. Their study suggested that strategic benefits outweigh the economic advantage in the SaaS adoption decision. However, the significance of the technology, organization, and environment contexts in the adoption of SaaS are not considered in this study. Lee et al. (2013) employed the political, economic, social and technological analysis (PEST analysis) to analyze the characteristics of SaaS markets in their initial stages. Their research aimed to improve knowledge from a multi-angular point a view, but the data collected was limited to

24 surveys from IT consultants. Kung et al. (2015) used INT theory to assess the adoption of SaaS in manufacturing and retail firms. Their study examined the moderating role of complexity in the INT variables pressures. Yang et al. (2015) explored the technology, organization, and environment contexts in organizational SaaS readiness by proposing a tripod readiness model.

Although few studies have addressed the SaaS adoption topic, they focus on the initial adoption of SaaS (Martins, Oliveira, & Thomas, 2016; W.-W. Wu, 2011b). None of the studies we reviewed have assessed the organization's continuance intentions of SaaS use. Although Benlian et al. (2011) addressed the usage continuance of SaaS, they based their study on the quality of SaaS solutions, thereby providing only limited insight into the influence of technological, organizational, and environment factors that may sustain SaaS use within an organization. Similarly, Martins et al. (2016) addressed the topic from a holistic perspective to evaluate SaaS adoption decision. However, their study did not assess the continuance intention of SaaS use. This study gathers at the pivot point where Martins et al. (2016) concluded their study to explain SaaS use. By using the same integrative lens that combines the TOE framework, INT, DOI theory, and the opportunity-risk framework, this research aimed to assess the organization's SaaS continuance intentions.

2.2. TOE framework

Tornatzky and Fleischer's (1990) framework explains the diffusion mechanism of complex innovations (K. Zhu, Dong, et al., 2006), taking into consideration the broader context in which the innovation occurs (Bose & Luo, 2011). It considers three contexts of an enterprise that influence the adoption of innovation: technology, organization, and environment. The technology context describes the internal and external technologies relevant to the firm, including the internal equipment and the company's practices (Starbuck, 1976). The organization context describes the company's size and the management structure (Viswanath Venkatesh & Bala, 2012; K. Zhu, Kraemer, & Xu, 2006). The environment context describes the external factors surrounding the firm's activity, such as competitors or trading partners (Tornatzky & Fleischer, 1990).

The TOE framework has been applied in the study of several emerging technologies and has also been used to evaluate different types of innovations (Banerjee & Ma, 2012; Martins, Oliveira, & Thomas, 2015; Picoto et al., 2014; K. Zhu, Dong, et al., 2006; K. Zhu & Kraemer, 2005). More recently, the TOE framework has been combined with other theories such as DOI theory and INT to increase its explanatory power (Oliveira et al., 2014; Viswanath Venkatesh & Bala, 2012; Yoon & George, 2013).

2.3. INT

The INT suggests that decisions are influenced by cultural factors and the environment in which firms act (Heikkilä, 2013). It distinguishes three different types of pressures on organizations: normative, mimetic, and coercive. The normative type is derived from regulations, standards, and the professionalism and knowledge among organizational decision makers. The mimetic type of pressure represents firms behaving in a manner similar to their peers. Coercive pressures represent the pressures from organizations upon which the firm depend on.

INT has been applied in the study of several technological innovations, such as e-procurement (Soares-Aguiar & Palma-dos-Reis, 2008), green IS (Butler, 2011), and intranet (Baptista, Newell, & Currie, 2010). Some studies have integrated INT with the TOE's environment context to enhance the explanatory power (Oliveira & Martins, 2011) and to ensure the inclusion of cultural and institutional elements in the better understanding of technology adoption within a firm.

2.4. DOI theory

The DOI theory (Rogers, 2010) describes the diffusion process of an innovation in five progressive stages. The first stage is the exposure to an innovative technology (i.e., the knowledge stage), followed by an increasing degree of interest to adopt the new technology (i.e., the persuasion stage). The third stage is the decision stage where a decision is made regarding the adoption of the innovation. In this research we focus on the last two stages of the diffusion process (i.e., the implementation stage and the confirmation stage). The implementation stage involves reporting the usefulness of the technology, and the confirmation stage is the reinforcement of the technology within the organization. The DOI

theory explains the dynamics of the diffusion process from the intention to adopt the innovation to its reinforcement. It has received substantial empirical support in literature (Oliveira & Martins, 2011; J.-H. Park, 2014; K. Zhu, Dong, et al., 2006). Many earlier innovation studies have established DOI's applicability in a wide range of settings including e-business (Ifinedo, 2011; K. Zhu, Dong, et al., 2006), biometrics (Lancelot Miltgen, Popovič, & Oliveira, 2013), and cloud computing (Low et al., 2011; Oliveira et al., 2014).

2.5. Opportunity-risk framework

The opportunity-risk framework is based on the theory of reasoned action (TRA) (Benlian & Hess, 2011; Gewald & Dibbern, 2009), and seeks to explain the impact of an individual's attitude toward technology adoption (Gewald & Dibbern, 2009). It addresses two dimensions of decision making, namely perceived opportunities and perceived risks (Benlian & Hess, 2011; Gewald & Dibbern, 2009). Perceived opportunities are the cognitive process of the decision maker in which explicit advantages of the technology are identified. Perceived risks relate to the cognitive process in which threats deriving from the technology are determined.

The usefulness of benefits and risks for the study of the diffusion process is widely supported (Gewald & Dibbern, 2009). Studies that have analyzed the impact of the benefits and risks of technological innovations include business process outsourcing (BPO) (Gewald & Dibbern, 2009), e-commerce (M. C. Lee, 2009), and SaaS (Benlian & Hess, 2011). In the SaaS context, Benlian and Hess (2011) suggested that the intention to increase the level of SaaS adoption is based on the decision makers' attitudes regarding SaaS, which in turn are affected by their behavior and assumptions.

To effectively understand the continuance intention of an innovative technology, it is imperative to understand its use (K. Zhu, Dong, et al., 2006). As our review of the literature indicated, most studies on the diffusion of SaaS have focused on the adoption stage. Research is sparse on the diffusion dynamics of SaaS within an organization after its initial adoption. By combining the perspectives of the DOI theory, TOE framework, INT, and the opportunity-risk framework to evaluate the post-adoption stages (i.e. level of actual SaaS use, and future intentions), we seek to complete the assessment of the missing stages in the diffusion cycle of SaaS adoption within an organization.

2.6. Post-adoption

Post-adoption refers to the last stage of the diffusion process of a technology that follows the adoption decision, and its continuance intention. This stage is crucial for strengthening or weakening the technology adoption since firms can either reverse the initial decision or decide to apply the technology beyond the initial intentions, to other operational areas or even across the entire enterprise (Khawaja Asjad Saeed & Abdinnour, 2013). Shaikh and Karjaluoto (2015) suggested that the technology acceptance model (TAM), expectation confirmation theory (ECT), and unified theory of acceptance and use of technology (UTAUT) should be used for the purposes of post-adoption research. For example, Venkatesh et al. (2011) combined ECT and UTAUT to study the usage stage of IT and its continuance intention. Hong et al. (2006) integrated the ECT and TAM to study mobile internet usage. Wang (2014) used TAM to study the post adoption phase of m-government in China. Roca and Gagné (2008) used TAM for the study of e-learning continuance. Saeed and Helm (2008) used TAM to study post-adoption of web-based student information systems. Heijden (2003) used TAM to explain the individual acceptance and usage of websites. Vatanasombut et al. (2008) used ECT and TAM to study the continuance intention for web-based applications. Although these theories are important for a better understanding of post-adoption phenomena, they are more suitable for an individual level of analysis than for investigation at the firm level, which is where the focus of our study resides.

