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ASSESSING SOFTWARE AS A SERVICE DIFFUSION: FROM ADOPTION TO ITS CONTINUANCE INTENTION

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ABSTRACT

Technological progress is enabling firms to acquire software from different architecture environments. One such architecture environment that has produced a considerable impact on the markets is software as a service (SaaS). SaaS focuses on delivering software hosted off-premises and accessed remotely by means of a subscription fee. Recognized by managers and researchers as a promising solution, it is expanding in the software markets. However, SaaS is surrounded by uncertainty as its perceived viability is still questioned. Although this has motivated recent research into the determinants of SaaS, evidence suggests that it is still not enough. Research has much to cover in order to improve our understanding of the SaaS diffusion process.

This dissertation investigates the SaaS diffusion process at a firm level by examining the drivers for each stage. Specifically, we analyze the different influences of the determinant factors on SaaS from the intention to adopt, passing through adoption, routinization and use, as well as its continuance intention. Because SaaS is considered a specific form of information systems outsourcing (ISO), in a first phase we assess the determinants in the context of ISO adoption in order to introduce to its investigation. The purpose of this approach is twofold. First, we test the appropriateness of the theoretical framework selected for the study of SaaS through its application in the analyses of ISO. Second, we find factors of ISO that are transferable to the SaaS context. In a second phase, we consider mediator and moderator influences and propose a new approach of applying a well known theoretical framework in the setting of SaaS adoption.

This dissertation contributes to scholarship by enhancing current knowledge of why firms adopt and use SaaS. It incorporates seven studies individually separated into chapters. Chapter 2 is a detailed literature review on ISO and SaaS. As mentioned above, SaaS a specific form of outsourcing. Chapter 3 introduces the main theme by evaluating the suitability of the base framework proposed in this work on the study of ISO. Chapters 4 and 5 are extensions of chapter 3, in which comparisons of the determinants for ISO adoption in different business areas are performed. In chapter 6 we assess the determinants of the SaaS diffusion process (i.e. intention, adoption, and routinization). The factors that influence SaaS use and its continuance intention are identified in chapter 7. In chapter 8 we provide a new

approach of applying the theoretical framework used in this dissertation in the context of SaaS adoption.

This work adopts a positivist epistemological posture. As for the research methodology, a deductive method is used. All studies of this dissertation with the exception of the one presented in chapter 2 are based on the technology-organization-environment (TOE) framework. Additionally, we integrate TOE framework with other theories to enhance the explanatory power of the model. Thus, in chapters 4 and 5 we use diffusion of innovation (DOI) theory; in chapter 6 the institutional theory (INT) is used, in addition to DOI theory; in chapter 7 we include opportunity-risk framework apart from the theories already mentioned.

The findings of this dissertation confirm that little research has indeed been performed on SaaS adoption, and more efforts are needed to provide an in-depth understanding of the topic. Through the analysis performed in the ISO context in chapters 3, 4, and 5, the TOE framework suitability as a theoretical basis for the study of SaaS is confirmed. Significant factors of ISO that are transferable for the SaaS context are also found. Relative advantage, complexity, technology competence, top management support, and normative pressures are determinants in the intention to adopt stage. Normative pressures are a constant determinant in the intention, adoption, and routinization stages. Additionally, a total effect (direct effect and indirect effect combined) of cost savings, relative advantage, and top management support is found in the adoption stage of SaaS. A cost savings total effect on the intention to adopt is also found. In terms of the post-adoption stages (i.e. SaaS use to its continuance intention) the findings confirm top management support and normative pressures as determinants of SaaS use. SaaS use and perceived opportunities are significant factors for the continuance intention. Moreover, the relationship between SaaS use and continuance intention is moderated by perceived opportunities. Finally, in this research we validate a new conceptual approach for the TOE framework by introducing moderator effects in its application.

This investigation fills a crucial research gap by providing a better understanding of the determinants that affect organizational SaaS diffusion, advancing newer paths of approaching a solid theoretical framework.

Keywords

Information systems outsourcing, technology-organization-environment framework, diffusion of innovations, IT adoption, Software-as-a-service (SaaS), Post-adoption, institutional theory (INT), opportunity-risk model, continuance intention, moderator effects.

RESUMO

O progresso tecnológico tem possibilitado às empresas a aquisição de software em diferentes ambientes arquitetónicos. Um exemplo de um ambiente distinto de arquitetura tecnológica que tem produzido um impacto considerável no mercado de software é o *software as a service* (SaaS). O SaaS refere-se a software instalado fora da infraestrutura da empresa, cujo acesso é efetuado remotamente por meio da subscrição do serviço. Reconhecido, quer pelos gestores e investigadores, como uma solução promissora e encontrando-se em fase de expansão nos mercados de software, a sua viabilidade ainda é questionada. Embora esta dúvida tenha motivado a investigação sobre os fatores determinantes do SaaS, evidências sugerem que não é suficiente. Requer-se assim mais investigação para melhorar o nosso entendimento sobre o processo difusão do SaaS.

Esta dissertação investiga os fatores determinantes para cada estágio do processo de difusão do SaaS, ao nível de empresa. Especificamente, analisamos as diferentes influências dos fatores determinantes desde a intenção de adotar, passando pela adoção, rotinização e uso, até à intenção de continuidade do SaaS. Porque o SaaS é considerado uma forma específica de outsourcing de sistemas de informação (ISO), numa primeira fase deste estudo avaliamos os fatores determinantes no contexto da adoção do ISO a fim de introduzir esta investigação. Esta abordagem tem dois objetivos: testar a adequação do quadro teórico escolhido para o estudo do SaaS através da sua aplicação no contexto do ISO e obter os fatores que se revelaram significativos no ISO e que podem ser utilizados no contexto do SaaS. Numa segunda fase, consideramos as influências de fatores moderadores e mediadores no estudo da adoção do SaaS e propomos uma nova abordagem para a aplicação do quadro teórico de referência.

Sete estudos, separados por capítulos, compilam esta investigação. É nosso objetivo ampliar o conhecimento atual sobre como as empresas adotam e usam o SaaS. Como mencionado, o SaaS é uma forma específica de outsourcing, assim o capítulo 2 é uma revisão detalhada da literatura sobre o ISO e SaaS. O capítulo 3 avalia a adequação do quadro teórico base proposto neste trabalho no âmbito do estudo do ISO. Os capítulos 4 e 5 são extensões do capítulo 3, nos quais são efetuadas análises comparativas dos fatores determinantes para a adoção do ISO entre as diferentes áreas de negócio. No capítulo 6, avaliamos os fatores determinantes do processo de difusão do SaaS (intenção, adoção e

rotinização). Os fatores que influenciam o seu uso e continuidade são identificados no capítulo 7. No capítulo 8, apresentamos uma nova abordagem para a aplicação do quadro teórico de referência utilizado nesta dissertação, no contexto da adoção do SaaS.

A postura epistemológica adotada é a positivista e utiliza-se o método dedutivo no respeitante à metodologia de pesquisa. Todos os estudos apresentados, com exceção do capítulo 2, são baseados no quadro teórico tecnologia-organização-ambiente (TOE). Adicionalmente, integramos o quadro teórico TOE com outras teorias para aumentar o poder explicativo do modelo. Assim, nos capítulos 4 e 5 utilizamos a teoria difusão da inovação (DOI); No capítulo 6 é utilizada a teoria institucional (INT), em conjunto com a teoria DOI; No capítulo 7, incluímos o quadro teórico oportunidade-risco para além das teorias já mencionadas.

Os resultados desta dissertação confirmam que a investigação sobre a adoção do SaaS é escassa e que são necessários mais esforços para conferir uma maior clareza sobre o tema. Da análise realizada no contexto do ISO, nos capítulos 3, 4 e 5, a adequação do quadro teórico TOE como base teórica de referência para o estudo do SaaS é confirmada. Os fatores determinantes para o ISO e que se adequam ao contexto do SaaS também foram identificados. A vantagem relativa, a complexidade, a competência tecnológica, o apoio da gestão de topo e as pressões normativas são determinantes no estágio da intenção de adotar. As pressões normativas são um fator determinante constante, nos estágios da intenção, adoção e rotinização. Além disso, um efeito total (efeito direto e efeito indireto combinado) da redução de custos, vantagem relativa e apoio da gestão de topo é verificado na fase de adoção do SaaS. Um efeito total de redução de custos sobre a intenção de adotar também é detetado. No que diz respeito aos estágios da pós-adoção (uso do SaaS e a intenção de continuidade), os resultados confirmam o apoio da gestão de topo e pressões normativas como determinantes no uso do SaaS. O uso do SaaS e oportunidades percebidas são fatores significativos para a intenção de continuidade. Além disso, a relação entre o uso do SaaS e a intenção de continuidade é moderada pelas oportunidades percebidas. Finalmente, apresentamos e validamos uma nova abordagem do quadro TOE, introduzindo efeitos moderadores na sua aplicação.

Esta dissertação preenche uma lacuna crucial na investigação, proporcionando um melhor entendimento dos fatores determinantes que afetam o processo de difusão do SaaS e avançando novos caminhos de abordagem de um quadro teórico de referência.

Keywords PT:

Outsourcing dos sistemas de informação, quadro tecnologia-organização-ambiente (TOE), difusão da inovação, adoção de TI, Software as a Service, pós-adoção, teoria institucional, modelo oportunidade-risco, intenção de continuidade, efeitos moderadores.

PUBLICATIONS

List of publications resulting from this dissertation.

Papers:

Martins, R., Oliveira, T., & Thomas, M. A. (2016). An empirical analysis to assess the determinants of SaaS diffusion in firms. Computers in Human Behavior, 62, 19-33.

Martins, R., Oliveira, T., & Thomas, M. A. (2015). Assessing Organizational Adoption of Information Systems Outsourcing. Journal of Organizational Computing and Electronic Commerce, 25(4), 360-378.

Book chapter:

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ISI Proceedings:

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ABBREVIATIONS

ASP - APPLICATION SERVICE PROVISION(DER)

AUC - AREA UNDER THE CURVE

AVE - AVERAGE VARIANCE EXTRACTED

BPO - BUSINESS PROCESS OUTSOURCING

CR - COMPOSITE RELIABILITY

CRM - CUSTOMER RELATIONSHIP MANAGEMENT (CRM),

DEMATEL - DECISION MAKING TRIAL AND EVALUATION LABORATORY

ECT - EXPECTATION CONFIRMATION THEORY

ERP - ENTERPRISE RESOURCE PLANNING

GDP - GROSS DOMESTIC PRODUCT

GSCM - GREEN SUPPLY CHAIN MANAGEMENT

HRM - HUMAN RESOURCE MANAGEMENT

IAAS - INFRASTRUCTURE AS A SERVICE

INT - INSTITUTIONAL THEORY

IS - INFORMATION SYSTEMS

ISO - INFORMATION SYSTEMS OUTSOURCING

IT - INFORMATION TECHNOLOGY(IES)

KMO - KAISER-MEYER-OLKIN

K-S - KOLMOGOROV–SMIRNOV

LR - LIKELIHOOD RATIO

OPIS - ON-PREMISE INSTALLATION SOFTWARE

PAAS - PLATFORM AS A SERVICE

PEST - POLITICAL, ECONOMIC, SOCIAL, AND TECHNOLOGICAL

PLS - PARTIAL LEAST SQUARES

RBV - RESOURCE-BASED VIEW

RFID - RADIO FREQUENCY IDENTIFICATION

RST - ROUGH SET THEORY

SAAS - SOFTWARE AS A SERVICE

SEM - STRUCTURAL EQUATION MODELLING

TAM - TECHNOLOGY ACCEPTANCE MODEL

TBP - THEORY OF PLANNED BEHAVIOR

TCE - TRANSACTION COST ECONOMICS

TCT - TRANSACTION COST THEORY

UTUAT - UNIFIED THEORY OF ACCEPTANCE AND USE OF TECHNOLOGY

VIF - VARIANCE INFLATION FACTOR

Chapter 1 – Introduction

1.1 MOTIVATION

The need for appropriate software to improve firms' performance is something widely recognized. During a firm's life cycle, different needs from different types of software are expected. This may entail large and very complicated expenses if the software adoption implies the traditional form of licensing of on-premises installation. Because of this, the access to different types of software was for many years limited to firms that could afford such acquisition. On-demand software emerged to democratize the access of firms to software. This new service model, named information systems outsourcing (ISO), was designed to reduce information technology (IT) costs and improve IT performance (Currie & Seltsikas, 2001; Heart, 2010). A considerable amount of research has been produced in the last 20 years that demonstrates its importance in the software markets. Nowadays, we find new technologies that have emerged based on the same functionality as ISO, such as SaaS (Benlian & Hess, 2011; Heart, 2010). SaaS has introduced a multi-tenant architecture, allowing users to access several software products on demand (Benlian & Hess, 2011). This means that SaaS can properly support demanding business requirements, and suppliers can achieve an economy of scale of their software products (Lee, Chae, & Cho, 2013). SaaS applications are growing in the market place, but there are still uncertainties regarding its viability (Benlian & Hess, 2011). So far, little research has been performed in this field. Thus, it is important to understand the determinant factors for SaaS diffusion at firm level (i.e. from its intention to adopt, adoption, routinization and use, to its continuance intention).

The main motivational factors to do this research are presented as follows:

- SaaS is gaining an increasing importance in the software markets;
- SaaS is a type of outsourcing, researchers found ISO research useful to pave the way to SaaS investigation;
- Research on SaaS is limited, and in order to attain a deeper understanding of the dynamic of its determinant factors on the diffusion process more studies are required;
- Although SaaS is considered a promising solution, it is surrounded by uncertainty regarding its future;

- The global scope of on-demand software participation and growth leads to knowledge gaps in the scope of technology-organization-environment.

1.2 ADOPTION MODELS

Adoption models for the study of information systems fall into different category levels of analysis. There are models that are used on an individual level of analysis such as the technology acceptance model (TAM) (Davis, Bagozzi, & Warshaw, 1989), and the unified theory of acceptance and use of technology (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003). On a firm level of analysis, models such as TOE framework (Tornatzky & Fleischer, 1990) and DOI theory (Rogers, 1995) and INT (DiMaggio & Powell, 1983) are used. Others might be used for both levels of analysis (i.e. individual and firm level) such as opportunity risk framework (Benlian & Hess, 2011; Gewald & Dibbern, 2009). Given that the target population of this dissertation is firms operating in Portugal, we focused on the models that fill this requirement. TOE's framework has been used in several studies to explain the adoption of technological innovations such as mobile supply chain (Chan & Chong, 2013), radio frequency identification (Chong & Chan, 2012; Kim & Garrison, 2010; Wang, Wang, & Yang, 2010), green IT (Bose & Luo, 2011; Thomas, Costa, & Oliveira, 2015), inter-organizational business process standards (Venkatesh, Thong, & Xu, 2012a), e-business (Oliveira & Dhillon, 2015; Oliveira & Martins, 2010a; Zhu, Kraemer, & Xu, 2003; Zhu, Kraemer, & Xu, 2006), SaaS (Yang, Sun, Zhang, & Wang, 2015), and cloud computing (Abdollahzadehgan, Gohary, & Amini, 2013; Low, Chen, & Wu, 2011; Oliveira, Thomas, & Espadanal, 2014). DOI theory (Rogers, 2010) has been used in information systems (IS) research to explain the adoption of Internet (Alam, 2009), e-procurement (Azadegan & Teich, 2010), Radio-frequency identification (RFID) (Tsai, Lee, & Wu, 2010), e-business (Ifinedo, 2011; Zhu, Dong, Xu, & Kraemer, 2006), and cloud computing (Low et al., 2011). The INT has been used in the study of electronic human resource management (Heikkilä, 2013), intranet (Baptista, Newell, & Currie, 2010), and green IS (Butler, 2011).

Literature suggests that the INT enriches the environmental context of the TOE framework (Ciganek, Haseman, & Ramamurthy, 2014; Oliveira & Martins, 2011; Yoon & George, 2013), and gains value when used together with the DOI theory. Finally, opportunity-risk model has been used for the study of business process outsourcing (BPO) (Gewald & Dibbern, 2009), e-commerce (Lee, 2009), and SaaS (Benlian & Hess, 2011).

Because the goals of each chapter differ, in each of them we describe the models used and specify in detail the reasons why they have been incorporated together.

1.3 RESEARCH FOCUS

The focus of this dissertation is to understand the determinant factors for SaaS diffusion at firm level, from the intention to adopt to its continuance intention (see Figure 1.1). Related subjects such as application service provision (ASP), and cloud computing are not an issue of interest, and therefore not within the scope of this investigation.

Figure 1.1 – Research focus on SaaS

SaaS has the following characteristics:

- Its acquisition requires a subscription fee;
- The software is hosted on the supplier's premises;
- The access to the software is made via internet;
- It is built in a multi-tenant architecture, which enables suppliers to achieve an economy of scale.

Although SaaS is grounded on cloud computing, literature suggests that a meaningful insight is gained if SaaS is addressed in an isolated manner, since the determinant factors can be quite different depending on the type of cloud service under study (Schneider & Sunyaev, 2014).

1.4 PURPOSE

The purpose of this dissertation is to provide a better understanding of the factors behind SaaS diffusion at a firm level. Given the similarity of SaaS and ISO, we first perform an

investigation focusing on ISO. SaaS emerged from ISO, and thus focusing on the latter will be useful to better understand the former. In order to facilitate the clear comprehension of the findings, the different studies that incorporate this research are separated into different chapters.

In chapter 2 a thorough literature review on ISO and SaaS is provided. It summarizes earlier findings and identifies gaps in current knowledge. Although it is the first chapter to be presented, it was the last one to be completed, since it was constantly updated based on the progression of the research.

In chapter 3 we assess the determinants for ISO adoption, as an introductory approach to the main theme. The goal is to examine the suitability of the theoretical basis selected for this study, and to identify the significant factors of ISO adoption which could be transferable to the SaaS context.

In chapters 4 and 5 we examine the reasons for ISO adoption among different business areas. The objective is to deepen the understanding of the topic and promote a comparative analysis. Through this detailed analysis we also intend to confirm the appropriateness of assessing the determinant factors from a technological, organizational, and environmental perspective.

In chapter 6 we analyze the determinants for the SaaS diffusion process. Specifically, we seek to gain a better understanding on the relationship between the factors and the three stages of SaaS diffusion, namely intention, adoption, and routinization. Until now only a few studies have addressed the adoption of SaaS at the firm level (Wu, Lan, & Lee, 2011), most of them focusing on the direct effects of the independent variables on a single stage (i.e. SaaS adoption), and not considering other stages.

In chapter 7 we explore the determinants for post adoption stages of SaaS, namely SaaS usage and its continuance intention. Although the importance of SaaS in today's global market cannot be ignored, only a few studies have assessed its use, and none of them addressed the strategic continuance intentions. To bring more clarity to the diffusion process, further research on post-adoption dynamics is necessary (Zhu, Dong, et al., 2006).

In chapter 8 a different path of applying the theoretical framework is suggested. The TOE framework is one of the most important adoption models at a firm level. Based on IT literature, TOE framework has only direct effects in explaining IT adoption. However, the question arises: can the environment context act as a moderator of the other contexts in the adoption process? In this chapter we propose an integrated research model to analyze the moderator effects of the environment context in the SaaS adoption process.

1.5 METHODS

Literature suggests the existence of three main epistemological perspectives (i.e. positivism, realism, and interpretivism). This dissertation follows the positivist approach. Several methods are required in this investigation, since it develops a new research model based on existing theories to explain SaaS diffusion process. The theory developed is tested in order to enhance our understanding of the topic, a set of hypotheses are introduced taking into account the context of the study, and all hypotheses are empirically tested. The theoretical framework and quantitative approach are described below.

1.5.1 Theoretical frameworks

Chapters 3 to 8 of this research are based on the TOE framework (Tornatzky & Fleischer, 1990). The diffusion of innovation theory (Rogers, 1995) is included in chapters 4, 5, and 6. The opportunity risk model (Benlian & Hess, 2011; Gewald & Dibbern, 2009) is used in chapter 7. Institutional theory is used in chapters 6, 7, and 8.

1.5.2 Quantitative research methods

In chapter 3 data from 261 firms is used to assess the organizational adoption of information systems outsourcing. Data were collected from a survey executed online, with an invitation for participation sent to several managers of firms in Portugal. Due to the dichotomous characteristic of the dependent variable (i.e. adopt or not adopt), logistic regression was used to test the research hypotheses.

In chapters 4 and 5, using the data described in chapter 3, the same method is used for comparing the determinant factors of ISO between different business areas. Particularly, a logistic regression method was used to test the research hypotheses.

In chapter 6 the results of another online survey are reported. This survey examined the determinant factors for three stages of SaaS diffusion (i.e. intention, adoption, routinization). Data were collected from a survey executed online, with an invitation for participation sent to several managers of firms in Portugal. A total of 265 usable responses were obtained. Structural equation modelling (SEM) was used to empirically test the research model. Specifically, we used Partial Least Squares (PLS) path modelling, which is a variance based technique required when maximum model complexity and low theoretical information are present (Henseler, Ringle, & Sinkovics, 2009).

In chapter 7 and 8, using the previous data from 265 firms, we used PLS path modelling to investigate the determinants for the post adoption stages of SaaS and to analyze the moderator effects of the TOE framework in the SaaS adoption, respectively.

Chapters 6, 7, and 8 report the results of testing the construct reliability, convergent validity, indicator reliability, and discriminant validity, followed by the assessment of the structural model and the hypotheses testing.

1.6 PATH OF RESEARCH

This dissertation assembles the findings of assorted investigation studies, individually reported in separate chapters. Two of these chapters are already published in international journals with double blind review process (Martins, Oliveira, & Thomas, 2015; Martins, Oliveira, & Thomas, 2016), another is published as a book chapter (Martins & Oliveira, 2014), and another was presented at an international conference (ISI indexed) (Martins, Oliveira, & Thomas, 2013). The remaining chapters are currently submitted for review at international journals.

A detailed literature review of both ISO and SaaS is included in the initial phase of this dissertation (chapter 2), as we realize the importance of ISO for a better understanding of SaaS. Although it was the first chapter to be initiated, it was also the last to be finalized. Based on the reports of earlier research, ISO was found to be a useful support to pave the way to the discussion on SaaS. Chapter 2 is currently under review at an international journal.

Because of the contradictory findings and gaps of knowledge verified, a specific theoretical framework that covers technological, organizational, and environmental factors was selected for this investigation. In order to test its suitability and assemble the relevant constructs for the study of SaaS, we first applied the framework in the study of ISO (chapters 3, 4, and 5). Chapter 3 was published in the *Journal of Organizational Computing and Electronic Commerce* (Martins et al., 2015). Chapter 4 was presented in Lisbon at the Iberian Conference on Information Systems and Technologies (CISTI) (Martins et al., 2013). Chapter 5 was published as a handbook chapter in a Springer strategic e-business management book (Martins & Oliveira, 2014). The publication date does not correspond to the chapter sequence, but the order of the chapters presented in this dissertation follows the true sequence of each study.

With the empirical support of the suitability of the theoretical model and with the constructs gathered, we initiate the focus of the investigation on SaaS, assessing the determinants of the first three stages (i.e. intention, adoption, and routinization) of the diffusion process. In order to do so, a panel of IS research experts re-examined the instrument and appropriateness of the constructs selected for the study of SaaS. Appropriate revisions were made based on their comments and observations. Chapter 6 was published in *Computers in Human Behavior* journal (Martins et al., 2016). In order to close the diffusion research process, in chapter 7 we initiate the study of the determinants for the post-adoption stages (i.e. SaaS use, its continued intention). Chapter 7 is currently submitted to an international journal, and in the review process.

In a conclusive stage of this investigation, we identified an opportunity to give an important final contribution and enhance the explanatory power of the theoretical framework used by introducing moderator effects. Thus, in chapter 8 we assess the moderator effects of the theoretical framework (i.e. TOE framework) in the context of SaaS adoption. Chapter 8 is currently under review at an international journal.

The conclusions of this research are presented in the last chapter (chapter 9). The fact that the chapters of this investigation are either in a submission process, under review, or were already accepted for publication demonstrate the quality of this dissertation.

Chapter 2 – Information Systems Outsourcing decision: Software as a Service literature review

2.1 INTRODUCTION

Information systems outsourcing (ISO) was considered a relatively new phenomenon in the 1990s (Jens Dibbern, Chin, & Heinzl, 2012). Since it was introduced, much research has been made on the topic, and its scholarship has matched its popularity (Martins et al., 2015). One of the main intriguing paths of analysis for researchers over the years has been why firms choose ISO (Lacity, Khan, Yan, & Willcocks, 2010). Tactical reasons top the list of the most examined factors (i.e. cost reduction, business improvement, uncertainty, business risks, and security concerns) rather than strategic objectives (Lacity et al., 2010). At least 20 theoretical perspectives have been applied (Lacity et al., 2010). Over the years, the vast diversity of theoretical angles and contradictory findings have contributed to finer nuances in our understanding of ISO (Liang, Wang, Xue, & Cui, 2016). Conscious of these issues, researchers have been contributing to academia by reviewing ISO literature from time to time (Dibbern et al. (2004), Lacity et al. (2009), Lacity et al. (2010), Schneider and Sunyaev (2014), and Liang et al. (2016)). Today, new forms of ISO decisions (i.e. re-outsourcing and new sourcing decision models, such as SaaS) have gained increasing interest (Liang et al., 2016).

SaaS has introduced a multi-tenant architecture in the software markets that enables suppliers to perform an economy of scale on their software products and users to access several software products via internet (Lee et al., 2013). In the same architectural form as ISO (Benlian & Hess, 2011; Heart, 2010), it plays an increasingly important role in the software markets (Cho & Chan, 2013). SaaS has captured enthusiasm of researchers and business managers, and is considered a promising information technology (IT) solution (Chou & Chiang, 2013). Saas and ISO share many benefits and disadvantages. Improved agility of the firm's business and lower up-front investment are some of the most highlighted benefits (Choudhary, 2007). High level of dependency to the supplier and the externalization of critical data are notable disadvantages (Benlian & Hess, 2011).

SaaS is increasingly drawing the attention of researchers, and it is foreseeable that more scholarship will emerge in the future. Recent studies have investigated different perspectives on the topic: some approach SaaS from the benefits and risks involved (Benlian & Hess, 2011), others from the environmental pressures perspective (Kung, Cegielski, & Kung, 2015), and some take a more holistic angle that gathers technological, organizational, and environmental factors (Martins et al., 2016; Yang et al., 2015). It is not surprising that most of these theoretical perspectives applied to SaaS have already been applied to ISO. SaaS is recognized as a special form of on-demand outsourcing, and research reported in earlier ISO studies serves as a useful foundation for designing studies on SaaS (Benlian & Hess, 2011).

The purpose of this review is to provide a discourse on SaaS scholarship in order to assist further research on the topic. In doing so, we conducted an in-depth literature review, and used earlier ISO literature to pave the way for the discussion.

The rest of the paper is structured as follows. First, the theoretical backgrounds of SaaS and ISO are presented. Then we present the research methodology and findings. Finally, we discuss the results and conclude.

2.2 BACKGROUND

In this section we give a brief introduction of ISO and SaaS concepts. ISO has been defined in a variety of ways by several authors (Dibbern, Goles & Hirschheim, 2004). Generally, a consensus prevails that outsourcing involves choosing a third party or an outside supplier to perform a task, function, or process, in order to achieve business-level benefits (Sanders, Locke, Moore, & Autry, 2007). Zhu et al. (2001) define ISO as the transfer of responsibility of a business activity or process to another entity. In the context of information systems, it represents a substantial contribution from an external vendor of physical and/or human resources in the constitution of the information technology (IT) infrastructure or its specific components (Loh & Venkatraman, 1992a). Extensive and continuing investments by firms of all sizes in ISO suggest that it is broadly viewed as a value-adding strategy (Gwebu, Wang, & Wang, 2010).

SaaS provides software access in a multi-tenant architecture, allowing users to access several software products on demand (Benlian & Hess, 2011). It emerged as an improved form of the application service provider (ASP) model (Kim et al., 2012; Xin & Levina, 2008),

and was the response of the software market to the limitations of the single-tenant ASP architecture. SaaS applications are generally characterized as being easy to access and use, being feature rich, and having good consumer adaptation (Zorrilla & García-Saiz, 2013). Compared to on-premise installation software (OPIS), SaaS has lower implementation costs, higher rate of improvement in software quality, and faster delivery of new features (Choudhary, 2007; Gonzálvez-Gallego, Molina-Castillo, Soto-Acosta, Varajao, & Trigo, 2015). 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).

SaaS is grounded in cloud computing, bundling software delivery with cloud service (Fan, Kumar, & Whinston, 2009; Park & Ryoo, 2013), and transforming IT resources into a ubiquitous service (Susarla, Barua, & Whinston, 2010). Other popular cloud computing services include Infrastructure as a Service (IaaS) and Platform as a Service (PaaS). Unlike SaaS, which relates to software, IaaS refers to the delivery of the infrastructure as service, and PaaS to the virtualization of platforms (Misra & Mondal, 2011). In the published literature, we find many studies addressing the global concept of cloud computing without a proper distinction between the sourcing models. Schneider (2014) advocates that a high degree of technical complexity and limited availability of human assets (knowledge required) may affect SaaS more than IaaS or PaaS. Also, internal IT capabilities are required when adopting IaaS and PaaS, and their absence inhibits their adoption. However, in the case of SaaS internal IT capabilities are more likely to be a driver of adoption (Schneider & Sunyaev, 2014). Thus, reasons for SaaS decision may differ from the rest of the sourcing models that are based on cloud computing. In this review, we focus only on studies that address SaaS.

2.3 RESEARCH METHODOLOGY

Following Webster and Watson's (2002) guidelines, we examined the most important literature in Information Systems (IS) covering research on ISO and SaaS. This research considered articles published only in top IS journals (e.g. Decision Support Systems, Journal of Strategic Information Systems, Journal of Management Information Systems, Information & Management, Computers in Human Behavior). Given that SaaS is a relatively new concept, we also included top IS level conferences such as ICIS and ECIS. We performed an

elaborated search on scholarly databases including EBSCOHost's Academic Search Complete and Business Source Complete, all databases within Proquest (e.g., ABI/INFORM Complete and the Applied Social Sciences Index and Abstracts), and Google Scholar.

We conducted the search through titles and abstracts using the following keywords: ISO literature review, SaaS decision, Software as a service, outsourcing. The selection targeted papers that reviewed ISO literature and investigated the SaaS adoption decision specifically.

2.4 FROM ISO TO SAAS

ISO establishes democratic fairness of IT capabilities, enabling business transformation and firms' competitiveness (Loh & Venkatraman, 1992b), but it represents large and difficult-to-reverse investments that have various inherent risks and associated costs (Watjatrakul, 2005). Researchers have investigated ISO and published a large amount of findings.

Dibbern et al. (2004) were the first authors to review the literature covering the first decade of ISO. Their research suggests a change of focus from cost reduction to a more strategic concern at firm level. Their study revealed not only the growing complexity of ISO practice, but also the interests among researchers to apply multiple theoretical perspectives to examine a multifaceted topic (Dibbern et al., 2004). Gonzalez et al. (2006) found that after year 2000, empirical investigation on ISO has increased. Their study found that most of the papers on ISO addressed reasons and risks, and from 2001 to 2005 the focus shifted to new sourcing innovations. Also, they found that the use of transaction economic theories and studies on the clients'/providers' relationships emerged in that period. Lacity et al. (2009) suggest an increasing focus on other types of sourcing models, such as business process outsourcing (BPO), and application service provision (ASP). They found that cost reduction was the main factor studied, followed by the focus on core capabilities, access to expertise, improved business/process performance, and technical reasons (Lacity et al., 2009). Lacity et al. (2010) pointed out the absence of environmental variables on the study of ISO. Also, they suggested mimetic influences as a significant factor for ISO adoption decision. Schneider and Sunyaev (2014) found that some factors are transferable from ISO to cloud computing. They also found a consistently positive influence of top management support and institutional pressures on ISO. Liang et al. (2016) suggested that novel types of sourcing seem to have resurrected the decision literature on ISO. Table 2.1 provides a summary of the literature on ISO.

Table 2.1 - Literature reviews on ISO

Reference	Scope	Data	Method	Findings
Dibbern et al. (2004)	ISO papers concerning why and what to outsource, which decision and how to implement, and the outcomes between 1992 and 2000.	84 studies	Structured the main explanatory factors and theoretical relationships in five main sourcing issues (why to outsource, what to outsource, which decision process to take, how to implement the sourcing decision, and what is the outcome of the sourcing decision).	From its beginnings ISO evolved as a cost-reduction tool. Similarly, the research focus has expanded from whether or not to outsource to the wider decision domains.
Gonzalez et al. (2006)	ISO papers from 1988 to 2005. They categorized the literature by the client/provider, and economic theoretical perspective.	131 studies	Divided the period under study into three blocks for the analysis of the evolution topics of interest in research.	Found a shift on the research focus, from reasons for ISO (as the topic most frequently discussed) to relationships between clients and providers, and the use of transaction economic theories. Also found an increase in the number of papers on other new sourcing technologies, such as offshore and global outsourcing.
Lacity et al. (2009)	ISO papers since 1990 to 2008 concerning adoption and risks.	191 studies	Coded 174 variables to report their findings in six different areas.	ISO determinants and success are the research areas most often studied. Cost reduction was the main factor studied. Following ISO strategy (i.e. the strategy behind the decision and effects of ISO decision), and mitigation of ISO risks. Other related research focused on offshore outsourcing, BPO, and the rise, decline, and resurrection of ASP.
Lacity et al. (2010)	ISO papers from 1992 to 2010 concerning adoption and outcomes.	164 studies	Coded 36 dependent variables, 138 independent variables, and 741 relationships between independent and dependent variables.	Found that mimetic influences, cost reduction, focus on core capabilities, access to expertise, business improvements, and technical reasons are the most significant factors studied for ISO adoption. Transaction cost (i.e. the effort, time, and costs incurred in searching, and negotiating a service contract with a supplier) and fear of losing control are the main inhibitors.
Schneider and Sunyaev (2014)	ISO and CC papers published before April 2014 concerning the determinant factors for its decision.	88 studies	Systematic coding of the determinant factors that influence sourcing decisions	Institutional influences and top management support have a consistent positive influence on ISO decision. Research indicated that there are some findings transferable from ISO to the CC context and others that are not.
Liang et al. (2016)	ISO papers from 1992 to 2013 concerning multiple themes (e.g. decisions, risks, BPO, ASP, offshoring, etc)	798 studies	Bibliometric analysis method to visualize the citation network path.	Research on ISO decisions has matured after 20 years of evolution. Novel sourcing varieties seem to have resurrected this path of analysis.

We acknowledge the detail and recentness of the literature review on ISO. Given that all researchers mentioned have reviewed ISO adoption in detail, we will not replicate their work. Instead, we will use their findings to create a discussion on SaaS.

In SaaS, we found few studies that have discussed SaaS adoption, even though the literature review identified many studies that addressed the current state and development trends of cloud services (Wu, 2011b). 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 the firm's IT plays an important role in 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 behavior (TBP), their study suggested that social determinants are the main influencers of 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`s theory with 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 decision making trial and evaluation laboratory (DEMATEL) approach, Wu (2011b) explored the perceived risks and benefits of adopting SaaS. This 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 sought to improve knowledge from a multi-angular point a view, but the data collected were 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.

Martins et al. (2016) proposed a conceptual model for assessing the determinants of SaaS diffusion process (i.e. intention, adoption, and routinization). Their study addresses the topic from a holistic perspective to evaluate the SaaS decision process and analyze the direct effects, as well as the total (direct and indirect) effects of the variables. Based on an empirical analysis of 265 firms, they demonstrated the usefulness of integrating technology-organization-environment (TOE) framework (Tornatzky & Fleischer, 1990), diffusion of innovations (DOI) theory (Rogers, 2010), and institutional (INT) theory (DiMaggio & Powell, 2000) to better understand the decision process of SaaS. Table 2.2 summarizes pertinent SaaS studies, including their focus, theories used, and conclusions.

Table 2.2 - Studies on SaaS decision

Reference	IT	Theory /framework	Drivers	Data	Findings
(Yang et al., 2015)	SaaS readiness (software as a service)	TOE framework	Technological: Relative advantage, simplicity, compatibility, experience ability. Organizational: IT infrastructure, top management support. Environment: Competitor pressure, partner pressure. Others: Attitude toward SaaS Intention to use SaaS	Data from 173 firms	Suggested that organizational users need to prepare from technological, organizational, and environmental aspects when facing SaaS adoption.
(Xin & Levina, 2008)	SaaS adoption	Production cost economics, Resource based view, Property rights theory, Institutional theory, IT governance theory.	Degree of desired software customization, demand uncertainty for client-specific functionality, demand uncertainty for service volume, client's cost capital, number of users, client's IT capability, institutional influences, enterprise IT architecture.	NA	Suggested that the maturity of the firm's IT plays an important role in SaaS adoption.
(Benlian et al., 2009)	SaaS adoption in different application types	Transaction cost theory, Resource-based view, Theory of planned behavior	TCT: Application specificity, application adoption uncertainty. RBV: Strategic value of application, application inimitability. TPB: attitude toward SaaS-adoption, subjective norm.	Survey of 374 IT executives, Germany	Suggest that social influence, attitude toward SaaS-adoption, adoption uncertainty, and strategic value to be the strongest and most consistent drivers across all application types. Firm size does not matter in SaaS-adoption, since large enterprises and small- and medium-sized companies had similar adoption rates.

(Kung et al., 2015)	SaaS adoption	Institutional theory, DOI theory	Coercive pressure, mimetic pressure, normative pressure, and perceived complexity	Survey of 289 retail firms	Suggested that INT constructs help to describe how environmental pressures affect intention to adopt SaaS.
(Lee et al., 2013)	SaaS adoption	PEST analysis	Customer factors, market factors, economic factors, supplier factors, political factors, social factors, technological factors.	Survey in 3 firms (24 responses)	Suggested customer and economic factors as most important for SaaS adoption. Supplier's attitude and the environment are inhibitors.
(Wu et al., 2011)	SaaS adoption	Perceived Risks and Perceived Benefits	Perceived Risks and Perceived Benefits factors	Case study	Suggested that strategic benefits outweigh the economic advantage in the SaaS adoption decision.
(Fan et al., 2009)	SaaS and traditional software	Game theory approach	Comparative statistics		SaaS providers have to incur significant operation cost. In the long run, service operation cost may significantly affect SaaS firm's ability to improve its software quality.
(Choudhary, 2007)	SaaS and perpetual licensing software	Two-period quality model	Price in period, software quality at different time periods, buyer type, ratio of second-generation vs. first-generation users, ratio of cost of quality for SaaS vs, perpetual licensing, benefit from basic features, component of utility function, social welfare under perpetual licensing and SaaS.	NA	Suggested that SaaS leads to greater investment in product development under most conditions, compared to perpetual licensing.
(Benlian & Hess, 2011)	SaaS adoption	Opportunity-risk framework	Salient risks beliefs: performance, economic, strategic, security, managerial risks. Salient opportunities beliefs: cost advantage, strategic flexibility, focus on core competencies, access to specialized resources, quality improvements.	Survey of 349 IT executives, Germany	Suggested security threats and cost advantages as the main factors to consider in SaaS adoption.
(Benlian, Koufaris, & Hess, 2011)	SaaS quality and usage continuance	IS SERVQUAL	Rapport, responsiveness, reliability, flexibility, features, security, SaaS quality, perceived usefulness, satisfaction, SaaS continuance intention.	Survey of 172 firms	Suggested that service quality has much more impact on satisfaction then on perceived usefulness.
(Martins et al., 2016)	SaaS diffusion	TOE framework, INT theory, and DOI theory	Normative pressures are drivers for the three stages of SaaS diffusion. The influence of technological, organizational, and environmental variables vary in each stage of the diffusion process.	Survey of 265 firms	Suggested that factors from the technological, organizational, and environmental contexts act distinctively between the different stages of SaaS diffusion (i.e. intention, adoption, and routinization).