At a firm level, Zhu and Kramer (2005), Zhu et al. (2006), and more recently Saeed and Abdinnour (2013) approached the theme from different perspectives using DOI theory, and TOE framework. Their studies demonstrated that the stages of post-adoption align well in the DOI theory and TOE framework.

Although studies on IT use and continuance intention are considered a key topic for IT research, they do not provide sufficient insights (Bagayogo, Lapointe, & Bassellier, 2014). It is important to include contextual factors that may express the complex nature of the organization, such as the organizational and environmental factors beyond the technological ones (Jia, Guo, & Barnes, 2017). This study addresses this gap and enriches post-adoption research by including moderator effects.

3. Conceptual model

We posit that the actual SaaS use within a firm affects its continuance intentions. To assess the extent to which early stages of SaaS adoption influence the future use of SaaS, the first part of this study evaluates the determinants that influence the actual SaaS use within an organization. Within the diffusion process, the TOE framework provides the contextual perspectives (i.e., technology, organization, and environment) to assess the actual SaaS use. Since institutional pressures specified by INT describe forces that are external to the organization, we include them in the environmental context. Earlier studies have drawn on INT in a similar manner (Viswanath Venkatesh & Bala, 2012). The DOI theory guides the different stages of SaaS diffusion, from its use (i.e., SaaS use) to its reinforcement (i.e., continuance intentions of SaaS). Earlier studies on the diffusion of innovative technologies have also combined the DOI theory with the TOE framework in this manner to improve their research models (Hossain, Standing, & Chan, 2017; Hsu, Kraemer, & Dunkle, 2006; Oliveira et al., 2014). The second part of this study assesses the continuance intention stage of SaaS diffusion. We posit that greater SaaS use in the early stages of the diffusion process leads to its continuance intention. Consequently, we use the opportunity-risk framework to evaluate the moderating influence of perceived opportunities and risks in the organization's continuance intention on SaaS. Literature reports the moderating effect of perceived risks in the continuance intention to increase the adoption level (Chiu et al., 2014). Similarly, perceived opportunities and risks may also moderate the relationship between SaaS use and continuance intentions (Benlian & Hess, 2011). We, therefore, assess the influence of both determinants in our research. The integrated research model that combines the TOE framework, INT, DOI theory, and the opportunity-risk framework is illustrated in Figure 1.

The constructs in the research model are based on IS literature. Technology competence and top management support (from the TOE framework) are factors in the technology and organization context, respectively. In the environment context, the factors are the coercive, mimetic and normative pressures. The stages of diffusion from the DOI theory that represent the dependent variables in this study are: SaaS use and continuance intention on SaaS. Finally, perceived opportunities and perceived risks are moderators of the relationship between the diffusion stages of SaaS. Since cost saving and security concerns are two important considerations in the organization's decision to adopt SaaS (Benlian & Hess, 2011;

Sookhak, Gani, Khan, & Buyya, 2017), we include both variables as antecedents of perceived opportunities and perceived risks respectively.

Figure 1

3.1. Technology context

The IT literature identifies a positive relationship between technology competence and the use of innovations (Gibbs & Kraemer, 2004; K. Zhu, Dong, et al., 2006). SaaS requirements differ from industry to industry, and on the type of SaaS based solution. The technological procedures for maintaining the data privacy and security, and systems availability are mostly the supplier's responsibility. Firms must have the technology competence (i.e., IT professionals and infrastructure) to integrate the technological procedures. As the supplier updates SaaS capabilities from time to time, technology competence ensures SaaS continuance use and organizational compliance. Thus, technological resources available to the organization, which include the IT infrastructure and IT professionals together, can positively affect the innovation usage at a firm (K. Zhu & Kraemer, 2005). The extent of the firm's technological ability to use SaaS and the availability of skills to exploit SaaS can enhance the use of SaaS-based solutions. Therefore,

H1. *Technology competence positively influences SaaS use.*

3.2. Organization context

Top management support plays an important role in the adoption of new technologies (Liang, Saraf, Hu, & Xue, 2007). It provides the vision, support, and commitment around the innovation (S Lee & Kim, 2007). The role of top management support is well recognized and identified in the literature as a key determinant for the success of IT projects (Bose & Luo, 2011; Lacity, Khan, & Willcocks, 2009). Top management support is needed to commit resources and create the environment required for the diffusion of technology (S Lee & Kim, 2007). By prioritizing the management of business processes through the use of SaaS-based technology, top management can deliver an important strategic message to employees regarding the organizational direction on SaaS use. This may help to reduce possible conflicts or decrease resistance toward SaaS (F. Wu, Mahajan, & Balasubramanian, 2003). Employees

may better recognize the value proposition of SaaS when top management supports the initiative. Hence,

H2. *Top management support positively influences SaaS use.*

3.3. Environment context

Government regulators and other firms may coercively pressure the organization to adopt certain business practices (Liang et al., 2007). The institutional angle of coercive pressures is authoritarian in its nature, leading to a submissive posture of the firm vis-à-vis the entity exerting such pressure. The SaaS use might not depend solely on the firm's decisions but may be driven by institutional entities with coercive strength. When the parent corporation utilizes SaaS, for example, the affiliated firms may also enhance the use of SaaS in order to avoid losing legitimacy or triggering non-compliance issues. Earlier studies report the influence of coercive pressures for the adoption of IT based systems (Teo, Wei, & Benbasat, 2003). The multiplicity of coercive pressure from the various sources can positively influence SaaS use. Therefore,

H3. *Coercive pressures positively influence SaaS use.*

Through established relationships with partnering organizations and agencies, firms share information, rules, and norms that then become legitimized as long standing practices (Powell & DiMaggio, 1991). They represent the normative pressures (Butler, 2011) employed by customers, general public, and suppliers on the adoption of new technologies (F. Wu et al., 2003). Under normative pressures, firms are persuaded to accept the shared decisions from entities that promote the technology. Although normative pressures may not be as strong as coercive pressures, professional networks often push the firm to align business practices with those of others (Liang et al., 2007). Because SaaS involves institutional dependence on the service providers, we posit that normative pressures positively influence the SaaS use within an organization. Thus,

H4. *Normative pressures positively influence SaaS use.*

Mimetic pressures describe the imitative behavior of firms in the belief that copying practices of successful organizations will likely increase their business success (Glover, Champion, Daniels, & Dainty, 2014). Mimetic pressures have been found to directly influence the

assimilation of IT technologies, such as ERP (Liang et al., 2007). Generally, this behavior occurs as a response to uncertainty in an attempt to reduce possible risks (Hu, Hart, & Cooke, 2007; Liang et al., 2007). Firms may learn from their peers and achieve economic advantages through minimized experimental costs (Cyert & March, 1963; Levitt & March, 1988). Under mimetic pressure, initiatives within the firm related to SaaS use could be an imitating behavior. Firms may follow actions of other firms for compliance reasons. Therefore,

H5. *Mimetic pressures positively influence SaaS use.*

3.4. Diffusion stages of SaaS

The process of technology diffusion within a firm is evolutionary in nature (Mishra, Konana, & Barua, 2007). After adoption, firms move to the 'use' stage of SaaS, in which they actually use the technology, and evaluate expectations in order to determine their continuance intention (Viswanath Venkatesh et al., 2011). An effective and continued use of SaaS allows firms to obtain economic advantages, improve business processes (Cooper & Zmud, 1990), and may lead the firm to consider extending SaaS to other areas within the organization. The impact of SaaS within the firm depends on its use (K. Zhu, Dong, et al., 2006). If firms do not recognize the value of using SaaS, it is likely that they will avoid future investments in SaaS. This suggests that SaaS use in the initial stages of the diffusion process will affect its continuance intention. We posit that greater SaaS use leads to a continuance intention of SaaS. Hence,

H6. *SaaS use positively influences the continuance intention of SaaS.*

3.5. Opportunities and risks of SaaS

Slovic and Peters (2006) report that low perceived risks are associated with high benefits, and vice-versa. SaaS offers several advantages for the firm (Fan, Kumar, & Whinston, 2009). There are wide-ranging SaaS solutions for business operations that cover both non-critical and critical business functions (Cho & Chan, 2013). When firms benefits from SaaS use, new perceived opportunities arise, adding intrinsic value and commitment to the technology (Vatanasombut et al., 2008). Thus, greater knowledge of SaaS through its use and experience affords firms a greater ability to perceive new opportunities (V Venkatesh, Thong, & Xu, 2012) and boosts the firm's interest in extending SaaS to other areas of business. Therefore,

we posit that benefits and opportunities identified from the actual use of SaaS will influence the firm's continuance intentions.

Additionally, as these perceptions are continuously adjusted (Bhattacherjee, 2001) and the process of a post-adoption diffusion within a firm remains evolutionary (Mishra et al., 2007), the continuance intention of SaaS use may be influenced by the effect of SaaS opportunities. This suggests that the transition from SaaS use to continuance intentions is moderated by SaaS opportunities. Thus,

H7a. *Perceived opportunities positively influence the continuance intention of SaaS.*

H7b. *Perceived opportunities moderate SaaS use and continuance intentions of SaaS, such that the effect will be stronger among firms with greater perceived opportunities.*

SaaS solutions are not without risks (Benlian & Hess, 2011). Perceived risks are considered to be an important determinant of both initial adoption intention and continuance intention (Chiu et al., 2014). Moreover, some studies suggest that it is more important to control the possible risks than the additional benefits (M. C. Lee, 2009). As the adoption of SaaS extend to more critical functions, the associated risks tend to increase. Through the actual use of SaaS, firms shape their consciousness regarding SaaS risks, and become more aware of its possible effects. Perceived risks may act negatively in the diffusion process and jeopardize the firm's continuance intention of SaaS (Benlian & Hess, 2011; Gewald & Dibbern, 2009). This suggests that if firms perceive higher risks from SaaS, the continuance intention will remain the same or decrease. Furthermore, earlier studies have reported a moderating effect of perceived risks in the relationship between perceived usefulness and continuance intention (H.-L. Yang & Lin, 2015). Thus, similar to the perceived opportunities but with the opposite effect, we posit that the effect of SaaS use on continuance intention is weaker when the level of perceived risks is higher. Therefore,

H8a. *Perceived risks negatively influence the continuance intention of SaaS.*

H8b. *Perceived risks moderate SaaS use and continuance intentions of SaaS, such that the effect will be weaker among firms with greater perceived risks.*

SaaS allows firms to use software through small periodic payments (Suarez, Cusumano, & Kahl, 2013). This reduces initial capital expenditure related to new software (Kim et al.,

2012), and brings benefits of continued updates and improvements provided by the supplier (Bezemer & Zaidman, 2014). Cost saving is thus considered to be one of the main benefits of SaaS (Benlian & Hess, 2011) enabling new opportunities for the firm. Although cost savings are considered in the adoption stage of the diffusion process, it is when firms have greater experience with technology through its use, that they confirm or rethink their initial expectations regarding its benefit. If cost saving is confirmed, it might lead to an enhancement of SaaS use elsewhere in the firm. Therefore,

H9. *Cost saving positively influences perceived opportunities.*

In SaaS architecture, the software is resident on the provider's data-center facilities, and data are exchanged over a shared public medium with or without the use of virtual private network (VPN) (Cho & Chan, 2013). The dependence on the supplier's security measures and procedures (Subashini & Kavitha, 2011) increases the risks related to information leakage and data integrity (Sangjae Lee, Park, & Lim, 2013), and may influence the firm's opinion about SaaS (Oliveira et al., 2014). As firms consider increased use of SaaS for managing critical operations, the intrinsic risks may undermine the continuance intention. Moreover, security concerns are considered to be the greatest risk associated with SaaS (Benlian & Hess, 2011). Hence,

H10. *Security concerns positively influence perceived risks.*

It is to be noted that hypotheses H7a, H8a, H9, and H10 were empirically tested by Benlian and Hess (2011) in Germany. Nevertheless, we test these hypotheses in our study as our research presents an opportunity for partial replication of Benlian and Hess' (2011) earlier findings, thereby contributing to the validation of the opportunity risk model.

3.6. Control variables

Control variables are used to address possible data variations in the post-adoption stages of SaaS (K. Zhu, Dong, et al., 2006). Liang et al., (2007) affirmed that control variables are required to account for differences in the firms. Based on literature reporting similar studies, industry and size of the firm were controlled (K. Zhu, Dong, et al., 2006).

4. Research methodology

4.1. Measurement

A survey was carried out in Portugal to test the theoretical constructs. An instrument was developed to assess SaaS use in firms and their continuance intentions. All constructs were based on literature (see Appendix A). The items were measured using a seven-point Likert scale ranging from "strongly disagree" to "strongly agree". For normative pressures, the scale applied was set as "very low" and "very high". Five professionals and researchers in the SaaS field examined the instrument for content validity. Data from 25 firms were used to conduct a pilot study. The pilot sample was not incorporated in the final analysis. Reliability and validity of the instrument was confirmed by the pilot study.

4.2. Data collection

The survey instrument was emailed to 2,000 companies. The company name and the contact information of the respective “key informant” (i.e., the name and email of the personnel within the firm who was most qualified to answer the survey) was provided by Dun & Bradstreet, one of the world’s leading sources for business information. The questionnaire included an explanation of the purpose of the research and its scope, as well as our willingness to share the study results. Two follow-up emails were sent to non-respondents after a two-week interval. A total of 301 usable responses were obtained, yielding a response rate of 15.1%. The sample distributions of the early and late respondent groups were compared using the Kolmogorov–Smirnov (K–S) test to test for non-response bias (Ryans, 1974). The sample distributions of the two groups did not differ statistically, indicating an absence of non-response bias (Ryans, 1974). The common method bias was examined using Harman’s one-factor test (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). No significant common method bias was found in the data set. The profile of the sample is shown in Table 1.