(Heart, 2010)	SaaS adoption	Conceptual model based on transaction cost economics (TCE) and trust-related theories	Perceived risk of systems unavailability, perceived risk of data insecurity, perceived risk of SaaS, perceived reputation of SaaS vendor, perceived capabilities of the SaaS vendor, and perceived trust in the SaaS vendor	143 respondents, the majority (96%) from firms	Suggested that the reputation and trust in the vendor are essential for minimizing SaaS risks and for firms to adopt it.
(Janssen & Joha, 2011)	Saas adoption in the public sector	-	SaaS benefits and risks according to four categories classification: economic, technical, political, and strategic stream.	13 Interviewees	The main benefit is having cost advantage without the need to install, control, and maintain the software. The main disadvantage is related to privacy and exposing or losing critical data.
(Winkler & Brown, 2013)	Decision rights between SaaS and on-premise software	Agency theory, TCE, and knowledge-based view.	IT governance, origin of initiative, specificity, scope of use, IT knowledge in business units, business knowledge in IT unit	Survey of 207 firms	Suggested that business competencies in IT units are even more important for IT units that seek to have decision rights for SaaS applications.
(Wu, 2011a)	SaaS adoption	Technology Acceptance Model (TAM)	Marketing efforts, social influence, perceived benefits, attitude toward technology innovations, security and trust, perceived usefulness, perceived ease of use, behavioral intention	Survey 120 members of the Taiwan Style Competence Study Group	Suggested perceived usefulness and perceived ease of use as two key determinants of behavioral intention to use SaaS.
(Wu, 2011b)	SaaS adoption	TAM, and Rough Set Theory (RST)	Social influence, perceived benefits, attitude toward technology innovations, security and trust, perceived usefulness, perceived ease of use, behavioral intention	Survey 246 firms	Suggested that providers must respond to users' concerns regarding cost-effectiveness, compatibility, security, and backups. Also, the users should examine their capabilities and strategies in terms of SaaS adoption.

Table 2.3 synthesizes the theories applied to the study of SaaS. It can be seen that transaction cost economics, institutional theory, technology-organization-environment framework, resource based view, diffusion of innovation theory, perceived benefits and risks, and technology acceptance model were applied in more than one study.

2.5 DISCUSSION

In this study we conducted a literature review on ISO and SaaS. Based on earlier ISO literature, we provide an overview of the major streams of past ISO research. We then present a discussion of current research on SaaS.

Through our analysis it seems consensual that ISO decision research was one of the hottest topics of IS research in 1990s. Although this research path slowed around 2000, it has been

Table 2.3 - Theories applied in SaaS decision studies

Authors	Transaction cost economics	Institutional theory	TOE framework	Production cost economics	Resource base view	Property rights theory	IT governance theory	Theory of the planned behavior	DOI theory	Perceived risks and benefits	Game theory	Two period quality model	Trust related theories	Agency theory	Knowledge based view	Technology acceptance model	Rough set theory	PEST Analysis	IS SERVQUAL
Choudhary (2007)												x							
Xin and Levina (2008)				x	x	x	x												
Fan et al. (2009)											x								
Benlian et al. (2009)	x				x			x											
Heart (2010)	x												x						
Wu et al. (2011)										x									
Benlian and Hess (2011)										x									
Benlian et al. (2011)																			x
Wu (2011a)																x			
Wu (2011b)																x	x		
Janssen and Joha (2011)										x									
Lee et al. (2013)																		x	
Winkler and Brown (2013)	x													x	x				
Yang et al. (2015)			x																
Kung et al. (2015)		x							x										
Martins et al. (2016)		x	x						x										

revived since 2006 (Liang et al., 2016), as the progressive technological development allowed ISO to evolve. In order to follow its evolution, the research expanded and integrated other factors beyond economical cost reduction factors that may influence its adoption. Technical and organization factors began to be incorporated in the later studies of ISO adoption (Lacity et al., 2009). As an example, one of the first organizational factors studied was the firm size and the industry (Dibbern et al., 2004). At that time, these factors were found to be significant influencers in the ISO decision. Studies supported that smaller firms and manufacturing industries were more likely to adopt ISO (Sobol & Apte, 1995). Today, studies support the same likelihood for larger firms, as these firms recognize ISO's potential and benefit from an internal structure capable of dealing with whatever risks that might arise from ISO (Martins et al., 2015).

Another stream of analysis is the risks associated with ISO. Until 1995 risks were a topic that captured most of the interest among academic researchers (Benlian & Hess, 2011; Gonzalez et al., 2006). Security concerns and fear of losing control were the most commonly identified inhibitors of ISO adoption (Lacity et al., 2010). Economic risks were also the target of examination, as researchers started to be conscious of the possible "hidden costs" of ISO (Benlian & Hess, 2011). ISO risk analysis decreased until 2000, but after 2001 it re-emerged (Gonzalez et al., 2006). As researchers began to study certain types of ISO, such as offshoring or ASP, studies focused on risks emerged (Lacity et al., 2009). During the last 20 years several theories have been applied to the study of ISO in order to cover all the factors that persuade firms to consider ISO adoption. Despite the multiple theoretical perspectives applied in ISO studies, little research has been made to address the influence of environmental variables in ISO studies (Lacity et al., 2010).

SaaS literature has benefitted from ISO literature. Because researchers recognize it as a sourcing variety of ISO, they design their studies considering what was already accomplished with ISO. Thus, although researchers continue to consider economic factors in the study of SaaS, they are already expanding the research stream to incorporate risks and environmental factors.

The economic feature of SaaS was one of the first to come under study. Xin and Levina (2008) brought it to discussion using concepts based on production cost economics. They identified three sources of cost savings (i.e. economy of scale, a solution to deal with uncertainty, and financial costs of capital - a solution to economize on fixed capital cost by spreading the service cost over time). Although their analysis did not offer empirical evidence of these propositions, it has been cited in many studies, as it was one of the first that examined the topic. Another economic theory applied was the transaction cost economics (TCE) theory. Benlian et al. (2009) assessed the application specificity (i.e. certain applications involving specific processes and data may have a negative impact in SaaS adoption, due to its monitoring complexity), and adoption uncertainty (i.e. the difficulty to establish clear contracts when business and technology drive complexity, which could negatively affect SaaS adoption). Although they found uncertainty to be a factor that influences the adoption of several enterprise applications (e.g. Office suites, CRM, and ERP), in terms of application specificity there was no empirical evidence of its influence on the adoption process. Heart (2010) posited that several risks (e.g. security) and increased transaction costs, negatively influence the intention to adopt SaaS. Also, they posited that

reputation, perceived capability and trust in the vendor enhance the intention to adopt SaaS. They found perceived risks and trust to be drivers for SaaS intention. Winkler and Brown (2013) suggested that specificity and scope of use influence SaaS decision. Scope of use was significantly associated with application governance post-implementation.

In terms of perceived risks and benefits, economic affairs were also studied under this stream of analysis. Benlian and Hess (2011) studied SaaS as a benefit but also as a risk. They posited that SaaS can bring cost advantages due to the lower initial investment, but also can be an economic risk as firms may have additional costs in reaching the expected level of service. Wu (2011) also approached the economical perspective in their analysis of perceived benefits and risks effect on SaaS adoption. They suggested that economic benefits have less impact than strategic benefits. Janssen (2011) suggested that economic factors are both beneficial and disadvantageous for firms. They posited economy of scale and lower upfront investment as benefits, and long-term indirect costs and the dependency degree on the supplier as disadvantages. The studies also included other benefits and risks (e.g. strategic and technical) beyond economic factors.

Another aspect that is worth mentioning is the effort that researchers have made to increase the explanatory power of their conceptual models. Researchers have combined different theories in order to better understand SaaS adoption. For example, researchers have combined transaction cost theory with resource-based view and theory of planned behavior (Benlian et al., 2009), agency theory with transaction cost economics and knowledge-based view (Winkler & Brown, 2013), and technology-organization-environment framework with institutional theory and diffusion of innovations (Martins et al., 2016). Theories applied to SaaS decision range from the TCE, perceived benefits and risks, to a more holistic approach integrating not only the technical and organizational factors, but also the environmental aspects in their studies, such as in Kung (2015) and Martins (2016).

Research on SaaS has much to cover. There are many studies approaching cloud computing as a global concept, and very few focusing on SaaS. We foresee that SaaS related studies will increase as researchers tend to better comprehend its differences against other types of cloud sourcing. Similar to ISO research, which moved from its general global concept to certain types of ISO (e.g. offshoring), we predict that the research will increasingly focus more on SaaS.

2.6 CONCLUSIONS

This study examined earlier academic research on ISO and SaaS. We conducted a literature review to cover earlier research on the topic of adopting ISO and SaaS. The results provide guidance for future investigations on both topics. Our literature review enhances knowledge in adoption studies by consolidating the different theoretical perspectives applied in the field of ISO and SaaS.

Chapter 3 – Assessing organizational adoption of information systems outsourcing

3.1 INTRODUCTION

Information systems outsourcing (ISO) covers a large diversity of technological activities, that range from the business process outsourcing to technical capabilities (Mann, Kauffman, Han, & Nault, 2011). Business processes refer to human resource management, supply chain management, contract negotiation, transaction management, and other similar business functions (Lacity, Khan, & Willcocks, 2009). The technical capabilities refer to application development, methodology capability, and infrastructure. ISO enables firms to reduce expenditure, and supplement IT competence (Han, Lee, & Seo, 2008). Despite the overall reduction of IT investments in recent years, ISO still remains attractive to firms (Qu, Pinsoneault, & Oh, 2011) and continues to gain momentum (Dibbern & Heinzl, 2009). Thus, ISO decision is an important strategic directive to which firms give continuing consideration and investment (Goscinski & Brock, 2010).

The accelerated pace of innovation in the field of IT led to the rapid popularity of ISO at the turn of the 21st century (Gonzalez, Gasco, & Llopis, 2010). Reasons identified include rapid technological change, firms seeking more flexibility to focus on the core business, and the competition in the market place (Zhu et al., 2001). According to Dibbern et al. (2012), in the early 1990s ISO was considered a new phenomenon adopted by the developed countries, but today it is increasingly distributed across the globe (Dibbern et al., 2012). As technology innovations continue to evolve, this prompts the need for new ISO related structures (Blaskovich & Mintchik, 2011). Although prior research has contributed to understanding ISO, a research gap related to the contextual factors that influence its adoption still remains (Dibbern et al., 2012). In addition, the joint effect of multiple contexts in understanding ISO diffusion has remained unaddressed.

This study aims to fill this research gap by applying the technology-organization-environment (TOE) framework (Tornatzky & Fleischer, 1990) to study the factors that influence ISO adoption. TOE framework is widely used for the study of IT adoptions at a firm level (Chong, Ooi, Lin, & Raman, 2009; Oliveira & Martins, 2011) and enables us to context the different factors that influence the adoption. From a technology perspective, the depth and range of IT

functions that can be outsourced offers agility and efficiency for businesses. From an organization perspective, the extensive and continuing investments in ISO by firms of all sizes suggest that ISO is broadly viewed as a value-adding strategy (Gwebu et al., 2010). ISO establishes the democratic fairness in IT capabilities, which enable business transformation and help firms become more competitive, efficient, and profitable (Loh & Venkatraman, 1992b). ISO also represents large and difficult-to-reverse investments with various inherent business risks and associated costs (Watjatrakul, 2005). It is more than just transaction-cost economics (TCE) (i.e. the cost incurred in making an economic exchange). From an environment perspective, supplier maturity and global scope of outsourcing participation are pivotal in leveling the organizational playing field (Choudhary, 2007). Thus, the continuing and rapid changes in the globalization of IT calls for specific technology, organization, and environment factors to be considered for a thorough understanding of ISO (Lacity et al., 2010). The recent economic downturn that led to a global recession also highlight the importance for a firm to leverage ISO for IS improvement and business impact (Lacity et al., 2009).

Published literature on ISO reveals that economic theories have been utilized in explaining outsourcing decisions (Dibbern et al., 2012), while an integrative analysis that combines the technology, organization, and environment contexts is still missing. The objective of this study is to provide a better understanding on the determinants of ISO diffusion, within the TOE contexts. In order to build a reliable instrument and effectively assess ISO adoption, the research focuses on the determinants of the firm's decision to adopt ISO. It does not address the likelihood of a firm's failed ISO initiative due to the lack of organizational preparation.

This study seeks to achieve three important contributions. First, we apply a holistic model to identify the factors that contribute to a firm's adoption of ISO. Second, replication of results help to reconcile prior findings (McDaniel, Rothstein, & Whetzel, 2006). Third, for outcomes that are inconsistent, such as the role of complexity, technology readiness, and regulatory environment, this study confirms general conclusions regarding their impact on the diffusion of ISO.

The paper is organized as follows. In the next section, we provide a background on ISO and review the literature on the TOE framework. Section 3 presents the research model along with hypotheses. In section 4, we describe the research methodology. Section 5 presents the

data analysis and results. Section 6 presents the discussion of results. The paper concludes by summarizing the implications for practitioners and researchers in Section 7 and Section 8.

3.2 BACKGROUND

3.2.1 Information systems outsourcing (ISO)

ISO has been defined in many ways by several authors (Dibbern et al., 2004). Generally, a consensus prevails that outsourcing involves choosing a third party or an outside supplier to perform a task, function, or process, in order to achieve business-level benefits (Sanders et al., 2007). Zhu et al. (2001) defines it as the transfer of responsibility of a business activity or process to another entity. In the context of information systems, ISO represents a significant contribution from an external vendor of physical and/or human resources in the constitution of the information technology (IT) infrastructure or its specific components (Loh & Venkatraman, 1992a).

The scholarship on ISO has matched its popularity. IS research on ISO focuses mainly on sourcing models such as application service provision (ASP), business process outsourcing (BPO), cloud computing, infrastructure outsourcing, and software development outsourcing. Kern et al. (2002) define ASP as the contracting of supplier provisioned resources delivered over the internet, and includes business functions such as customer relationship management (CRM), enterprise resource planning (ERP), and all types of e-commerce and e-business. BPO is when the supplier manages the execution of a client's business process in functional areas such as human resource management, finance, and accounting (Lacity, Feeny, & Willcocks, 2003). Cloud computing infrastructure is the more recent paradigm that enables on-demand access to shared pool of configurable computing resources (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013). Infrastructure outsourcing offers the functional basis for the support of business needs by providing necessary IT services (Nyrhinen & Dahlberg, 2007). The software development outsourcing refers to the external software development projects contracted to an outside firm (Gefen, Wyss, & Lichtenstein, 2008).

In a comprehensive evaluation of ISO, Lacity et al. (2010) identified multiple factors that motivate firms to outsource. They include cost reduction (Barthélemy & Geyer, 2005), access to expertise (Clark, Zmud, & McCray, 1995; Lacity, Hirschheim, & Willcocks, 1994), focus on core capabilities (Lacity et al., 1994; Linder, 2004), head count reduction (De Loof, 1995),

flexibility enablement (Slaughter & Ang, 1996), change catalyst (Linder, 2004), and political reasons (Hall & Liedtka, 2005; Lacity et al., 1994). Overall, service receivers realize value added benefit from outsourcing (Grover, Cheon, & Teng, 1996), and continue to adopt ISO as a strategic directive (Quinn, 2000).

3.2.2 Technology-organization-environment (TOE) framework

The TOE framework (Tornatzky & Fleischer, 1990) integrates the different factors that influence the adoption of innovation. It considers three contexts (i.e. technological, organizational, and environmental) of an organization in the adoption decision. The technology context refers to the internal and external technologies relevant to the firm, which includes current technology practices and the internal technology capabilities of the company (Starbuck, 1976), as well as the relevant technologies that are externally available (Hage, 1980). The organization context refers to the descriptive measures of the organization, such as its scope and size (Oliveira & Martins, 2011; Tornatzky & Fleischer, 1990). Finally, the environment context corresponds to the constraints and opportunities for the adoption of technological innovation, which includes the various actors that impact the decision process, such as market elements, competitors, and regulators (Tornatzky & Fleischer, 1990).

TOE framework has been applied in several research fields, such as mobile supply chain (Chan & Chong, 2013), radio frequency identification (Chong & Chan, 2012; Kim & Garrison, 2010; Wang et al., 2010), green IT (Bose & Luo, 2011), inter-organizational business process standards (Venkatesh et al., 2012a), e-business (Oliveira & Martins, 2010a; Zhu et al., 2003; Zhu, Kraemer, et al., 2006), and cloud computing (Abdollahzadehgan et al., 2013; Low et al., 2011). It has gathered strong empirical support, and it is useful for understanding the diffusion process of innovations (Zhu, Dong, et al., 2006).

ISO engages all three contexts and operates outside conventional organization structures (Agerfalk & Fitzgerald, 2008). The TOE framework thus serves as a suitable model to understand the determinants that influence its adoption, and we use it as the basis to develop the research model. Based on published literature, and consistent with Oliveira et al. (2014), we gather the most representative factors from the TOE framework, and examine them taking into consideration their appropriateness for the ISO study.

3.3 RESEARCH MODEL AND HYPOTHESES

We propose a research model (Figure 3.1) based on the TOE framework to determine the drivers for ISO adoption. The constructs are identified from the IS literature. We selected the most representative factors from well cited literature on adoption research, and analysed each factor to establish its appropriateness to the ISO field. In the technological context, complexity (Abdollahzadehgan et al., 2013; Chan & Chong, 2013; Chang, Hwang, Hung, Lin, & Yen, 2007; Chau & Tam, 1997; Wang et al., 2010), relative advantage (Abdollahzadehgan et al., 2013; Ghobakhloo, Arias-Aranda, & Benitez-Amado, 2011; Princely Ifinedo, 2011; Ramdani, Kawalek, & Lorenzo, 2009; Wang et al., 2010), and technology readiness (Kuan & Chau, 2001; Low et al., 2011; Oliveira et al., 2014; Venkatesh & Bala, 2012; Zhu & Kraemer, 2005) are relevant for ISO adoption study. Firm size (Chong & Chan, 2012; Ghobakhloo et al., 2011; Oliveira et al., 2014; Ramdani et al., 2009; Wang et al., 2010) and top management support (Bose & Luo, 2011; Chan & Chong, 2013; Chong & Chan, 2012; Ghobakhloo et al., 2011; Oliveira et al., 2014) are factors that influence the organizational context. Competitive pressure (Bose & Luo, 2011; Chong & Chan, 2012; Ghobakhloo et al., 2011; Oliveira et al., 2014; Zhu & Kraemer, 2005) and regulatory environment (Bose & Luo, 2011; Princely Ifinedo, 2011; Kuan & Chau, 2001; Oliveira et al., 2014; Zhu & Kraemer, 2005) are factors in the environmental context.

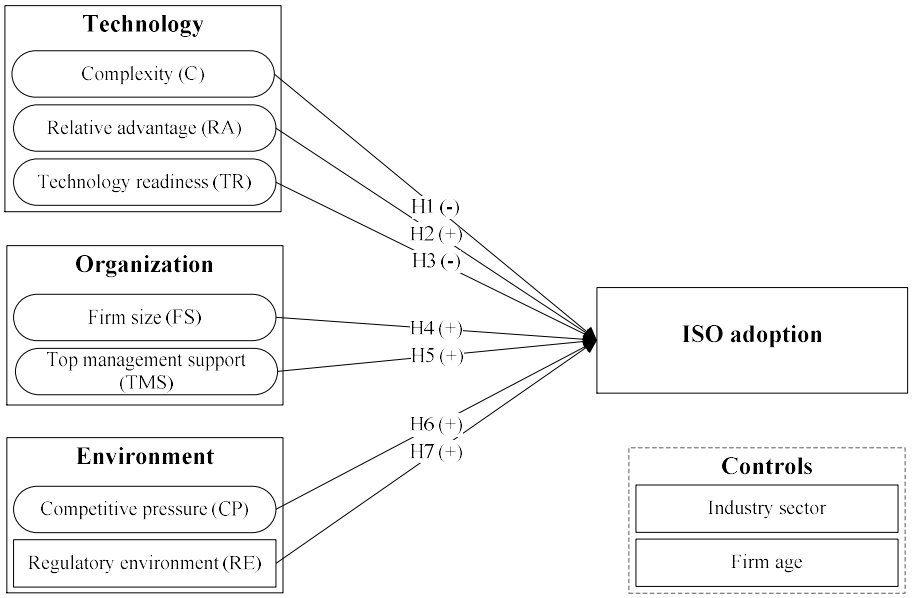


Figure 3.1 - The research model for the ISO adoption study

3.3.1 Technology context

Complexity is the degree to which an innovation is perceived as being difficult to understand or use (Beatty, Shim, & Jones, 2001; E. Rogers, 2003). If the company perceives ISO integration to be simple, its likelihood of adoption increases (Oliveira et al., 2014). ISO can change the way processes are managed in a firm. With the entry of a third party, the role of the different stakeholders within the company may change and are often complex enough to challenge understanding. If ISO adoption requires changes in the role of employees, and new levels of skills, the firm might choose not to adopt (Beatty et al., 2001). Also, depending on the functional area of the business that is outsourced, the challenge may be greater for firms if the requisite technical expertise is not internally available. Finally, if data privacy procedures in the ISO environment are complex, they might be perceived as additional challenges for the firm (Oliveira et al., 2014). Literature reports complexity as an inhibitor for the implementation of new technologies, and that it is negatively related to the adoption process (Wang et al., 2010). Thus,

H1. Complexity has a negative effect on the adoption of ISO.

Relative advantage refers to the degree to which a task, function, or process is perceived as being able to provide greater organizational benefit (Rogers 2003). If the new technology brings a clear advantage for the firm, there is a greater chance of adoption (Oliveira et al., 2014; Wang et al., 2010). With ISO adoption, maintenance costs and installation expenses are diminished when compared to the on-premise management of IT resources (Choudhary, 2007). It shifts the investment costs to the supplier, thereby reducing the firm's capital expenditures. Beyond this cost advantage, ISO also enables firms to become more competitive (Benlian & Hess, 2011). Relative advantage is thus a positive driver for ISO adoption. Therefore, we propose,

H2. Relative advantage has a positive effect on the adoption of ISO.

Technology readiness is recognized as an important driver for adoption (Venkatesh & Bala, 2012). It refers to the technological characteristics available in the organization such as the IT infrastructure, and the IT professionals (Zhu & Kraemer, 2005). The IT infrastructures are the installed technologies, systems, and applications (Ngai, Cheng, Au, & Lai, 2007). IT professionals are people within the organization, and experts who are skilled in implementing the innovation. ISO is the contracting of the technological and professional assets (Loh & Venkatraman, 1992a). With ISO, the suppliers grant human resources and expertise that

enable organizations to achieve agility and efficiency. When firms have technological and professional assets in-house, the need for ISO adoption is reduced. Thus, a high level of technology readiness of an organization negatively influences the adoption of ISO. Hence,

H3. Technology readiness has a negative effect on the adoption of ISO.

3.3.2 Organization context

Firm size is an important factor that influences adoption (Tornatzky & Fleischer, 1990). Earlier research refers to firm size as a resource indicator that enables firms to invest in capabilities leading to business growth and transformation (Bose & Luo, 2011). Zhu (2005) found a positive relationship between firm size and adoption, and state that larger companies are more capable to invest in the IT adoption (Zhu et al., 2003). Firm size is often treated as a proxy for financial resources. However, firm size is a broader indicator than financial resources, and expresses the firm's resource capability (e.g., slack resources, human expertise, number of employees) to face possible risks associated with technology investment strategies (Zhu, Kraemer, et al., 2006). Although ISO was initially designed for small firms to fill the IT competence gap, possible risks of its implementation (e.g. data privacy) may inhibit its adoption by small firms, which tend to be risk averse. In comparison, larger firms are more prepared to face the risks and more prepared to absorb adverse effects. Firm size is therefore an important determinant for ISO adoption. Thus,

H4. Firm size has a positive effect on the adoption of ISO.

Top management support is the vision, support, and commitment provided to foster the desired environment for the adoption of innovation (Lee & Kim, 2007). The literature identifies top management support as a significant factor that positively influences adoption of ISO (Grover et al., 1996). This factor is well considered in earlier studies and identified as a key determinant for the success of ISO projects (Bose & Luo, 2011; Lacity et al., 2009). ISO adoption may entail profound changes in the firms' business processes and organizational functions. The perception of change can lead to uncertainty about the future role of some employees in the outsourcing environment and trigger a sense of disruption. The viability of engaging in ISO is dependent on the top management support. Top management can positively influence the adoption of ISO by creating an environment of greater convergence of ideas (McGowan & Madey, 1998). Thus,

H5. Top management support has a positive effect on the adoption of ISO.

3.3.3 Environment context

Competitive pressure refers to the pressure resulting from a threat of losing competitive advantage (Lin & Lin, 2008). It has long been recognized in the literature as an important driver for technology diffusion and adoption. The greater the competitive intensity, the greater the impetus to focus on the core business (Oliveira & Martins, 2010b). Firms may simply follow their competitors in response to pressure or adopt technology as a strategic necessity to gain advantage over their peers (Martín, López-Catalán, & Ramón-Jerónimo, 2012; Wang et al., 2010). IT literature suggests that outsourcing is the response to very competitive environments (Cordella & Willcocks, 2012). ISO can change competitiveness, and provide new ways to leverage the firm's activity in relation to other companies (Bose & Luo, 2011). It shifts select responsibilities to the supplier, allowing firms to focus on their core business. Additionally, ISO allows firms to reduce their costs related to investment in developing internal IT capabilities. Hence,

H6. Competitive pressure has a positive effect on the adoption of ISO.

Regulatory environment is recognized as a critical factor influencing adoption (Zhu & Kraemer, 2005). In terms of regulatory environment, government policies may encourage businesses to pursue ISO. When the regulatory environment requires organizations to comply with standards and legal directives, firms are more willing to outsource IT capabilities to an external entity. Whether it is the lack of technological capacity or because the firm may find it more profitable to outsource, ISO may be an attractive option for companies. The ongoing challenges of compliance can also have a positive effect on ISO adoption. Therefore,

H7. Regulatory environment has a positive effect on the adoption of ISO.

3.3.4 Control variables

It is common to use control variables in IS studies (Zhu, Dong, et al., 2006; Zhu et al., 2003) when the variation of data is not captured by the explanatory variables. We use industry sector and age of the firm as control variables (Venkatesh & Bala, 2012). The industry sector can influence the adoption of ISO, as some industries may be more willing to adopt ISO than others. The age of the firm can also influence ISO adoption. Well-established firms may have the resources needed to face potential risks of ISO.

3.4 RESEARCH METHODOLOGY

3.4.1 Construct measures

To test the research model a survey questionnaire was developed and reviewed for content validity by a group of ten researchers and academic experts, and two language experts (Venkatesh, Thong, & Xu, 2012b). A pilot study with a sample of 30 firms (that were not included in the main survey) was then conducted to assess the reliability and validity of the constructs. Minor revisions were made to the questionnaire based on the pilot study results. Table 3.1 summarizes the items measuring the respective independent variables. All items shown in Table 3.1 were measured using a five-point Likert scale ranging from "(1) strongly disagree" to "(5) strongly agree".

Table 3.1 - Measurement items on five-point Likert scale (ISO adoption)

Variables	Measurement items	Adapted source
Complexity	C1. Used complexity in integrating ISO. C2. Complexity in developing ISO. C3. Degree of complexity in terms of work practices in ISO.	Grover (1993) Bradford and Florin (2003)
Relative advantage	RA1. ISO adoption will lead to cost reduction. RA2. ISO adoption will lead to transaction acceleration. RA3. ISO adoption will provide timely information for decision making. RA4. ISO adoption will increase business opportunities. RA5. ISO adoption improves competitiveness.	Li (2008) To and Ngai (2006)
Top management support	TMS1. Top management supports ISO adoption. TMS2. Top management is aware of the benefits of ISO. TMS3. Top management considers ISO important for the organization. TMS4. Top management encourages employees to use ISO.	Li (2008) Beatty et al. (2001)
Competitive pressure	CP1. In our industry ISO adoption is useful to allow competition. CP2. The leading firms in our industry are committed to the adoption of ISO.	Chwelos et al. (2001) To and Ngai (2006)
Regulatory environment	RE. The adoption of ISO in my firm was promoted by measures taken by the government or other regulatory authorities.	Zhu et al. (2006)

The technology readiness and firm size items were not measured using the Likert scale. They were assessed using the number of employees and the total business volume as indicators. Table 3.2 presents the measurement items for these two variables.

Table 3.2 - Other measurement items (ISO adoption)

Variables	Measurement items	Adapted source
Technology readiness	TR1. Number of IT professionals in my firm. TR2. Technological capability of the company to adopt ISO.	Zhu et al. (2006) Li (2008)
Firm size	FS1. Number of employees. FS2. Annual business volume.	Cho (2006) Premkumar and Roberts (1999)

The dependent variable, ISO adoption, is dichotomous (0: non-adopter, 1: adopter). It was determined by asking the respondents if their firms had adopted ISO.

3.4.2 Data Collection

An online version of the survey was created and an invitation for participation was sent to managers of 600 firms. The firms were selected using a random draw from a source list provided by Dun & Bradstreet, one of the world's leading providers of commercial information and insight on businesses. The distribution included 20% large firms (>250 employees), 40% medium-sized firms (50-250 employees), and 40% small firms (<50 employees). A total of 261 usable responses were received, yielding a total response rate of 43.5%. Table 3.3 summarizes the survey response characteristics. About 80% of the responses were from business owners, managing directors, heads of IT departments, and other senior members of IT. This suggests a high quality of the data source.

Table 3.3 - Sample characteristics (*n=261)* (ISO adoption)

	Number	Percentage		Number	Percentage
Firm age:			**ISO adoption:**		
< 10 years	48	18.4%	Yes	117	44.8%
11 – 20 years	74	28.4%	No	144	55.2%
21 - 50 years	93	35.6%	**Industry sector:**		
> 51 years	46	17.6%	Manufacturing	73	28.0%
Respondent's position:			Commerce	35	13.4%
Owner/proprietor	6	2.3%	Services	121	46.4%
Managing director/board member	112	42.9%	Construction	20	7.7%
Owner/proprietor	6	2.3%	Health	12	4.5%
Head of IT	8	3.0%	**Employee number:**		
Other senior member of IT	7	2.7%			
Head of IT	8	3.0%	< 50	99	37.9%
Other senior member of IT	7	2.7%	50-250	108	41.4%
Strategy development	74	28.4%	250	54	20.7%
Other	54	20.7%			

3.4.3 Instrument validation

Factor analysis was applied to assess the construct validity of the measures. Based on factor analysis with varimax rotation (other rotations yielded similar results) six factors were obtained with eigenvalues greater than 1. The factors are relative advantage, top management support, complexity, technology readiness, firm size, and competitive pressure. They explain 84.6% of the total variance in the data. The Kaiser-Meyer-Olkin (KMO) test was used to measure the adequacy of the sample. It returned a value of 0.81, suggesting that the correlation matrix is adequate for factor analysis (Sharma, 1996). Table 3.4 shows the loadings above 0.5 for the measurement model. The items load higher than 0.50 on their associated factors, confirming the convergent validity of the factors (Chau & Tam, 1997).

Table 3.4 - Factor and validity analysis (ISO adoption)

Variable	RA	TMS	C	TR	FS	CP
RA1	0.789					
RA2	0.844					
RA3	0.843					
RA4	0.882					
RA5	0.859					
TMS1		0.864				
TMS2		0.910				
TMS3		0.899				
TMS4		0.857				
C1			0.920			
C2			0.925			
C3			0.919			
TR1				0.995		
TR2				0.996		
FS1					0.899	
FS2					0.906	
CP1						0.909
CP2						0.687
Eigenvalue	5.97	2.82	2.09	1.76	1.46	1.12
% of variance explained	33.2%	15.7%	11.6%	9.8%	8.1%	6.2%

Note: - Presented only loadings with absolute value greater than 0.5.
- Relative advantage (RA); top management support (TMS); complexity (C); technology readiness (TR); firm size (FS); competitive pressure (CP).

The factors were then evaluated for reliability as shown in Table 3.5. All coefficients have Cronbach's alpha greater than 0.7. This confirms that the measurement instrument is valid and reliable, and can be used to test the research model.

Table 3.5 - Reliability properties

Variable	Cronbach´s α
Complexity (C)	0.917
Relative advantage (RA)	0.929
Technology readiness (TR)	0.997
Firm size (FS)	0.784
Top management support (TMS)	0.943
Competitive pressure (CP)	0.704

3.5 DATA ANALYSIS AND RESULTS

The dichotomous characteristic of the dependent variable allows the use of logistic regression to test the research hypotheses. We begin our analysis by checking the multi-collinearity, for which we calculate the variance inflation factor (VIF) (Oliveira & Martins, 2010b). The VIF ranges from 1.05 (lowest) to 2.02 (highest). The values are below the threshold of 10, indicating the absence of multi-collinearity amongst the variables (Hair, Anderson, Tatham, & Black, 1998).

The goodness-of-fit of the regression is assessed in four ways. First, to analyse the joint statistical significance of the independent variables, we compute the likelihood ratio (LR) test, which is statistically significant (p-value<0.01). This implies a strong relationship between the dependent and independent variables. Second, we compute the two pseudo R^2 (Cox and Snell R^2 = 0.36, Nagelkerke R^2 = 0.48), which yield satisfactory results. Third, we use the Hosmer-Lemeshow test (Hosmer & Lemeshow, 1980; Lemeshow & Hosmer, 1982), which reveal no differences between fitted values of the model and the actual values (p-value is 0.37). Finally, the discrimination power of the model is evaluated in two ways. We use the area under the curve (AUC), which is equal to 85.9%, indicating an excellent discrimination (Hosmer & Lemeshow, 2000). Table 3.6 shows that the logistic regression model is 80.1% accurate in its prediction. The adoption by random choices (Oliveira & Martins, 2010b; Zhu et al., 2003) based on the equation,

$$\left(\left[\frac{\text{adopters}}{\text{adopters} + \text{non - adopters}}\right]^2 + \left[\frac{\text{non - adopters}}{\text{adopters} + \text{non - adopters}}\right]^2\right)$$

is 50.5% for the dependent variable (ISO adoption), which is less than the regression results. We therefore conclude that the logistic regression has much higher discriminating power than the random choice. The four statistical procedures suggest a close model fit, satisfactory discriminating power, and evidence to accept the overall significance of the model.

Table 3.6 - Classification table

	Total	Predicted Adopters	Predicted Non-adopters	Percent correct
Adopters	144	121	23	84.0%
Non-adopters	117	29	88	75.2%
Overall				80.1%

The logistic regression results are shown in Table 3.7. The Wald test is used to test the significance of regression coefficients of the independent variables. As shown in Table 3.7, relative advantage, firm size, top management support, and competitive pressure factors are significant at the 5% level, and the coefficients show that they are positively related to the dependent variable (ISO adoption). Thus, hypotheses H2, H4, H5, and H6 are supported. The remaining three factors, namely complexity, technological readiness, and regulatory environment are not statistically significantly. Thus, hypotheses H1, H3, and H7, are not supported.

Table 3.7 - Results of the logistic regression analysis

Variable	*B*	*Std. Error*	*Wald*	*Sig.*
Complexity (C)	-0.178	0.175	-1.01	0.310
Relative advantage (RA)	**0.649**	**0.186**	**3.48**	**0.000**
Technology readiness (TR)	-0.342	0.348	-0.98	0.326
Firm size (FS)	**1.242**	**0.581**	**2.14**	**0.033**
Top management support (TMS)	**0.801**	**0.181**	**4.42**	**0.000**
Competitive pressure (CP)	**1.238**	**0.195**	**6.33**	**0.000**
Regulatory environment (RE)	0.171	0.205	0.83	0.405

Figure 3.2 shows the effects of each statistically significant variable on ISO adoption. The scores for each variable are on the horizontal axis (the range varies between the minimum and maximum of the scores), and adoption of ISO is plotted on the vertical axis. The analysis of Figure 3.2 shows that for competitive pressure, the adoption of ISO varies from 0.09 to 0.98 (vertical axis), for the respective range of variable values between the minimum and maximum (horizontal axis). By comparison, the adoption of ISO varies from 0.15 to 0.92 for top management support, 0.20 to 0.87 for relative advantage, and 0.43 to 0.98 for firm size, in their respective variable ranges. The analysis indicates that competitive pressure is the most important determinant of ISO, followed by top management support, relative advantage, and firm size.