Table 1

5. Data analysis

Structural equation modeling (SEM) was used to empirically assess the research model. PLS is a variance based technique that is appropriate for the study of conceptual models that have

not been tested before (Ke, Liu, Wei, Gu, & Chen, 2009; Teo et al., 2003). As the research model is complex and little theoretical information is present (Henseler, Ringle, & Sinkovics, 2009), and the items in our data are not normally distributed ($p<0.01$, Kolmogorov–Smirnov's test) (Wynne W Chin, Marcolin, & Newsted, 2003), partial least squares (PLS) path modelling is an appropriate method for this study. We used Smart PLS 3 (Ringle, Wende, & Becker, 2015) to evaluate the reliability and validity of the measurement model and analyze the structural model.

5.1. Measurement model

The results of the measurement model are shown in Tables 2 and 3. Construct reliability of scales was assessed using composite reliability (CR). The CR value is higher than 0.7 for all constructs (Table 2), indicating that the construct reliability is adequate (Henseler et al., 2009; Straub, 1989). As all constructs have average variance extracted (AVE) values higher than 0.50 (Fornell & Larcker, 1981; Hair, Sarstedt, Ringle, & Mena, 2012), the convergent validity of the measurement model is also adequate. The indicator reliability was evaluated based on the criteria that the loadings should be greater than 0.70 and loadings less than 0.4 eliminated (Churchill Jr, 1979; Henseler et al., 2009). As shown in Table 3, all loadings are above 0.7, indicating that the instrument presents good indicator reliability.

Table 2

The discriminant validity of the constructs was examined using three criteria: Fornell–Larcker, cross-loadings, and Heterotrait-Monotrait Ratio (HTMT). The square root of AVE (diagonal elements) is higher than the correlations between the constructs (Table 2), so the first criterion (that square root of AVE should be higher than the correlations between the construct) is supported (Fornell & Larcker, 1981). The second criterion requires that the loadings (in bold) are higher than cross loadings (W W Chin, 1998). As seen in Table 3, all loadings (in bold) are higher than the cross-loadings. HTMT is lower the threshold of 0.9 (see Appendix B). Thus, the discriminant validity of the constructs is adequate.

Table 3

The measurement model results indicate that the construct reliability, indicator reliability, convergent validity, and discriminant validity of the constructs are satisfactory, and that the constructs can be used to test the structural model.

5.2. Structural model

The structural model was assessed by examining the coefficients of determinants (R^2), the path coefficients, and their significance levels. The hypothesized construct relationships were tested using a bootstrapping with 5000 re-samples. Multicollinearity of all constructs were assessed based on the variance inflation factor (VIF). The VIF ranges from 1.23 to 2.15, which is below the threshold of 3.3, indicating the absence of multicollinearity. Figure 2 shows the PLS results of the final model.

Figure 2

The model explains 41.9% of variation in SaaS use. Top management support (0.27; $p<0.01$) and normative pressures (0.26; $p<0.01$) are found to be statistically significant in explaining SaaS use. Thus, H2 and H4 are supported. Technology competence (0.11; $p>0.10$), coercive pressures (0.07; $p>0.10$), and mimetic pressures (0.10; $p>0.10$) are found to be not statistically significant. Consequently, H1, H3, and H5 are not supported.

With regard to SaaS continuance intention, the model explains 61.8% of variation. The results indicate that SaaS use (0.43; $p<0.01$) and perceived opportunities (0.47; $p<0.01$) are statistically significant in explaining SaaS continuance intention. Thus, H6 and H7a are supported. Perceived risks (-0.04; $p>0.10$) is found to be not statistically significant. Therefore, H8a is not supported.

The moderating effect of perceived risks (H8b) (0.11, $p>0.10$) is found to be not statistically significant. The moderating effects of perceived opportunities (H7b) (-0.17; $p<0.05$) is confirmed but in a negative direction, indicating that the effect of SaaS use on its continuance intention is weaker among firms with higher perceived opportunities. In addition, the predicted SaaS continuance intention shows that SaaS use is more important to firms with lower perceived opportunities, than to firms with higher perceived opportunities (Figure 3).

Figure 3

The results also show that cost saving (0.76; $p<0.01$) and security concerns (0.57; $p<0.01$) are antecedents of perceived opportunities and perceived risks, respectively, thus confirming H9 and H10. The research model explains 58.0% of variation of the perceived opportunities, and 32.1% of the perceived risks variation.

We then assessed the mediation effect of SaaS use between TOE factors and the SaaS continuance intention to determine the variance derived from each construct. The results are presented in Table 4. In Model 1 we used only the control variables to explain SaaS use and its continuance intention. It explains 0.9% of variation in SaaS use and 0.7% of variation in continuance intention. Model 2 represents the effect of TOE factors on SaaS use and continuance intention. It explains 41.8% of variation in SaaS use and 40.8% of variation in continuance intention. We then conducted incremental estimations while maintaining the effect of TOE factors on SaaS use. In Model 3 we tested the effect of SaaS use in explaining continuance intention and found that the model explains 35.7% of variation in SaaS continuance intention. In Model 4 we added perceived opportunities and risks to Model 3. The model explained 56.9% of variation in SaaS continuance intention. In Model 5 we evaluated the effect of TOE factors and the perceived opportunities and risks to explain SaaS continuance intention and found that it explained 56.0% of variation in SaaS continuance intention. In Model 6 we added the effect of the mediator variable, i.e., SaaS use, to Model 5, and found that it explained 59.7% of variation in SaaS continuance intention. The final model (Model 7), which emerged based on the proposed research model explains 61.8% of variation in SaaS continuance intention. Models 4, 5, 6, and 7 also explain 58.0% of variation in perceived opportunities and 32.1% of variation in perceived risk.

To test if SaaS use mediated the TOE factors on the SaaS continuance intention, we followed the Preacher and Hayes (2008) approach. We started by first checking if only direct effects (without mediator, i.e., SaaS use) are statistically significant to explain continuance intention. Based on Model 5, we conclude that only normative pressures and mimetic pressures are statistically significant, indicating that SaaS use may be mediated by either or both of these two factors. We then included the mediator variable, i.e., SaaS use (Model 6). We tested if indirect effect of normative pressures and mimetic pressures are significant on SaaS continuance intention. We conclude that only the indirect effect of normative pressures is

statistically significant ($p<0.01$). The variance accounted for (VAF) was 0.28, indicating that SaaS use is a partial mediator of normative pressure on SaaS continuance intention.

Table 4

6. Discussion

We conducted a comprehensive empirical assessment of SaaS diffusion (i.e., SaaS use and continuance intention) using an integrated research model that combines the TOE framework, INT, DOI theory, and the opportunity-risk framework. The results indicated that SaaS use is influenced by two factors, namely normative pressures and top management support. The results showed that current SaaS use and perceived opportunities influenced SaaS continuance intention. In addition, the findings showed that cost saving influences perceived opportunities, and security concerns influence perceived risks. Additionally, SaaS use leading to its continuance intention is weaker among firms with higher levels of perceived opportunities (see Figure 3).

Our findings indicated that SaaS use is not affected by the firm's technological competence. Although some studies have found technology competence to be an important determinant of IT innovation adoption and use (K. Zhu & Kraemer, 2005), the results of this study suggest the contrary for SaaS. A plausible explanation is that the SaaS architecture shifts the infrastructure and technical needs to the supplier, thereby reducing the need for IT competence within the firm.