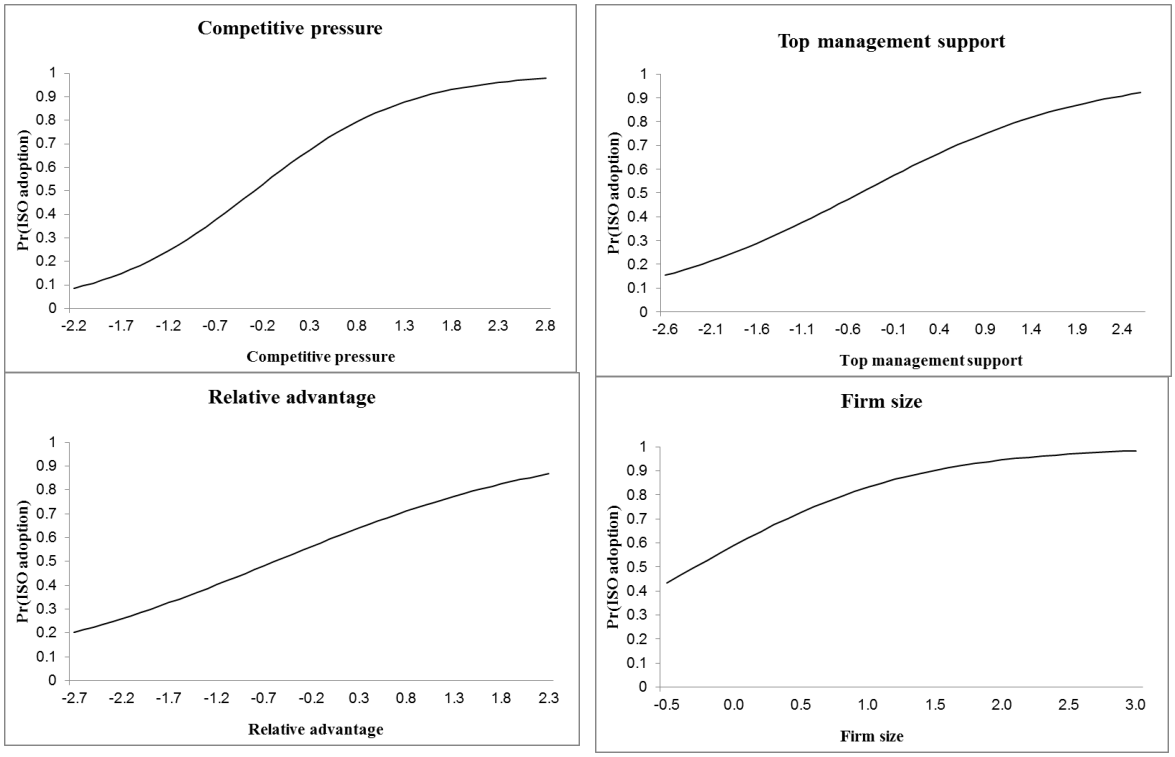


Figure 3.2 - Likelihood of ISO adoption

3.6 DISCUSSION

The goal of this study was to understand the contextual factors that contribute to the firm's adoption of ISO. Based on the TOE framework, a research model was developed that links ISO to the technology, organization, and environment context. In terms of the technology context, relative advantage is found to have a positive influence on ISO adoption. This finding is consistent with similar studies (Oliveira et al., 2014). Firms find ISO to be a strategic direction in which to seek relative advantage. The findings indicate that firms associate ISO adoption with benefits such as expenditure reduction and opportunities to become more competitive by allowing greater focus on the core business. The analysis of results did not confirm the significance of the remaining two variables of the technology context (complexity and technology readiness), which earlier IT literature has reported as being important. Earlier studies have been inconclusive about the effect of complexity on ISO (Chau & Tam, 1997; Low et al., 2011; Thong, 1999; Wang et al., 2010). A plausible explanation is that organizations no longer feel that complexity is a challenge for ISO

adoption. ISO suppliers have matured and reached a level at which they are able to provide reliable ISO solutions. This motivates firms to perceive that ISO is not complex to integrate within the firm's business functions. Second, technology readiness was not found to be statistically significant. In this study we hypothesized that greater technology readiness of an organization may have a negative influence on ISO adoption. Although technology readiness refers to the availability of IT infrastructure and IT professionals in the firm, our findings indicate that firms do not consider this factor to be relevant for ISO adoption. This finding is in accordance with Low (2011). A possible explanation is that organizations are more willing to accept the technology readiness of the service provider in the integration activities.

With regard to the organization context, the study results indicate that all factors are significant and positively related to the adoption of ISO (Table 3.7). This finding is consistent with earlier studies that suggest firm size and top management support as decisive to adopt ISO (Thong, 1999). Top management support can champion the firm's interest in ISO, and provide organizational resources and financial commitment for its adoption. Our study also confirms that larger firms with higher annual business volume are more willing to adopt ISO. The results of the survey suggest that larger firms have the resources (e.g., employees and investments in security measures) to weather potential risks from ISO adoption. Thus, we can conclude that organization context plays an important role in explaining ISO adoption.

In terms of environment context, the study finds competitive pressure to be significant for ISO adoption. It is also the most important independent variable (see Figure 3.2) that may influence the firm to consider ISO adoption. The results of the study suggest that competitive pressure motivates firms to adopt ISO as it frees them to focus on their core business. This finding is similar to those of earlier studies that have also found competitive pressure to be significant in technology adoption (Wang et al., 2010). Regulatory environment was not found to be significant and our results contradict earlier findings (Zhu, Kraemer, Xu, & Dedrick, 2004). It may be that government regulations and policies are not meaningful motivators for firms to pursue ISO.

3.7 IMPLICATIONS AND LIMITATIONS

IT managers are constantly challenged when introducing a new technology as a strategic driver for organizational performance. ISO has matured as an acceptable concept and a compelling strategic practice for organizations. This study highlights the importance of considering the technology, organization, and environment factors when aligning the change management process involving ISO. The study has significant implications for practitioners and researchers. First, the results provide empirical evidence that relative advantage, top management support, firm size, and competitive pressure influence the firm's decision toward ISO. This finding is consistent with Lee (2009), who suggests that adoption of new approaches requires strong top management support. The results also suggest that larger firms, which typically face more competitive pressure, recognize the benefits of ISO and are more willing to outsource the IT capabilities. This is consistent with findings from earlier studies on ISO (Cho, 2006; Zhu et al., 2003). As this is an area that continues to evolve at a multinational scale and will most likely remain significant in the near future, the replication of results is important, as it confirms the current scholarly opinion related to ISO studies. Second, the research model proposed in this study demonstrates the usefulness of the TOE framework to assess the factors influencing ISO. This confirms the appropriateness of TOE for developing research models for future studies in adoption of innovation and technology diffusion within organizations.

The study is not without limitations. First, the interpretation of the results is based on data from a single country – Portugal – and therefore the findings may not be sufficiently conclusive to be extended to business communities in other parts of the world. Future research may compare the results of our study to similar studies conducted in other countries. Second, other additional variables may be included in the research model, change management being one of them. We opted to include only factors that were relevant to the TOE context. Nevertheless, the model proposed in this research provides a sound basis for future studies that can be formulated to include additional variables. Third, this study does not differentiate industry sectors. Making such a distinction would be a useful and worthy pursuit. We therefore recommend undertaking additional studies of ISO in different business areas (e.g., finance or human resources), and different sectors (e.g., manufacturing and services). Expanding the scope of the study to include other countries and comparing those findings with those of the current study will enhance our understanding of the topic.

3.8 CONCLUSION

Despite considerable research in recent years, the field of ISO continues to attract inquiry. This study proposed a research model based on the TOE framework to assess the influence of the technology, organizational, and environmental context on ISO adoption. The model was tested using a sample of 261 firms, and results indicate that the organizational context is more meaningful in explaining ISO adoption than the technology and environmental contexts. The study identified firm size, top management support, relative advantage, and competitive pressure as the main drivers of ISO, thus reconciling findings from earlier studies, a need for which has been increasingly expressed in social science research.

Chapter 4 – Comparing Information Systems Outsourcing between Human Resource and Finance

4.1 INTRODUCTION

Information systems outsourcing (ISO) is considered a strategic initiative that enables firm innovativeness through the creation of value networks (Lacity et al., 2010; McFarlan & Nolan, 1995; Quinn & Hilmer, 1994). It is the renting supplier-owned resource delivered over the internet (Kern, Lacity, & Willcocks, 2002). According to IDC the value of ISO in Portugal is 0.66% of the GDP, and according to the same source this value is much lower compared to the European average (1.47%) (IDC, 2006). Therefore, it is imperative to understand the factors that can affect its adoption. This paper seeks to advance researchers' understanding of the determinants of ISO adoption in two different business areas of a firm namely, human resources, and finance. For this, we developed a conceptual model based on the technology-organization-environment (TOE) framework (Tornatzky & Fleischer, 1990) and the diffusion of innovation (DOI) theory (Rogers, 1995). We tested the developed model using survey data from 261 firms that operate in Portugal.

The paper is organized as follows: First, we present the theories and literature review. Secondly, we describe the research model and hypotheses. Thirdly, we discuss the results of the estimate and tests for the developed model. Finally, we present the main conclusions.

4.2 LITERATURE REVIEW

As the literature reports, creativity and innovation are stimulated by multidisciplinary teams operating outside conventional organization structures (Nonaka, 1991). Since ISO falls in a similar category, the TOE framework serves as a good model to understand the determinants that affect its adoption. The TOE framework has many gained consistent empirical support (Wang et al., 2010), and is widely regarded as useful in explaining the adoption of technological innovations (Oliveira & Martins, 2010b). The TOE framework comprises three distinct contexts: technological, organizational, and environmental. The technological context covers the internal and external technologies relevant to the firm. It includes current practices and the internal equipment of the company (Starbuck, 1976), as

well as the technologies that are available externally (Hage, 1980). The organizational context refers to the descriptive measures of the organization, such as its scope and size (Oliveira & Martins, 2011; Tornatzky & Fleischer, 1990). Finally, the environmental context corresponds to the constraints and opportunities for technological innovation, which include the various actors that may impact the decision process, such as regulators, customers, and suppliers (Tornatzky & Fleischer, 1990).

The process of innovation in an organization is quite complex. The number of individuals involved and their attitude to innovation could mean that not all opinions converge in the same direction during the decision process (Oliveira & Martins, 2011). The DOI theory, developed by Rogers (1995), is related to the organizational innovativeness, which is composed of the individual leaders' characteristics, the internal characteristics of the organizational structure, and the external characteristics of the organization. Individual (leader) characteristics describe the attitude toward change; internal organizational structure characteristics describe their degree of centralization, complexity, formalization, interconnectedness, organization slack, and size. There is a similarity between some of the factors that comprise the DOI theory (Rogers, 1995) and the TOE framework (Tornatzky & Fleischer, 1990), such as complexity and firm size, which are described further in this paper. Finally, external environment describes the external characteristics of the organization with regard to the system openness (Oliveira & Martins, 2011).

4.3 RESEARCH MODEL AND HYPOTHESIS

We considered four contexts based on both models presented above: technology, organization, and environment from the TOE framework (Tornatzky & Fleischer, 1990), and individual (leader) characteristics from the DOI theory (Rogers, 1995). The two models are considered to be consistent (Zhu, Dong, et al., 2006; Zhu, Kraemer, et al., 2006), and are the most widely used firm-level adoption models (Wang et al., 2010). The hypotheses are presented below.

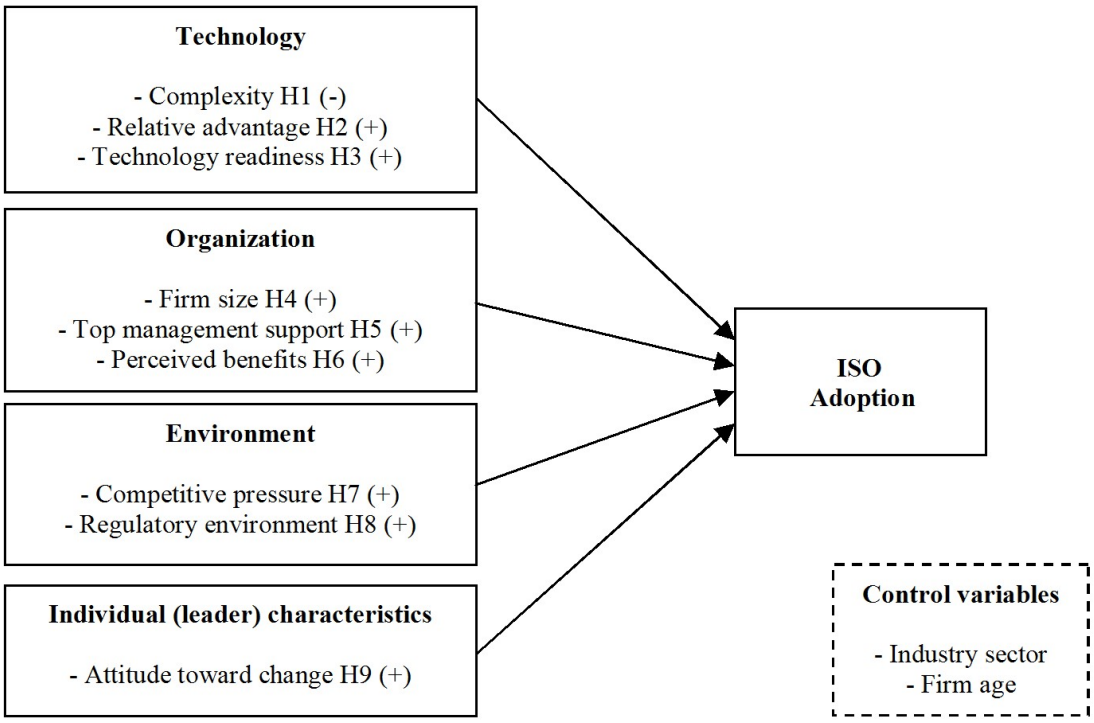


Figure 4.1 - The conceptual model for deciding on ISO adoption

The research literature indicates that firms may be less likely to adopt an innovation or technology if it requires a high level of new skills for their employees (Beatty et al., 2001). Since complexity leads to resistance resulting from the lack of skills and knowledge (Rogers, 1983), it could jeopardize the adoption of ISO. Thus, we propose the following hypothesis:
H1. Complexity will have a negative effect on the adoption of ISO.

Relative advantage refers to the degree to which a particular innovation is perceived as being able to provide greater organizational benefit (Rogers, 1983). Literature reports a positive relationship between relative advantage and technology adoption (Tornatzky & Klein, 1982). Thus, the following hypothesis is also proposed:
H2. Relative advantage will have a positive effect on the adoption of ISO.

Technology readiness reflects the physical assets, the human resources (Mata, Fuerst, & Barney, 1995), and the IT professionals within the organization who have expertise to implement the innovation (Ngai, Cheng, Au, & Lai, 2007). Since ISO is the externalization of

these assets (Loh & Venkatraman, 1992a), we will assume that the higher the level of technology readiness of an organization, the less likely it will be to adopt ISO. Thus, we propose the following hypothesis on technology readiness:

H3. Technology readiness will have a negative effect on the adoption of ISO.

Firm size is defined as an organizational attribute to the diffusion of innovation (Rogers, 1995), and is measured by the number of employees and the number of establishments (Cho, 2006). As larger firms are more likely to make this kind of investment (Majumdar, 1995; Quadros, Furtado, Bernardes, & Franco, 2001; Zhu et al., 2003), the following hypothesis is proposed:

H4. Firm size will have a positive effect on the adoption of ISO.

Top management support has been identified in the literature as a factor that positively affects the adoption of technological innovation (Grover et al., 1996), providing the vision, support, and commitment needed to foster the desired environment for the adoption of innovation (Lee & Kim, 2007). Since ISO is seen as a strategic decision (DiRomualdo & Gurbaxani, 1998), this factor can positively affect the adoption of innovation, creating an environment of greater convergence of ideas (McGowan & Madey, 1998). Therefore, we propose the following hypothesis:

H5. Top management support will have a positive effect on the adoption of ISO.

Perceived benefits refers to the degree to which new technologies provide more benefits than older ones (Lin & Lin, 2008). The firm must perceive that the adoption will either resolve existing problems or provide new business opportunities (Beatty et al., 2001), and capture the extent of agreement with claimed benefits relative to its local condition (Chau & Tam, 1997). Hence, the following hypothesis on perceived benefits is proposed:

H6. Perceived benefits will have a positive effect on the adoption of ISO.

Competitive pressure is defined in the literature as the pressure resulting from a threat of losing competitive advantage (Lin & Lin, 2008). The greater the competitive intensity, the greater is the propensity for technology adoption (Teo, Wei, & Benbasat, 2003). Thus, we propose the following hypothesis on competitive pressure:

H7. Competitive pressure will have a positive effect on the adoption of ISO.

The regulatory environment is recognized as a critical factor affecting innovation. The more restrictive the regulatory environment is, the more it is that firms will be willing to delegate management to an entity outside of their organization. The constant difficulty of adaptation for legal requirements can have a positive effect on ISO adoption, so we propose the following hypothesis:

H8. Regulatory environment will have a positive effect on the adoption of ISO.

Attitude toward change describes the attitude of the leader (Rogers, 1995). The role played by the leader determines the capacity for innovation (Cannon, 1985), and may substantially influence the perception of innovation (Wejnert, 2002). Thus, we propose the following and final hypothesis:

H9. Attitude toward change will have a positive effect on the adoption of ISO.

It is common to see the use of control variables in information systems studies (Zhu, Dong, et al., 2006; Zhu et al., 2003), since they are used to control the variation of data that were not captured by the explanatory variables. In this study, we control for industry sector and firm age.

4.4 RESEARCH METHODOLOGY

4.4.1 Construct Measures

Our construction of items of measurement for the study of ISO adoption takes into account the existing instruments. However, some of the items used were adapted to the context of ISO. Table 4.1 and 4.2 summarizes the items used to measure the respective independent variables. Most items were measured using a five-point Likert scale ranging from “(1) strongly disagree” to “(5) strongly agree”.

The technology readiness and firm size items were not measured by a Likert scale. Table 4.2 presents the items used to these two variables. The dependent variable, adoption, is dichotomous (0: non-adopter, 1: adopter). It was determined by asking respondents if their firms adopted ISO specifically for the following two business areas: human resources, and finance.

Table 4.1 - Measurement items on five-point Likert scale

Variable	Measurements items	Adapted from
Complexity	C1. Used complexity in integrating system. C2. Complexity in developing the system process. C3. Degree of complexity in terms of work practices in operating the system. C4. Our firm interaction with the system is clear and understandable.	Grover (1993); Chang et al. (2007); Premkumar and Roberts (1999); Bradford and Florin (2003)
Relative advantage	RA1. ISO adoption will lead to cost reduction. RA2. ISO adoption will lead to transaction acceleration. RA3. ISO adoption will provide timely information for decision making. RA4. ISO adoption will increase the business opportunities. RA5. ISO adoption improves competitiveness.	Li (2008); To and Ngai (2006)
Top management support	TMS1. Top management supports ISO adoption. TMS2. Top management support is aware of the benefits of ISO. TMS3. Top management considers ISO important for the organization. TMS4. Top management encourages employees to use ISO.	Li (2008); Beatty et al. (2001)
Perceived benefits	PB1. ISO may help improve the performance of my firm. PB2. ISO can save my firm time in managing their processes. PB3. ISO may offer a wider range of products to my firm. PB4. ISO may offer a greater number of services to my firm. PB5. ISO may offer good investment to my firm.	Yiu et al. (2007)
Competitive pressure	CP1. In our industry, ISO adoption is useful to allow competition. CP2. The leading firms in our industry are committed to the adoption of ISO. CP3. Percentage of firms in our industry using ISO. CP4. ISO is a strategic necessity to compete.	Chwelos et al. (2001); To and Ngai (2006); Li (2008)
Regulatory environment	RE1. There is adequate legal protection for ISO.	Zhu et al. (2006)
Attitude toward change	ATC1. For me, the adoption of ISO is desirable. ATC2. When I am confronted with information, both positive and negative, on a new technology, I favour the positive information. ATC3. Firms outside my industry are usually a better source of information about technologies than firms in my industry. ATC4. I think that using ISO is a good idea.	Lee (2009); Gatignon and Robertson (1989)

Table 4.2 – Other measurement items (HR vs Finance)

Variables	Measurements items	Adapted from
Technology readiness	TR1. Number of personal computers that are currently in use in my firm divided by the number of employees. TR2. Number of IT professionals located in my firm divided by the number of employees.	Zhu et al.(2006)
Firm size	FS1. Number of employees. FS2. Annual business volume. FS3. Number of factories.	Cho (2006); Gibbs and Kraemer (2004); Hsu et al. (2006); Premkumar and Roberts (1999)

4.4.2 Data Collection

The sample was a random selection of firms from Portugal. In order to meet minimum standards for strata size class of firm, strata were to include a 20% share of large firms (>250 employees), 40% of medium-sized firms (50-250), and 40% of smallest-sized firms (< 50 employees).
The survey was executed online, with an invitation for participation sent to several managers of the sample firms. A total of 261 usable responses were completed. About 80% of the data were collected from owners, managing directors, heads of IT, and other senior members of IT, which suggests the high quality of the data source.

4.4.3 Instrument Validation

A factor analysis was applied in order to assess the construct validation of the measures. Based on factor analysis with varimax rotation (with other rotations the results are similar), eight factors were obtained with eigenvalues greater than 1. These eight factors explain 83.6% of the total variance in the data. The Kaiser-Meyer-Olkin (KMO) test measures the adequacy of the sample. It returned a value of 0.87, revealing that the matrix of correlation is adequate for factor analysis (Sharma, 1996). Table 4.3 presents the loadings that are above 0.5, and corroborate the convergent validity of the associated factors (Chau & Tam, 1997). The eight factors found were easily interpreted, they are: perceived benefits (PB), relative advantage (RA), top management support (TMS), complexity (C), technology readiness (TR), firm size (FS), attitude toward change (ATC), and competitive pressure (CP). These results are in accordance with the literature review. In short, the measurement instrument is valid and reliable, and it can be used to test the proposed research model.

4.5 DATA ANALYSIS

Overall results point to practical ways to apply the model and make decisions based on specific business areas within an organization. After the measurement instrument was validated and the dichotomous characteristics of the dependent variables defined, a logistic regression was applied to test the research hypotheses in the two business areas, i.e., human resources, and finance. Specifically, we began analysis by checking the multicollinearity, for which we calculated the variance inflation factor (VIF). The VIF ranged

from a low of 1.05 to a high of 2.04. The values are below the threshold of 10, indicating that there is no problem of multi-collinearity amongst the variables (Hair et al., 1998).

The goodness-of-fit of the two regressions were assessed in three ways. Firstly, to analyse the joint statistical significance of the independent variables, we computed the likelihood ratio (LR) test, which is statistically significant (p-value<0.01) for two regressions.

Table 4.3 - Factor and validity analysis (HR vs Finance)

Variable	Perceived benefits	Relative advantage	Top management support	Complexity	Technology readiness	Firm size	Attitude toward change	Competitive pressure
	(PB)	(RA)	(TMS)	(C)	(TR)	(FS)	(ATC)	(CP)
PB1	0.755							
PB2	0.843							
PB3	0.848							
PB4	0.836							
PB5	0.836							
RA1		0.764						
RA2		0.776						
RA3		0.791						
RA4		0.859						
RA5		0.820						
TMS1			0.862					
TMS2			0.864					
TMS3			0.872					
TMS4			0.837					
C1				0.921				
C2				0.925				
C3				0.915				
TR1					0.994			
TR2					0.995			
FS1						0.896		
FS3						0.907		
ATC1							0.789	
ATC2							0.854	
CP1								0.909
CP2								0.687
% of variance explained	16.7%	16.0%	14.3%	10.5%	8.1%	6.6%	5.8%	5.7%
Cronbach´s α	0.947	0.929	0.943	0.917	0.997	0.784	0.628	0.704

Note: *C4, FS2, CP3, CP4, ATC3, and ATC4 question-items were excluded after factor analysis estimation due to low loadings (lower then 0.5). We presented only loadings with an absolute value greater than 0.5.

This implies a strong relationship between the dependent and independent variables for all regressions. Secondly, we used the Hosmer-Lemeshow test (Hosmer & Lemeshow, 1980; Lemeshow & Hosmer, 1982), which reveals that there are no differences between the fitted values of the model and the actual values for all regressions (p-value is 0.69, and 0.22,

respectively for human resources, and finance). Finally, the discrimination power of the model was evaluated in two ways. We used the area under the curve (AUC), which varied from 0.82-0.83 (see Table 4.4), revealing an excellent discrimination (Hosmer & Lemeshow, 2000). Also, the corrected classification of logistic regression varies from 75.7%-77.8% (Table 4.4). The adoption by random choices ([adopters/(adopters + non-adopters)]2 + [non-adopters/(adopters + non-adopters)]2) varies between 52.9%-68.1% for two ISO adoption scenarios, which is much less than in the case of our regressions. We, therefore, conclude that the two logistic regressions have much higher discriminating power than the random choice. The three statistical procedures reveal a substantial model fit and a satisfactory discriminating power, and there is evidence for accepting an overall significance of the two models.

The logistic regressions results are presented in Table 4.4. To test the significance of regression coefficients of the independent variables, the Wald test was used. As shown in Table 4.4, complexity was statistically significant for human resources ($p < 0.01$), and finance ($p < 0.10$), and by the coefficients we see that it is negatively related. Relative advantage is positively and statistically significant for finance ($p<0.01$) business area. Top management support, perceived benefits, and competitive pressure are positively related for both business areas ($p<0.01$). Attitude toward change is negatively and statistically significant for both business areas ($p<0.01$). Finally, technology readiness, firm size, and regulatory environment are not statistically significant for either business areas.

Table 4.4 - Logistic regression

Independent variables	**Human resources (β)**	**Finance (β)**
Complexity	- 0.489***	- 0.307*
Relative Advantage	0.042	0.476***
Technology readiness	- 0.580	1.243
Firm size	0.413	0.079
Top management support	0.591***	0.781***
Perceived benefits	0.841***	0.731***
Competitive pressure	0.770***	0.786***
Regulatory environment	0.339	- 0.151
Attitude toward change	- 0.318*	- 0.351**
Goodness of fit		
Random choice	55.8%	52.9%
Correctly classified	77.8%	75.7%
Area under curve	0.83	0.82

Note: β: standardized coefficients. * $p< 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table 4.5 summarizes the tested hypotheses. The hypotheses that are supported include: H1, H5, H6, and H7 for human resources, and finance; and, H2 for finance. On the other hand, four hypotheses (H3, H4, H8, and H9) are not supported for either of the two business areas.

Table 4.5 - Summary of confirmed hypotheses

Hypotheses	**Confirmed hypotheses**	
	Human resources	**Finance**
Complexity H1 (-)	Yes	Yes
Relative Advantage H2 (+)	No	Yes
Technology readiness H3 (+)	No	No
Firm size H4 (+)	No	No
Top management support H5 (+)	Yes	Yes
Perceived benefits H6 (+)	Yes	Yes
Competitive pressure H7 (+)	Yes	Yes
Regulatory environment H8 (+)	No	No
Attitude toward change H9 (+)	No	No

In the next section, discussion is based on the results of Table 4.5.

4.6 DISCUSSION

The study identified the determinants of ISO adoption in two different business areas, namely human resources, and finance. Based on the results of the study and the organizational context, we determine that top management support, competitive pressure, complexity, and emphasize perceived benefits (H5, H7, H1, and H6) are crucial to ISO. All four factors are statistically significant facilitators for ISO adoption in both business areas. In addition, these findings are supported in literature (Cho, 2006; Lee, 2009; Pan & Jang, 2008). Firms must perceive the clear and tangible benefits to adopt (Cho, 2006), as the adoption of new technologies requires top management support (Lee, 2009; Pan & Jang, 2008).

For the human resources business area, we find that top management support, perceived benefits, and competitive pressure are significant for ISO. Perceived benefits are positively related with innovation adoption (Beatty et al., 2001), as well as top management support (Lee & Kim, 2007) and competitive pressure (Wang et al., 2010). Complexity and attitude

toward change were found to be statistically significant inhibitors because they affect ISO adoption negatively. This is an area that is very sensitive to business, as it has direct implications on employees, where a simple mistake could destabilize the normal function of company activity. Hence, the management of all processes between the supplier and the firm must be clear and simple in order to mitigate the risk of error. The attitude toward change will have a negative impact on the human resources business area, contrary to what we had said initially. Also, firms see in the outsourcing of this business area a way to improve themselves, and focus on their core business. Complexity is negatively corroborated by earlier studies (Chau & Tam, 1997; Low et al., 2011), as well as an attitude toward change (Illegems, Verbeke, & S'Jegers, 2001).

In finance we find that complexity, relative advantage, top management support, perceived benefits, competitive pressure, and attitude toward change are relevant for ISO. Among them, complexity and attitude toward change are inhibitors where as top management support, perceived benefits, competitive pressure, and relative advantage are facilitators. The significance of relative advantage has been reported in earlier studies (Li, 2008), as well as the remaining factors, which were presented above.

4.7 THEORETICAL IMPLICATIONS

In other studies about the adoption of ISO, the comparisons between business areas are missing. This paper offers insight into ISO by comparing two distinct areas of business, i.e. human resources and finance. As the rates of ISO adoption were lower than expected in the past, it is very important to understand the factors that affect it. The study will be useful for business managers and decision makers to gain a balanced perception of ISO. Furthermore, by combining the TOE framework (Tornatzky & Fleischer, 1990), and the DOI theory (Rogers, 1995), we offer a newly developed model for research to study the determinants of ISO adoption. To the best of our knowledge, this study is one of the first to examine the adoption of ISO by comparing the different business areas. It is also the first of its kind to use the combination of the two popular models.

4.8 CONCLUSIONS

The rate of ISO in Portugal are still lower compared to the European average (IDC, 2006).,In order to understand ISO adoption, it is essential conduct an in depth analysis to determine if the drivers that impact ISO are different across different business areas such as human resources and finance.

In this paper, we propose a conceptual model with nine determinants for the adoption of ISO. We empirically tested our model in two business areas (human resources, and finance). In general, our hypotheses are confirmed. Thus, our research model seems appropriate. Through the comparison of two distinct business areas, the study spotlights the significant differences and similarities pertaining to ISO. Notably, top management support, competitive pressure, complexity, and perceived benefits are important factors in both business areas. Technology readiness and regulatory environment have no significance in ISO for either business areas. This means that it does not matter how well a firm is equipped with information systems infrastructure and individual experts when making a decision to adopt ISO. Also, the rules imposed by business regulators are not sufficiently compelling reasons for a company to negate the adoption of ISO in the areas of human resource and finance.

Chapter 5 – Information systems outsourcing, the umbrella term for e-business strategic management sourcing: service comparison

5.1 INTRODUCTION

Information systems outsourcing (ISO) is the umbrella term that includes a range of options that are external to the firm (Sanders et al., 2007), such as business process outsourcing (BPO) (Lacity et al., 2009); the application service provision (ASP), which is defined as the renting supplier-owned resource delivering the solution over the internet; enterprise resource planning (ERP); customer relationship management (CRM); and all types of e-commerce and e-business, amongst others (Kern, Willcocks, et al., 2002). Although in many articles it is common for e-business to be considered the same as e-commerce, the fact is that e-commerce is concerned only with the exchange of goods of financial value, while e-business denotes more general dealings or commercial activities, including operational activities and logistics (Jones, Wilikens, Morris, & Masera, 2000).

ISO is considered a strategic initiative that enables firm innovativeness through the creation of value networks (Lacity et al., 2010; McFarlan & Nolan, 1995; Quinn & Hilmer, 1994). Because the decision to outsource an e-business project has significant influence on a firm's ability to balance competing needs, to deploy its best talent, and to prevent leakage of knowledge embedded in assets (Agrawal, Kishore, & Rao, 2006), this chapter offers guidance on decision making and recommendations for outsourcing any information systems. Also because of rapid changes in technology and ISO activities, both practitioners and researchers must include ever more – and ever more specific – factors in order to understand ISO (Grover et al., 1996). Furthermore, according to IDC the value of ISO in Portugal is 0.66% of the GDP, and according to the same source this value is much lower compared to the European average (1.47%) (IDC, 2006).Therefore, it is imperative to understand the factors that can most affect its adoption.

This chapter seeks to advance researchers' understanding of the determinants of ISO adoption in the different firms' areas, such as human resources, finance, logistics, sales, and marketing. As a result, managers' and academics' future studies can focus on different features of the knowledge used to make ISO decisions.

We developed a conceptual model based on the technology-organization-environment (TOE) framework (Tornatzky & Fleischer, 1990) and the diffusion of innovation (DOI) theory (Rogers, 1995). And to the best of the authors' knowledge, this is one of the first studies to examine ISO adoption in the five business areas, using the conjunction of models proposed. We tested the developed model using survey data from 261 firms that operate in Portugal.

The chapter is organized as follows: First, we present the theories and literature review. Secondly, we describe the research model and hypotheses. Thirdly, we discuss the results of the estimate and tests for the developed model. Finally, we present the main conclusions, including practical limitations and specific suggestions for applications in business firms and future research studies.

5.2 LITERATURE REVIEW

As the literature reports, creativity and innovation are stimulated by multidisciplinary teams operating outside conventional organization structures (Agerfalk & Fitzgerald, 2008; Garvin, 1993; Goldman & Gabriel, 2005; Inkpen, 1996; Leonard-Barton, 1995; Nonaka, 1991). Since ISO falls into a similar category, we propose that the TOE framework provides a good model to understand the determinants that affect its adoption, because, beyond the features already mentioned, it has many consistent empirical supports (Wang et al., 2010), and is widely regarded as extremely useful in explaining the adoption of technological innovations (Chau & Tam, 1997; Gibbs & Kraemer, 2004; Oliveira & Martins, 2010b; Xu, Zhu, & Gibbs, 2004; Zhu, Dong, et al., 2006). The TOE framework comprises three distinct contexts: technological, organizational, and environmental. The technological context covers the internal and external technologies relevant to the firm, which include current practices and the internal equipment of the company (Starbuck, 1976), as well as the technologies that are available externally (Hage, 1980; Khandwalla, 1970). The organizational context refers to the descriptive measures of the organization, such as its scope and size (Oliveira & Martins, 2011; Tornatzky & Fleischer, 1990). Finally, the environmental context corresponds to the constraints and opportunities for technological innovation, which include the various actors that may impact the decision process, such as regulators, customers, and suppliers (Tornatzky & Fleischer, 1990).

The process of innovation in an organization is quite complex. The number of individuals involved and their attitude to innovation could mean that not all opinions converge in the same direction during the decision process(Oliveira & Martins, 2011). As the decision on innovation is seen as a mental process through which an individual first approaches the idea of innovation and then develops an attitude toward it, diffusion plays an important role since is a special type of communication, and the spread of new ideas essentially consists of the creation and sharing of information between participants in achieving a common understanding (Rogers, 1995).

The DOI theory, developed by Rogers (1995), is related to the organizational innovativeness, which is composed of the individual leaders' characteristics, the internal characteristics of the organizational structure, and the external characteristics of the organization. Individual (leader) characteristics describe the attitude toward change; internal organizational structure characteristics describe their degree of centralization, complexity, formalization, interconnectedness, organization slack, and size. There is a similarity between some of the factors that comprise the DOI theory (Rogers, 1995) and the TOE framework (Tornatzky & Fleischer, 1990), such as complexity and firm size, which are described further in this chapter. Finally, external environment describes the external characteristics of the organization with regard to the system openness (Oliveira & Martins, 2011).

5.3 RESEARCH MODEL AND HYPOTHESES

We considered four contexts based on both models presented above: technology, organization, and environment from the TOE framework (Tornatzky & Fleischer, 1990), and individual (leader) characteristics from the DOI theory (Rogers, 1995). The two models are considered to be consistent (Zhu, Dong, et al., 2006; Zhu, Kraemer, et al., 2006), and are the most widely used firm-level adoption models (Wang et al., 2010). All hypotheses are presented below.

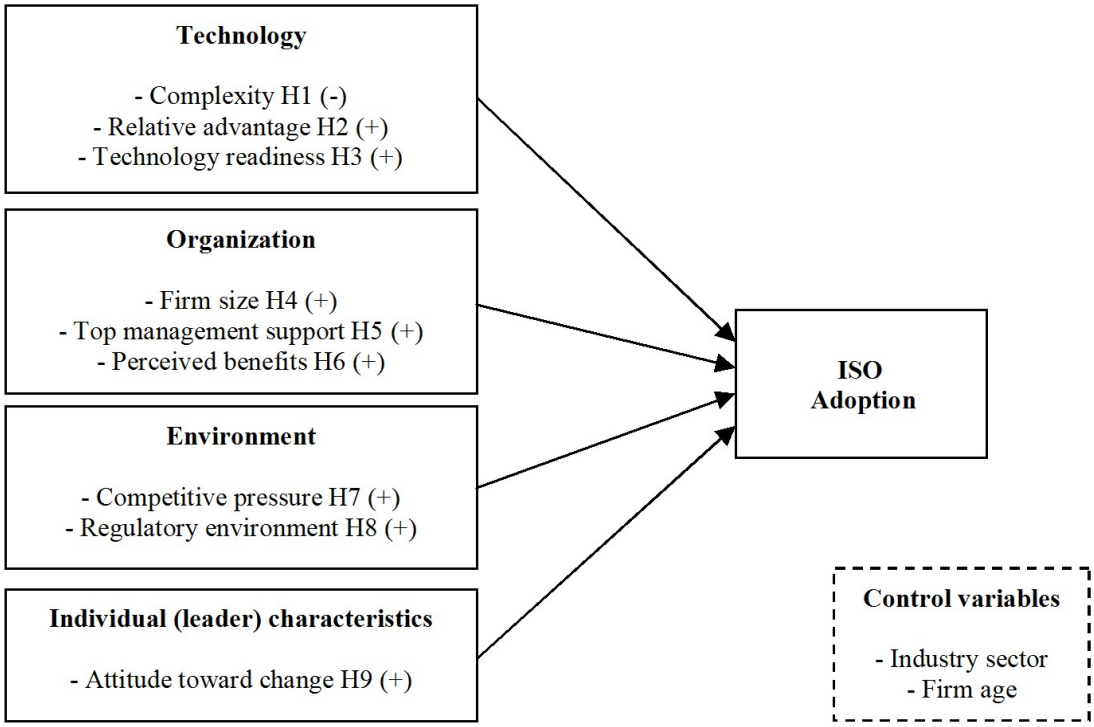


Figure 5.1 - The conceptual model for deciding on ISO adoption

5.3.1 Hypotheses

The research literature indicates that firms may be less likely to adopt an innovation or technology if it requires a high level of new skills for their employees (Beatty et al., 2001). Since complexity is the degree to which a given innovation is perceived as being difficult to understand or use (Beatty et al., 2001; Corrocher, 2003; Rogers, 1995), and leads to resistance resulting from the lack of skills and knowledge (Rogers, 1983), it could jeopardize the adoption of ISO. Thus, we propose the following hypothesis:

H1. Complexity will have a negative effect on the adoption of ISO.

Relative advantage refers to the degree to which a particular innovation is perceived as being able to provide greater organizational benefit (Rogers, 1983). This variable has been identified as a significant driver for IT innovations usage (Iacovou, Benbasat, & Dexter, 1995a; Premkumar, Ramamurthy, & Nilakanta, 1994). Furthermore, the literature reports a

positive relationship between relative advantage and IT/IS adoption (Tornatzky & Klein, 1982). Thus, the following hypothesis is also proposed:

H2. Relative advantage will have a positive effect on the adoption of ISO.

Technology readiness reflects the physical assets, the human resources (Mata et al., 1995), the IT professionals within the organization who have expertise to implement the innovation, and the IT infrastructure, such as installed technologies, systems, and applications (Ngai et al., 2007). Since ISO is the externalization of these assets (Loh & Venkatraman, 1992a), this factor may have a positive influence in innovation adoption (Zhu & Kraemer, 2005). In this study, we will assume that the higher the level of technology readiness of an organization, the less likely it will be to adopt ISO. Thus, we propose the following hypothesis on technology readiness:

H3. Technology readiness will have a negative effect on the adoption of ISO.

Firm size is an indicator of the firm's resources and an important factor that influences innovation adoption (Tornatzky & Fleischer, 1990). It is defined as an organizational attribute to the diffusion of innovation (Rogers, 1995), and is measured by the number of employees and the number of establishments (Cho, 2006). The existence of a positive relationship between firm size and adoption of technological innovation has been detected. As larger firms are more likely to make this kind of investment (Majumdar, 1995; Quadros et al., 2001; Zhu et al., 2003), the following hypothesis is proposed:

H4. Firm size will have a positive effect on the adoption of ISO.

Top management support has been identified in the literature as a factor that positively affects the adoption of technological innovation (Grover et al., 1996), providing the vision, support, and commitment needed to foster the desired environment for the adoption of innovation (Lee & Kim, 2007). In fact, in almost all innovative endeavours, top management support is extremely important (Beatty et al., 2001), and it will help focus efforts toward the realization of organizational benefits and lend credibility to functional managers responsible for its implementation and use (Bradford & Florin, 2003). Since ISO is seen as a strategic decision (DiRomualdo & Gurbaxani, 1998), this factor can positively affect the adoption of innovation, creating an environment of greater convergence of ideas (McGowan & Madey, 1998). Therefore, we propose the following hypothesis:

H5. Top management support will have a positive effect on the adoption of ISO.

Perceived benefits refers to the degree to which new technologies provide more benefits than do old ones (Lin & Lin, 2008). This variable has been shown to impact technology adoption (Banerjee & Golhar, 1994; Oliveira & Martins, 2010a, 2010b). The firm must perceive that the adoption will either resolve existing problems or provide new business opportunities (Beatty et al., 2001), and capture the extent of agreement with claimed benefits relative to its local condition (Chau & Tam, 1997). The following hypothesis on perceived benefits is proposed:

H6. Perceived benefits will have a positive effect on the adoption of ISO.

Competitive pressure is defined in the literature as the pressure resulting from a threat of losing competitive advantage (Lin & Lin, 2008). It refers to the pressure of competition in the adoption of innovation (Gatignon & Robertson, 1989). It is the industry in which the company operates that increases the likelihood of adoption of innovation (Kimberly & Evanisko, 1981; Thong, 1999; Utterbac, 1974). The greater the competitive intensity, the greater is the technology adoption (Gatignon & Robertson, 1989; Globerman, 1975; Levin, Levin, & Meisel, 1987; Ngai et al., 2007; Oliveira & Martins, 2010b; Teo et al., 2003; Thong, 1999). Competitive pressure has been identified as an important determinant in the adoption of innovation (Gibbs & Kraemer, 2004; Grover, 1993). Firms can simply follow their competitors in order to respond to pressure, regardless of the expected benefits, based solely on their success (Teo et al., 2003). Increased competition makes firms feel the need to seek advantage compared to their peers, through innovation (Wang et al., 2010). Thus, we propose the following hypothesis on competitive pressure:

H7. Competitive pressure will have a positive effect on the adoption of ISO.

The regulatory environment is recognized as a critical factor affecting innovation. The more restrictive the regulatory environment is, the more it is that firms will be willing to delegate management to an entity outside of their organization. The constant difficulty of adaptation for legal requirements can have a positive effect on ISO adoption, so we propose the following hypothesis:

H8. Regulatory environment will have a positive effect on the adoption of ISO.

Attitude toward change describes the attitude of the leader (Rogers, 1995). The role played by the leader determines the capacity for innovation (Cannon, 1985), and may substantially influence the perception of innovation (Wejnert, 2002). Thus, we propose the following and final hypothesis on attitude:

H9. Attitude toward change will have a positive effect on the adoption of ISO.

5.3.2 Control variables

It is common to see the use of control variables in information systems studies (Zhu, Dong, et al., 2006; Zhu et al., 2003), since they are used to control the variation of data that were not captured by the explanatory variables. In this study, we need to control for industry sector and firm age.

5.4 RESEARCH METHODOLOGY

5.4.1 Construct measures and data collection

Our construction of items of measurement for the study of ISO adoption takes into account the existing instruments. However, some of the items used were adapted to the context of ISO. Table 5.1 and 5.2 summarizes all of the information about the items measuring the respective independent variables. Most items were measured using a five-point Likert scale ranging from “(1) strongly disagree” to “(5) strongly agree”.

The technology readiness and firm size items were not measured by a Likert scale. Table 5.2 presents the items of these two variables.

The dependent variable, adoption, is dichotomous (0: non-adopter, 1: adopter). It was determined by asking respondents if their firms adopted ISO specifically for the following products: human resources, finance, logistics, sales, and marketing.

A group of experts was formed to analyse each question and suggest improvements for the writing and questionnaire structure. Based on the follow-ups, we reviewed some of the texts of our original research questions. After that, a pilot test was conducted. The pilot test provided the acceptable level of reliability required for all the items comprising the questionnaire.

Table 5.1 - Measurement items on five-point Likert scale (service comparison)

Variables	Measurements items	Adapted from
Complexity	C1. Used complexity in integrating system. C2. Complexity in developing the system process. C3. Degree of complexity in terms of work practices in operating the system. C4. Our firm interaction with the system is clear and understandable.	Grover (1993); Chang et al. (2007); Premkumar and Roberts (1999); Bradford and Florin (2003)
Relative advantage	RA1. ISO adoption will lead to cost reduction. RA2. ISO adoption will lead to transaction acceleration. RA3. ISO adoption will provide timely information for decision making. RA4. ISO adoption will increase the business opportunities. RA5. ISO adoption improves competitiveness.	Li (2008); To and Ngai (2006)
Top management support	TMS1. Top management supports ISO adoption. TMS2. Top management support is aware of the benefits of ISO. TMS3. Top management considers ISO important for the organization. TMS4. Top management encourages employees to use ISO.	Li (2008); Beatty et al. (2001)
Perceived benefits	PB1. ISO may help improve the performance of my firm. PB2. ISO can save my firm time in managing their processes. PB3. ISO may offer a wider range of products to my firm. PB4. ISO may offer a greater number of services to my firm. PB5. ISO may offer good investment to my firm.	Yiu et al. (2007)
Competitive pressure	CP1. In our industry, ISO adoption is useful to allow competition. CP2. The leading firms in our industry are committed to the adoption of ISO. CP3. Percentage of firms in our industry using ISO. CP4. ISO is a strategic necessity to compete.	Chwelos et al. (2001); To and Ngai (2006); Li (2008)
Regulatory environment	RE1. There is adequate legal protection for ISO.	Zhu et al. (2006)
Attitude toward change	ATC1. For me, the adoption of ISO is desirable. ATC2. When I am confronted with information, both positive and negative, on a new technology, I favour the positive information. ATC3. Firms outside my industry are usually a better source of information about technologies than firms in my industry. ATC4. I think that using ISO is a good idea.	Lee (2009); Gatignon and Robertson (1989)

Table 5.2 - Other measurement items (service comparison)

Variables	Measurements items	Adapted from
Technology readiness	TR1. Number of personal computers that are currently in use in my firm divided by the number of employees. TR2. Number of IT professionals located in my firm divided by the number of employees.	Zhu et al.(2006)
Firm size	FS1. Number of employees. FS2. Annual business volume. FS3. Number of factories.	Cho (2006); Gibbs and Kraemer (2004); Hsu et al. (2006); Premkumar and Roberts (1999)

The sample was obtained from a source list from Dun & Bradstreet, which is one of the world's leading sources of commercial information and insight on businesses. The sample was a random selection of firms from Portugal. In order to meet minimum standards for strata size class of firm, strata were to include a 20% share of large firms (>250 employees), 40% of medium-sized firms (50-250), and 40% of smallest-sized firms (< 50 employees). The survey was executed online, with an invitation for participation sent to several managers of the sample firms. The sample was of 600 firms. A total of 261 usable responses were completed, yielding a total response rate of 43.5%. Table 5.3 shows the sample characteristics. About 80% of the data were collected from owners, managing directors, heads of IT, and other senior members of IT, which suggests the high quality of the data source.

Table 5.3 - Sample characteristics *(n=261)* (service comparison)

	Obs.	(%)		Obs.	(%)
Firm age:			**ISO adoption:**		
< 10 years	48	18.4	Human resources	86	33.0
11 – 20 years	74	28.4	Finance	99	37.9
21 - 50 years	93	35.6	Logistics	68	26.1
> 51 years	46	17.6	Sales	54	20.7
			Marketing	52	19.9
			Industry sector:		
Respondent title:			Manufacturing	73	28.0
Owner/proprietor	6	2.3	Commerce	35	13.4
Managing director/board member	112	42.9	Services	121	46.4
Head of IT	8	3.0	Construction	20	7.7
Other senior member of IT	7	2.7	Health	12	4.5
Strategy development/organization	74	28.4	**Employee number:**		
			< 50	99	37.9
Other	54	20.7	50 - 250	108	41.4
			> 250	54	20.7

5.4.2 Instrument validation

A factor analysis was applied in order to assess the construct validation of the measures. Based on factor analysis with varimax rotation (with other rotations the results are similar), eight factors were obtained with eigenvalues greater than 1. These eight factors explain 83.6% of the total variance in the data. The Kaiser-Meyer-Olkin (KMO) test measures the adequacy of the sample. It returned a value of 0.87, revealing that the matrix of correlation is adequate for factor analysis (Sharma, 1996). Table 5.4 presents only the loadings above 0.5. The results of the items that load higher than 0.50 on their associated factors corroborate the

convergent validity of the factors (Chau & Tam, 1997). The eight factors found were easily interpreted, they are: perceived benefits (PB), relative advantage (RA), top management support (TMS), complexity (C), technology readiness (TR), firm size (FS), attitude toward change (ATC), and competitive pressure (CP). These results are in accordance with the literature review.

In short, the measurement instrument is valid and reliable, and it can be used to test the proposed research model.

Table 5.4 – Factor analysis (service comparison)

Variable	Perceived benefits	Relative advantage	Top management support	Complexity	Technology readiness	Firm size	Attitude toward change	Competitive pressure
	(PB)	(RA)	(TMS)	(C)	(TR)	(FS)	(ATC)	(CP)
PB1	0.755							
PB2	0.843							
PB3	0.848							
PB4	0.836							
PB5	0.836							
RA1		0.764						
RA2		0.776						
RA3		0.791						
RA4		0.859						
RA5		0.820						
TMS1			0.862					
TMS2			0.864					
TMS3			0.872					
TMS4			0.837					
C1				0.921				
C2				0.925				
C3				0.915				
TR1					0.994			
TR2					0.995			
FS1						0.896		
FS3						0.907		
ATC1							0.789	
ATC2							0.854	
CP1								0.909
CP2								0.687
% of variance explained	16.7%	16.0%	14.3%	10.5%	8.1%	6.6%	5.8%	5.7%
Cronbach´s α	0.947	0.929	0.943	0.917	0.997	0.784	0.628	0.704

Note: *C4, FS2, CP3, CP4, ATC3, and ATC4 question-items were excluded after factor analysis estimation due to low loadings (lower then 0.5). We presented only loadings with an absolute value greater than 0.5.

5.5 DATA ANALYSIS AND RESULTS

Overall results point to practical ways to apply the model and make decisions based on specific areas. After the measurement instrument was validated and the dichotomous characteristics of the dependent variables defined, a logistic regression was applied to test the research hypotheses in the five ISO products, i.e., human resources, finance, logistics, sales, and marketing. Specifically, we began analysis by checking the multicollinearity, for which we calculated the variance inflation factor (VIF). The VIF ranged from a low of 1.05 to a high of 2.04. The values are below the threshold of 10, indicating that there is no problem of multi-collinearity amongst the variables (Hair et al., 1998).

The goodness-of-fit of the five regressions were assessed in three ways. Firstly, to analyse the joint statistical significance of the independent variables, we computed the likelihood ratio (LR) test, which is statistically significant (p-value<0.01) for five regressions. This implies a strong relationship between the dependent and independent variables for all regressions. Secondly, we used the Hosmer-Lemeshow test (Hosmer & Lemeshow, 1980; Lemeshow & Hosmer, 1982), which reveals that there are no differences between fitted values of the model and the actual values for all regressions (p-value is 0.69, 0.22, 0.70, 0.51, and 0.54, respectively for human resources, finance, logistics, sales, and marketing). Finally, the discrimination power of the model was evaluated in two ways. We used the area under the curve (AUC), which varied from 0.74-0.84 (see Table 5.5), revealing an excellent discrimination (Hosmer & Lemeshow, 2000). Also, the corrected classifications of logistic regression varies from 75.3%-83.4% (Table 5.5). The adoption by random choices ([adopters/(adopters + non-adopters)]2 + [non-adopters/(adopters + non-adopters)]2) varies between 52.9%-68.1% for five ISO adoption, which is much less than in the case of our regressions. We, therefore, conclude that the five logistic regressions have much higher discriminating power than the random choice. The three statistical procedures reveal a substantial model fit and a satisfactory discriminating power, and there is evidence for accepting an overall significance of the five models.

The logistic regressions results are presented in Table 5.5. To test the significance of regression coefficients of the independent variables, the Wald test was used. As shown in Table 5.5, complexity was statistically significant for human resources ($p < 0.01$), finance ($p < 0.10$), and logistics ($p < 0.05$) business areas, and by the coefficients we see that it is negatively related. Relative advantage is positively and statistically significant for finance

(p<0.001), logistics (p<0.001), and sales (p<0.001) business areas. Firm size is only statistically significant (p<0.10) for the logistics business area. Top management support and perceived benefits are positively related to all business areas (p<0.001). Competitive pressure is positively related to all business areas (p<0.001), except for marketing. Attitude toward change is negatively and statistically significant in the following regressions: human resources (p<0.001), finance (p<0.001), logistics (p<0.001); contrarily, this variable is statistically significant for sales regression (p<0.001). Finally, technology readiness and regulatory environment are not statistically significant for any business area.

Table 5.5 - Logistic regression

Independent variables	**Human resources (β)**	**Finance (β)**	**Logistics (β)**	**Sales (β)**	**Marketing (β)**
Complexity	- 0.489***	- 0.307*	- 0.396**	- 0.244	- 0.182
Relative Advantage	0.042	0.476***	0.572***	0.424**	0.188
Technology readiness	- 0.580	1.243	1.107	- 2.602	3.043
Firm size	0.413	0.079	0.553*	- 0.323	- 0.149
Top management support	0.591***	0.781***	0.784***	0.643***	0.616***
Perceived benefits	0.841***	0.731***	1.031***	0.668***	0.741***
Competitive pressure	0.770***	0.786***	0.800***	0.879***	0.258
Regulatory environment	0.339	- 0.151	- 0.314	- 0.349	- 0.242
Attitude toward change	- 0.318*	- 0.351**	- 0.364*	0.699***	- 0.224
Goodness of fit					
Random choice	55.8%	52.9%	61.5%	67.2%	68.1%
Correctly classified	77.8%	75.7%	78.8%	83.8%	78.4%
Area under curve	0.83	0.82	0.83	0.84	0.74

Note: β: standardized coefficients. * p< 0.10; ** p < 0.05; *** p < 0.01.

Table 5.6 summarizes the hypotheses tested. Several hypotheses are supported: H1 for human resources, finance, and logistics; H2 for finance, logistics, and sales; H4 only for logistics; H5 and H6 for all business areas; and H7 for all business areas, except marketing. H9 is only supported for the sales business area. On the other hand, only two hypotheses are not supported for any business area (H3 and H8).

Table 5.6 - Summary of confirmed hypotheses

Hypotheses	**Confirmed hypotheses**				
	Human resources	**Finance**	**Logistics**	**Sales**	**Marketing**
Complexity H1 (-)	Yes	Yes	Yes	No	No
Relative Advantage H2 (+)	No	Yes	Yes	Yes	No
Technology readiness H3 (+)	No	No	No	No	No
Firm size H4 (+)	No	No	Yes	No	No
Top management support H5 (+)	Yes	Yes	Yes	Yes	Yes
Perceived benefits H6 (+)	Yes	Yes	Yes	Yes	Yes
Competitive pressure H7 (+)	Yes	Yes	Yes	Yes	No
Regulatory environment H8 (+)	No	No	No	No	No
Attitude toward change H9 (+)	No	No	No	Yes	No

In the next section, discussion is based on the results of Table 5.6.

5.6 DISCUSSION

The study identified the determinants of ISO adoption in different business areas, such as human resources, finance, logistics, sales, and marketing. Because ISO is an umbrella term that includes a range of sourcing options, we offer e-business recommendations and suggest how to use them, along with ideas for further research.

Based on the results of the study and the organizational context, we can recommend that implementation of decision making on ISO include top management support and emphasize perceived benefits (H5 and H6). These two are statistically significant facilitators for ISO adoption in all business areas. In addition, these findings are supported in literature (Cho, 2006; Lee, 2009; Pan & Jang, 2008). These two factors are, therefore, the basis for the adoption of ISO, and all types of sourcing that are associated with it. Firms must perceive the clear and tangible benefits to adopt (Cho, 2006), as the adoption of new technologies requires top management support (Lee, 2009; Pan & Jang, 2008). Secondly, and similarly noteworthy as determining factors, are the finance and sales business area. Using these factors could better position the providers of such solutions when submitting their offer(s), and we recommend that a similar methodology be applied for both areas. However, despite the similarities observed, substantial differences exist between the determinants when comparing the different business areas. We, therefore, recommend that managers, decision-makers, and future researchers apply the following determinants for each business area.

For the human resources business area, we suggest that top management support, perceived benefits, and competitive pressure be used in evaluating ISO. Perceived benefits are positively related with innovation adoption (Beatty et al., 2001), as well as top management support (Lee & Kim, 2007) and competitive pressure (Wang et al., 2010). Complexity and attitude toward change were found to be statistically significant inhibitors because they affect ISO adoption negatively. This is an area that is very sensitive to business, as it has direct implications on employees, where a simple mistake could destabilize the normal function of company activity. Hence, the management of all processes between the supplier and the firm must be clear and simple in order to mitigate the risk of error. The attitude toward change will have a negative impact on the human resources

business area, contrarily to what we had said initially. Also, firms see in the outsourcing of this business area a way to improve themselves, and focus on their core business. Complexity is negatively corroborated by earlier studies (Chau & Tam, 1997; Low et al., 2011), as well as an attitude toward change (Illegems et al., 2001).

In finance and logistics business areas, we suggest that complexity, relative advantage, top management support, perceived benefits, competitive pressure, and attitude toward change be used in evaluating ISO. These variables have opposite effects, i.e., complexity and attitude toward change are inhibitors and top management support, perceived benefits, competitive pressure, and relative advantage are facilitators. Relative advantage significance was reported in earlier studies (Li, 2008), as well as the remaining factors, which were presented above. Despite the similarity, there is a difference with respect to the influence of firm size that is only statistically significant in the logistics business area. Earlier studies found that firm size facilitates innovation (Cho, 2006).These findings indicate that managers for both business areas must apply practically the same methodology, taking into account the differences indicated above.

In the sales business area, we suggest that relative advantage, top management support, perceived benefits, competitive pressure, and attitude toward change be used in evaluating ISO. All these findings have literature support, as presented earlier. The fact that attitude toward change is positively significant in only the sales area could be related to the fact that this business area is more dedicated to outside actors (customers), and thus the individual characteristics assume a major role in the sales business area. This finding is very useful for suppliers, as they may focus their efforts on the individual (leader) characteristics and increase their chances of success.

The marketing business area was found to have the smallest set of determinants of all. We suggest that top management support and perceived benefits be used in evaluating ISO. The literature support for these findings was presented earlier. One possible explanation for this finding could be more restricted offers and knowledge about ISO in this particular area. Thus, it is important for suppliers to provide more solutions of this kind for this business area.

5.7 THEORETICAL IMPLICATIONS

In other studies about the adoption of ISO, the comparisons between business areas are missing. Thus, this chapter offers recommendations for areas of business when applying analysis of the value of ISO. As the rates of ISO adoption were lower than expected in the past, it is very important to understand the factors that affect it. As a result, business managers and decision makers may apply balanced perceptions of ISO in different areas and decrease, increase, maintain, or invert the situation. Based on the conjunction of the TOE framework (Tornatzky & Fleischer, 1990), and the DOI theory (Rogers, 1995), we offer our newly developed model for research to study the determinants of ISO adoption across the different business areas of firms. To the best of our knowledge, this study is one of the first to examine the adoption of ISO comparing the different business areas and using the combination of the two models. Despite the importance of all contexts not taking place in each business area alone, in general we found importance for all contexts. Although we found differences in the importance of drivers for ISO adoption in the different business areas, managers, decision makers, and researchers can apply appropriate forms of analysis of ISO using all H1-H9 areas respectively, except H3, and H8.

5.8 CONCLUSIONS

In recent years technology has continued to enable new sourcing models of ISO – such as application service provision (ASP), business process outsourcing (BPO), and cloud computing (Lacity et al., 2010; Lacity et al., 2009). However, the value rates of
ISO in Portugal are still lower compared to the European average (IDC, 2006), and in order to promote ISO adoption, it is essential to clarify the factors that explain this adoption, and make a deep analysis to see if different business areas have the same drivers.

In this chapter, we propose a conceptual model with nine determinants for the adoption of ISO. We empirically tested our model in five business areas (human resources, finance, logistics, sales, and marketing). In general, our hypotheses are confirmed. Thus, our research model seems appropriate. Through the comparison of different business areas, we can see the statistically significant differences between them, as well as their similarities. Notably, top management support and perceived benefits are important factors in all business areas. Also, there is a clear similarity between the factors that affect the adoption of

financial and logistics business area. Moreover, technology readiness and regulatory environment have no significance for the adoption of each business area. This means that it does not matter how well a firm is provided with information systems infrastructure and individual experts when making a decision on ISO adoption in the different business areas. Also, the rules imposed by business regulators are not sufficiently difficult to perform for a company to negate the adoption of ISO in the several business areas.

5.9 LIMITATIONS AND FUTURE STUDIES

The research supporting the use of the merged model is limited in some ways. Firstly, it is based on data from a single country, and the findings, therefore, may not seem sufficient to the entire international business community. To solve this limitation, future research might extend the study to other countries. Secondly, the study analysed only the adoption decisions, so for a better comprehension of ISO, it is suggested that future research focus on the stages of post-adoption, in particular the use and impact. Thirdly, for the study of the proposed model, the variables included in our team's view best pertained to the subject under study. However, for future research and implementation by managers, we recommend adding other variables in order to improve the understanding of the topic. Fourthly, since the studied term covered a variety of sourcing options, we encourage future, confirmatory studies of the model that can be applied in a more focused way to every type of IT adoption covered. Finally, in future research new sampling and analysis might be used to validate our model, such as analysing comparative samples between two specific types of industry.

In summary, the procedures to follow to implement the model are:

- *Step 1. Provide top management with the need to outsource.* Give all the information that will help them realize the need for outsourcing of information systems. Naturally, when one intends to carry out this change, it is always for a better and a more innovative solution, justifying the change. But what often happens is that the top management is not sensitive to the current difficulties in the management of processes by their employees with current systems. And so they ask themselves: why change when the work appears done? Hence, there is a need to explain the current difficulties and that there may be benefits in terms of efficiency if the existing information systems are switched to outsourcing.

- *Step 2. Formulate a comparative list of all the benefits offered by potential suppliers.* There are many solutions, and they differ. It is, therefore, important to choose the solution that meets the real needs of your company. This will be important in terms of process management efficiency and costs savings for the outsourcing solution.

- *Step 3. See what your competitors do.* The best way to implement a successful outsourcing solution is to analyse what your competitors do. Given the difficulty inherent in this analysis, the best approach is to examine potential suppliers with outsourcing solutions already in place with your competitors and from there extract the best practices.

- *Step 4. Analyse the degree of innovation* that outsourcing could lead to compared with existing systems, as well as the degree of complexity in its implementation.

Chapter 6 – An empirical analysis to assess the determinants of SaaS diffusion in firms

6.1 INTRODUCTION

From the outset, Software as a Service (SaaS) has caught the attention of managers and researchers (Amiri, 2016; Benlian & Hess, 2011). Firms worldwide spend substantial sums to deploy SaaS based innovations. Globally, firms of different sizes and industries are establishing SaaS based innovations in various functional areas such as enterprise resource planning (ERP), customer relationship management (CRM), and supply chain management (SCM) (Lee et al., 2013; Sultan, 2011). It is expected that SaaS delivery will exceed the traditional software product delivery by increasing margins (Mahowald & Connor, 2012). For example, in 2019 the SaaS market is expected to reach $112.8 billion (IDC, 2015), and the spending on "as a service" offerings is forecast to grow to $258 billion in 2020 (Goode, Lin, Tsai, & Jiang, 2015). The SaaS environment allows firms to access software via the Internet without on-premise installations while avoiding high costs for the initial installation (Kim et al., 2012; Kung et al., 2015). It is the ideal solution for firms with lower budgets that need software to manage their processes. Besides cost savings, additional benefits from SaaS include achieving competitive advantage, and improving performance quality and business flexibility (Kim et al., 2012; Yang et al., 2015).

Although researchers are increasingly interested in the SaaS phenomenon, earlier studies generally have focused on the technological (Choudhary, 2007) and economic benefits of SaaS (Susarla, Barua, & Whinston, 2009). Only few studies have addressed the adoption of SaaS at the firm level (Wu et al., 2011); most focus on the direct effects of the independent variables on a single stage of SaaS adoption, and do not consider other stages of innovation diffusion. Pre-adoption stage (i.e., intention to adopt) and post-adoption stage (i.e., routinization) are crucial and worthy of consideration in a firm's decision to integrate innovative technology in its value chain activities to generate business value (Zhu, Dong, et al., 2006). Furthermore, studying SaaS is challenging, as it is still an evolving concept, and its role as a dominant software delivery model has emerged only in the recent years (Subashini & Kavitha, 2011). To fully realize the direct and indirect effects of the determinants on the different stages of SaaS diffusion within a firm, this study develops a conceptual research model that integrates the innovation characteristics of SaaS and

institutional pressures to diffuse SaaS in the value chain activities, with the technology-organization-environment (TOE) context of the firm. The conceptual research model draws upon the theoretical perspectives of the technology-organization-environment (TOE) framework (Tornatzky & Fleischer, 1990), diffusion of innovations (DOI) theory (Rogers, 2010), and institutional (INT) theory (DiMaggio & Powell, 2000). We use the conceptual research model to assess the factors that influence the diffusion of SaaS. Specifically, we seek to gain a better understanding of the relationship between the factors and the three stages of SaaS diffusion, namely intention, adoption, and routinization.

The contribution of this study is twofold. First, to demonstrate the usefulness of integrating three prominent adoption theories to evaluate factors influencing the diffusion of SaaS, an empirical analysis of data from 265 firms is conducted. Our study highlights the importance of systematically assessing the differential effects of the determinants across the different stages of SaaS diffusion. Second, we investigate the direct and indirect effect of the innovation characteristics, institutional pressures, and technology-organization-environment perspectives on the three stages of SaaS diffusion. In doing so, our research provides a more holistic assessment of the determinants of SaaS diffusion compared to earlier studies that mostly focus on a single stage of SaaS adoption.

The paper is organized as follows. In the next section we provide a background on SaaS including related studies and the theoretical foundations used in this study. In Section 3 we present the conceptual research model along with hypotheses. In Section 4 we describe the research method and design, followed by the analysis of results in Section 5. In section 6 we discuss the major findings of our study, managerial implications, theoretical contributions, and limitations of the study. Finally, we conclude the paper by suggesting directions for future research.

6.2 THEORETICAL BACKGROUND

6.2.1 SaaS

SaaS is perceived by IT executives as a solution that may help firms to reduce capital expenses while increasing cash flow (Benlian & Hess, 2011). In general, SaaS focuses on delivering software that is hosted off-premises, and accessed remotely by means of a subscription fee (Espadas et al., 2013). Grounded in cloud computing, SaaS bundles

software delivery with cloud service (Fan et al., 2009; Park & Ryoo, 2013), transforming IT resources into a ubiquitous service (Susarla et al., 2010). Besides SaaS, other popular cloud computing services include Infrastructure as a Service (IaaS), and Platform as a Service (PaaS). Unlike SaaS, which relates to software, IaaS refers to the delivery of the infrastructure as service, and PaaS to the virtualization of platforms (Misra & Mondal, 2011). In this research we focus only on the diffusion of SaaS at the firm level.

SaaS emerged as an improved form of application service provider (ASP) model (Kim et al., 2012; Xin & Levina, 2008). It was the response of the software market to the limitations of the single-tenant ASP architecture. SaaS is a multi-tenant architecture, allowing users to access several software products on demand (Benlian & Hess, 2011). Generally SaaS applications are characterized as being easy to access and use, feature rich, and having good consumer adaptation (Zorrilla & García-Saiz, 2013). Furthermore, compared to on-premise installation software (OPIS), the benefits of SaaS include lower implementation costs, higher rate of improvement in software quality, and faster delivery of new features (Choudhary, 2007; Gonzálvez-Gallego et al., 2015). 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).

Today, firms have two options when faced with a software decision. They can either acquire it as the traditional OPIS or they can obtain it as a service (i.e., SaaS). SaaS differs in many ways from the OPIS. First, unlike OPIS, SaaS data are stored on the service provider's server (Jula, Sundararajan, & Othman, 2014). Related research indicates this as a factor that negatively affects the adoption of SaaS, as it raises security concerns. The more sensitive the user's data, the greater are the perceived risks (Misra & Mondal, 2011). Nevertheless, as most SaaS providers offer inherent disaster recovery options (i.e. backup servers located in a different geographical area), some firms view this as an advantage instead of a risk. Second, SaaS allows bundling software with service (Fan et al., 2009). The service brings an additional benefit that, when added to the software delivery, is perceived as a competitive factor and contributes to the effective differentiated positioning of SaaS compared to OPIS. Finally, SaaS does not require large initial costs (Benlian & Hess, 2011), and is instead based on a subscription model (Choudhary, 2007). The firm is thus spared the high implementation costs as in OPIS, but pays in small amounts to ensure continuity of the

service. Unlike OPIS, there is little conflict between present and future versions of the software, since there is a greater continuity guarantee that allows vendors to release new features and make them available to all subscribers (Choudhary, 2007).

6.2.2 Related literature on SaaS adoption

Even though the literature identifies many studies that address the current state and development trends of cloud services, few studies have discussed SaaS adoption (Wu, 2011b). Most research on SaaS focuses on outsourcing (Benlian & Hess, 2011), or ASP (Susarla et al., 2009). Benlian et al. (2009) examined the drivers that influence SaaS adoption based on theories such as the transaction cost theory (TCT), resource-based view (RBV), and the theory of planned behavior (TBP). Their findings suggest that social influence was one of the main factors influencing SaaS adoption. However, their research did not consider other stages of technology diffusion, namely the pre-adoption stage of evaluating the potential of SaaS to improve value chain performance (i.e., intention), and the post-adoption stage of reengineering processes from the integration of SaaS in departments and value chain activities (i.e., routinization).

Wu (2011a) developed and empirically tested a research model to examine important factors that influence SaaS adoption. The study combines the diffusion of innovation`s theory with technology acceptance model (TAM), which is suitable for analysis at an individual level. The inquiry is limited to the telecommunication industry, and may not sufficiently extend to other industries. Using a case study method involving decision making trial and evaluation laboratory (DEMATEL) approach, Wu (2011b) explored the perceived risks and benefits of adopting SaaS. The study suggests 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. Benlian and Hess (2011) analyzed the opportunities and risks associated with increasing SaaS adoption based on an opportunity-risk model. They propose that security threats and cost advantages are the dominant factors for SaaS adoption. Their research also focuses on the risks and benefits of SaaS, yet does not consider possible environmental factors. Xin and Levina (2008) draw on an economic and strategic management model to study the factors affecting SaaS adoption. They argue that the maturity of the firm's IT plays an important role in SaaS adoption. However, their research model focuses only on the initial stage of adoption (i.e. propensity to adopt SaaS), and does not offer empirical evidence of its actual adoption

and routinization. Susarla et al. (2009) investigated optimal contractual designs in SaaS based on transaction cost economics (TCE). They suggested governance structures for monitoring SaaS costs, but their study does not differentiate between SaaS and ASP. Kung et al. (2015) focused on the environmental factors that influence the intention to adopt SaaS, and Yang et al. (2015) explored the technology, organization, and environment contexts in organizational SaaS readiness by proposing a tripod readiness model. However, neither of these studies provides a holistic analysis of the diffusion stages (i.e. intention, adoption, and routinization). The diffusion process of a technology does not begin or end in the adoption stage, it initiates in the evaluation stage of SaaS (i.e. intention to adopt), and moves on to its formal adoption, and finally to its routinization (Bose & Luo, 2011). It is a dynamic process in which the technology may never advance beyond intention, or never proliferate within the company.

As can been seen, earlier studies on SaaS provide us with only small isolated explanations of the diffusion phenomenon that are mostly related to the adoption or intention. For a deeper understanding of the entire diffusion process, there is a need for studies to focus on all of the three stages. The application of the three diffusion stages is not something new in the IT literature, however, as it was already applied to the study of other technologies, such as e-business (Zhu, Kraemer, et al., 2006), Green IT (Bose & Luo, 2011; Thomas et al., 2015), RFID (Chong & Chan, 2012), and mobile supply chain management (Chan & Chong, 2013). To the best of our knowledge, our study is the first to empirically assess all three stages of SaaS diffusion within an organization.

6.2.3 Adoption models

In addition to the DOI theory (Rogers, 2010), TOE Framework (Tornatzky & Fleischer, 1990), and INT theory (DiMaggio & Powell, 1983), other popular theories commonly used in innovation diffusion and adoption studies include the technology acceptance model (TAM) (Davis et al., 1989), the theory of planned behavior (TPB) (Ajzen, 1991), and the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003). Only DOI theory, TOE framework, and INT theory are considered in this research, as the others pertain to an individual's choice.

Technology-organization-environment (TOE) framework

The TOE framework (Tornatzky & Fleischer, 1990) aims to explain the process of innovation at the firm level. It considers three contexts that influence the adoption of an innovation in a firm - the technology, the organization, and the environment context. The technology context refers to the internal and external technologies relevant to the firm. It includes current technology practices and infrastructure internally available at the company (Starbuck, 1976), as well as the relevant technologies that are externally available for use (Hage, 1980). The organization context refers to the descriptive measures of the organization, such as its scope and size (Oliveira & Martins, 2011; Tornatzky & Fleischer, 1990). The environment context corresponds to the limitation and opportunities for technological innovation, which includes the various actors that may affect the decision process, market elements, competitors, and regulators (Tornatzky & Fleischer, 1990). Although this framework has been used to explain the process of several IT innovations at the firm level, Bose and Luo (2011) argue that it does not provide a concrete model for describing the factors that influence the organizational adoption decision, but instead provides a taxonomy for classifying adoption factors in their respective context. They encourage researchers to take a broader context into account in which innovation takes place (Bose & Luo, 2011).

TOE's framework has been used in several studies to explain the adoption of technological innovations, such as mobile supply chain (Chan & Chong, 2013), radio frequency identification (Chong & Chan, 2012; S. Kim & Garrison, 2010; Wang et al., 2010), green IT (Bose & Luo, 2011; Thomas et al., 2015), inter-organizational business process standards (Venkatesh et al., 2012a), e-business (Oliveira & Martins, 2010a; Zhu et al., 2003; Zhu, Kraemer, et al., 2006), SaaS (Yang et al., 2015), and cloud computing (Abdollahzadehgan et al., 2013; Low et al., 2011). However, the TOE framework is not expansive, and does not take into consideration key factors such as cost savings and security concerns, which are critical to the firm's adoption of SaaS. Researchers have recognized this limitation, and called for integrative approaches that combine more than one theoretical perspective to understand the different stages of adoption of technological innovation (Iacovou, Benbasat, & Dexter, 1995b; Zhu, Dong, et al., 2006; Zhu & Kraemer, 2005). Thus theoretical models that comprehensively analyze the factors in the technology, organization, and environment contexts (Zhu, Kraemer, et al., 2006) are required for the study of intention, adoption, and post-adoption of a technology. To enhance the explanatory power of the research models,

earlier studies have therefore combined the TOE framework with DOI Theory (Chan & Chong, 2013; Chong et al., 2009; Oliveira et al., 2014; Wang et al., 2010), and INT (Oliveira & Martins, 2011; Yoon & George, 2013).

Diffusion of innovation (DOI) theory

DOI theory (Rogers, 2010) explains the diffusion of innovation within a firm. It states that an innovation goes through a five-stage process until it thrives in the firm (Sharma, 2009). First there is the knowledge stage, which describes the exposure to the innovation. Second is the persuasion stage, which describes the degree of interest in the innovation. Third comes the decision stage, in which there is a decision regarding the adoption of the innovation. Fourth is the implementation stage, which describes the usefulness of the innovation. Finally, there is the confirmation stage, in which the innovation is reinforced. Although the DOI theory presents five stages, most studies on innovation diffusion focus on only three [i.e. intention (persuasion stage), adoption (decision stage), and routinization (implementation stage)] (Chong & Chan, 2012; Zhu, Kraemer, et al., 2006). Similarly, in this research, we address these same three stages.

The DOI theory also states that there are five factors that influence the innovation adoption decision. Relative advantage is the improvement that the innovation may bring to the firm. Compatibility is the level of affinity of the innovation with the existing values and needs. Complexity is the degree of difficulty to understand or use the innovation. Trialability describes how easily an innovation may be experimented with. Finally, observability is the extent to which the innovation is visible to others. Among the five factors, relative advantage, compatibility, and complexity are applicable to all three stages of SaaS diffusion in a firm, and are included in our study. Many IT innovation studies exclude trialability and observability because they are not consistently related to the innovation diffusion process (Chong et al., 2009; Oliveira et al., 2014).

DOI (Rogers, 2010) theory has been widely used in IS research to explain the adoption of Internet (Alam, 2009), e-procurement (Azadegan & Teich, 2010), RFID (Tsai et al., 2010), e-business (Ifinedo, 2011; Zhu, Dong, et al., 2006), and cloud computing (Low et al., 2011). By drawing a distinction between the stages that comprise the diffusion process, DOI theory provides a broad perspective of the diffusion phenomenon and offers good explanations about how new innovations are adopted.