In the technology context, top management support is a driver for SaaS use. This result is consistent with earlier studies (Oliveira et al., 2014). Communicating support from top management encourages employees to perceive SaaS as a strategic vision. As employees tend to follow directions of the top management, organizational support and commitment toward SaaS may receive wider support and lower resistance.

With regard to the environmental context, only normative pressures was significant to SaaS use. Prior studies have already suggested the role of normative pressures in technology adoption (Liang et al., 2007; Shin, 2009). The survey showed that the extent of SaaS use by the firm's suppliers and customers, and the government's promotion of IT use could exert normative pressures that influence the organization's SaaS use. Mimetic pressures were not

found to be significant for SaaS use. Earlier studies reported these to be important only when higher complexity was associated with innovations (Liu, Ke, Wei, Gu, & Chen, 2010; Teo et al., 2003). SaaS relegates technology complexity (e.g., software development, maintenance, and upgrades) to the SaaS provider. As firms in the same industry are likely to be aware of the benefits of SaaS, they may be less susceptible to mimetic pressures. The study also did not find coercive pressures to be significant. An explanation may be that despite the dominating positions that other firms may hold, SaaS use may be more normative in nature than the result of coercive pressures. Our results corroborate the belief that regulatory requirements are not a reason for SaaS use.

Within the diffusion process, SaaS use was found to be a facilitator for SaaS continuance intention. Similarities to this finding (i.e., the influence of technology use on continuance intention) have been suggested in other studies (Bose & Luo, 2011; D. H. Zhu, Chang, Luo, & Li, 2014; K. Zhu, Dong, et al., 2006). The results of our analysis provide additional support, confirming the link between the degree of use of SaaS and its continuance intention. As firms continue to manage business processes using SaaS, there may be greater propensity and willingness to extend SaaS to other business areas of the organization.

Our results show that perceived opportunities positively influence the organization's SaaS continuance intention but have a negative moderating effect on the relationship between the two dependent variables of SaaS diffusion. So, as firms identify more perceived opportunities, the greater is the continuance intention regarding SaaS. However, the effect of SaaS use as a predictor for continuance intention will be weaker among firms with greater perceived opportunities of SaaS. This implies that when the level of perceived opportunities increases, current SaaS use was not as crucial in determining the continuance intention. It was also found that perceived risks had no influence on the post-adoption stage of SaaS and that this factor does not moderate the relationship between SaaS use and continuance intention. Although this finding is at odds with findings reported in an earlier study (Benlian & Hess, 2011), other research has reported a weaker effect of perceived risks on the continuance intention of prominent emerging technologies (Chiu et al., 2014). The survey results suggested that providers of SaaS are ensuring the correct application of security measures in order to minimize potential risks. Firms recognize these efforts and are willing to considerer SaaS continuance without significant concerns of possible risks.

The study results indicated that cost saving is an antecedent of perceived opportunity, and security concerns is an antecedent of perceived risks. This finding is consistent with earlier research (Benlian & Hess, 2011; Gewald & Dibbern, 2009). Our study thus confirms cost saving as an opportunity and security as a potential risk in the context of SaaS. The findings may help firms to assess SaaS options better while formulating organizational strategies.

6.1. Practical Implications

Our findings identified determinants that affect the diffusion of SaaS. The study highlighted the significance of top management support and normative pressures in the organization's use of SaaS. Top management support is crucial for users to understand the firm's strategic use of SaaS. Given the degree of influence of top management, their support can help gain acceptance and cooperation among users toward SaaS and its integration within the firm's business functions. Normative pressures are exerted by social influences that surround the firm (Shin, 2009), and firms collectively tend to follow industry norms. Our study underlines the importance of normative pressures and indicates that SaaS use is not necessarily shaped by coercive or imitative behavior, but by culture, values, and norms within the industry. In addition to providing internal support, it is therefore essential that top management and decision makers understand industry-wide SaaS practices prior to developing strategic directives for the continuing use of SaaS within the firm.

Our study assessed the influence of perceived risks and opportunities on the diffusion stages of SaaS. These variables play an important role during the initial stages of SaaS diffusion, but only perceived opportunities were found to influence the continuance intention of SaaS. Recent technological advances in SaaS security standards may help to minimize concerns of information leakage and data integrity (Sangjae Lee et al., 2013). Reconciling opportunities associated with SaaS capabilities may help managers to better align SaaS offerings with the business needs of the organization.

Our analysis also found that SaaS use mediates the influence of the normative pressures on the SaaS continuance intention within the firm. The study thus sheds light on the effect of various factors that are important for practitioners to mitigate the pitfalls of SaaS diffusion. SaaS providers may find the study results beneficial for the development of SaaS capabilities that increase the prospects of SaaS use within a firm.

6.2. Theoretical Implications

The study makes important contributions to research in the area of SaaS. Most studies on SaaS diffusion have focused on a single-stage (i.e., intention or adoption). Our research differentiated the last two stages of the diffusion cycle, namely current SaaS use and continuance intention, and empirically evaluated determinants that influence the transition between them. The study thus fills an important research gap by providing a better understanding of the determinants that affect SaaS diffusion in an organization.

The research model we developed by combining the TOE framework, DOI theory, INT, and the opportunity-risk model seeks to provide a better understanding of the SaaS diffusion process. Our model provides a holistic and purposeful basis for evaluating the post-adoption stages of SaaS use. The model utilized the context of technology, organization, and environment, and included perceived opportunities and risks as moderators between the diffusion stages of SaaS. We also evaluated SaaS use as a mediator of the technology, organization, and environment context factors to assess its effects on continuance intention. The study represents an initial step in examining the impact of these types of effects on the organizational diffusion of SaaS. Compared to earlier studies (Chiu et al., 2014; H.-L. Yang & Lin, 2015), our research offers theoretical depth in the analysis by presenting the moderation and mediation results and highlighting the variance explained by the theoretical constructs (W. Hong, Chan, Thong, Chasalow, & Dhillon, 2014). Our research thus makes valuable contributions to the SaaS diffusion and use knowledge base. Researchers may find the model and the instrument applicable to diffusion studies of other emerging technologies.

6.3. Limitations and future directions

This research is not without limitations. First, data for this study were gathered from one country, Portugal, after the International Monetary Fund - European Union bailout package rescue plan. The country is still recovering from the global economic crisis, and the bailout package rescue plan is a critical factor that could influence organizational growth strategies. The effect of this variable was not considered in our study. Further research to extend the research model and compare the results in the changing economic environment would be worthwhile. Second, our research focused on a specific set of contextual factors. For example,

earlier research has examined factors affecting SaaS continuance intentions through a service quality lens (Benlian et al., 2011). Future research may compare the results of our research model taking into account the significant service quality factors for SaaS continuance. Also, in this study, we only considered the most important factors of the TOE framework and the opportunity-risk model in the context of SaaS diffusion. As other factors become relevant in the future, their inclusion may be necessary. Finally, this research does not use a longitudinal approach. Future research may apply the research model to explore the SaaS use and its continuance intention using a longitudinal approach.