Institutional theory (INT)

The INT theory describes how firms act as institutions in shaping behaviors and cognitions of individuals within them (Chatterjee, Grewal, & Sambamurthy, 2002). The theory offers insights regarding the importance of organizational structure and actions (Teo et al., 2003). It states that the firm's decisions are not driven purely by rational goals of efficiency, but also by social and cultural factors (DiMaggio & Powell, 1983; Oliveira & Martins, 2011). The firm's institutional pressures surround its actions to adopt forms of behavior in order to preserve its legitimacy. Thus, according to INT theory, the firm's decision to adopt a new technological innovation may be influenced by the institutional environment in which it operates. DiMaggio and Powell (1983) suggest that organizations face three types of isomorphic pressures — coercive, normative, and mimetic. Coercive pressures are based on external pressure from institutions that exercise some kind of power over the firm. Normative pressures are derived from the regulation pertaining to the professional activity. Mimetic pressures emanate from responses to uncertainty through mimicking the actions of other firms (Liang, Saraf, Hu, & Xue, 2007; Scott, 2000; Swanson & Ramiller, 2004).

The INT gives us important insights into possible institutional constraints that may influence the adoption of a technological innovation, such as electronic human resource management (Heikkilä, 2013), intranet (Baptista et al., 2010), and green IS (Butler, 2011). However, in isolation the INT theory fails to include factors that go beyond institutional pressure. Nevertheless, INT enriches the environmental context of the TOE framework (Ciganek et al., 2014; Oliveira & Martins, 2011; Yoon & George, 2013), and thereby gains value when used in conjunction with the TOE framework and the DOI theory.

6.3 CONCEPTUAL MODEL AND HYPOTHESES

We propose a research model that encompasses three prominent models used in the study of innovation adoption at the firm level (Oliveira & Martins, 2011). The integrative model incorporates the established theoretical lenses of TOE framework, DOI theory, and INT theory to determine the drivers of SaaS diffusion. The relevance of using these theoretical perspectives for the study of IT adoption at a firm level has received consistent empirical support (Chan & Chong, 2013; Chong et al., 2009; Ciganek et al., 2014; Oliveira et al., 2014; Wang et al., 2010; Yoon & George, 2013). IS literature reports that combining the TOE framework and the DOI theory improves the ability of the model to explain IT adoptions (Hsu,

Kraemer, & Dunkle, 2006). Similarly, the INT theory enriches the environmental context of the TOE framework (Oliveira & Martins, 2011). As the institutional pressures from INT (i.e., coercive, normative, and mimetic pressures) represent the external forces that influence the diffusion process of SaaS, we include these factors in the environment context of TOE framework. They expansively cover the external factors that may influence SaaS diffusion within an organization (Yoon & George, 2013). Combining the TOE framework, DOI theory, and INT theory thus provides a theoretically grounded basis to assess the technology, organization, and environment characteristics that influence SaaS diffusion.

The integrative research model is shown in Figure 6.1. The constructs are identified based on published IS literature on the diffusion of technological innovation in firms. In the technology context, relative advantage, compatibility, and complexity from the DOI theory are factors important to the diffusion of SaaS (Abdollahzadehgan et al., 2013; Dwivedi, Papazafeiropoulo, Ramdani, Kawalek, & Lorenzo, 2009; Princely Ifinedo, 2011; Low et al., 2011; Mora-Monge, Azadegan, & Teich, 2010; Picoto, Bélanger, & Palma-dos-Reis, 2014). In addition, we assume that SaaS generates cost savings advantages and security concerns (Benlian & Hess, 2011). Therefore, similar to Oliveira et al. (2014), we include these variables (i.e. cost savings and security concerns) as antecedents to the relative advantage of SaaS. They determine whether the diffusion of SaaS will be relatively more advantageous if it provides cost savings and less advantageous if there are security concerns. In the organizational context, support from the top management, and the availability of technical and human skills (i.e. technology competence) (Abdollahzadehgan et al., 2013; Low et al., 2011; Oliveira et al., 2014; Yang et al., 2015) are considered important for the diffusion of SaaS. As indicated by the search, and by definition, technology competence is a function of the organizational IT infrastructure and workforce (Picoto et al., 2014), such as the technology capabilities and the IT personnel who have the skills to implement and use the technology (Zhu & Kraemer, 2005). Coercive, normative, and mimetic pressures from INT theory represent factors specific to the environmental context (Kung et al., 2015; Yoon & George, 2013). Since the purpose of this study is to gain deeper insights into the dynamic process of SaaS adoption, we include intention to adopt SaaS, SaaS adoption, and SaaS routinization as dependent variables. They are consistent with other studies on innovation adoption (Chong & Chan, 2012), as well as DOI's stages of innovation. Earlier research suggests the applicability of the variables that compound the technology, organization, and environment contexts for the study of the three stages of the technology diffusion (Bose &

Luo, 2011; Chan & Chong, 2013; Chong & Chan, 2012; Thomas et al., 2015; Zhu, Kraemer, et al., 2006).

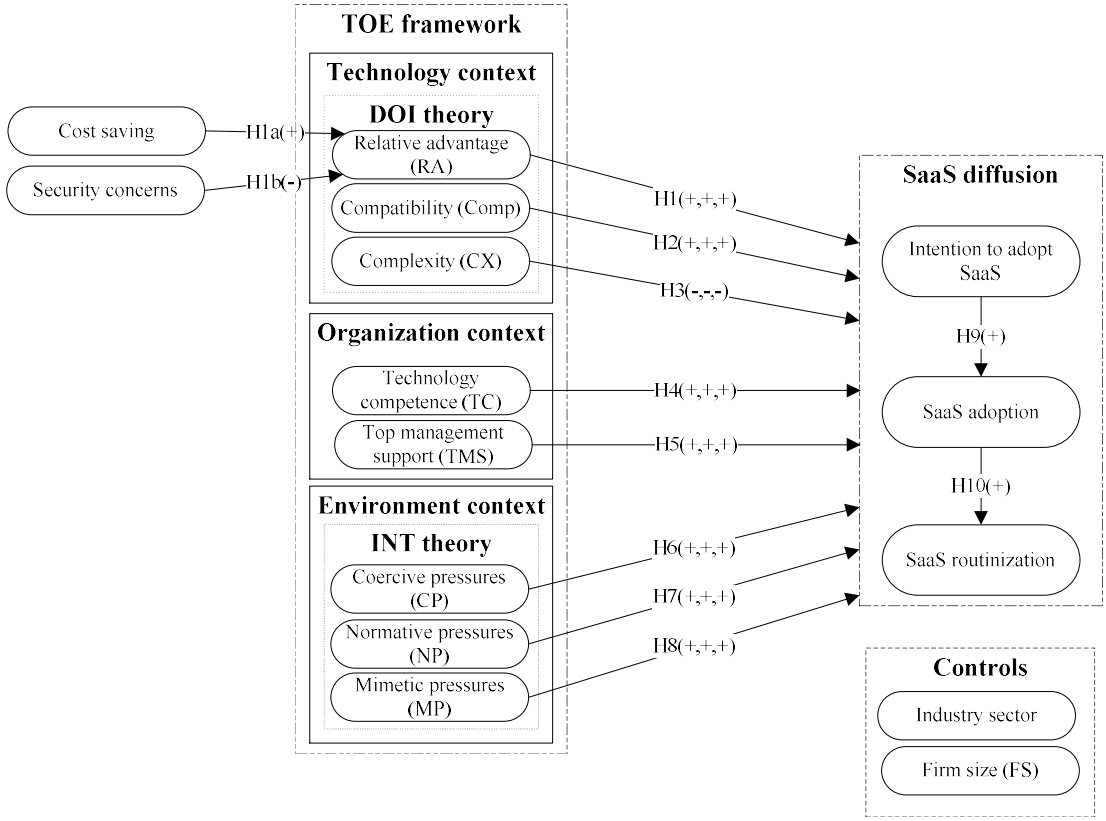


Figure 6.1 - SaaS diffusion conceptual model.

6.3.1 Technology context

SaaS was initially developed to reduce capital expenses associated with the acquisition of new software by firms (Kim et al., 2012). The software payment is made as periodic or usage-based fees, and software customization and user training are provided at lower costs (Suarez, Cusumano, & Kahl, 2013). Costs savings in SaaS are perceived by firms as an opportunity (Benlian & Hess, 2011). Additionally, SaaS providers spend a fair portion of their budget improving infrastructure for their customers (Bezemer & Zaidman, 2014). This ensures continuing innovation in software without any significant increase in the billable amount. Cost savings thus represent a relative advantage to the firms considering SaaS diffusion. Therefore we propose,

H1a. Cost savings positively influence the relative advantage of SaaS.

With SaaS the firm is heavily dependent on the supplier of SaaS for security measures and procedures (Subashini & Kavitha, 2011). SaaS providers manage software at their data centers for various customers (Cho & Chan, 2013). This introduces the potential for information leak and chances of compromising the integrity of organizational data (Lee, Park, & Lim, 2013). Furthermore, the Internet based connection from the firm to the SaaS provider may also be viewed as a potential security concern. Because permission control and access administration is managed by the SaaS provider, the firm may not know if their data are breached unless the provider alerts them to that fact. Contrary to cost savings, security concerns may be less advantageous to the organization's decision to implement SaaS solutions. Therefore we propose,

H1b. Security concerns negatively influence the relative advantage of SaaS.

Relative advantage refers to the degree to which an innovation is perceived as being able to provide greater organizational benefit (Rogers, 2010). This variable has been identified as a strong driver of IT innovation (Iacovou et al., 1995b). Literature reports a positive relationship between relative advantage and IT adoption (Tornatzky & Klein, 1982). One of the many advantages of SaaS is that investments in software development, maintenance, and update are undertaken by the SaaS service provider, and are not the responsibility of the firm that adopted SaaS (Choudhary, 2007). Shifting these roles to the SaaS provider effectively allows the firm to focus on its core business. The merits represent a competitive advantage and a greater impetus for the diffusion of SaaS to generate business value. Therefore we propose,

H1. Relative advantage positively influences SaaS diffusion (intention, adoption, and routinization).

Compatibility is the degree to which SaaS may be integrated with the organization´s business process and the existing IT systems (Chong & Chan, 2012). The organization may perceive the SaaS solution to be compatible if it has a greater fit to the organization's present situation. Therefore, compatibility can lead to a greater propensity for SaaS adoption. We therefore propose,

H2. Compatibility positively influences SaaS diffusion (intention, adoption, and routinization).

Complexity is the degree to which an innovation is perceived as being difficult to understand or use (Beatty et al., 2001; Rogers, 2010). SaaS can change the way processes are managed in a firm. Additionally, firms may be less likely to adopt SaaS if it demands a high level of new skills for their employees (Beatty et al., 2001). This variable is reported in the literature as a factor that inhibits the implementation of new technologies, and one that negatively influences its adoption (Wang et al., 2010). We therefore propose,

H3. Complexity negatively influences SaaS diffusion (intention, adoption, and routinization).

6.3.2 Organization context

Technology competence refers to the technological characteristics available in the organization, such as the IT infrastructure and the IT professionals (Zhu & Kraemer, 2005). The IT infrastructure is the installed technologies, systems, and applications (Ngai et al., 2007). IT professionals are people in the organization who have the expertise to implement SaaS. Technology competence may have a positive influence on the firm's decision to adopt SaaS (Zhu & Kraemer, 2005). As in other empirical studies that have identified technological competence as an important determinant of IT adoption (Oliveira & Martins, 2010b; Pan & Jang, 2008), we assume that the higher the level of an organization's technology competence, the more prepared the company is for SaaS adoption. Hence, we propose,

H4. Technology competence positively influences SaaS diffusion (intention, adoption, and routinization).

Top management support is the vision, support, and commitment provided to foster the desired environment for the adoption of SaaS (Lee & Kim, 2007). Because of the nature of SaaS, the actual adoption may entail profound changes in a firm's business processes and organization structure. The viability of the changes depends on top management support. Without their support it is unlikely that the decision to adopt SaaS will be effective. Additionally, literature identifies top management support as an important factor that positively influences the adoption of technological innovation (Grover et al., 1996). Since SaaS is a strategic decision (DiRomualdo & Gurbaxani, 1998), top management can positively influence the adoption of SaaS by creating an environment of greater convergence of ideas (McGowan & Madey, 1998). Therefore, we propose,

H5. Top management support positively influences SaaS diffusion (intention, adoption, and routinization).

6.3.3 Environment context

Coercive pressures are the formal or informal pressures exerted on organizations by other organizations upon which they are dependent (DiMaggio & Powell, 1983; Teo et al., 2003). The sources of coercive pressures include resource-dominant organizations, regulatory bodies, and parent corporations (Teo et al., 2003). Although SaaS involves some degree of institutional dependence on another firm, the diversity of sources that contribute to such pressures persuades us to hypothesize a positive relationship between coercive pressures and the adoption of SaaS. Thus,

H6. Coercive pressures positively influence SaaS diffusion (intention, adoption, and routinization).

Normative pressures arise from relationships in which firms share information, rules, and norms (Powell & DiMaggio, 1991). A firm that has ties with another organization that has adopted SaaS is more likely to share information about their benefits and costs (Burt, 1982; Teo et al., 2003). As a result of professional relationships, the firm might be more willing to evaluate, adopt, or use SaaS (Aubert, Léger, & Larocque, 2012). Normative pressures can stimulate SaaS diffusion stages depending on the entities that apply this kind of pressure. There is strong empirical support in the IS literature for this variable to be included as a predictor of adoption (Teo et al., 2003). Therefore, we propose,

H7. Normative pressures positively influence SaaS diffusion (intention, adoption, and routinization).

Mimetic pressures refer to the tendency of an organization to imitate the actions of other structurally similar organizations even when there are no power relationships (Teo et al., 2003). The similarity may include sharing industry specific goals, customers, or suppliers. When there is uncertainty, firms may imitate others to economize on shared costs (Cyert & March, 1963), minimize experimentation costs (Levitt & March, 1988), or avoid risks of being the first adopters (Lieberman & Montgomery, 1988; Teo et al., 2003). This variable has been found to be a predictor of adoption in past studies (Teo et al., 2003). We therefore propose,

H8. Mimetic pressures positively influence SaaS diffusion (intention, adoption, and routinization).

6.3.4 Diffusion stages

Intention to adopt SaaS occurs when the firm starts to consider the technology, organization, and environment context for the diffusion of SaaS in the value chain activities. In this stage the firm gathers information on SaaS in order to evaluate its appropriateness (Zhu et al., 2003). Through this process the firm becomes aware of the advantages that SaaS may bring to the organization. The next stage is SaaS adoption, which refers to the decision making regarding SaaS (Chong & Chan, 2012). Based on the market options, in this stage the firm decides on the SaaS solution appropriate for its needs. Earlier studies on innovation adoption suggest a systemic sequence between the stages of adoption (Chan & Chong, 2013). The intention stage establishes the baseline for the firm to move toward the effective adoption, and the adoption leads to its routinization (Chan & Chong, 2013). Thus, we propose,

H9. Intention to adopt SaaS positively influences SaaS adoption.

H10. SaaS adoption positively influences SaaS routinization.

6.3.5 Control variables

The control variables are essential when the variation of data is not captured by the explanatory variables. The use of control variables is common in IS studies (Zhu, Dong, et al., 2006). We use industries and firm size as control variables.

6.4 RESEARCH METHODOLOGY

6.4.1 Measurement

To test the conceptual model, a questionnaire was developed to conduct a survey of firms that are considering to adopt or have already adopted SaaS in Portugal. The constructs (cost savings, security concerns, relative advantage, compatibility, complexity, technology competence, top management support, coercive pressures, normative pressures, mimetic pressures, intention to adopt SaaS, SaaS adoption, and SaaS routinization) were based on published literature (see Table 6.1), and measured using a seven-point Likert scale on an interval level ranging from "strongly disagree" to "strongly agree", and "very low" to "very high" for normative pressures. Table 6.1 lists each construct and its measurement items. Consistent with the literature, all constructs are operationalized as reflective.

Table 6.1 - Measurement items (SaaS diffusion)

Constructs	Measurement Items	Source
Cost savings	Cost1. SaaS is more effective than the alternative. Cost 2. Organizations can avoid unnecessary cost and time by using SaaS. Cost3. SaaS saves time and effort.	(Chong & Chan, 2012)
Security concerns	Sec1. The confidentiality and security of your business data are not guaranteed when adopting SaaS solutions. Sec2. In case of damage, present liability law is still unclear about who will bear the liability. Sec3. The SaaS provider will exploit contractual loopholes (i.e., incomplete contracting) to the detriment of your company.	(Benlian & Hess, 2011)
Relative advantage	Ra1. SaaS allows you to manage business operations in an efficient way. Ra2. The use of SaaS services improves the quality of operations. Ra3. Using SaaS allows the firm to perform specific tasks more quickly. Ra4. The use of SaaS offers new opportunities. Ra5. Using SaaS allows the firm to increase business productivity.	(Oliveira et al., 2014)
Compatibility	Comp1. SaaS is compatible with existing IT infrastructure. Comp2. SaaS is compatible with our business processes and operations. Comp3. SaaS is compatible with our other existing systems (e.g. Finance, ERP, CRM, SCM). Comp4. It is easy to integrate SaaS with our other existing systems (e.g. Finance, ERP, CRM, SCM).	(Chong & Chan, 2012)
Complexity	Cx1. The use of SaaS requires a lot of mental effort. Cx2. The use of SaaS is frustrating. Cx3. The use of SaaS is too complex for our business operations. Cx4. The skills needed to adopt SaaS are too complex for the employees of the firm.	(Oliveira et al., 2014)
Technology competence	Tc1. The technology infrastructure of my company is available to support SaaS. Tc2. My company is dedicated to ensuring that 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	*Please indicate (1 = very low; 7 = very high)* 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)
Intention to adopt SaaS (evaluation)	SaaSi1. My company intends to use SaaS if possible. SaaSi2. My company collects information about SaaS with the possible intention of using it. SaaSi3. My company has conducted a pilot test to evaluate SaaS.	(Chan & Chong, 2013)
SaaS adoption	SaaSa1. My company invests resources in SaaS. SaaSa2. Business activities in our company require the use of SaaS. SaaSa3. Functional areas in my company require the use of SaaS.	(Chan & Chong, 2013)
SaaS routinization	SaaSr1. We have integrated SaaS with our existing backend/legacy systems. SaaSr2. SaaS is being implemented with our trading partners. SaaSr3. SaaS is being implemented with our customers.	(Chan & Chong, 2013)

The questionnaire items were reviewed for content validity by a group of five IS professionals and IS researchers familiar with SaaS. Appropriate revisions were made based on their commentaries. Since the questionnaire was administered in Portugal, the instrument was translated from English to Portuguese and re-examined by the IS researchers and bilingual experts. A pilot test was conducted among 30 companies that were not included in the main survey. The results confirmed the reliability, validity, and translational equivalence of the instrument.

6.5 DATA

An online version of the survey was emailed to qualified personnel at 2000 firms (i.e. CIO's, directors, and senior IS managers) along with a brief but complete explanation of the research scope and relevance. The study utilized the "key informant" approach for data collection to identify the respondents who are knowledgeable about SaaS (Benlian & Hess, 2011; Oliveira et al., 2014; Pinsonneault & Kraemer, 1993). The company and contact data were provided by Dun & Bradstreet, one of the world's leading sources for commercial information and insight on businesses. Invitation to the online survey was sent to a broad set of firms from several industry sectors (e.g. manufacturing, construction, services, commerce, health, and information and communications). To increase content validity, we indicated that the questionnaire be completed by the individuals who are most familiar with the firm's direction regarding SaaS. To increase response rate, all respondents were given the opportunity to receive the findings of the study. A follow up email was sent to non-respondents after two weeks. Data were collected in early 2014. A total of 265 usable responses (168 early respondents and 97 late respondents) were obtained at the end of eight weeks, yielding a response rate of 13.3%. To test for non-response bias, the sample distributions of the early and late respondent groups were compared using the Kolmogorov–Smirnov (K–S) test (Ryans, 1974). The sample distributions of the two groups did not differ statistically, indicating the absence of non-response bias (Ryans, 1974) (Table 6.2).

Initially, the common method bias was examined using Harman's one-factor test (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). It revealed that the most variance explained by one factor was 35.6%, none of the factors had variance more than the 50% threshold value. We thus conclude that common method bias was not a serious concern. Thereafter, the marker-variable technique was used (Lindell & Whitney, 2001; Malhotra, Kim, & Patil, 2006). No significant common method bias was found in the data set.

Table 6.2 – Testing possible Biases

	Full sample (n = 265)		Early respondents (n = 168)		Late respondents (n = 97)		Kolmogorov–Smirnov test
	Mean	S.D.	Mean	S.D.	Mean	S.D.	p-Value
Cost savings	4.50	1.44	4.60	1.44	4.32	1.42	0.78
Security concerns	4.25	1.39	4.36	1.44	4.06	1.27	0.31
Relative advantage	4.71	1.29	4.77	1.31	4.61	1.25	0.79
Compatibility	4.32	1.31	4.36	1.36	4.25	1.23	0.94
Complexity	2.64	1.16	2.63	1.16	2.66	1.16	1.00
Technology competence	4.01	1.33	4.05	1.34	3.94	1.32	1.00
Top management support	3.77	1.63	3.77	1.71	3.78	1.51	0.50
Coercive pressures	2.55	1.50	2.55	1.55	2.56	1.44	0.79
Normative pressures	3.01	1.30	3.04	1.36	2.96	1.19	0.67
Mimetic pressures	2.95	1.42	2.92	1.45	3.01	1.37	0.67
Intention to adopt SaaS (evaluation)	3.53	1.60	3.61	1.60	3.40	1.61	0.71
SaaS adoption	2.94	1.71	3.01	1.70	2.84	1.73	0.98
SaaS routinization	2.79	1.65	2.85	1.66	2.70	1.63	1.00

The profile of the sample is shown in Table 6.3. 45% of the respondents were from the services sector, 31% from the manufacturing industry, 9% from commerce, 8% from construction, 4% from health, and 3% from the information and communication industries. The respondents were qualified individuals within the firms, indicating a good quality of the data. 60% of the respondents were heads of IT, IS directors, managers, CIO's, and board members. The remaining 40% of the respondents were managers from other departments with specific knowledge of the subject.

Table 6.3 - Sample characteristics (*n=265*) (SaaS diffusion)

Industry			**Firm size (number of employees)**		
Manufacturing	83	31%	Micro (=<10)	20	8%
Construction	21	8%	Small (11-50)	54	20%
Services	119	45%	Medium (51-250)	131	49%
Commerce	24	9%	Large (>250)	60	23%
Health	10	4%			
Information and communication	8	3%			
Respondents' position					
Board member	22	8%			
CIO	6	2%			
IS Managers, Director IT, Head of IT	130	50%			
Other department managers	107	40%			

6.6 RESULTS

Structural equation modeling (SEM) was used to empirically assess the research model. There are two families of SEM techniques: covariance-based techniques and variance-based techniques (Henseler et al., 2009). Partial Least Squares (PLS) path modeling is a variance based technique that is required when maximum model complexity and low theoretical information are present (Henseler et al., 2009). In addition, PLS does not demand normal distribution (Chin, Marcolin, & Newsted, 2003). Because the items in our data are not normally distributed ($p<0.01$, Kolmogorov–Smirnov's test) and the complexity of the model is substantiated, PLS is the most appropriate method to be applied (Henseler et al., 2009).

6.6.1 Measurement model

Table 6.4 shows the average variance extracted (AVE) and composite reliability (CR). All constructs have CR higher than 0.7, thus confirming the reliability of scales (Henseler et al., 2009; Straub, 1989). The measurement model also demonstrates convergent validity, as the average variance extracted (AVE) is greater than 0.5 for all of the constructs. This implies that the latent variable explains more than half of the variance of its indicators (Fornell & Larcker, 1981; Hair, Sarstedt, Ringle, & Mena, 2012).

Table 6.4 - CR, AVE and correlations

	AVE	*CR*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
1. Cost	0.82	0.93	**0.91**												
2. Security	0.69	0.87	-0.13	**0.83**											
3. RA	0.76	0.94	0.62	-0.19	**0.87**										
4. Comp	0.76	0.93	0.50	-0.25	0.59	**0.87**									
5. CX	0.73	0.92	-0.35	0.24	-0.17	-0.17	**0.86**								
6. TC	0.67	0.86	0.41	-0.06	0.39	0.51	-0.12	**0.82**							
7. TMS	0.88	0.96	0.46	-0.14	0.49	0.51	-0.13	0.67	**0.94**						
8. CP	0.80	0.92	0.22	0.00	0.24	0.22	0.06	0.26	0.29	**0.90**					
9. NP	0.76	0.90	0.37	-0.11	0.42	0.39	-0.05	0.48	0.47	0.56	**0.87**				
10. MP	0.93	0.98	0.35	-0.04	0.35	0.35	0.03	0.39	0.44	0.67	0.54	**0.97**			
11. SaaSi	0.79	0.92	0.52	-0.11	0.51	0.45	-0.19	0.59	0.63	0.34	0.58	0.45	**0.89**		
12. SaaSa	0.87	0.95	0.43	-0.19	0.45	0.42	-0.11	0.56	0.59	0.57	0.63	0.55	0.73	**0.93**	
13. SaaSr	0.82	0.93	0.37	-0.12	0.39	0.39	-0.10	0.49	0.55	0.44	0.58	0.48	0.63	0.71	**0.91**

Note: Cost savings (Cost); Security concerns (Security); Relative advantage (RA); Compatibility (Comp); Complexity (CX); Technology competence (TC); Top management support (TMS); Coercive pressures (CP); Normative pressures (NP); Mimetic pressures (MP); intention to adopt SaaS (SaaSi); SaaS adoption (SaaSa); SaaS routinization (SaaSr). All loadings have an absolute value greater than 0.5.

The indicator reliability was evaluated based on the criterion that the loadings should be greater than 0.70 (Churchill Jr, 1979; Henseler et al., 2009). As shown in Table 6.5, the loadings (in bold) are greater than 0.7, meaning that the instrument presents good indicator reliability.

Table 6.5 - Factor analysis (SaaS diffusion)

	Cost	Security	RA	Comp	CX	TC	TMS	CP	NP	MP	SaaSi	SaaSa	SaaSr
Cost1	**0.86**	-0.15	0.48	0.44	-0.25	0.33	0.35	0.24	0.33	0.31	0.37	0.37	0.30
Cost2	**0.94**	-0.08	0.57	0.43	-0.30	0.37	0.42	0.18	0.30	0.32	0.49	0.40	0.35
Cost3	**0.92**	-0.13	0.63	0.48	-0.38	0.40	0.47	0.19	0.36	0.33	0.54	0.41	0.35
Sec1	-0.15	**0.97**	-0.23	-0.26	0.23	-0.09	-0.17	0.02	-0.12	-0.04	-0.14	-0.19	-0.13
Sec2	-0.05	**0.80**	-0.08	-0.16	0.19	0.03	-0.05	-0.07	-0.07	-0.06	-0.02	-0.14	-0.06
Sec3	-0.06	**0.71**	-0.04	-0.13	0.21	0.00	-0.01	0.03	0.02	0.05	-0.01	-0.07	-0.03
RA1	0.58	-0.20	**0.91**	0.58	-0.17	0.39	0.49	0.24	0.41	0.36	0.49	0.45	0.37
RA2	0.56	-0.22	**0.91**	0.53	-0.16	0.35	0.46	0.26	0.36	0.36	0.45	0.43	0.35
RA3	0.53	-0.21	**0.87**	0.50	-0.13	0.36	0.42	0.30	0.40	0.36	0.44	0.41	0.39
RA4	0.52	-0.09	**0.78**	0.45	-0.14	0.25	0.36	0.07	0.30	0.19	0.41	0.27	0.26
RA5	0.53	-0.10	**0.89**	0.52	-0.14	0.34	0.41	0.18	0.36	0.25	0.44	0.40	0.35
Comp1	0.42	-0.13	0.51	**0.84**	-0.14	0.47	0.44	0.11	0.29	0.28	0.44	0.36	0.35
Comp2	0.47	-0.22	0.52	**0.91**	-0.18	0.44	0.47	0.21	0.32	0.32	0.44	0.41	0.34
Comp3	0.45	-0.29	0.55	**0.88**	-0.18	0.41	0.41	0.20	0.38	0.30	0.35	0.33	0.33
Comp4	0.39	-0.24	0.49	**0.85**	-0.10	0.44	0.44	0.26	0.39	0.33	0.29	0.36	0.33
CX1	-0.18	0.12	0.02	0.02	**0.72**	-0.01	0.07	0.12	0.10	0.13	0.00	0.01	0.04
CX2	-0.37	0.20	-0.22	-0.16	**0.90**	-0.07	-0.12	0.07	-0.03	0.01	-0.16	-0.10	-0.07
CX3	-0.34	0.24	-0.20	-0.17	**0.95**	-0.09	-0.12	0.04	-0.05	0.03	-0.20	-0.11	-0.11
CX4	-0.21	0.20	0.01	-0.11	**0.83**	-0.17	-0.10	0.05	-0.04	0.06	-0.12	-0.07	-0.09
TC1	0.40	0.00	0.37	0.51	-0.11	**0.76**	0.49	0.10	0.30	0.27	0.46	0.34	0.31
TC2	0.37	-0.09	0.42	0.44	-0.05	**0.87**	0.63	0.33	0.50	0.41	0.50	0.56	0.49
TC3	0.23	-0.04	0.16	0.31	-0.13	**0.82**	0.52	0.18	0.35	0.27	0.47	0.46	0.38
TMS1	0.48	-0.09	0.45	0.49	-0.15	0.62	**0.92**	0.19	0.39	0.37	0.60	0.49	0.50
TMS2	0.39	-0.12	0.45	0.44	-0.11	0.61	**0.95**	0.30	0.47	0.41	0.58	0.56	0.49
TMS3	0.42	-0.16	0.49	0.50	-0.11	0.67	**0.95**	0.33	0.47	0.46	0.60	0.60	0.55
CP1	0.15	-0.03	0.18	0.14	0.12	0.18	0.22	**0.91**	0.49	0.52	0.28	0.47	0.36
CP2	0.14	-0.02	0.17	0.17	0.06	0.20	0.21	**0.90**	0.44	0.52	0.25	0.45	0.35
CP3	0.28	0.03	0.28	0.26	-0.01	0.31	0.34	**0.87**	0.56	0.71	0.37	0.58	0.45
NP1	0.33	-0.16	0.43	0.38	-0.06	0.45	0.46	0.52	**0.93**	0.50	0.57	0.62	0.55
NP2	0.34	-0.03	0.33	0.33	-0.07	0.44	0.42	0.42	**0.88**	0.47	0.51	0.54	0.54
NP3	0.28	-0.08	0.33	0.30	-0.01	0.36	0.35	0.54	**0.81**	0.44	0.43	0.49	0.42
MP1	0.37	-0.05	0.38	0.37	0.03	0.38	0.45	0.66	0.54	**0.95**	0.44	0.56	0.48
MP2	0.33	-0.04	0.33	0.35	0.03	0.39	0.43	0.62	0.50	**0.98**	0.43	0.51	0.47
MP3	0.32	-0.03	0.30	0.30	0.04	0.36	0.41	0.65	0.53	**0.97**	0.42	0.50	0.45
SaaSi1	0.57	-0.16	0.57	0.49	-0.20	0.55	0.60	0.33	0.55	0.47	**0.91**	0.69	0.59
SaaSi2	0.49	-0.08	0.46	0.38	-0.22	0.52	0.60	0.32	0.51	0.39	**0.92**	0.64	0.56
SaaSi3	0.31	-0.05	0.32	0.30	-0.07	0.49	0.48	0.26	0.48	0.31	**0.82**	0.62	0.53
SaaSa1	0.44	-0.18	0.46	0.42	-0.12	0.57	0.61	0.45	0.58	0.47	0.80	**0.91**	0.71
SaaSa2	0.40	-0.18	0.41	0.42	-0.10	0.51	0.49	0.55	0.59	0.52	0.61	**0.94**	0.62
SaaSa3	0.36	-0.17	0.40	0.34	-0.09	0.49	0.54	0.59	0.59	0.53	0.61	**0.94**	0.64
SaaSr1	0.36	-0.10	0.35	0.38	-0.14	0.41	0.50	0.37	0.50	0.37	0.58	0.64	**0.90**
SaaSr2	0.34	-0.15	0.38	0.34	-0.10	0.44	0.50	0.40	0.52	0.46	0.58	0.65	**0.94**
SaaSr3	0.30	-0.06	0.34	0.34	-0.04	0.48	0.49	0.43	0.55	0.48	0.56	0.62	**0.88**

Note: Cost savings (Cost); Security concerns (Sec); Relative advantage (RA); Compatibility (Comp); Complexity (CX); Technology competence (TC); Top management support (TMS); Coercive pressures (CP); Normative pressures (NP); Mimetic pressures (MP); intention to adopt SaaS (SaaSi); SaaS adoption (SaaSa); SaaS routinization (SaaSr). All loadings have an absolute value greater than 0.5.

The discriminant validity of the constructs was examined using two criteria: the Fornell–Larcker criterion and cross-loadings. First, the Fornell–Larcker criterion requires that the

square root of AVE be higher than the correlations between the construct (Fornell & Larcker, 1981). As shown in Table 6.4, the square root of AVE (diagonal elements) is higher than the correlations between the constructs. Second, the factor loading must be higher than all cross loadings (Chin, 1998). As seen in Table 6.5, all loadings are higher than the cross-loadings. Thus both measures satisfy the discriminant validity of the constructs.

The assessments of construct reliability, convergent validity, indicator reliability, and discriminant validity of the constructs are satisfactory, indicating that the constructs can be used to test the conceptual research model.

6.6.2 Structural model

The significance of the path coefficients was assessed by means of a bootstrapping procedure with 5000 iterations of resampling (Hair, Ringle, & Sarstedt, 2011; Henseler et al., 2009). The PLS results are shown in Figure 6.2. The results of our analysis indicate that the effect of cost savings ($\hat{\beta}$ =0.61; p<0.01) as an antecedent of relative advantage is statistically significant, whereas the effect of security concerns on relative advantage is not statistically significant. Thus, the hypothesis of cost savings as a predictor of relative advantage (H1a) is confirmed. The hypothesis that security concerns negatively influence the relative advantage of SaaS (H1b) is not confirmed. The research model explains 40.0% of variation of the relative advantage.

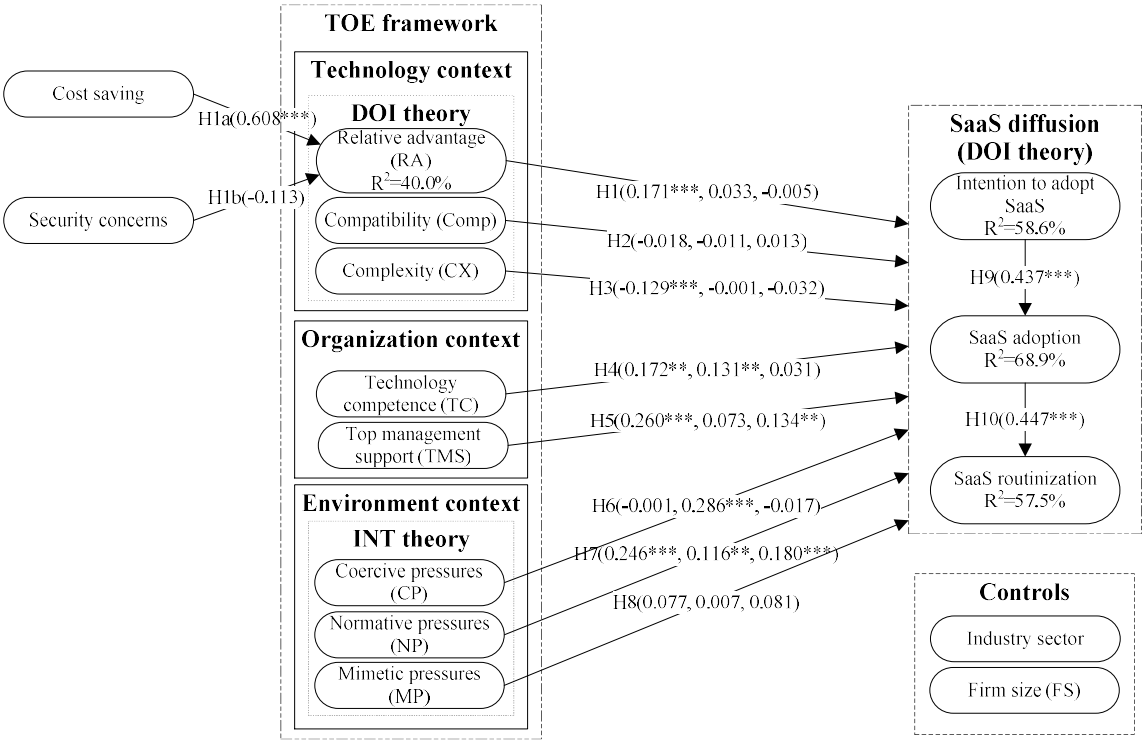
To assess the influence of the technology, organization, and environment context, the direct effects of each variable on the three SaaS diffusion stages are evaluated. The arrows in Figure 6.2 indicate the variables that are statistically significant to each of the adoption stages. The results suggest that relative advantage ($\hat{\beta}$ =0.17; p<0.01), complexity ($\hat{\beta}$ =-0.13; p<0.01), technology competence ($\hat{\beta}$ =0.17; p<0.05), top management support ($\hat{\beta}$ =0.26; p<0.01), and normative pressures ($\hat{\beta}$ =0.25; p<0.01) are statistically significant to explain the intention to adopt SaaS. The research model explains 58.6% of variation in intention to adopt SaaS.

For the SaaS adoption stage, the results indicate that technology competence ($\hat{\beta}$ =0.13; p<0.05), coercive pressures ($\hat{\beta}$ =0.29; p<0.01), normative pressures ($\hat{\beta}$ =0.12; p<0.05), and

intention to adopt SaaS ($\hat{\beta}$ =0.44; p<0.01) are statistically significant in explaining SaaS adoption. The model explains 68.9% of variation in SaaS adoption.

With regard to SaaS routinization, the results show that top management support ($\hat{\beta}$ =0.13; p<0.05), normative pressures ($\hat{\beta}$ =0.18; p<0.01), and SaaS adoption ($\hat{\beta}$ =0.45; p<0.01) are statistically significant. The model explains 57.5% of variation in SaaS routinization.

Thus, hypotheses H1a, H7, H9, and H10 are supported, and H1b, H2, and H8 are not supported. For hypotheses H1, H3, H4, H5, and H6, the study suggests that the variables have a varying influence on the SaaS diffusion stages. In other words, not all variables influence all stages of SaaS diffusion.



Note: Standardized coefficients. * p< 0.10; ** p < 0.05; *** p < 0.01

Figure 6.2 - Structural model of SaaS diffusion.

6.7 DISCUSSION

This study seeks to understand the determinants of SaaS diffusion and their influence on the three stages of diffusion (i.e., intention, adoption, and routinization). The degree of influence between the stages is also taken into account. The results show the direct effect of five determinants on the intention to adopt SaaS (i.e. relative advantage, complexity, technology competence, top management support, and normative pressures). Four determinants (technology competence, coercive pressures, normative pressures, and intention to adopt SaaS) have a direct effect on SaaS adoption, and three determinants (top management support, normative pressures, and SaaS adoption) have a direct influence on SaaS routinization. The discussion of the results is presented below.

Technology context

Relative advantage was found to have a positive influence on the intention to adopt SaaS. This finding is consistent with earlier innovation studies (Chong & Chan, 2012; Martins et al., 2015). The results suggest that firms consider it worthwhile to evaluate whether investment in SaaS may leverage greater organizational advantages. Advantages of using SaaS may include business process operations efficiency, operations quality, speed of task execution, increasing business productivity, and the possibility of new opportunities. Firms may assess the advantages of SaaS to determine if it may improve their competitive position relative to the peers. Although relative advantage was not found to have a direct effect on the remaining two stages of SaaS diffusion, the total effect (i.e., direct effect and indirect effect combined, 0.033+0.171*0.437= 0.108) of relative advantage is found to be statistically significant in explaining SaaS adoption stage (see Appendix A). Since providers may have different commercial SaaS packages, during the evaluation stage the firm not only evaluates the advantages of SaaS, but also evaluates the various suppliers and their SaaS offerings.

Firms tend to associate the SaaS concept with cost savings (Benlian & Hess, 2011). We therefore added this variable to explain relative advantage. Our results confirm cost savings as an indicator of the relative advantage of SaaS. Similar findings are reported in earlier studies (Benlian & Hess, 2011; Oliveira et al., 2014). In addition, the total effect (see Appendix A) of cost savings was found to be statistically significant in explaining intention to adopt SaaS (0.608*0.171=0.104) and SaaS adoption stages (0.608*0.171*0.437+0.608*0.033=0.066).

Firms may view security concerns as a drawback to SaaS adoption (Benlian & Hess, 2011). The results of our study did not find security concerns to be a statistically significant predictor of relative advantage. It may be that firms are more confident in the increasing efforts of SaaS providers to ensure data integrity and privacy (Oliveira et al., 2014). However, this finding contrasts with other studies that have reported security concerns of SaaS (Benlian & Hess, 2011). Since earlier studies pre-date the current scale of SaaS adoption, further research is required to determine whether firms have reached a point at which security concerns of SaaS may not outweigh its benefits.

Compatibility was not found to be significant to any stage in the diffusion of SaaS. This finding is comparable to those of earlier innovation studies (Low et al., 2011). Compatibility is viewed as the ability to integrate SaaS within the firm's existing business process and IT systems. Commonly the interface development needed to ensure the normal flow of data between SaaS based applications and the firm's software is guaranteed by the provider. This may suggest the lack of concern regarding SaaS compatibility in the firm's value chain activities.

Complexity is an inhibitor to the intention to adopt SaaS. Other studies have also found complexity to negatively influence the adoption of innovation (Wang et al., 2010). Complexity associated with SaaS incorporates the learning effort and disruption of business operations. It may stem from a firm's poor comprehension of its own role and the supplier's role in SaaS integration. The lack of knowledge regarding complexity may result in the firm perceiving a need for new skills for SaaS implementation and use. Our study indicates that complexity affects only the initial stage of SaaS diffusion. Complexity was not found to be statistically significant to the two following stages (i.e. adoption and routinization).

Organization context

Technology competence was found to be a predictor in the early stages of SaaS diffusion (i.e. intention to adopt SaaS, and SaaS adoption). This finding is consistent with earlier studies on innovation (Venkatesh & Bala, 2012). Technology competence includes the firm's resources such as IT infrastructure and the IT professionals (i.e. experts to implement SaaS) available in the firm. Our study indicates that availability of these resources in the firm may have an impact on SaaS adoption. Firms are more likely to consider or adopt SaaS if they have the technology competence required to implement it. Technology competence is not

found to have an effect on SaaS routinization. This is not surprising given the positive influence of technology competence on the early stages of SaaS adoption. As the routinization stage is mostly the access and use of the software in the business processes, it is possible that firms assimilate SaaS without the need for more technological skills or IT knowledge needed for its execution.

Top management support is found to have a direct effect on the intention to adopt SaaS and SaaS routinization stages. Although the study does not indicate a direct influence of this variable on the SaaS adoption stage, the total effect (0.073+0.260*0.437=0.187) of top management support ($p<0.01$) toward SaaS adoption was found to be significant (see Appendix A). The study thus reveals the importance of top management support in all stages of SaaS diffusion, and re-affirms the relevance of this variable in the adoption of technology innovation.

Environment context

Coercive pressures are found to be statistically significant to the SaaS adoption stage. This finding is consistent with those reported in other innovation studies (Hu, Hart, & Cooke, 2007). Coercive pressures are induced by the regulatory bodies, or parent corporations (Teo et al., 2003). The results of our study suggest that the firm perceives coercive pressures only in the adoption stage of SaaS. A plausible explanation is that the mandatory nature of coercive pressures forces the firm to adopt SaaS. The intention to evaluate the technology and routinize its use on a regular basis is not affected when the firm is faced with coercive pressures to adopt SaaS. Additional studies will help to determine the extent to which coercive pressures to adopt an innovation may drive the organizational decision to evaluate the technological solution.

Our results reveal that normative pressures are statistically significant for all SaaS diffusion stages. This finding is consistent with other similar IS innovation studies (Liang et al., 2007; Teo et al., 2003; Wu, Mahajan, & Balasubramanian, 2003). Sharing information, and norms between entities (i.e. customers, suppliers, and government entities) may equate to the firm's intention to initiate the evaluation of SaaS. Adoption by partnering entities together with news of successful experiences may have an impact on the firm's diffusion of SaaS (Swanson & Ramiller, 2004). Partnering suppliers, customers, and government agencies that have

implemented SaaS may also exert normative pressure leading to the routinization of SaaS in the firm's business processes.

Surprisingly, mimetic pressures are not statistically significant in any of the SaaS diffusion stages. This result is at odds with the findings of other studies in the IS literature that report support for mimetic effect in the firm's actions toward innovations adoption (Teo et al., 2003). It is possible that SaaS is becoming so widely adopted and accepted by competitors that it does not affect the interest that the firm might have in SaaS.

Diffusion stages

This study evaluated SaaS assimilation within a firm as a multi-stage process conceptualized in three stages - intention to adopt SaaS, SaaS adoption, and SaaS routinization. Our findings indicate that each stage is significant during the transition. The results show that intention to adopt SaaS affects SaaS adoption, which in turn affects the SaaS routinization. The results are consistent with other studies on diffusion of innovation (Chan & Chong, 2013). Together with the systematic assessment of the contextual factors on each stage, our study reveals the direct and total effects of the determinants that shape the diffusion of SaaS in an organization. Our study thus offers valuable insights to managers and IS researchers, which are summarized next.

6.7.1 Managerial Implications

This study offers several insights of interest to practitioners. It draws attention to direct and indirect effects of the innovation characteristics, institutional pressures, and technology-organization-environment perspectives at three stages of SaaS diffusion. By highlighting the differential effects of the variables on each stage, the study offers insights to managers as the organization considers SaaS for its value chain activities.

In the intention to adopt stage of the SaaS diffusion process, the study indicates that managers may recognize the relative advantage of cost savings and relative advantage. Although integration of SaaS in the value chain may require process reengineering and reconfiguration, identifying improvements in operations efficiency, quality, and productivity, and speed of task execution may position the organization to move to the next stage in the diffusion process (i.e. adoption). Our results do not indicate that security concerns are less

advantageous to the intention to adopt SaaS. We speculate that this may have to do with the increased efforts from SaaS providers to ensure the integrity and availability of services rendered. Since security issues were reported as a relevant factor in earlier studies (Benlian & Hess, 2011), we believe that this initial concern has triggered action from the SaaS providers to address these concerns. Therefore, when considering SaaS acquisition, we recommend that managers perform adequate analysis to determine related improvements to the value chain activities. Even though security concerns were not found to be relevant in our study, we recommend that firms not overlook security issues, and continue to evaluate the measures implemented by the suppliers.

Complexity is another factor that is found to be relevant at the intention stage. Our study suggests that organizations are more concerned about the complexity of integrating SaaS in the business processes than its compatibility with the existing systems. This may suggest a lack of knowledge among firms regarding SaaS technology prior to its adoption. Complexity is not found to be significant in the later stages of adoption. Thus, many of the questions surrounding complexity of SaaS may disappear once the SaaS technology has been adopted. When considering the various SaaS solutions, identifying providers who have implemented SaaS solutions among their peers may benefit the firm in minimizing possible complexity issues. When evaluating the suitability of SaaS, managers may also wish to ensure that adequate technology competence required for SaaS implementation is present. This requirement relates to IT infrastructure or technical competence of its human resources in understanding and implementing SaaS technology. Since the adoption of SaaS may entail changes to the firm's business processes, the support of top management is crucial. When the top management establishes a vision for utilizing SaaS, formulates strategies for diffusion, and communicates support, it may engender the confidence needed for managers to explore SaaS in the intention stage. With respect to the environmental context, the results suggest that normative pressures may be more important during the intention stage. Our study suggests that firms may be more willing to consider SaaS if partnering firms share rules, norms, or information related to SaaS (Powell & DiMaggio, 1991).

In the adoption stage of the SaaS diffusion process the direct effects of the determinants are more significant in the organization and the environment context than in the technology context. Although our study did not indicate direct influence of cost savings, relative advantage and top management support in this stage of SaaS adoption (see Figure 6.2) the total effect (direct effect and indirect effect combined) of these variables are found to be

relevant (see Appendix A). This highlights the support from top management for the adoption of SaaS when cost savings is identified as a relative advantage. To assist the top management in gauging this relative advantage, managers can establish service expectations, stipulate performance goals, and measure performance outcomes at the firm's functional units that utilize SaaS. Another noteworthy determinant in the adoption stage of SaaS is coercive pressures. A plausible explanation is that the degree of institutional dependence may compel the firm to align its behavior with organizations in the industry association, resource-dominant peers, and regulatory agencies. As in the previous stage of the diffusion (i.e., intention to adopt), normative pressures from suppliers and customers are also a strong driver for SaaS adoption.

In the routinization stage the external influence of normative pressures was found to be most important. SaaS may be favorably viewed by the firm's suppliers, customers, and government agencies once it has been accepted, adopted, and institutionalized within the firm. Routinization of SaaS may call for redesigning the business processes and coordinating organizational changes. This may explain the continued role of top management support in the routinization stage as revealed in our empirical findings.

6.7.2 Theoretical Implications

Our research makes important contributions to the SaaS literature. First, researchers have emphasized the need for holistic approaches that integrate more than one theoretical perspective for the study of IT innovations (Fichman, 2004; Lyytinen & Damsgaard, 2011; Oliveira & Martins, 2011; Oliveira et al., 2014). Our study responds to this call and incorporates three well known IS theories (i.e. TOE framework, DOI theory and INT) for the study of SaaS. Using an integrative approach that brings together the technology, organization, and environment perspectives we develop a research model to assess the determinants of SaaS diffusion.

Second, unlike earlier studies that focus on either the intention stage or the adoption stage of SaaS, we use the research model to evaluate all stages of SaaS diffusion in an organization. The study of an isolated stage does not provide a thorough understanding of the assimilation of technology in the organization (Chan & Chong, 2013). Our study thus demonstrates the deeper insights that can be gained from simultaneously assessing the various stages of technology diffusion. Furthermore, to the best of our knowledge, no earlier studies have

taken a holistic approach to empirically validate the direct and indirect effects of the innovation characteristics of SaaS diffusion and the underlying technology, organization, and environment context. Our study not only addresses an important research gap, but also contributes to the wider body of scientific knowledge on SaaS adoption and use.

Third, our study offers empirical evidence of the suitability of integrating theories in diffusion studies. In developing our research model, we integrated institutional pressures from INT with the environment context of the TOE framework. Although research has already been conducted in this manner (i.e. integrating the INT in the environment context of TOE) (Ciganek et al., 2014; Yoon & George, 2013), our study reinforces this applicability and establishes a new methodological path for future studies. The replication of its appropriateness helps to reconcile earlier efforts, the absence of which inhibits future scientific progress (McDaniel et al., 2006). Additionally, we combined the TOE framework with the DOI theory to enrich the research model.

Finally, the research model and instrument enabled us to systematically determine the effect of sets of variables on each stage of the diffusion process. The results of our study also indicate a high explanatory power of our integrative research model. The model and the instrument can be successfully applied in other technology diffusion studies.

6.8 LIMITATIONS AND FUTURE DIRECTIONS

The study has limitations that may pave the way toward future research. First, this investigation does not assess whether the results differ across multiple industries. Future research may consider a comparative study across different types of industries. Since this research was conducted in Portugal, it would be interesting to investigate if the results are consistent in other countries. Second, since this study does not specify the type of SaaS-based application, it would be interesting to consider whether such a distinction would produce differential results. Third, SaaS adoption is a dynamic process that is evolving before our eyes. Our study does not offer a longitudinal perspective on the diffusion stages. As with earlier innovation adoption studies (Zhu, Kraemer, et al., 2006), we suggest additional research to assess SaaS diffusion over an extended period of time. For future directions we additionally suggest that the model developed herein and its applicability in studies of other IS technologies may be compared and discussed.

6.9 CONCLUSION

SaaS is a technology innovation that has witnessed increasing importance to a firm's IT services portfolio (Cho & Chan, 2013). It allows firms to access software capabilities with minimal installation costs and infrastructure requirements (Suarez et al., 2013). The presumed benefits include performance improvement, time savings, easier collaboration, reduced capital investment, and global accessibility (Kim et al., 2012). We conduct an empirical study to examine the SaaS diffusion process across three stages, namely intention, adoption, and routinization. To assess the effects of the determinants on the different stages of SaaS diffusion we develop a conceptual research model based on the technology, organization, and environment perspectives, the innovation characteristics, and institutional pressures. The integrative research model was evaluated using data from 265 firms. It is found that sets of factors have different effects on each stage of SaaS diffusion.

The results indicate that cost savings, relative advantage, complexity, technology competence, top management support, and normative pressures influence the intention to adopt SaaS. Cost savings, relative advantage, technology competence, top management support, coercive pressures, and normative pressures influence the adoption stage of SaaS. Top management support, and normative pressures influence the routinization of SaaS within the organization. Each stage is relevant to the diffusion of SaaS, as intention to adopt SaaS influences SaaS adoption, which in turn influences SaaS routinization. The study offers valuable insights to organizational decision makers, IT managers, and IS researchers who may wish to examine the diffusion process of SaaS in an organization.

Chapter 7 – Contextualizing the drivers of SaaS usage and assessing continuance intention

7.1 INTRODUCTION

Software as a service (SaaS) is an innovation in the software technology that offers several advantages. It allows firms to access software via the Internet without on-premise installations (Kim et al., 2012). 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). When the technology was first introduced firms demonstrated willingness to move non-critical information systems (IS) functions to SaaS based solutions. Today many organizations are more receptive to moving core IT functions (Tsipi 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), there remains uncertainty about its use and the organization's continuance intentions toward SaaS in their businesses. Although several reasons for SaaS adoption have been identified (McHall, 2011), it still remains unclear what factors influence the organizational use of SaaS and its continuance intention. In this study, we treat continuance intention similarly to a repurchase decision. It follows an adoption decision, influenced by the usage experience, and may reverse the initial adoption decision or extend on an enterprise-wide scale to other business areas of the company (Bhattacherjee, 2001; Venkatesh, Thong, Chan, Hu, & Brown, 2011).

A few studies have addressed SaaS diffusion at the firm level. They mainly focus on the early stage of the diffusion process, i.e., the initial stages of the adoption of SaaS (Benlian, 2009; Wu, 2011b; 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 continuance behavior, which leads to a continuance intention regarding the technology (Venkatesh et al., 2011). Post-adoption is therefore a key topic in IS research that is only now starting to receive the attention it deserves (Bhattacherjee, 2001; Bhattacherjee & Premkumar, 2004; Venkatesh et al., 2011). Although the importance of SaaS in today's global market cannot be

ignored, few studies have assessed its use, and no studies have addressed the strategic continuance intentions. To bring more clarity to the diffusion process, further research on post-adoption dynamics is necessary (Zhu, Dong, et al., 2006). In this study we address this important research gap.

SaaS continuance describes the continuous usage behavior that can take the use of SaaS into other business areas of the firm (Benlian et al., 2011). It includes the continuance intention and the continuous use of a technology (Bhattacherjee, 2001; Li & Liu, 2014). For the study of post-adoption of a technology, IS literature suggests the need for a theoretical model to analyze the technological, organizational, and environmental elements (Iacovou et al., 1995b; Zhu, Dong, et al., 2006; Zhu & Kraemer, 2005). These are the contexts that affect technology use within an organization (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 (Zhu & Kraemer, 2005). The TOE framework has received ample empirical support (Chong & Chan, 2012; Yoon & George, 2013; Zhu & Kraemer, 2005), and has enabled researchers to explore the adoption 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 et al., 2014; Picoto et al., 2014; Venkatesh & Bala, 2012; 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; 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; 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; Im, Kim, & Han, 2008). Thus, additional research is needed to better theorize these effects. To advance our understanding of factors that influence an organization's use of SaaS, and its continuance intention, we develop a research model that links the TOE framework (Tornatzky & Fleischer, 1990), INT (DiMaggio & Powell, 1983), DOI (Rogers, 2010), and opportunity-risk framework (Benlian & Hess, 2011; Gewald & Dibbern, 2009).

This study makes three important 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, opportunity-risk model, and post-adoption literature. We then describe the research model and the hypotheses. The research methodology and results are presented. We then provide a discussion of the findings, followed by implications for practice and theory. We conclude by summarizing the limitations and directions for future research.

7.2 LITERATURE REVIEW

7.2.1 Software as a Service (SaaS)

SaaS emerged as an improved form of the application service provider (ASP) model (Kim et al., 2012; Xin & Levina, 2008). It bundles software delivery with cloud service (Chowdhury, 2012; Fan et al., 2009), transforming IT resources into a ubiquitous service (Susarla et al., 2010). Unlike ASP, SaaS is based on a multi-tenant architecture, allowing users on-demand access to software products (Benlian & Hess, 2011). It enables firms to conduct a range of value chain activities such as customer relationships, human resources, sales, and online transaction management without requiring capital investment in the installation and maintenance of the software (Zorrilla & García-Saiz, 2013).

Table 7.1- SaaS diffusion studies published in peer review journals

Topic	Theories	Methods	Data	Conclusions	Author
Software comparison SaaS vs. traditional software	Two-period model quality vs. investment	Comparative statistics	-	SaaS leads to higher software quality compared to traditional software.	**(Choudhary, 2007)**
SaaS adoption	Production cost economics, Resource based view, Property rights theory, Institutional theory, IT governance theory	-	-	-	**(Xin & Levina, 2008)**
Competition between SaaS and traditional software	Game theory approach	Comparative statistics	Two firms comparison examination	Costs may significantly affect the SaaS provider's ability to improve software quality.	**(Fan et al., 2009)**
SaaS adoption	Transaction cost theory, Resource-based view, Theory of planned behavior	Partial least squares (PLS)	Survey of 374 IT executives, Germany	Social influence, attitude toward SaaS, uncertainty, and strategic value are determinants for all SaaS application types.	**(Benlian et al., 2009)**
SaaS adoption	Perceived Risks and Perceived Benefits	Decision making trial and evaluation laboratory (Dematel)	Case study, Taiwan	Cost and benefits are essential factors for SaaS adoption.	**(Wu et al., 2011)**
Intention to increase the SaaS level	Opportunity-risk framework	Partial least squares (PLS)	Survey of 349 IT executives, Germany	Security threats are the dominant factor influencing IT executives' overall risk perceptions. Cost advantages are the strongest driver affecting IT executives' perceptions of SaaS opportunities.	**(Benlian & Hess, 2011)**
SaaS Quality, and its role in usage continuance	Service Quality	-	Survey of 172 firms	Rapport, responsiveness, reliability, flexibility, features, and security affect SaaS Quality. Perceived usefulness, satisfaction influence SaaS continuance	**(Benlian et al., 2011)**
Intention to adopt SaaS	INT, DOI theory	-	Survey of 289 retail firms	Interaction effects between mimetic pressure and perceived technology complexity	**(Kung et al., 2015)**
SaaS adoption	TOE framework	Partial least squares (PLS)	Survey of 173 organizational users	Technological, organizational, and environmental contexts are important for SaaS adoption	**(Yang et al., 2015)**
SaaS adoption	Two-factor theory	PEST analysis	Survey of 3 firms (24 responses)	Economic factors are drivers for SaaS adoption. Environment factors inhibited SaaS adoption	**(Lee et al., 2013)**
SaaS diffusion	TOE framework, INT theory, and DOI theory	Partial least squares (PLS)	Survey of 265 firms	Factors from the technological, organizational and environmental contexts act distinctively between the different stages of SaaS diffusion (i.e. intention, adoption, and routinization).	**(Martins et al., 2016)**

Although a few studies have addressed the SaaS diffusion process, they mainly address the initial stages of SaaS adoption (Benlian, 2009; Kung et al., 2015; Wu, 2011b; Xin & Levina, 2008). Table 7.1 summarizes pertinent studies, including their focus, theories used, and conclusions. As can be seen, none of the studies have assessed the level of actual SaaS use in the organization or continuance intentions. 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 on SaaS. Also, Martins et al. (2016) proposed a conceptual model for assessing the determinants of SaaS diffusion process (i.e. intention, adoption, and routinization). Their study addresses the topic from a holistic perspective to evaluate the SaaS decision process and analyze the direct effects, as well as the total (direct and indirect) effects of the variables. However their study does not assess the continuance intention. Nonetheless, this study follows their guidelines in terms of SaaS usage. In our research we develop a holistic research model using the integrative lens of the TOE framework, INT, DOI theory, and opportunity-risk framework to not only explain SaaS use, but also to assess the organization's SaaS continuance intentions.

7.2.2 Technology-organization-environment (TOE) framework

The TOE framework (Tornatzky & Fleischer, 1990) explains the diffusion process of complex innovations (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, company's practices (Starbuck, 1976), and the external technologies available for use (Hage, 1980). The organization context describes the company's size and the management structure (Venkatesh & Bala, 2012; Zhu, Kraemer, et al., 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 used to study the adoption of innovations such as mobile supply chain (Chan & Chong, 2013), radio frequency identification (Chong & Chan, 2012; Kim & Garrison, 2010; Wang et al., 2010), green IT (Bose & Luo, 2011), and cloud computing (Abdollahzadehgan et al., 2013; Low et al., 2011; Oliveira et al., 2014). It has also been used to evaluate the use of different types of innovations (Banerjee & Ma, 2012;

Martins et al., 2015; Picoto et al., 2014; Zhu, Dong, et al., 2006; 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; Picoto et al., 2014; Venkatesh & Bala, 2012; Yoon & George, 2013).

7.2.3 Institutional theory (INT)

The INT states that the firm's decisions are affected by cultural factors and the environment in which they act (DiMaggio & Powell, 1983; Heikkilä, 2013; Oliveira & Martins, 2011). The theory describes how firms operate as institutions in shaping behaviors and cognitions of individuals (Chatterjee et al., 2002). DiMaggio and Powell (1983) distinguished three types of isomorphic pressures on organizations: coercive, normative, and mimetic. Coercive pressures are the external formal and informal pressures exerted on organizations by other organizations upon which they depend. Normative pressures derive from regulations, standards, and the professionalism and knowledge among organizations. Mimetic pressures emanate from responses to uncertainty through copying actions of other firms (Liang et al., 2007; Scott, 2000; Swanson & Ramiller, 2004).

INT theory has been applied in the study of several technological innovations, such as electronic human resource management (Heikkilä, 2013), intranet (Baptista et al., 2010), green IS (Butler, 2011), and e-procurement (Soares-Aguiar & Palma-dos-Reis, 2008). Some studies have integrated INT with the TOE's environment context to enhance the explanatory power (Oliveira & Martins, 2011) and ensure the inclusion of cultural and institutional elements of the firm.

7.2.4 Diffusion of innovation (DOI) theory

The DOI theory (Rogers, 2010) describes the diffusion process of an innovation in five stages. The first stage is the knowledge stage, which describes the exposure to the innovation. The second is the persuasion stage, describing the degree of interest in the innovation. The third is the decision stage, in which there is a decision regarding the adoption of the innovation. The fourth is the implementation stage, which involves reporting the usefulness of the innovation. Finally, the fifth is the confirmation stage, which describes the reinforcement of the innovation. In this study we focus on the last two stages of the diffusion process of an innovation (i.e. implementation stage - SaaS use, and confirmation stage -

continuance intention). The DOI theory explains the dynamics of the diffusion process from the intention to adopt the innovation to its reinforcement. It has received strong empirical support in literature (Oliveira & Martins, 2011; Park, 2014; Zhu, Dong, et al., 2006). Many earlier innovation studies have established DOI's applicability in a wide range of areas including internet (Alam, 2009), e-procurement (Azadegan & Teich, 2010), e-business (Ifinedo, 2011; Zhu, Dong, et al., 2006), biometrics (Lancelot Miltgen, Popovič, & Oliveira, 2013), and cloud computing (Low et al., 2011; Oliveira et al., 2014).

7.2.5 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 (Lee, 2009), and SaaS (Benlian & Hess, 2011). In the SaaS context, Benlian and Hess (2011) suggest 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 (Zhu, Dong, et al., 2006). Most studies on the diffusion of SaaS have focused on the earlier stage of the diffusion process (i.e. intention to adopt, or adoption). Research is limited on better understanding 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 adoption cycle of SaaS diffusion within an organization.

7.2.6 Post-adoption

Post-adoption is the 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 (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 (Venkatesh et al., 2011) combined ECT and UTAUT to study the usage stage of IS and its continuance intention. Hong et al. (Hong, Thong, & Tam, 2006) integrated the ECT and TAM to study mobile internet usage. Wang (Wang, 2014) used TAM to study the post adoption phase of m-government in China. Roca and Gagné (Roca & Gagné, 2008) used TAM for the study of e-learning continuance. Saeed and Helm (Saeed & Abdinnour-Helm, 2008) used TAM to study post-adoption of web-based student information systems. Heijden (Van der Heijden, 2003) used TAM to explain the individual acceptance and usage of websites. Vatanasombut et al. (Vatanasombut, Igbaria, Stylianou, & Rodgers, 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 (Zhu & Kraemer, 2005), Zhu et al. (Zhu, Dong, et al., 2006), and more recently Saeed and Abdinnour (Saeed & Abdinnour, 2013) used DOI theory. Their studies demonstrated that the stages of post-adoption align well in the DOI theory.

7.3 CONCEPTUAL MODEL

We posit that the actual SaaS use of 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 (i.e., coercive, normative, and mimetic pressures) represent forces that are external to the organization, we include these factors in the environment context of TOE. Earlier studies have drawn on INT in a similar manner to enrich the environmental context of the TOE framework (Oliveira & Martins, 2011; Soares-Aguiar & Palma-dos-Reis, 2008; 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 joined the DOI theory with the TOE framework in this manner to enhance the explanatory power of research models (Hsu et al., 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 opportunity-risk framework is illustrated in Figure 7.1.

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. Coercive, normative, and mimetic pressures from INT are factors in the environment context. 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), we include both variables as antecedents of perceived opportunities and perceived risks respectively.

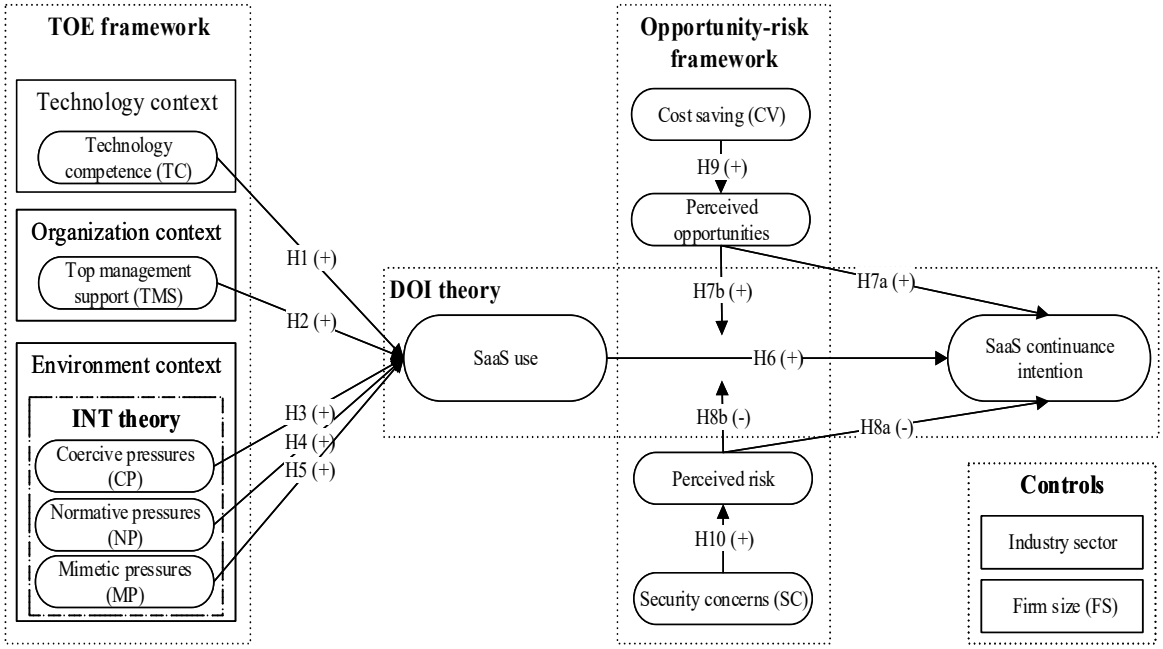


Figure 7.1 – The conceptual model for post-adoption of SaaS

7.3.1 Technology context

Literature identifies a positive relationship between technology competence and the use of innovations (Gibbs & Kraemer, 2004; Zhu, Dong, et al., 2006). Technology competence refers to the technological characteristics available in the organization such as the IT infrastructure and the IT professionals (Zhu & Kraemer, 2005). The IT infrastructure covers the installed technologies, systems, and applications (Ngai et al., 2007) within the firm that allow the use of a SaaS solution. IT professionals are the specialized human resources with the technical knowledge to support the use of SaaS. Technical resources available to the organization, which include the IT infrastructure and IT professionals together, can positively affect the innovation usage at a firm (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.

7.3.2 Organization context

Top management support plays an important role in the adoption of new technologies (Liang et al., 2007). It provides the vision, support, and commitment around the innovation (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 et al., 2009). Top management support is needed to commit resources and create the environment required for the diffusion of technology (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 (Wu et al., 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.

7.3.3 Environment context

Coercive pressures refer to the formal or informal pressures exerted on the firms from other organizations upon which they are dependent (DiMaggio & Powell, 1983; Teo et al., 2003). Government regulators and associations are examples of institutions that may coercively pressure the firm to adopt certain business practices (Liang et al., 2007). Resource dominant organizations and parent corporations are also sources of such pressures (Teo et al., 2003). 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 et al., 2003). The multiplicity of coercive pressure from the various sources can have a positive influence on the organization's 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, the general public, and suppliers on the adoption of new technologies (Wu et al., 2003). Under normative pressures, firms are persuaded to accept the shared decisions from the 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 et al., 2007; Liang et al., 2007). Firms may learn from their peers and achieve economic advantages by economizing on shared costs (Cyert & March, 1963) and minimizing experimentation costs (Levitt & March, 1988). Initiatives within the firm for SaaS use may initiate an imitating behavior. Firms may follow actions of other firms for compliance and use SaaS. Therefore,

H5. Mimetic pressures positively influence SaaS use.

7.3.4 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 (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 (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 the 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 on SaaS.

7.3.5 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 et al., 2009). There are widely 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 with a greater ability to perceive new opportunities (Venkatesh et al., 2012a) and boosts the firm's interest in applying SaaS to other areas of their 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 effect of SaaS use on continuance intention 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 regarding SaaS.

H7b. Perceived opportunities moderate SaaS use and continuance intentions regarding 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 (Lee, 2009). As the adoption of SaaS increasingly covers more critical functions, the associated risks tend to increase. Through the actual use of SaaS, firms shape their consciousness regarding SaaS risks, and they become more aware of its possible effects. Perceived risks may act negatively in the diffusion process and jeopardize the firm's continuance intention regarding SaaS (Benlian & Hess, 2011; Gewald & Dibbern, 2009). This suggests that if firms perceive high 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 (Yang & Lin, 2015). Thus, similar to the perceived opportunities but with the opposite effect, we expect 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 regarding SaaS.
H8b. Perceived risks moderate SaaS use and continuance intentions regarding 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 et al., 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 is perceived by firms as an opportunity (Benlian & Hess, 2011), which 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 (S. Lee et al., 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.

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

7.3.6 Control variables

To address possible data variations in the post-adoption stages of SaaS (Zhu, Dong, et al., 2006), control variables are required to account for differences in the firms (Liang et al., 2007). Based on literature reporting similar studies, we use industry and firm size as control variables (Zhu, Dong, et al., 2006).

7.4 RESEARCH METHODOLOGY

7.4.1 Measurement

To test the theoretical constructs a survey was carried out in Portugal. An instrument was developed to assess SaaS use in firms and their continuance intentions. All constructs were based on literature (see Table 7.2). The items were measured using a seven-point Likert scale ranging from "strongly disagree" to "strongly agree", and "very low" to "very high" for normative pressures. The instrument was reviewed for content validity by a group of five IS professionals and IS researchers familiar with SaaS.

The survey was translated from English to Portuguese and re-examined by the IS researchers and bilingual experts in order to ensure translational equivalence. A pilot test was conducted among 30 firms that were not included in the main survey. The results confirmed the reliability and validity of the instrument.

7.4.2 Data collection

An online version of the survey was emailed to 2000 firms in 2014. Only firms that actually use SaaS were considered. Dun & Bradstreet, one of the world's leading sources for commercial information, provided the company and contact data (i.e. name and email contacts of the qualified personnel within the firms). The study utilized the "key informant" approach for data collection to identify the respondents who are knowledgeable about SaaS (Benlian & Hess, 2011; Oliveira et al., 2014; Pinsonneault & Kraemer, 1993). The questionnaire thus targeted respondents who were qualified personnel within the firms (i.e. CIOs, directors, and senior IS managers). The questionnaire included an explanation of the purpose of the research and its scope. To increase content validity, we mentioned that individuals who are most familiar with the firm's direction concerning SaaS should complete

the survey. To increase the response rate, respondents were given the opportunity to receive the findings of the study. Two follow up emails were sent to non-respondents at two week intervals.

Table 7.2 - 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.	(A. Y.-L. 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.	(A. Y.-L. 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)

A total of 265 usable responses were obtained, yielding a response rate of 13.3%. To test for non-response bias the sample distributions of the early and late respondent groups were compared using the Kolmogorov–Smirnov (K–S) test (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 et al., 2003). No significant common method bias was found in the data set. The profile of the sample is shown in Table 7.3.

Table 7.3 - Sample characteristics (*n=265*) (SaaS post-adoption)

Industry			**Firm size (number of employees)**		
Manufacturing	83	31%	Micro (=<10)	20	8%
Construction	21	8%	Small (11-50)	54	20%
Services	119	45%	Medium (51-250)	131	49%
Commerce	24	9%	Large (>250)	60	23%
Health	10	4%			
Information and communication	8	3%			
Respondent's position					
Board member	22	8%			
CIO	6	2%			
IS Managers, Director IT, Head of IT	130	50%			
Other department managers	107	40%			

7.5 DATA ANALYSIS

Structural equation modeling (SEM) was used to empirically assess the research model. Partial least squares (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 et al., 2009), and as the items in our data are not normally distributed ($p<0.01$, Kolmogorov–Smirnov's test) (Chin et al., 2003), PLS path modelling is an appropriate method for this study. We used Smart PLS 2.0 M3 (Ringle, Wende, & Will, 2005) to evaluate the reliability and validity of the measurement model and analyze the structural model.

7.5.1 Measurement model

The results of the measurement model are shown in Tables 7.4 and 7.5. Construct reliability of scales was assessed using composite reliability (CR). The CR value is higher than 0.7 for all constructs (Table 7.4), 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 et al., 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 7.5, all loadings are above 0.7, indicating that the instrument presents good indicator reliability.

Table 7.4 – Correlation Matrix

Constructs	*AVE*	*CR*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1. TC	0.668	0.857	**0.817**										
2. TMS	0.882	0.957	0.676	**0.939**									
3. CP	0.804	0.925	0.270	0.293	**0.897**								
4. NP	0.758	0.903	0.483	0.473	0.560	**0.871**							
5. MP	0.934	0.977	0.394	0.444	0.663	0.542	**0.967**						
6. SaaSU	0.820	0.932	0.495	0.549	0.439	0.583	0.484	**0.906**					
7. PercO	0.871	0.953	0.441	0.572	0.280	0.418	0.430	0.464	**0.883**				
8. PercR	0.780	0.914	-0.145	-0.211	-0.084	-0.109	-0.099	-0.143	-0.362	**0.859**			
9. CS	0.822	0.933	0.405	0.458	0.220	0.367	0.352	0.369	0.761	-0.281	**0.933**		
10. SC	0.739	0.894	-0.033	-0.101	-0.008	-0.075	-0.026	-0.093	-0.122	0.562	-0.108	**0.907**	
11. SaaSInc	0.830	0.936	0.441	0.494	0.354	0.465	0.472	0.593	0.695	-0.263	0.500	-0.094	**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).

The discriminant validity of the constructs was examined using two criteria: Fornell–Larcker criteria and cross-loadings. The square root of AVE (diagonal elements) is higher than the correlations between the constructs (Table 7.4), so the first criterion (the 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) must be higher than cross loadings (Chin, 1998). As seen in Table 7.5, all loadings (in bold) are higher than the cross-loadings. Thus, the discriminant validity of the constructs is also adequate.