7. Conclusion

Of the few studies that have addressed SaaS diffusion in an organization, most have focused on the early phase of the diffusion process, i.e., the intention to adopt SaaS. There is little scholarly evidence on the factors that influence SaaS use and its continuance intention. To evaluate the determinants of the post-adoption stages of SaaS diffusion, we developed a research model that combines the TOE framework, INT, DOI theory, and the opportunity-risk framework. The model was tested with a sample of 301 firms. The results indicated that normative pressures and top management positively affect SaaS use. The study found that the continuance intention of SaaS is influenced by the current SaaS use within the organization, as well as the perceived opportunities of SaaS. The analysis of results highlighted the direct effect of cost saving on perceived opportunities and the direct effect of security concerns on perceived risks. In addition, the study found that the importance of SaaS use to explain continuance intention was weaker among firms with higher perceived opportunities of SaaS.

The research offers further evidence that, in evaluating the diffusion of IT innovations, such as SaaS, an approach that takes into consideration the technology, organization, and environment contexts of the organization, along with the perceptions of opportunities and risks, is more meaningful in providing valuable insights to practitioners and researchers.

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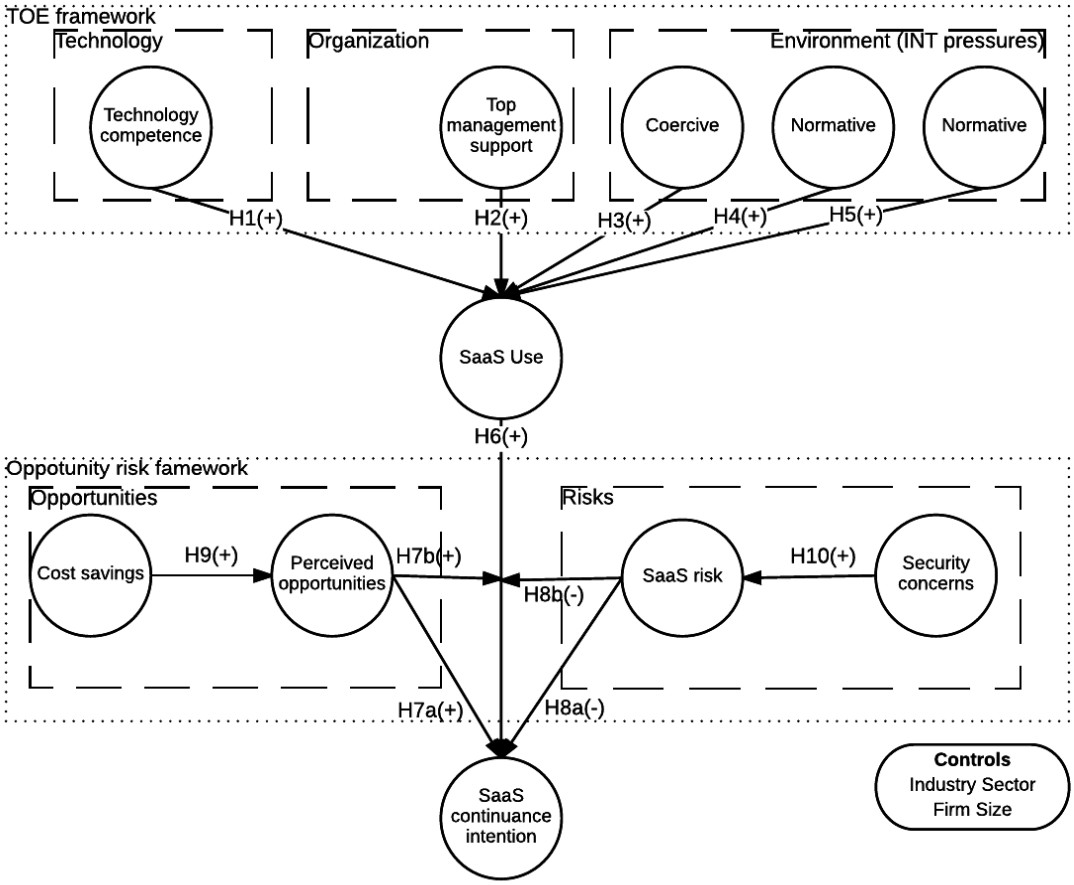
Appendix A