Table 7.5 – Factor analysis (SaaS post-adoption)

	TC	TMS	CP	NP	MP	SaaSU	PercO	PercR	CS	SC	SaaSInc
TC1	**0.741**	0.489	0.103	0.300	0.270	0.309	0.432	-0.102	0.404	0.026	0.379
TC2	**0.884**	0.629	0.331	0.499	0.406	0.494	0.407	-0.192	0.370	-0.059	0.433
TC3	**0.820**	0.524	0.180	0.351	0.265	0.381	0.254	-0.043	0.232	-0.030	0.265
TMS1	0.615	**0.919**	0.187	0.392	0.374	0.503	0.594	-0.195	0.479	-0.071	0.471
TMS2	0.614	**0.948**	0.298	0.469	0.413	0.485	0.488	-0.169	0.391	-0.087	0.419
TMS3	0.672	**0.951**	0.334	0.471	0.459	0.554	0.530	-0.227	0.420	-0.124	0.498
CP1	0.185	0.218	**0.914**	0.488	0.519	0.359	0.204	-0.067	0.145	-0.034	0.296
CP2	0.204	0.207	**0.905**	0.438	0.515	0.355	0.176	-0.071	0.140	-0.024	0.237
CP3	0.315	0.339	**0.870**	0.560	0.715	0.450	0.345	-0.086	0.284	0.028	0.398
NP1	0.449	0.462	0.523	**0.923**	0.504	0.553	0.417	-0.139	0.332	-0.127	0.444
NP2	0.443	0.418	0.415	**0.883**	0.473	0.537	0.337	-0.033	0.344	-0.013	0.383
NP3	0.361	0.347	0.542	**0.801**	0.437	0.419	0.337	-0.119	0.278	-0.053	0.388
MP1	0.385	0.447	0.657	0.539	**0.951**	0.479	0.425	-0.119	0.368	-0.033	0.458
MP2	0.390	0.426	0.615	0.505	**0.980**	0.476	0.413	-0.085	0.333	-0.022	0.465
MP3	0.365	0.412	0.652	0.528	**0.969**	0.448	0.406	-0.082	0.320	-0.021	0.447
SaaSU1	0.414	0.502	0.369	0.503	0.368	**0.896**	0.455	-0.189	0.360	-0.083	0.540
SaaSU2	0.446	0.499	0.395	0.526	0.460	**0.937**	0.414	-0.146	0.341	-0.125	0.543
SaaSU3	0.484	0.490	0.429	0.554	0.484	**0.884**	0.392	-0.056	0.303	-0.045	0.528
PercO1	0.424	0.544	0.210	0.381	0.362	0.404	**0.932**	-0.316	0.732	-0.052	0.611
PercO2	0.385	0.518	0.303	0.375	0.426	0.446	**0.942**	-0.371	0.702	-0.153	0.636
PercO3	0.425	0.540	0.270	0.415	0.415	0.449	**0.926**	-0.326	0.696	-0.137	0.698
PercR1	-0.048	-0.130	-0.007	-0.047	-0.020	-0.044	-0.254	**0.870**	-0.188	0.522	-0.158
PercR2	-0.096	-0.095	-0.088	-0.088	-0.100	-0.112	-0.267	**0.874**	-0.235	0.495	-0.187
PercR3	-0.234	-0.324	-0.125	-0.151	-0.140	-0.218	-0.430	**0.906**	-0.317	0.473	-0.345
CS1	0.329	0.351	0.235	0.330	0.311	0.299	0.599	-0.225	**0.864**	-0.134	0.410
CS2	0.373	0.416	0.181	0.305	0.320	0.349	0.712	-0.240	**0.943**	-0.064	0.461
CS3	0.394	0.468	0.191	0.363	0.328	0.352	0.745	-0.294	**0.911**	-0.101	0.483
SC1	-0.094	-0.165	0.016	-0.121	-0.044	-0.131	-0.173	0.576	-0.150	**0.888**	-0.174
SC2	0.029	-0.053	-0.072	-0.067	-0.059	-0.055	-0.079	0.444	-0.045	**0.864**	-0.047
SC3	0.002	-0.012	0.033	0.020	0.048	-0.035	-0.036	0.397	-0.065	**0.825**	0.015
SaaSInc1	0.428	0.464	0.370	0.426	0.445	0.540	0.562	-0.240	0.367	-0.093	**0.860**
SaaSInc2	0.361	0.416	0.279	0.425	0.393	0.535	0.648	-0.221	0.491	-0.076	**0.928**
SaaSInc3	0.419	0.472	0.324	0.421	0.454	0.546	0.685	-0.259	0.502	-0.090	**0.943**

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). All loadings presented with absolute value greater than 0.5.

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.

7.5.2 Structural model

The structural model was then 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. Figure 7.2 shows the PLS results of the final model.

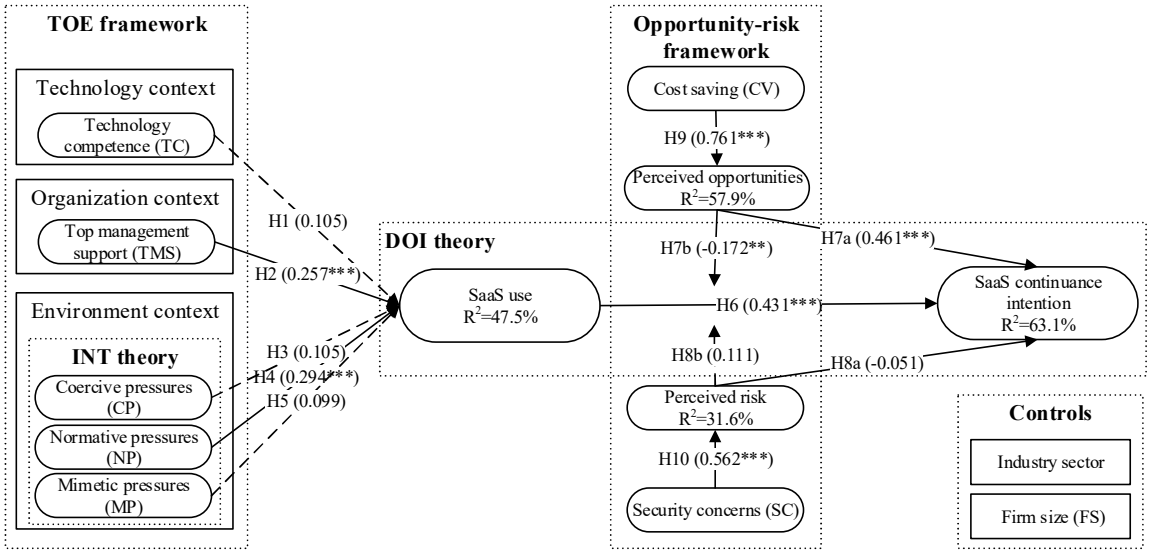


Figure 7.2 - Structural model (variance-based technique) for post-adoption of SaaS

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

The model explains 47.5% of variation in SaaS use. Top management support ($\hat{\beta}$ =0.26; p<0.01) and normative pressures ($\hat{\beta}$ =0.29; p<0.01) are found to be statistically significant in explaining SaaS use. Thus, H2 and H4 are supported. Technology competence ($\hat{\beta}$ –0.11; p>0.10), coercive pressures ($\hat{\beta}$ –0.11; p>0.10), and mimetic pressures ($\hat{\beta}$ –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 63.1% of variation. The results indicate that SaaS use ($\hat{\beta}$ =0.43; p<0.01) and perceived opportunities ($\hat{\beta}$ =0.46; p<0.01) are statistically significant in explaining SaaS continuance intention. Thus, H6 and H7a are supported. Perceived risks ($\hat{\beta}$ =-0.05; p>0.10) is found to be not statistically significant. Therefore, H8a is not supported.

The moderating effect of perceived risks (H8b) ($\hat{\beta} = 0.11$, p>0.10) is found to be not statistically significant. The moderating effects of perceived opportunities (H7b) ($\hat{\beta} = -0.17$; p<0.05) is confirmed but in a negative direction, indicating that the effect of SaaS use in 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 7.3).

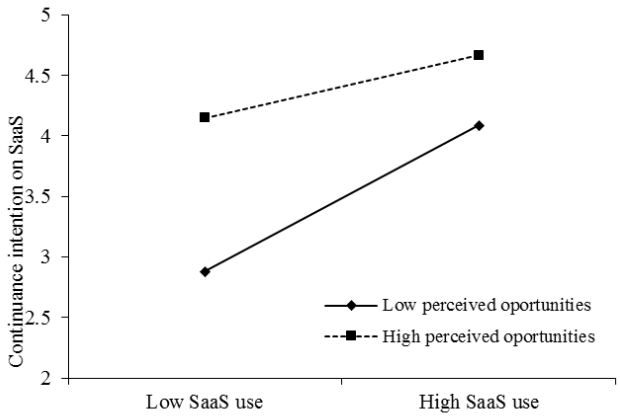


Figure 7.3 - Predicted SaaS continuance intention – Interaction between perceived opportunities and SaaS use.

The results of our analysis also indicate that the effects of cost saving ($\hat{\beta} = 0.76$; p<0.01) and security concerns ($\hat{\beta} = 0.56$; p<0.01) are antecedents of perceived opportunities and perceived risks, respectively. Thus, H9 and H10 are confirmed. The research model explains 57.9% of variation of the perceived opportunities, and 31.6% 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 that derives from each construct. The results are presented in Table 7.6. In Model 1 we used only the control variables to explain SaaS use and its continuance intention. It explains 2.4% of variation in SaaS use and 1.4% of variation in continuance intention. Model 2 represents the effect of TOE factors on SaaS use and continuance intention. It explains 47.5% of variation in SaaS use and 36.9% 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 37.3% of variation in SaaS continuance intention. In Model 4 we added perceived opportunities and risks to Model 3. The model explained 58.4% 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 54.6% 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 59.4% of variation in SaaS continuance intention. Note that in this model none of the TOE factors were found to be statistically significant in explaining SaaS continuance intention. The final model (Model 7), which emerged based on the research model proposed explains 63.1% of variation in SaaS continuance intention. Models 4, 5, 6, and 7 also explain 57.9% of variation in perceived opportunities and 31.5% 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 start 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 ($p<0.10$). The variance accounted for (VAF) was 0.78, indicating that SaaS use is a strong mediator of normative pressure on SaaS continuance intention.

Table 7.6 – 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)		2.4%		47.5%		47.5%		47.5%		47.5%		47.5%		47.5%
Technological competence (TC)			0.103		0.105		0.105		0.103		0.101		0.105	
Top management support (TMS)			0.260***		0.257***		0.257***		0.260***		0.261***		0.257***	
Coercive pressures (CP)			0.105		0.105		0.105		0.105		0.106		0.105	
Normative pressures (NP)			0.292***		0.294***		0.294***		0.292***		0.292***		0.294***	
Mimetic pressures (MP)			0.100		0.099		0.099		0.100		0.099		0.099	
Firm size	Included		Included		Included		Included		Included		Included		Included	
Industry dummies	Included		Included		Included		Included		Included		Included		Included	
Perceived opportunities (PercO)								57.9%		57.9%		57.9%		57.9%
Cost saving (CS)							0.761***		0.761***		0.761***		0.761***	
Perceived risk (PercR)								31.5%		31.5%		31.5%		31.5%
Security concerns (SC)							0.562***		0.562***		0.562***		0.562***	
SaaS continuance intention		1.4%		36.9%		37.3%		58.4%		54.6%		59.5%		63.1%
Technological competence (TC)			0.116						0.081		0.052			
Top management support (TMS)			0.222***						0.008		-0.057			
Coercive pressures (CP)			0.007						0.034		0.001			
Normative pressures (NP)			0.182**						0.110*		0.026			
Mimetic pressures (MP)			0.229***						0.126*		0.103			
Perceived opportunities (PercO)							0.516***		0.528***		0.489***		0.461***	
Perceived risk (PercR)							-0.033		-0.039		-0.040		-0.051	
SaaS use (SaaSu)					0.607***		0.355***				0.307***		0.431***	
PercO * SaaSu													-0.172**	
PercR * SaaSu													0.111	
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.

7.6 DISCUSSION

We conducted a comprehensive empirical assessment of the SaaS diffusion stages (i.e. SaaS use, and continuance intention) using an integrated research model that combines the TOE framework, INT, DOI theory, and opportunity-risk framework. The results indicated that SaaS use is influenced by two factors, namely top management support and normative pressures. 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 7.2).

Our findings indicated that SaaS use is not affected by the firm's technology competence. Although some studies have found technology competence to be an important determinant of IT innovation adoption and use (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. As suggested by the survey results, the firm needs only to ensure that adequate knowledge is available for SaaS integration within the organization.

In the technology context, top management support was found to have a positive influence on SaaS use. This finding is consistent with other innovation studies, such as those regarding mobile supply chain management (Chan & Chong, 2013), and cloud computing (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 environment context, only normative pressures were found to be significant to SaaS use. The results are consistent with other studies on IT innovation that have 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 can 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 transfers 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 acquisition.

Within the diffusion process, SaaS use was found to be a facilitator for SaaS continuance intention. Similarities to this finding related to stages of adoption have been suggested in other studies (Bose & Luo, 2011; Zhu, Chang, Luo, & Li, 2014; 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 increase SaaS proliferation in 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, the importance of current SaaS use on the continuance intention decreases. 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 prior research has reported a weaker effect of perceived risks on the continuance intention stage of prominent emerging technologies (Chiu et al., 2014). The survey results seems to suggest that providers of SaaS are ensuring the correct application of security measures in order to minimize potential risks. Firms recognize those efforts, and are willing to considerer SaaS continuance without giving significance to the possible risks involved.

The study results indicate 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 diffusion within an organization. The findings may help firms to better assess SaaS options while formulating organizational strategies.

7.6.1 Practical Implications

Our findings revealed critical factors that influence the various stages of SaaS diffusion. 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, as SaaS use may not be shaped by coercive or imitative behavior, but by culture, values, and norms within the industry. In addition to providing the internal support of top management, it is therefore essential that managers understand industry-wide SaaS practices prior to developing strategic directives targeting continuance intention 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 be significant in the later stages of diffusion. Recent technological advances in SaaS security standards may help to minimize concerns of information leakage and data integrity (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 also find the study beneficial for the development of SaaS capabilities that increase the prospects of SaaS use within the firm shifting to continuance intentions.

7.6.2 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). In this study we differentiate the last two stages of the diffusion cycle, namely current SaaS use and continuance intention, and empirically evaluate the determinants that influence the transition between them. Our 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 joining the TOE framework, DOI theory, INT, and opportunity-risk model seeks to provide a clear understanding of the SaaS diffusion process. Our new 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 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; Yang & Lin, 2015), ours offers theoretical depth in the analysis by presenting the moderation and mediation results and highlighting the variance explained by the theoretical constructs (Hong, Chan, Thong, Chasalow, & Dhillon, 2014). Our research thus makes a valuable contribution to the SaaS diffusion and use knowledge base. Researchers may find the model and the instrument applicable to diffusion studies of other emerging technologies.

7.6.3 Limitations and future directions

This research is not without limitations. First, it does not assess whether the results differ across the different types of SaaS based technologies. Future research may consider a comparative study between varying types of SaaS applications and the industry types. Second, data for this study were gathered during 2014 from one country, Portugal, right 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 is not considered in our study. Further research in order to extend the research model and

compare the results in different economic environments would be worthwhile. Third, 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 considered only the most important factors of the TOE framework and opportunity-risk model in the context of SaaS diffusion. As other factors may 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.

7.7 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 initial stages of the adoption of 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 opportunity-risk framework. The model was tested with a sample of 265 firms. The results indicate that top management and normative pressures positively influence SaaS use. The study also 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 indicated 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 is weaker among firms with higher perceived opportunities of SaaS.

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

Chapter 8 – Is the environmental context of the TOE framework limited to a direct influence on the adoption decision? - An empirical investigation into the software as a service (SaaS) adoption.

8.1 INTRODUCTION

Research on information technologies (IT) adoption is a very important line of investigation, helping us to understand the technology itself and its effects on a firm's productivity and competitiveness (Liu et al., 2010; Oliveira & Martins, 2011). Consequently, over the years several theories and explanatory frameworks have been developed to help understand this phenomenon. One such framework is the technology-organization-environment (TOE) model (Tornatzky & Fleischer, 1990). It explains the different factors that influence the innovation adoption at a firm level taking into consideration the technological, organizational, and environmental contexts. Since it was introduced, the TOE framework has often been modified in order to improve its explanatory power, and to help it to be adapted to the context of the technology studied. Researchers have also found it useful to integrate the TOE framework with other IT theories, such as diffusion of innovations (DOI) theory (Rogers, 2010), and institutional theory (INT) (DiMaggio & Powell, 1983) to better explain the adoption phenomenon. In the majority of studies, the analysis of the direct effect of TOE contextual factors is well established. TOE framework is one of the theoretical frameworks most widely applied to the study of technology adoption at firm level (Oliveira & Martins, 2011; Venkatesh & Bala, 2012; Zhu, Kraemer, et al., 2006), and can be a useful framework to understand newer technologies such as software as a service (SaaS) adoption.

SaaS refers to software remotely hosted, developed, managed, and delivered via internet by a service provider (Cho & Chan, 2013). In the information systems (IS) literature, it is recognized as a technology capable of providing several advantages to firms, such as operational and financial benefits, and it is rising as the dominant IT service delivery model (Subashini & Kavitha, 2011). SaaS is considered to be a promising solution (Wu, 2011a), and is garnering interest among researchers and business managers (Chou & Chiang, 2013) with a market forecasted to reach $112.8 billion in 2019 (Goode et al., 2015). Notwithstanding, SaaS can represent a vulnerability to firms (Benlian & Hess, 2011), given

that it is delivered via the internet, and firms often face serious challenges related to software availability and critical data management (Lee et al., 2013). The weighing of the pros and cons in terms of the technological, organizational, and environmental scope, leads to firms' uncertainty regarding SaaS adoption. So far, few studies have focused on this topic (Wu, 2011a), and more research is needed to improve our understanding of the SaaS adoption phenomenon (see Table 8.1).

The literature on SaaS has highlighted a non-direct influence of the environmental institutional factors in the adoption decision process (Schneider & Sunyaev, 2014). According to Schneider and Sunyaev (2014), the reason for such an outcome is related to the uniqueness of the SaaS environment, such as the uncertainty that emerges from the lack of transparency, and the immature legal situation that may allow for legal conflicts on data privacy (Boehler & Ramos, 2014). However, it seems that the outcomes of the environmental institutional pressures are mixed, as Kung et al. (2015) found a positive direct influence of mimetic and normative pressures on the intention to adopt SaaS. Although the study suffers from an incomplete sample (i.e. IT managers from manufacturing and retailing organizations), making it difficult to generalize, the results of the institutional influences are conflicting. In order to bring clarification on earlier results, new approaches of the environmental institutional pressures are needed. In their research on green supply chain management (GSCM) practices adoption Zhu and Sarkis (2007) approached matters in a different way by assessing the role of environmental pressures as moderators. Although they did not use the TOE framework in their study, they established the moderator effect pattern of the institutional pressures in the effect of GSCM practices and the organizational process. In light of the conflicting results surrounding the environmental factors regarding SaaS, and given newer approaches to view environmental pressures as moderators in other technology contexts, the following question arises: Can the environment-related factors outlined by the TOE framework act as a moderator in the context of SaaS adoption? The answer to this question provides newer avenues for approaching the TOE framework. Assessing the moderating influences of the environment factors over the technological and organizational factors provides a more contextualized view of the TOE framework (Martocchio & Frink, 1994). IT literature has a gap regarding the impact of the moderator effects within TOE framework and its importance in innovation adoption (Venkatesh & Bala, 2012). We hope with this study to contribute by filling that gap. Specifically, we develop a conceptual model incorporating the TOE framework and the INT theory for understanding SaaS adoption. We argue that this integration (the TOE framework and INT theory) will enhance the explanatory

power of our model to elucidate the SaaS adoption phenomenon (Oliveira & Martins, 2011). Moreover, our study also assesses the role of the environmental factors as moderators in the TOE framework.

The paper is structured as follows. First we discuss the broader literature on SaaS. We then introduce the TOE framework, INT theory, and SaaS. Next we present the research model and hypotheses, followed by methodology and data analysis. Then we present our results, and finally we discuss our findings and highlight the main conclusions.

8.2 THEORETICAL BACKGROUND

8.2.1 Software as a service (SaaS)

SaaS enables firms to access software applications in an outsourcing arrangement (Goode et al., 2015). It is based in a multi-tenant architecture, allowing providers to offer their users an on-demand access to several software products (Benlian & Hess, 2011), and firms remotely access a software that is hosted in an off-premise location via the internet (Espadas et al., 2013). The responsibility for the regular development and software maintenance lies with the service provider (Cho & Chan, 2013). Due to its IT architecture, SaaS offers several benefits, from the lower implementation costs to the higher rate of improvement in software quality (Choudhary, 2007).

Few studies have addressed the SaaS adoption topic (Wu, 2011b). Xin and Levina (2008) draw on an economic and strategic management model to study the factors affecting SaaS adoption. Their study suggests that the maturity of the firm's IT has an important role in terms of SaaS adoption. However, the study does not offer empirical evidence of its applicability.

Benlian et al. (2009) focused on the drivers for the different types of applications. Based on the transaction cost theory (TCT), resource-based view (RBV), and the theory of planned behavior (TBP), their study suggests that the social determinants are main influencers for SaaS adoption. However, the study did not examine how the social determinants influence the adoption (i.e. normative, coercive, or mimetic). Wu (2011a) used diffusion of innovation's theory and technology acceptance model (TAM) to study SaaS adoption, finding that social influence is a very important element for SaaS adoption, although the pattern of the influence was unclear.

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. Their research focused on the risks and benefits of SaaS, but did not consider possible environmental factors.

Wu (2011b) explored the perceived risks and benefits of adopting SaaS, using the decision making trial and evaluation laboratory (DEMATEL) approach. He found that strategic benefits outweigh the economic advantage in SaaS adoption, but focused on only the benefits and risks, neglecting other technological, organizational, and environmental factors.

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. Although they sought to improve knowledge from a multi-angular point a view, their data were limited to 24 surveys from IT consultants.

Yang et al. (2015) explored the technology, organization, and environmental contexts in organizational SaaS readiness by proposing a tripod readiness model. Yet, their study focused on only the direct effects of the variables. 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.

Table 8.1 – Studies on SaaS diffusion

Reference		IT	Theory /framework	Drivers	Data	Comments
(Yang et al., 2015)		SaaS readiness (software as a service)	TOE framework	**Technological:** Relative advantage, simplicity, compatibility, experienceability. **Organizational:** IT infrastructure, top management support. **Environment:** Competitor pressure, partner pressure. **Others:** Attitude toward SaaS Intention to use SaaS	Data from 173 firms	Their study focused on only the direct effects of the variables.
(Xin & Levina, 2008)		SaaS adoption	Production cost economics, Resource based view, Property rights theory, Institutional theory, IT governance theory.	Degree of desired software customization, demand uncertainty for client-specific functionality, demand uncertainty for service volume, client's cost capital, number of users, client's IT capability, institutional influences, enterprise IT architecture.		Their study did not offer empirical evidence of its applicability.

(Benlian et al., 2009)		SaaS adoption	Transaction cost theory, Resource-based view, Theory of planned behavior	**TCT:** Application specificity, application adoption uncertainty. **RBV:** Strategic value of application, application inimitability. **TPB:** attitude toward SaaS-adoption, subjective norm.	Survey of 374 IT executives, Germany	Their study did not examine how the social determinants influence the adoption (i.e. normative, coercive, or mimetic).
(Kung et al., 2015)		SaaS adoption	Institutional theory, DOI theory		Survey of 289 retail firms	Their study did not examine the moderating role of the INT variables' pressures on technological and organizational contexts.
(Lee et al., 2013)		SaaS adoption	PEST analysis	Customer factors, market factors, economic factors, supplier factors, political factors, social factors, technological factors.	Survey in 3 firms (24 responses)	Although their research aimed to improve knowledge from a multi-angular point a view, the data were limited to 24 surveys from IT consultants.
(Wu et al., 2011)		SaaS adoption	Perceived Risks and Perceived Benefits	Perceived Risks and Perceived Benefits factors		Their study focused on only the benefits and risks, neglecting other technological, organizational, and environmental factors.
(Fan et al., 2009)		SaaS and traditional software	Game theory approach	Comparative statistics		Their study did not consider moderator factors.
(Choudhary, 2007)		SaaS and perpetual licensing software	Two-period quality model	Price in period, software quality at different time periods, buyer type, ratio of second-generation vs. first-generation users, ratio of cost of quality for SaaS *vs*., perpetual licensing, benefit from basic features, component of utility function, social welfare under perpetual licensing and SaaS.		They model the differences in how new software features are disseminated in SaaS and perpetual licensing.
(Benlian & Hess, 2011)		SaaS adoption	Opportunity-risk framework	Salient risks beliefs: performance, economic, strategic, security, managerial risks. Salient opportunities beliefs: cost advantage, strategic flexibility, focus on core competencies, access to specialized resources, quality improvements.	Survey of 349 IT executives, Germany	They did not consider possible environmental factors.
(Benlian et al., 2011)		SaaS quality and usage continuance	IS SERVQUAL	Rapport, responsiveness, reliability, flexibility, features, security, SaaS quality, perceived usefulness, satisfaction, SaaS continuance intention.	Survey of 172 firms	Their study provided limited insight into the influence of technological, organizational, and environmental factors on SaaS.
(Martins et al., 2016)		SaaS diffusion	TOE framework, INT theory, DOI theory	Normative pressures are drivers for the three stages of SaaS diffusion. The influence of technological, organizational, and environmental variables vary in each stage of the diffusion process.	Survey of 265 firms	Their study did not offer insights on the moderator influences.

Martins et al. (2016) proposed a conceptual model for assessing the determinants of SaaS diffusion process (i.e. intention, adoption, and routinization). Their study does not offer insights on the moderator influences.

The majority of studies on SaaS adoption have focused on assessing the direct effects of a limited set of factors. Despite the relevance of earlier studies for the understanding of SaaS, researchers have been suggesting that testing the moderating effects are a significant part of the growing body of empirical research findings in IS (Carte & Russell, 2003). In SaaS, that part is missing. Considering the deeper understanding of the phenomenon that the moderator variables could give us, more effort should be made to assess its influences on SaaS. In this study we respond to this demand. To the best of our knowledge no study has undertaken a comprehensive approach to understand the moderator influences.

8.2.2 Technology-organization-environment (TOE) framework and Institutional theory (INT)

The TOE framework enables researchers to grasp the broader picture where the innovation occurs, integrating the different factors that influence adoption into their respective context (Bose & Luo, 2011; Venkatesh & Bala, 2012). The theoretical framework posits that technological, organizational, and environmental contexts influence the adoption of IT innovation at a firm level (Zhu, Kraemer, et al., 2006). The technological context describes the internal and external technologies relevant for the firm (Starbuck, 1976); the organizational context refers to the management structure (Venkatesh & Bala, 2012; Zhu, Kraemer, et al., 2006); and the environmental context is related to the external factors surrounding the firm's activity (Tornatzky & Fleischer, 1990). In existing research, the TOE framework has received considerable empirical support, as it has been successfully applied to the study of several types of technology adoption such as mobile supply chain (Chan & Chong, 2013), radio frequency identification (Chong & Chan, 2012; Kim & Garrison, 2010; Wang et al., 2010), green IT (Bose & Luo, 2011), inter-organizational business process standards (Venkatesh et al., 2012a), and cloud computing (Abdollahzadehgan et al., 2013; Low et al., 2011; Oliveira et al., 2014).

Notwithstanding, the TOE framework alone neglects the impact of inter-organizational relationships (Chan & Chong, 2013). IT literature reports that INT theory has the strength to reinforce the environmental context of the TOE framework (Oliveira & Martins, 2011),

considering the institutional pressures in explaining IT adoption. Joining the TOE framework and the INT theory together, we enhance the explanatory power of the conceptual model (Oliveira et al., 2014). The INT theory encompasses three types of isomorphic pressures: coercive, normative, and mimetic (DiMaggio & Powell, 1983). Coercive pressures derive from the external pressures exerted by institutions on which firms depend. Normative pressures emerge from professionalization and the concept of sharing knowledge between firms, creating common procedures. Mimetic pressures arise from an imitation process that firms apply, copying the actions of another firm (Liang et al., 2007; Scott, 2000; Swanson & Ramiller, 2004). The INT theory thus specifies these distinct institutional pressures that emerge from the firm's environment, and shape its behavior (DiMaggio & Powell, 1983; Ke et al., 2009). The theory posits that the firm's decision is beyond rational thinking, and instead drifts from its institutional context: firms tend to maximize their legitimacy in the decision-making process through the support of their institutional environment (Heikkilä, 2013; Kostova, 1999), and act according to what is expected, justifying their decision (Cui & Jiang, 2012; DiMaggio & Powell, 1983). INT theory has been successfully applied to the study of several innovations, such as electronic supply chain management (Ke et al., 2009), e-procurement (Soares-Aguiar & Palma-dos-Reis, 2008), electronic human resource management (Heikkilä, 2013), green IS (Butler, 2011), and intranet (Baptista et al., 2010). The INT theory provides understanding on the firm's structure and actions (Teo et al., 2003). Nonetheless, the INT theory does not consider the technological and organizational factors that influence the adoption process. Integrating INT theory in the TOE framework thus fills this gap (Tornatzky & Fleischer, 1990).

8.2.3 Drivers emerging from the literature

In our study, we include the theoretical factors from the TOE framework that are relevant for the SaaS adoption research. The factors were selected in a two step process (Venkatesh & Bala, 2012; Zhu, Kraemer, et al., 2006): first, we identified the factors using prior research based on the TOE framework; second, we reviewed them in the context of SaaS, and then adopted the ones that were most relevant to our context.

The selected factors were the following. Among the technological factors, technology competence (Kuan & Chau, 2001; Oliveira et al., 2014; Venkatesh & Bala, 2012; Yang et al., 2015; Zhu, Dong, et al., 2006; Zhu & Kraemer, 2005; Zhu, Kraemer, et al., 2006), which refers to the technological structure and IT knowledge to implement and explore the new

technology (Zhu & Kraemer, 2005), was seen as relevant. From the organizational context we identified top management support (Abdollahzadehgan et al., 2013; Bose & Luo, 2011; Chan & Chong, 2013; Oliveira et al., 2014; Tsai et al., 2010; Yang et al., 2015; Yoon & George, 2013), which ensures the convergence of the organization interests around the new technology (Lee & Kim, 2007). From the environmental context, competitive pressure and regulatory support were the most important (Bose & Luo, 2011; Kuan & Chau, 2001; Oliveira et al., 2014; Thomas et al., 2015; Zhu & Kraemer, 2005). However, it is our understanding that these factors do not provide broad environmental coverage for the study of SaaS adoption. Plus, competitive pressure and regulatory support factors which were already embedded in the INT theory, which covers in a more comprehensive way all the possible external forces that may influence SaaS adoption (DiMaggio & Powell, 1983; Yoon & George, 2013). Institutional pressures were found to be important influencers of adoption in earlier studies (Bala & Venkatesh, 2007). Thus, coercive, normative, and mimetic pressures were the selected factors identified from the environmental context (Powell & DiMaggio, 1991; Teo et al., 2003).

8.3 CONCEPTUAL MODEL

The proposed model for this research incorporates two established theoretical lenses: the TOE framework (Tornatzky & Fleischer, 1990) and the INT theory (DiMaggio & Powell, 1983). Based on the TOE framework, three categories of factors are considered as potential influencers of SaaS adoption: technology, organization, and environment. In the technology context, based on literature we selected technology competence (Oliveira et al., 2014; Venkatesh & Bala, 2012; Zhu, Kraemer, et al., 2006). In the organizational context, we nominated top management support (Abdollahzadehgan et al., 2013; Chan & Chong, 2013; Oliveira et al., 2014). Finally, in environment context we used INT theory (coercive pressures, normative pressures, and mimetic pressures), which complements this context of TOE framework (Oliveira & Martins, 2011).

In order to answer our initial question, “can the environment context act as a moderator of the others contexts (technological and organizational) in the adoption process?” we propose that the environment context has not only a direct effect on adoption of SaaS (as usual in adoption model literature), but also moderates the remaining contexts. Thus, we intend to advance understanding on how the different effects of technological and organizational

contexts are shaped by the environmental context. Figure 8.1 presents the conceptual model for SaaS adoption.

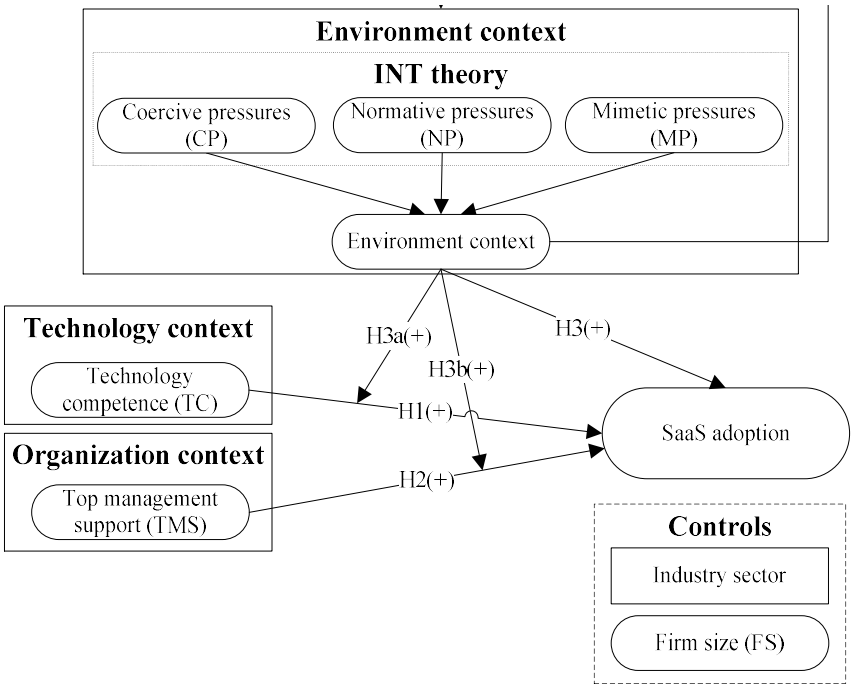


Figure 8.1 - Conceptual model of SaaS adoption

8.3.1 The Role of Technology-related Factors

Technology competence includes the technical infrastructure and human knowledge that can positively influence the firm's adoption of an innovation (Zhu & Kraemer, 2005). Previous research has identified technological competence as an important technology-related determinant of IT adoption (Oliveira & Martins, 2010b; Pan & Jang, 2008). In this study we posit that technology competence will have a positive effect in terms of SaaS adoption, as it enhances the firm's ability to access and better exploit the SaaS functionalities. Thus,

H1. Technology competence will positively influence SaaS adoption.

8.3.2 The Role of Organizational Factors

Top management support is the vision, support, and commitment required for the adoption of innovation (Lee & Kim, 2007). IT literature identifies top management support as an important factor that positively influences the adoption of technological innovation (Grover et

al., 1996). The adoption of SaaS may change the firm's business process, and organization structure. The legitimacy to empower those changes depends on the top management support. Top management can give an important strategic message, bringing together the firm's efforts toward SaaS adoption. Thus,

H2. Top management support will positively influence SaaS adoption.

8.3.3 The Role of the Environmental Factors

The environment context is based on INT theory (DiMaggio & Powell, 1983), and includes: the coercive pressures, normative pressures, and mimetic pressures. Each variable from the INT theory is triggered from a different institutional angle that instigates the firm's action in a distinctive manner. The coercive pressures refer to the submission of the focal firm to the pressure from other institutional entities such as government, etc. Resource-dominant organizations, parent corporations, government regulators, and associations, are sources of such coercive pressures (Liang et al., 2007; Teo et al., 2003). The degree of coercive strength from these entities determines specific formal or informal pressures on the firm's actions (DiMaggio & Powell, 1983; Teo et al., 2003). In the normative pressures, the institutional angle is related to what is shared between firms, persuading firms to accept the shared decisions from the entities that promote that pressure. Examples of pressure sources include customers, general public, and suppliers (Wu et al., 2003). Normative pressures arise from relationships in which firms share a diversity of norms, rules, and information (Powell & DiMaggio, 1991). In the mimetic pressures, the institutional angle has to do with what the rival entities are accomplishing, leading to a copying posture from the firms. Mimetic pressures describe the imitative behavior of firms toward similar organizations in order to capture their success (Glover et al., 2014; Teo et al., 2003). Learning with their peers, firms achieve economic advantages by minimizing experimentation costs (Levitt & March, 1988). It is therefore reasonable to believe that the INT variables represent specific factors of the environment context, i.e., INT variables are the first-order construct, and these constructs are formative of the second-order construct, which is environmental context (reflective-formative type) (Ringle, Sarstedt, & Straub, 2012) .

The environment context reflects the surrounding environment of the firm's activity (Tornatzky & Fleischer, 1990). Elements like the industry, competitors, and regulatory bodies illustrate the environment context (Venkatesh & Bala, 2012). Interacting with these elements allows the firms to take advantages, but also constrains its activities (Damanpour &

Schneider, 2006). The elements converted into institutional pressures are found to be significant for SaaS adoption (Yoon & George, 2013). According to the IT literature, firms maximize their legitimacy in the decision process through the support of their institutional environment (Heikkilä, 2013; Kostova, 1999). Jansen et al. (2006) argued that environmental factors moderate the effectiveness of some types of innovation. They support that several managerial implications are balanced from the environmental pressures. Other studies also report a very important moderator effect of the environmental factors on the company's performance (Wang, Chen, & Chen, 2012). Firms operate as part of a specific environment, and their decisions are shaped from its context (DiMaggio & Powell, 1983; Ke et al., 2009). Although prior studies have already found a direct influence of the environment context in SaaS adoption (Yang et al., 2015), there is no evidence of the possible moderating effects that this context can produce in the technological and organizational contexts to explain the adoption process. As firms are part of a distinct surrounding environment, and their actions are affected by it, it is legitimate to question if the environmental context somehow influences the remaining contexts of the TOE framework. Therefore, in this study we posit that the environment context may positively moderate the SaaS adoption process. Thus,

H3. Environment context will positively influence SaaS adoption.

H3a. Environment context moderates the relationship between technology competence and SaaS adoption.

H3b. Environment context moderates the relationship between the top management support and SaaS adoption.

8.3.4 Control variables

Based on the literature we use industries and firm size as control variables (Zhu, Dong, et al., 2006). This variables helps us to considerer the differences between the firms (Liang et al., 2007).

8.4 RESEARCH METHODOLOGY

8.4.1 Measurement

An instrument was developed and a questionnaire survey was conducted for collecting data. The constructs were adapted from published literature to the SaaS context (see Table 8.2), using a seven-point numerical scale. For content revision and validity, a panel of experts of

five IS professionals and IS researchers was formed. Based on their observations, we rewrote some of the items to improve the clarity in our questionnaire. Then, we undertook a pilot test in a sample of 30 firms, which were not included in the main survey. The results provided evidence of the reliability and validity of the instrument.