Appendix B

Figure 1–The conceptual model



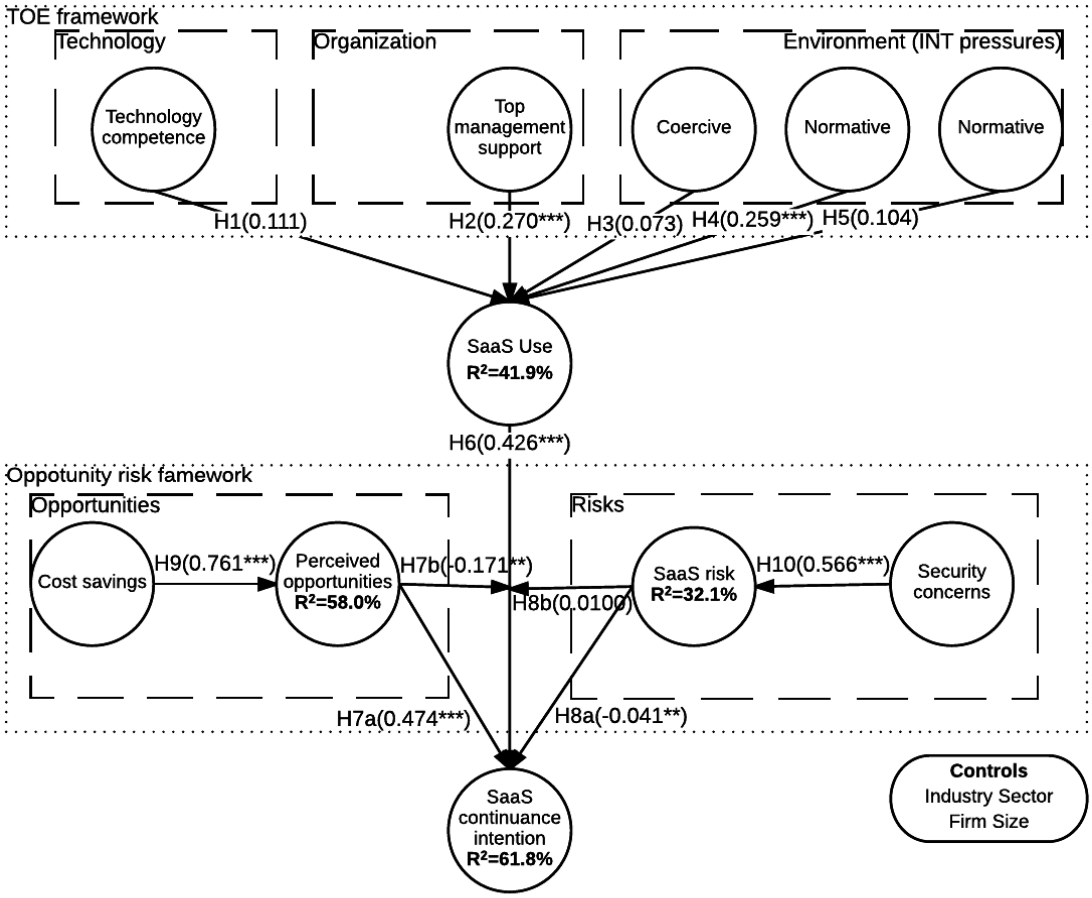


Figure 2. Structural model (variance-based technique) for post-adoption of SaaS

*(Note: * p< 0.10; ** p < 0.05; *** p < 0.01)*

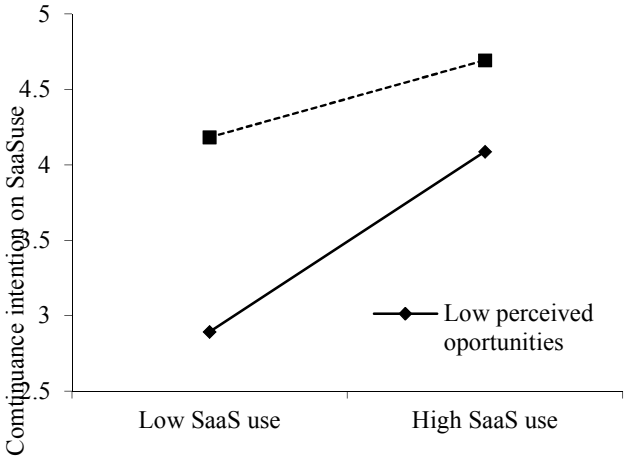


Figure 3. Predicted SaaS continuance intention – Interaction between perceived opportunities and SaaS use.

Table 1 - Sample characteristics (*n=301*)

Industry			**Firm size (number of employees)**		
Services	129	43%	Micro (=<10)	19	6%
Manufacture	95	32%	Small (11-50)	67	22%
Commerce	32	10%	Medium (51-250)	146	49%
Construct	23	8%	Large (>250)	69	23%
Health	13	4%			
Information and communication	9	3%			
Respondent's position					
Board member	24	8%			
CIO	8	3%			
Managers of IT	159	53%			
Managers from other departments	110	36%			

Table 2 – Correlation Matrix

	Mean	SD	CR	TC	TMS	CP	NP	MP	SaaSu	PercO	PercR	CS	SC	SaaSInc
TC	3.917	1.297	0.854	**0.814**										
TMS	3.791	1.582	0.952	0.663	**0.932**									
CP	2.608	1.446	0.917	0.280	0.287	**0.887**								
NP	3.018	1.278	0.891	0.503	0.457	0.579	**0.857**							
MP	3.019	1.415	0.977	0.410	0.450	0.650	0.561	**0.967**						
SaaSu	2.786	1.641	0.927	0.473	0.527	0.402	0.543	0.467	**0.899**					
PercO	4.726	1.233	0.950	0.441	0.559	0.283	0.414	0.437	0.466	**0.930**				
PercR	3.952	1.288	0.919	-0.099	-0.188	0.012	-0.068	-0.048	-0.136	-0.360	**0.890**			
CS	4.552	1.340	0.928	0.393	0.417	0.228	0.350	0.349	0.335	0.761	-0.252	**0.900**		
SC	4.263	1.351	0.895	-0.032	-0.103	0.031	-0.071	-0.014	-0.091	-0.145	0.566	-0.091	**0.860**	
SaaSInc	3.964	1.597	0.936	0.460	0.522	0.339	0.496	0.509	0.587	0.687	-0.256	0.482	-0.114	**0.911**

Note: Technology competence (TC); Top management support (TMS); Coercive pressures (CP); Normative pressures (NP); Mimetic pressures (MP); SaaS use (SaaSU); Perceived opportunities (PercO); Perceived risk (PercR); Cost saving (CS); Security concerns (SC); SaaS continuance intention (SaaSInc). The diagonal in bold is the square root of the average variance extracted (AVE).

Table 3 – Factor analysis

	TC	TMS	CP	NP	MP	SaaSu	PercO	PercR	CS	SC	SaaSInc
TC1	**0.739**	0.485	0.127	0.324	0.265	0.291	0.414	-0.086	0.395	0.008	0.381
TC2	**0.872**	0.604	0.329	0.507	0.422	0.464	0.400	-0.143	0.358	-0.055	0.435
TC3	**0.824**	0.518	0.188	0.366	0.286	0.371	0.275	0.000	0.222	-0.016	0.304
TMS1	0.596	**0.908**	0.179	0.361	0.376	0.480	0.580	-0.187	0.435	-0.093	0.505
TMS2	0.608	**0.943**	0.290	0.463	0.419	0.456	0.459	-0.136	0.345	-0.072	0.441
TMS3	0.648	**0.945**	0.328	0.453	0.459	0.532	0.522	-0.199	0.384	-0.119	0.508
CP1	0.176	0.178	**0.891**	0.478	0.480	0.276	0.176	0.035	0.134	0.014	0.252
CP2	0.197	0.175	**0.885**	0.460	0.479	0.287	0.154	0.035	0.138	0.027	0.180
CP3	0.326	0.351	**0.884**	0.569	0.697	0.450	0.359	-0.021	0.285	0.037	0.406
NP1	0.467	0.443	0.536	**0.925**	0.510	0.520	0.402	-0.098	0.307	-0.126	0.475
NP2	0.464	0.407	0.430	**0.890**	0.499	0.509	0.339	-0.006	0.315	-0.018	0.425
NP3	0.347	0.307	0.559	**0.744**	0.431	0.340	0.325	-0.078	0.278	-0.029	0.368
MP1	0.402	0.450	0.643	0.564	**0.954**	0.459	0.432	-0.072	0.364	-0.025	0.494
MP2	0.404	0.435	0.603	0.521	**0.978**	0.460	0.419	-0.031	0.331	-0.007	0.493
MP3	0.381	0.418	0.639	0.541	**0.968**	0.435	0.415	-0.035	0.316	-0.009	0.488
SaaSu1	0.403	0.482	0.345	0.467	0.357	**0.891**	0.449	-0.164	0.330	-0.073	0.534
SaaSu2	0.429	0.483	0.358	0.495	0.440	**0.932**	0.424	-0.150	0.313	-0.125	0.530
SaaSu3	0.443	0.455	0.381	0.502	0.461	**0.872**	0.383	-0.052	0.260	-0.048	0.520
PercO1	0.422	0.521	0.219	0.372	0.363	0.409	**0.930**	-0.295	0.736	-0.065	0.598
PercO2	0.376	0.505	0.299	0.367	0.432	0.434	**0.938**	-0.369	0.698	-0.168	0.618
PercO3	0.430	0.533	0.272	0.415	0.423	0.454	**0.922**	-0.342	0.690	-0.171	0.697
PercR1	-0.028	-0.133	0.075	-0.023	0.000	-0.059	-0.266	**0.880**	-0.172	0.521	-0.165
PercR2	-0.058	-0.073	0.003	-0.038	-0.022	-0.080	-0.261	**0.869**	-0.208	0.508	-0.176
PercR3	-0.171	-0.288	-0.043	-0.115	-0.101	-0.216	-0.427	**0.919**	-0.289	0.486	-0.335
CS1	0.302	0.294	0.234	0.310	0.306	0.247	0.590	-0.203	**0.852**	-0.106	0.385
CS2	0.365	0.381	0.188	0.303	0.315	0.306	0.703	-0.217	**0.943**	-0.061	0.436
CS3	0.385	0.436	0.201	0.331	0.323	0.342	0.748	-0.256	**0.904**	-0.082	0.473
Sec1	-0.076	-0.168	0.041	-0.112	-0.044	-0.123	-0.187	0.579	-0.126	**0.889**	-0.183
Sec2	0.015	-0.055	-0.049	-0.070	-0.046	-0.069	-0.105	0.441	-0.040	**0.860**	-0.065
Sec3	-0.005	-0.014	0.088	0.017	0.067	-0.027	-0.060	0.414	-0.051	**0.830**	-0.016
SaaSInc1	0.427	0.471	0.353	0.442	0.474	0.542	0.538	-0.205	0.343	-0.078	**0.855**
SaaSInc2	0.391	0.455	0.265	0.458	0.432	0.533	0.646	-0.230	0.473	-0.110	**0.931**
SaaSInc3	0.441	0.500	0.314	0.456	0.487	0.533	0.686	-0.262	0.493	-0.122	**0.944**

Note: All loadings presented with absolute value greater than 0.5.

Table 4– Research models estimations

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Beta	**R^2**	**Beta**	**R^2**	**Beta**	**R^2**	**Beta**	**R^2**	**Beta**	**R^2**	**Beta**	**R^2**	**Beta**	**R^2**
SaaS use (SaaSu)		0.9%		41.8%		41.8%		41.9%		41.8%		41.8%		41.9%
Technological competence (TC)			0.1038		0.110		0.111		0.108		0.108		0.111	
Top management support (TMS)			0.273***		0.270***		0.269***		0.272***		0.273***		0.270***	
Coercive pressures (CP)			0.075		0.074		0.073		0.075		0.075		0.073	
Normative pressures (NP)			0.256***		0.259***		0.259***		0.256***		0.256***		0.259***	
Mimetic pressures (MP)			0.106		0.105		0.104		0.106		0.105		0.104	
Firm size	Included		Included		Included		Included		Included		Included		Included	
Industry dummies	Included		Included		Included		Included		Included		Included		Included	
Perceived opportunities (PercO)								58.90 %		58.0%		58.0%		58.0%
Cost saving (CS)							0.761***		0.761***		0.761***		0.761***	
Perceived risk (PercR)								32.1%		32.1%		32.1%		32.1%
Security concerns (SC)							0.566***		0.566***		0.566***		0.566***	
SaaS continuance intention		0.7%		40.8%		35.7%		56.9%		56.0%		59.7%		61.8%
Technological competence (TC)			0.081						0.055		0.030			
Top management support (TMS)			0.2602** *						0.070		0.016			
Coercive pressures (CP)			-0.067						-0.038		-0.060			
Normative pressures (NP)			0.223***						0.150**		0.090			
Mimetic pressures (MP)			0.280***						0.188***		0.169***			
Perceived opportunities (PercO)							0.515***		0.470***		0.433***		0.474***	
Perceived risk (PercR)							-0.033		-0.055		-0.051		-0.041	
SaaS use (SaaSu)					0.594***		0.345***				0.256***		0.426***	
PercO * SaaSu													-0.171**	
PercR * SaaSu													0.100	
Firm size	Included		Included		Included		Included		Included		Included		Included	
Industry dummies	Included		Included		Included		Included		Included		Included		Included	

Note: * p < 0.10, ** p < 0.05, *** p < 0.01; The controls variables, i.e., industry dummies and firm size were included in Model 1 to 7 and are not statistically significant in any of the models.

Appendix A

Measurement items

Constructs	Measurement Items	Source
Technology competence	TC1. The technology infrastructure of my company is available to support SaaS. TC2. My company is dedicated to ensuring employees are familiar with SaaS. TC3. My company has good knowledge of SaaS.	(Chan & Chong, 2013)
Top management support	TMS1. Top management is likely to take risk involving the implementation of SaaS. TMS2. Top management actively participates in establishing a vision and formulating strategies for utilizing SaaS. TMS3. Top management communicates its support for the use of SaaS.	(Chong & Chan, 2012)
Coercive pressures	CP1. The local government requires our firm to use SaaS. CP2. The industry association requires our firm to use SaaS. CP3. The competitive conditions require our firm to use SaaS.	(Liang et al., 2007)
Normative pressures	NP1: The extent of SaaS adoption by your firm's suppliers. NP2: The extent of SaaS adoption by your firm's customers. NP3: The extent to which the Government's promotion of Information Technology influences the firm to use SaaS.	(Liang et al., 2007)
Mimetic pressures	*Our main competitors who have adopted SaaS:* Mp1. Have greatly benefitted. Mp2. Are favorably perceived by others in the same industry. Mp3. Are favorably perceived by their suppliers and customers.	(Liang et al., 2007)
SaaS use	SaaSU1. We have integrated SaaS with our existing backend/legacy systems. SaaSU2. SaaS is being implemented with our trading partners. SaaSU3. SaaS is being implemented with our customers.	(Chan & Chong, 2013)
Perceived opportunities	PercO1: Adopting SaaS has many advantages. PercO2: Adopting SaaS is useful for increasing operational excellence. PercO3: Overall, I consider SaaS adoption to be a useful strategic option.	(Benlian & Hess, 2011)
Perceived risks	PercR1: Adopting SaaS applications is associated with a high level of risk. PercR2: There is a high level of risk that the expected benefits of adopting SaaS-based applications will not materialize. PercR3: Overall, I consider the adoption of SaaS-based applications to be risky.	(Benlian & Hess, 2011)
Cost saving	CS1. SaaS is more effective than the alternative. CS2. Organizations can avoid unnecessary cost and time by using SaaS. CS3. SaaS saves time and effort.	(Chong & Chan, 2012)
Security concerns	SC1. The confidentiality and security of business data are not guaranteed when adopting SaaS solutions. SC2. In case of damages, present liability law is still unclear about who will bear liability. SC3. The SaaS provider will exploit contractual loopholes (i.e., incomplete contracting) to the detriment of the company.	(Benlian & Hess, 2011)
SaaS continuance intention	SaaSe1: If there is a better SaaS solution, it should be used for the application domain I am in charge of. SaaSe2: Our company should increase the existing level of adopting SaaS-based applications. SaaSe3: I support the further adoption of SaaS-based applications.	(Benlian & Hess, 2011)

Appendix B

Heterotrait-Monotrait Ratio (HTMT)

	TC	TMS	CP	NP	MP	SaaSu	PercO	PercR	CS	SC	SaaSInc
TC											
TMS	0.789										
CP	0.303	0.291									
NP	0.618	0.518	0.685								
MP	0.468	0.475	0.675	0.631							
SaaSu	0.567	0.582	0.432	0.627	0.506						
PercO	0.535	0.604	0.288	0.477	0.463	0.517					
PercR	0.141	0.205	0.060	0.104	0.059	0.154	0.400				
CS	0.486	0.455	0.240	0.413	0.378	0.376	0.838	0.284			
SC	0.059	0.108	0.080	0.102	0.068	0.105	0.158	0.656	0.101		
SaaSInc	0.560	0.572	0.357	0.577	0.548	0.663	0.752	0.286	0.535	0.120	