Table 8.2 - Measurement Items

Constructs	Authors
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 involved in implementing 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 *(1 = very low; 7 = very high)* **Please indicate** **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 your 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 adoption **SaaSa1:** My company invests resources to adopt SaaS. **SaaSa2:** Business activities in our company require the use of SaaS. **SaaSa3:** Functional areas in my company require the use of SaaS.	**(Chan & Chong, 2013)**

8.5 DATA COLLECTION

An online questionnaire with a brief but complete explanation of the research scope and relevance was sent to qualified personnel at nearly 2000 firms (i.e. CIOs, directors, and senior IS managers). These contacts were taken from a list of companies of Dun & Bradstreet, one of the world's leading sources for commercial information and insight on businesses. We used the "key informant" approach to identify, from all the responses, those having knowledge about SaaS (Benlian & Hess, 2011; Oliveira et al., 2014; Pinsonneault & Kraemer, 1993). We sent an invitation to a broad range of firms from several industry sectors in Portugal (e.g. manufacturing, construction, services, commerce, health, and information

and communications). In order to increase content validity and response rate, we indicated that the respondents should be individuals with SaaS knowledge within the firms, and we offered to share the results of the research. A follow up email was sent to the non-respondents after two weeks. A total of 265 usable responses (168 early respondents and 97 late respondents) were obtained at the end of eight weeks, yielding a response rate of 13.3%. Based on the Kolmogorov–Smirnov (K–S) test we performed a test for the non-response bias, comparing the early and late respondent groups (Ryans, 1974). The results indicate an absence of non-response bias, as the sample distributions of the two groups did not differ statistically (Ryans, 1974) (see Table 8.3). The common method bias was examined in two ways. First, using Harman's one-factor test (Podsakoff et al., 2003), confirming that none of factors individually explain the majority of the variance, i.e., the first factor explains 44.1% of the variance. Second, using a marker-variable technique (Lindell & Whitney, 2001), adding a theoretically irrelevant marker variable in the research model, obtaining 0.040 (4.0%) as the maximum shared variance with other variables; a value that can be considered as low (Johnson, Rosen, & Djurdjevic, 2011). No significant common method bias was found.

Table 8.4 shows the characteristics of the respondents. The sample includes services sector (45%), manufacturing industry (31%), commerce (9%), construction (8%), health (4%), and information and communication industries (3%). Most of the respondents were qualified individuals within the firms – yielding a rate of 60% rate of heads of IT, IS directors, managers, CIO´s, and board managers, and a rate of 40% of managers from other departments with specific knowledge on SaaS.

Table 8.3 – Testing possible biases: early vs. late respondents

Constructs	Full (n=265)		Early (n=168)		Late (n=97)		Kolmogorov–Smirnov (K–S)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Z score	P-value
Technology competence (TC)	3.959	1.315	3.996	1.333	3.895	1.288	0.703	0.706
Top management support (TMS)	3.791	1.611	3.785	1.672	3.801	1.507	0.903	0.389
Coercive pressures (CP)	2.562	1.471	2.559	1.523	2.567	1.384	0.843	0.476
Normative pressures (NP)	3.018	1.294	3.057	1.347	2.950	1.199	0.827	0.501
Mimetic pressures (MP)	2.955	1.411	2.916	1.437	3.021	1.371	0.875	0.428
Environment context	2.858	1.190	2.854	1.237	2.865	1.111	0.720	0.677
SaaS adoption	2.929	1.686	2.977	1.679	2.845	1.704	0.786	0.567

Table 8.4 - Sample characteristics (n=265)

Industry	**N=265**	**%**	**Respondent's position**	**N=265**	**%**
Manufacturing	83	31%	Board member	22	8%
Construction	21	8%	CIO	6	2%
Services	119	45%	IS Managers, Director IT, Head of IT	130	50%
Commerce	24	9%	Other department managers	107	40%
Health	10	4%	**Firm size (number of employees)**	**N=265**	**%**
Information and communication	8	3%	Micro (=<10)	20	8%
			Small (11-50)	54	20%
			Medium (51-250)	131	49%
			Large (>250)	60	23%

8.6 DATA ANALYSIS

The partial least squares (PLS) technique was applied in this study. The reason for using PLS is because it is a useful technique for analyzing topics that have not been tested before (Ke et al., 2009; Teo et al., 2003). The PLS allows latent constructs to be modeled with formative indicators (Goo, Kishore, Rao, & Nam, 2009). Also, the PLS technique prevents restrictive distributional assumptions when determining path coefficients that are significantly different from zero (Fornell & Bookstein, 1982; Gefen & Straub, 2005; Goode et al., 2015). Our research model has never been tested before, the items in our data are not normally distributed ($p<0.01$, Kolmogorov–Smirnov's test) (Chin et al., 2003), and includes formative constructs. Therefore, PLS path modeling is an appropriate method for this study. Smart PLS 2.0 M3 (Ringle et al., 2005) was used to evaluate the reliability and validity of the measurement model, and analyze the structural model.

8.6.1 Measurement model

A measurement model was conducted to assess the construct reliability, indicator reliability, convergent validity, and discriminator validity of scales for the reflective constructs. The results of the measurement model are shown in Tables 8.5 and 8.6. Construct reliability was tested using the composite reliability (CR). The CR results are higher than 0.7 for all constructs (Table 8.6), indicating the appropriateness and internal consistency of the constructs (Henseler et al., 2009; Straub, 1989). The indicator reliability was evaluated based on the criteria that loading should be greater than 0.7 (Churchill Jr, 1979; Henseler et al., 2009). In Table 8.6 we see that all loading (in bold) are greater than 0.7, and consequently the indicator reliability is achieved. Convergent validity was demonstrated using average variance extracted (AVE). The AVE values are greater than 0.50 for each construct (Table

8.5), and thus the convergent validity of the measurement model is established (Fornell & Larcker, 1981; Hair et al., 2012).

Table 8.5 – Correlation, composite reliability (CR), and average variance extracted (AVE)

	CR	TC	TMS	CP	NP	MP	SaaSa
Technology competence (TC)	0.857	**0.817**					
Top management support (TMS)	0.957	0.675	**0.939**				
Coercive pressures (CP)	0.926	0.267	0.292	**0.898**			
Normative pressures (NP)	0.904	0.480	0.473	0.565	**0.871**		
Mimetic pressures (MP)	0.977	0.392	0.444	0.658	0.542	**0.967**	
SaaS adoption (SaaSa)	0.951	0.567	0.588	0.563	0.631	0.545	**0.930**

Note: Values in diagonal (bolt) are the AVE square root.

Fornell–Larcker criteria and cross-loadings were used to examine the discriminant validity of the constructs. Using the correlation between constructs and AVE squared root we assess the discriminant validity of each construct. As shown in Table 8.5, the AVE square root of each construct (diagonal elements) is higher than the correlations between the constructs. Thus, the first criterion for discriminant validity of the constructs is supported (Fornell & Larcker, 1981). The second criterion for discriminant validity is that the loadings (in bold) must be higher than cross loadings (Chin, 1998). As seen in Table 8.6, all loadings (in bold) are higher than the cross-loadings. Thus, the discriminant validity of the constructs is confirmed.

Table 8.6 – Loadings and cross-loadings

Construct	Item	TC	TMS	CP	NP	MP	SaaSa
	TC1	**0.732**	0.487	0.101	0.300	0.270	0.336
Technology competence (TC)	TC2	**0.883**	0.630	0.328	0.496	0.406	0.562
	TC3	**0.828**	0.524	0.176	0.347	0.265	0.454
	TMS1	0.614	**0.911**	0.183	0.388	0.374	0.484
Top management support (TMS)	TMS2	0.614	**0.952**	0.294	0.467	0.412	0.560
	TMS3	0.672	**0.953**	0.331	0.469	0.459	0.602
	CP1	0.185	0.221	**0.921**	0.499	0.520	0.471
Coercive pressures (CP)	CP2	0.205	0.212	**0.911**	0.446	0.515	0.452
	CP3	0.316	0.342	**0.859**	0.563	0.715	0.580
	NP1	0.449	0.464	0.521	**0.918**	0.504	0.621
Normative pressures (NP)	NP2	0.444	0.419	0.409	**0.863**	0.473	0.536
	NP3	0.361	0.349	0.541	**0.829**	0.437	0.488
	MP1	0.384	0.449	0.651	0.539	**0.950**	0.563
Mimetic pressures (MP)	MP2	0.389	0.427	0.608	0.503	**0.979**	0.516
	MP3	0.365	0.413	0.647	0.529	**0.970**	0.502
	SaaSa1	0.576	0.615	0.443	0.582	0.469	**0.902**
SaaS adoption (SaaSa)	SaaSa2	0.511	0.487	0.545	0.587	0.519	**0.948**
	SaaSa3	0.497	0.537	0.581	0.592	0.533	**0.941**

The construct reliability, indicator reliability, convergent validity, and discriminant validity of the reflective constructs are established, and the results support the construct reliability of the measurement model. Therefore, the constructs were fit to be used to test the structural model.

We modeled the environmental factor as a second-order construct, reflective-formative type (Ringle et al., 2012), with coercive pressures, normative pressures, and mimetic pressures that are reflective in themselves. These constructs are formative measures of the environmental context. For the formative construct a measurement model was performed to assess the multicollinearity and the significance and sign of weights. To evaluate the multicollinearity we perform the variance inflation factor (VIF) statistic. Table 8.7 reveals that the VIF ranges from 1.58 (lowest) to 1.91 (highest). The values are below the threshold of 3.3, indicating the absence of multicollinearity among the variables (Lee & Xia, 2010). In terms of significance and sign, the three pressures are statistically significant ($p<0.01$) and with positive sign. Consequently, the formative construct can be used to test the structural model.

Table 8.7 – Formative measurement model evaluation

Formative construct (second-order construct)	Constructs (first-order reflective)	Weights	VIF
Environmental context (reflective-formative type)	Coercive pressures (CP)	0.375***	1.911
	Normative pressures (NP)	0.354***	1.579
	Mimetic pressures (MP)	0.443***	1.868

Note: *p>0.10; **p<0.05; ***p<0.01

8.6.2 Test of the Structural Model

Before assessing the structural model we tested the multicollinearity of all constructs, based on the variance inflation factor (VIF). The VIF ranges from 1.39 to 1.97. The values are below the threshold of 3.3, indicating the absence of multicollinearity among the variables (Lee & Xia, 2010). The structural model (Figure 8.2) presents the variation explained, and the path coefficients. The significance levels of the hypothesized construct were performed using bootstrapping with 5000 resamples.

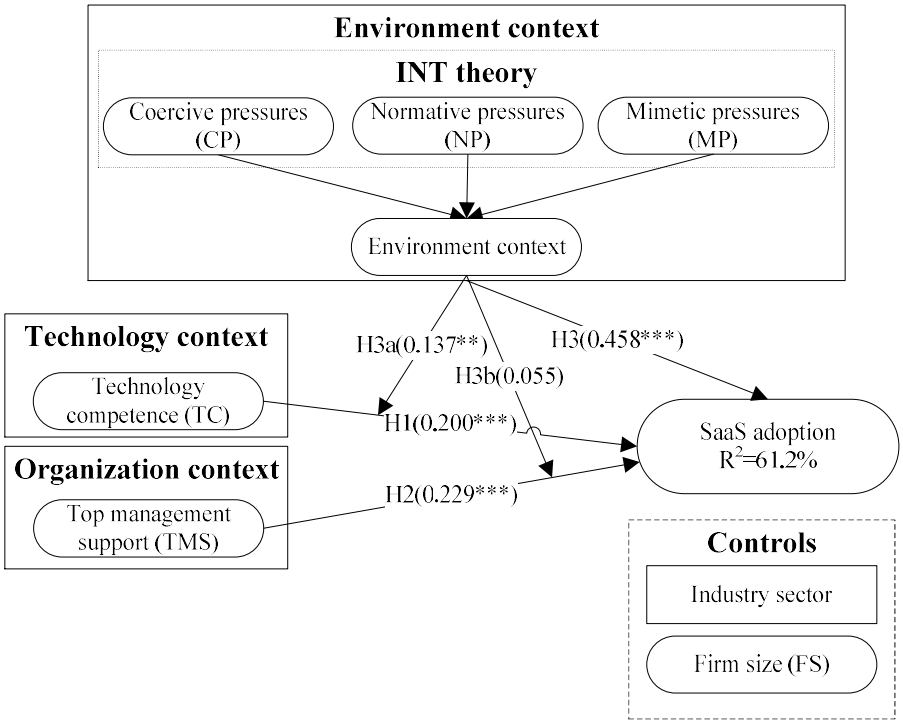


Figure 8.2 - Structural model (variance-based technique) for SaaS adoption

(Note: standardized coefficients. * p< 0.10; ** p < 0.05; *** p < 0.01)

Our model explains 61.2% of the variation in SaaS adoption. From the technology context, technology competence is statistically significant ($\hat{\beta}$ –0.20; p<0.01). Thus, H1 is supported. From the organizational context, top management support is statistically significant to SaaS adoption ($\hat{\beta}$ =0.23; p<0.01). Therefore, H2 is also confirmed.

Coercive pressures ($\hat{\beta}$ =0.36; p>0.01), normative pressures ($\hat{\beta}$ =0.35; p>0.10), and mimetic pressures ($\hat{\beta}$ =0.44; p>0.01) are significantly related to the environmental context. The environmental context ($\hat{\beta}$ = 0.46; p>0.01) is significantly related to SaaS adoption. Consequently H3 is supported. The moderating effect of the environmental context ($\hat{\beta}$ =0.14; p>0.05) is confirmed for the technological context, but not for the organizational context. Thus, H3a is confirmed, and H3b is not. The environmental context not only explains the SaaS adoption, but also moderates the relationship of technology competence and SaaS adoption.

8.7 DISCUSSION

Our study examined a contextualized version of the TOE framework in the context of SaaS adoption, focusing on the role of the moderating effects of the environmental factors. While the TOE framework has been used to explain the adoption of different types of IT innovations, no studies report its moderator effects (Venkatesh & Bala, 2012). Each context (i.e. technology context, organization context, and environmental context) of the TOE framework influences the adoption of innovation, but because these contexts are part of the same reality, they interact with each other (namely the environmental context), affecting the casual relationship of the direct effects. Evaluating the TOE framework moderators improves our understanding of when and how a specific effect operates (Martocchio & Frink, 1994).

Our results confirm that technology competence is a driver for SaaS adoption. This finding is supported by earlier research (Venkatesh & Bala, 2012). The availability of IT infrastructure and human expertise to implement SaaS are taken into consideration in the adoption process.

Similarly, top management support was found to influence SaaS adoption. This finding is consistent with other innovation studies, such as those regarding mobile supply chain management (Chan & Chong, 2013) and cloud computing (Oliveira et al., 2014). Top management support affords the firms consensual decision to adopt SaaS, diminishing any kind of struggle over its rejection.

Within the environmental context of SaaS, coercive pressures were found to be significantly related. Coercive pressures arise from the regulatory bodies, or parent corporations (Teo et al., 2003). The mandatory nature of such pressure leads to a higher level of environmental participation, which in turn positively influences SaaS adoption. This finding is consistent with those of earlier studies, in which coercive pressures were found to be significant in IT adoption (Hu et al., 2007). Normative pressures were also found to be significant, in line with earlier research (Liang et al., 2007; Teo et al., 2003; Wu et al., 2003). Normative pressures are performed by partnering suppliers, customers, and government agencies that have successfully implemented SaaS (Swanson & Ramiller, 2004). These entities by nature share information and norms with the firm, leading to a higher level of participation of the environmental context in SaaS adoption. Similar to other institutional pressures, mimetic

pressures were found to be significant, also consistent with earlier studies (Teo et al., 2003). Mimetic pressures reflect the act of imitating other structurally similar organizations, such as competitors (Teo et al., 2003). In order to avoid unnecessary risks of being the first adopters (Lieberman & Montgomery, 1988; Teo et al., 2003), firms rely on the experience of competitors, leading to a higher level of participation of the environmental context in SaaS adoption.

In terms of the moderating effects, we found that the environmental context influences the relationship between the technology competence and SaaS adoption. As mentioned, technology competence measures the firm's technological ability to adopt SaaS. According to our results, these capacities are positively moderated by the contextual environment. In Figure 8.3 we can see that the effect of technology competence as a predictor for SaaS adoption will be stronger among firms with a higher level of environmental participation. Thus, when the level of the environmental context participation increases, the importance of technology competence also increases in terms of SaaS adoption. Surprisingly, top management support revealed not to be responsive to the influence of the environmental moderator. Our results show a non-significance of the environmental context effect on the relationship between top management support and SaaS adoption. It remains unclear why the hypothesized moderating effect was not verified, and further research may be necessary to shed light on this matter.

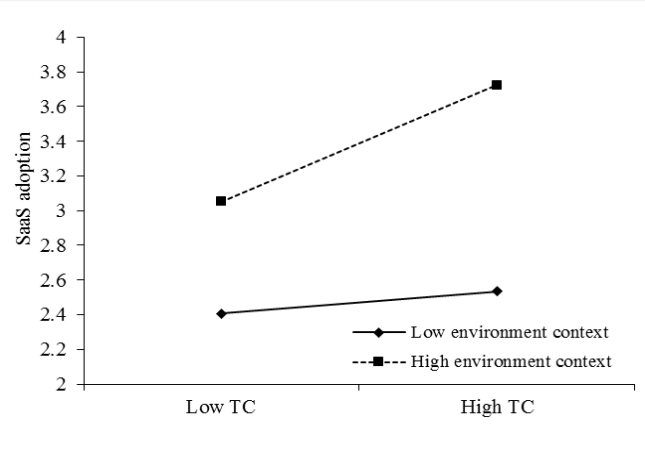


Figure 8.3 – Effect of technology competence as a predictor for SaaS adoption

There are several important implications of this study for managers and decision-makers. First, our findings indicate that they should ensure that the firm has the technological competence to embrace SaaS. On one hand, the firm needs qualified personnel who can integrate an internal implementation team if the firm's decision is in fact to adopt SaaS. On the other hand, managers must ensure that the firm has the communications infrastructure necessary to accommodate SaaS. Although SaaS suppliers provide software with a set of IT management services included, in order to remotely access the software the firm will always have to ensure the adequate communications infrastructure. Second, managers have to be aware of the environment surrounding the firm, as the environment enhances the importance of the technology competence in the process of SaaS adoption. This implies that SaaS adoption is not an isolated process, but pervades the firm's environment in terms of technological capability. Finally, the firm's responsiveness to external pressures will depend on the institution and the kind of authoritative relationship with such pressures, which will shape in a more comprehensive and accurate manner the surrounding contexts in which firms operate.

Theoretical implications include the following. First, this study contrasts with prior research as we draw attention to the moderator effects of the TOE framework. Addressing the moderator influences proved to improve our understanding of the performance of the direct effects of the TOE framework. Second, the research joins two established theories from IT adoption literature, the TOE framework, and the INT theory. Based on these we developed a conceptual model for the study of SaaS adoption. Also, the instrument that was applied in this study was confirmed for reliability, validity, and discriminant value. The developed model was demonstrated to be adequate for the study of IT innovations, as we empirically tested it. We hope that our approach opens new horizons for the application of the TOE framework, considering its moderating effects in future studies.

In spite of the contributions provided by this research, the study is not without limitations. First, it was conducted in a small European country (Portugal), during a well known economic crisis. It would be interesting to apply the model developed in other countries and in different economic contexts, and to investigate if the results are consistent. Also, the study was applied in the context of SaaS. Future investigations can address the possible application of the model developed in the study of other technologies.

8.8 CONCLUSION

This study reports on an empirical investigation to assess the direct and moderator effects of the TOE framework in the SaaS context. Specifically, the study explored the determinants for SaaS adoption using the technological, organizational, and environmental theoretical lens of the TOE framework. Based on two well-grounded theories (i.e. the TOE framework and institutional theory), we examined the determinants for SaaS adoption. The TOE framework was re-designed in order to examine not only its direct effects, but also its moderator effects. We found that technological, organizational, and environmental contexts are significant influencers of SaaS adoption. While the environmental context has a direct impact on SaaS adoption, we found that it also moderates the relationship between technological context and SaaS adoption, i.e., the effect of technology competence as a predictor for SaaS adoption is stronger among firms with a higher level of environmental context. Furthermore, we confirm the usefulness of integrating the INT theory to improve the explanatory strength of the TOE framework. Overall, the research provides new instrumental ways to use the TOE framework application regarding its moderating influences.

Chapter 9 – Conclusions

SaaS is gaining traction in software markets (IDC, 2012). Recognized by managers and researchers as a promising solution, it democratizes the firm's access to software with minimal installation costs and infrastructure requirements (Benlian & Hess, 2011; Suarez et al., 2013). While firms are moving from traditional license software to SaaS, a deeper understanding of the reasons of SaaS adoption is needed. In order to address this and provide a better knowledge of the SaaS diffusion process (i.e. from intention to adopt to its continuance intention) at a firm level, several studies were undertaken.

In the second chapter of this dissertation we present a detailed literature review on SaaS diffusion. Recognized as a special form of on-demand outsourcing, investigators found prior ISO research to be a useful ground-base upon which to build their discussion on SaaS (Benlian & Hess, 2011). In this work, we also use prior literature on ISO to lead the study on SaaS. The aim is to describe earlier SaaS literature in order to assist further investigations on the topic. Although highly important, few studies have discussed SaaS adoption in depth, and the majority of them address it either in the outsourcing or in the cloud computing scope (Wu, 2011b). However, cloud computing is more than SaaS, as it includes Infrastructure as a Service (IaaS) and Platform as a Service (PaaS). Due to the substantial differences between them, literature suggests that the reasons for SaaS adoption may differ from the rest of the sourcing models that comprise cloud computing (Schneider & Sunyaev, 2014). More studies focusing on SaaS are needed to provide a deeper comprehension of the topic. The findings reported in chapter 2 confirm that little research has indeed been performed on SaaS adoption, and this investigation fills that gap.

In order to introduce the study of SaaS and test the suitability of the proposed baseline TOE framework, chapters 3 to 5 are dedicated to ISO and the reasons for its adoption. Chapter 3 assesses organizational adoption of information systems outsourcing. The findings suggest that ISO adoption is influenced by factors from technological, organizational, and environmental contexts. Chapter 4 compares the effect of the determinants of ISO adoption across two business areas: human resources and finance. The findings related to a financial scope show that firms perceive ISO as an advantage compared to human resources. Also, individual firm leader characteristics have a negative impact on ISO adoption on both business areas. In chapter 5 the comparison is performed between five business areas: human resources, finance, logistics, sales, and marketing. Findings suggest that complexity

is perceived in areas such as human resources, finances, and logistics, and as a relative advantage in finance, logistics, and sales. Overall, the TOE framework was proven suitable to the study of ISO. The chapters mentioned were also useful as guidelines for the selection of factors suitable for the SaaS diffusion process.

In chapters 6 and 7, the focus was on SaaS. Chapter 6 assesses the determinants of SaaS diffusion process (i.e. intention, adoption, and routinization), suggesting that relative advantage, complexity, technology competence, top management support, and normative pressures are vital to the intention to adopt SaaS. Normative pressures are a constant significant determinant during the intention, adoption, and routinization stages. Additionally, in the intention to adopt and adoption stages a total effect (direct effect and indirect effect combined) of cost savings was found. Similarly, a total effect of relative advantage and top management support was found in the adoption stage. Chapter 7 approaches the topic from its usage to its continuance intention. Findings confirm top management support and normative pressures as determinants for the use of SaaS. SaaS use and perceived opportunities are significant factors in the continuance intention. Moreover, the relationship between SaaS use and continuance intention is moderated by perceived opportunities. Both chapters highlight the different stages of SaaS diffusion, and provide insights into the diffusion process of SaaS at a firm level from a holistic perspective, while demonstrating the usefulness of integrating prominent adoption theories in its evaluation. Additionally, by examining the indirect, moderator, and mediator effects, both chapters enhance the underlying base theory, and make the findings relevant to practitioners.

Given that we use the TOE framework as a baseline framework for this study, chapter 8 provides a new approach to applying it. We assess the moderator influence of the environmental factors over the technological and organizational ones in the context of SaaS adoption. This chapter is disruptive in relation to previous studies, as prior analysis of the TOE factors is limited to the direct influences. This contribution is especially important as earlier studies report conflicting results in terms of environmental context influence in the adoption process. Assessing the moderating influences of the environment factors over the technological and organizational factors provides a more contextualized view of the TOE framework (Martocchio & Frink, 1994). Table 9.1 lists the significant constructs found in this study.

Table 9.1 – Significant constructs

Factors		ISO adoption								SaaS diffusion						TOE	
		Chapter 3	Chapter 4		Chapter 5					Chapter 6			Chapter 7			Chapter 8	
		ISO adoption	HR	Finance	HR	Finance	Logistics	Sales	Marketing	Intention	Adoption	Routinization	Use	Continuance intention	Moderators	SaaS adoption	Moderators
Complexity			●	●	●	●	●		●	●							
Relative advantage		●		●		●	●	●		●	○						
Technology readiness/competence										●	●					●	
Firm size		●					●										
Top management support		●	●	●	●	●	●	●	●	●	○	●	●			●	
Perceived benefits			●	●	●	●	●	●	●								
Competitive pressure		●	●	●	●	●	●	●									
Regulatory environment																	
Attitude toward change			●	●	●	●	●	●									
Compatibility																	
Coercive pressures											●					●	●
Normative pressures										●	●	●	●			●	●
Mimetic pressures																●	●
Cost savings										○	○						
Security concerns																	
Perceived opportunities														●	●		
Perceived risks																	
SaaS use														●			

Note: ● Direct effects; ○ Total effects. Additionally, the significance of cost savings as a predictor of relative advantage was demonstrated.

Overall, the results reveal that managers may recognize a relative advantage and cost saving solution in SaaS, despite the expected additional effort required in the integration process. Curiously, firms neglect possible security concerns giving preference to the improvements that SaaS may offer (i.e. operations efficiency, productivity, speed of task execution). As mentioned in chapter 6, it is our opinion that suppliers' actions explain this finding, as they have been applying proper measures to minimize security issues in recent years. Managers are not worried about technical compatibilities of SaaS with the firm's IT infrastructure and current systems in use. They seem, however, quite concerned about possible complexity caused by SaaS integration in the business operations reorganization.

This finding is related with the importance of technology competence (i.e. IT infrastructure and technicians) in the early stages of SaaS diffusion (i.e. intention and adoption).

With SaaS a reengineering and reconfiguration process is expected within the firm. This may affect managers' perceptions in terms of technology competence needed to embrace the new solution. Complexity is no longer an issue for firms with SaaS adoption, and technology competence concerns fade away with its integration. Technological factors are important only in the stage of intention to adopt SaaS, after which they become less important to firms. In the stages of adoption, routinization, and use, organizational and environmental factors prevail. The adoption stage is influenced by coercive pressures that encourage firms to adopt SaaS. Coercive pressures may be exerted by resource-dominant organizations, or parent corporations, which coercively persuade firms to adopt SaaS. As for top management support and normative pressures, both are a constant in the diffusion process of SaaS. Through vision and strategy, top management can harmonize the different interests within the firm around SaaS, engender the confidence needed for managers to explore SaaS and redesign the business processes, and coordinate organizational changes. Partnering firms, suppliers, and customers are also entities capable of influencing the diffusion process from its intention through its usage. Since these entities are articulated with the firm in a long-term relationship, which implies the existence of trust, firms may favorably view SaaS once it has been accepted, adopted, and institutionalized by one of those entities. Firm's continuance intention on SaaS is directly influenced by SaaS use and the perceived opportunities. Also, the relationship between SaaS use and continuance intentions is moderated by the perceived opportunities. Thus, when firms perceive that opportunities come with the continuing use of SaaS, such as an increase in operational excellence, the significance of current use of SaaS is less important.

9.1 CONTRIBUTIONS

This study makes valuable contributions to the scholarly knowledge base on technology diffusion, promoting the discussion and enhancing understanding of SaaS.

In chapter 2 a synthesis of findings from existing research on ISO and SaaS is presented. A set of theoretical models and determinant factors of SaaS decisions were derived from IT research and the outcomes of the review provided a basis for future research.

In chapter 3 the suitability of the lens of the TOE framework is tested for this study. SaaS is considered a type of ISO, and this chapter therefore served as an introduction for the appropriateness of its use for the main topic of study, i.e., SaaS. As such, the impacts of technological, organizational, and environmental factors on ISO are evaluated. The replication of results helped reconcile earlier reported findings, and confirmed the role of the factors in which research has been inconsistent.

Chapters 4 and 5 are extensions of chapter 3, as they compare the determinants for the ISO adoption in the different business areas. Chapter 4 compared human resources with finance and chapter 5 included sales, marketing, and logistics in the comparison. Both chapters deepened the reasons for ISO adoption in the different areas of an organization, and contributed to the understanding of the dynamic between the constructs.

Chapter 6 evaluated direct and indirect effects of the constructs on the intention, adoption, and routinization stages of the SaaS diffusion process. The chapter highlighted the importance of systematically assessing the differential effects of the determinants across the different diffusion stages, and demonstrated the usefulness of integrating TOE framework, DOI theory, and INT to enhance the explanatory power of the conceptual model.

In chapter 7 moderator variables were included in the theoretical model to assess the continuance intention on SaaS. This chapter provides an important contribution to the diffusion literature, as it focused on the post adoption stages of SaaS – SaaS use and its continuance intention. Through the evaluation of the moderation and mediation effects, this chapter enhances the underlying theory base, and makes the findings relevant to research.

In chapter 8 we evaluated the moderator influences of the TOE framework in the SaaS adoption context. Earlier literature reports an absence of the impact of the moderator effects within the TOE framework and its importance in innovation adoption (Venkatesh & Bala, 2012). This chapter fills this gap. We redesigned the TOE framework by introducing a moderator effect of environmental influences over technological and organizational factors. The chapter provides new routes for applying the TOE framework.

9.2 LIMITATIONS AND FUTURE RESEARCH

The dissertation has limitations that need to be considered. Results are derived from data from a single country – Portugal. In order to support their interpretation and extend the outcomes for the entire business community, replication of the studies may be required with data from other countries. Also, this research lacks a comparative analysis between different settings (e.g., human resources, finance, logistics) on SaaS, similar to what was carried out for ISO. The evaluation of the results across multiple industries is absent, and future research may consider a comparative study across different business areas. Since this research does not specify the type of SaaS-based application (e.g., customer relationship management, human resources, finance) it would be interesting to consider whether such a distinction would produce different results.

The present research does not offer a longitudinal perspective on the diffusion stages. As SaaS diffusion can be considered a dynamic process, additional research may be necessary to evaluate the results over an extended period of time.

SaaS diffusion is not static, nor are the firm's needs or their perceptions over time. Thus, it is plausible that new factors may become relevant in the diffusion process in the future. With this assumption in mind, adjustments to the models proposed may be required through the incorporation of new pertinent variables. Nonetheless, the models proposed in this research provide the basis for projecting future scenarios.

Regardless of the limitations, researchers may find sound grounding in this dissertation for future paths of investigation.

REFERENCES

Abdollahzadehgan, A., Gohary, M. M., & Amini, M. (2013). The Organizational Critical Success Factors for Adopting Cloud Computing in SMEs. *Journal of Information Systems Research and Innovation (JISRI), 4*(1), 67-74.

Agerfalk, P., & Fitzgerald, B. (2008). Outsourcing to an unknown workforce: Exploring opensourcing as a global sourcing strategy. *MIS Quarterly, 32*(2), 385-409.

Agrawal, M., Kishore, R., & Rao, H. R. (2006). Market reactions to e-business outsourcing announcements: An event study. *Information & Management, 43*, 861-873.

Ajzen, I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes, 50*(2), 179-211.

Alam, S. S. (2009). Adoption of internet in Malaysian SMEs. *Journal of Small Business and Enterprise Development, 16*(2), 240-255.

Amiri, A. (2016). Application placement and backup service in computer clustering in Software as a Service (SaaS) networks. *Computers & Operations Research, 69*, 48-55.

Armbrust, M., Fox, A., Griffith, R., Joseph, A., Katz, R., Konwinski, A., . . . Zaharia, M. (2010). A View of Cloud Computing. *Communications of the ACM, 53*(4), 50-58.

Aubert, B., Léger, P.-M., & Larocque, D. (2012). Differentiating weak ties and strong ties among external sources of influences for enterprise resource planning (ERP) adoption. *Enterprise Information Systems, 6*(2), 215-235.

Azadegan, A., & Teich, J. (2010). Effective benchmarking of innovation adoptions: A theoretical framework for e-procurement technologies. *Benchmarking: An International Journal, 17*(4), 472-490.

Bala, H., & Venkatesh, V. (2007). Assimilation of interorganizational business process standards. *Information Systems Research, 18*(3), 340-362.

Banerjee, P. K., & Ma, L. C. (2012). Routinisation of B2B E-commerce by small firms: A process perspective. *Information Systems Frontiers, 14*(5), 1033-1046.

Banerjee, S., & Golhar, D. (1994). Electronic Data Interchange - Characteristics of Users and Nonusers. *Information & Management, 26*(2), 65-74.

Baptista, J., Newell, S., & Currie, W. (2010). Paradoxical effects of institutionalisation on the strategic awareness of technology in organisations. *The Journal of Strategic Information Systems, 19*(3), 171-183.

Barthélemy, J., & Geyer, D. (2005). An empirical investigation of IT outsourcing versus quasi-outsourcing in France and Germany. *Information & Management, 42*(4), 533-542.

Beatty, R. C., Shim, J. P., & Jones, M. C. (2001). Factors influencing corporate web site adoption: Time-based assessment. *Information & Management, 38*(6), 337-354.

Benlian, A. (2009). A transaction cost theoretical analysis of Software-as-a-Service (SaaS)-based sourcing in SMBs and enterprises. *ECIS*, 25-36.

Benlian, A., & Hess, T. (2011). Opportunities and risks of software-as-a-service: Findings from a survey of IT executives. *Decision Support Systems, 52*(1), 232-246.

Benlian, A., Hess, T., & Buxmann, P. (2009). Drivers of SaaS-adoption–an empirical study of different application types. *Business & Information Systems Engineering, 1*(5), 357-369.

Benlian, A., Koufaris, M., & Hess, T. (2011). Service quality in software-as-a-service: developing the SaaS-Qual measure and examining its role in usage continuance. *Journal of Management Information Systems, 28*(3), 85-126.

Bezemer, C.-P., & Zaidman, A. (2014). Performance optimization of deployed software-as-a-service applications. *Journal of Systems and Software, 87*, 87-103.

Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. (2013). Digital business strategy: Toward a next generation of insights. *MIS Quarterly, 37*(2), 471-482.

Bhattacherjee, A. (2001). Understanding information systems continuance: an expectation-confirmation model. *MIS Quarterly*, 351-370.

Bhattacherjee, A., & Premkumar, G. (2004). Understanding changes in belief and attitude toward information technology usage: a theoretical model and longitudinal test. *MIS Quarterly*, 229-254.

Blaskovich, J., & Mintchik, N. (2011). Information technology outsourcing: A taxonomy of prior studies and directions for future research. *Journal of Information Systems, 25*(1), 1-36.

Boehler, N. B., & Ramos, G. A. (2014). US/EU Data Protection Conflicts: Whither safe harbor? *For The Defense, 56*(4), 62–67.

Bose, R., & Luo, X. (2011). Integrative framework for assessing firms' potential to undertake Green IT initiatives via virtualization–A theoretical perspective. *The Journal of Strategic Information Systems, 20*(1), 38-54.

Bradford, M., & Florin, J. (2003). Examining the role of innovation diffusion factors on the implementation success of enterprise resource planning systems. *International Journal of Accounting Information Systems, 4*(3), 205-225.

Burt, R. S. (1982). Toward a structural theory of action: network models of social Structure, Perception, and Action.

Butler, T. (2011). Compliance with institutional imperatives on environmental sustainability: Building theory on the role of Green IS. *The Journal of Strategic Information Systems, 20*(1), 6-26.

Cannon, T. (1985). Innovation, creativity and small firm organization. *International Small Business Journal, 4*(1), 33-41.

Carte, T. A., & Russell, C. J. (2003). In pursuit of moderation: Nine common errors and their solutions. *MIS Quarterly*, 479-501.

Chan, F. T., & Chong, A. Y.-L. (2013). Determinants of mobile supply chain management system diffusion: a structural equation analysis of manufacturing firms. *International Journal of Production Research, 51*(4), 1196-1213.

Chang, I., Hwang, H., Hung, M., Lin, M., & Yen, D. (2007). Factors affecting the adoption of perspective of hospital electronic signature: Executives' information department. *Decision Support Systems, 44*(1), 350-359.

Chatterjee, D., Grewal, R., & Sambamurthy, V. (2002). Shaping up for e-commerce: institutional enablers of the organizational assimilation of web technologies. *MIS Quarterly*, 65-89.

Chau, P. Y. K., & Tam, K. Y. (1997). Factors affecting the adoption of the open systems: An exploratory study. *MIS Quarterly, 21*(1), 1-24.

Chin, W. (1998). Issues and opinion on structural equation modeling *MIS Quarterly, 22*(1).

Chin, W. W., Marcolin, B. L., & Newsted, P. R. (2003). A partial least squares latent variable modeling approach for measuring interaction effects: Results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study. *Information Systems Research, 14*(2), 189-217.

Chiu, C. M., Wang, E. T., Fang, Y. H., & Huang, H. Y. (2014). Understanding customers' repeat purchase intentions in B2C e-commerce: the roles of utilitarian value, hedonic value and perceived risk. *Information Systems Journal, 24*(1), 85-114.

Cho, V. (2006). Factors in the adoption of third-party B2B portals in the textile industry. *Journal of Computer Information Systems, 46*(3), 18-31.

Cho, V., & Chan, A. (2013). An integrative framework of comparing SaaS adoption for core and non-core business operations: An empirical study on Hong Kong industries. *Information Systems Frontiers*, *17(3)*, 629-644.

Chong, A., Ooi, K., Lin, B., & Raman, M. (2009). Factors affecting the adoption level of c-commerce: An empirical study. *Journal of Computer Information Systems, 50*(2), 13-22.

Chong, A. Y.L., & Chan, F. T. (2012). Structural equation modeling for multi-stage analysis on Radio Frequency Identification (RFID) diffusion in the health care industry. *Expert Systems with Applications, 39*(10), 8645-8654.

Chou, S.W., & Chiang, C.H. (2013). Understanding the formation of software-as-a-service (SaaS) satisfaction from the perspective of service quality. *Decision Support Systems, 56*, 148-155.

Choudhary, V. (2007). Comparison of software quality under perpetual licensing and software as a service. *Journal of Management Information Systems, 24*(2), 141-165.

Chowdhury, G. (2012). An agenda for green information retrieval research. *Information Processing & Management, 48*(6), 1067-1077.

Churchill Jr, G. A. (1979). A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research*, 64-73.

Chwelos, P., Benbasat, I., & Dexter, A. (2001). Research report: Empirical test of an EDI adoption model. *Information Systems Research, 12*(3), 304-321.

Ciganek, A. P., Haseman, W., & Ramamurthy, K. (2014). Time to decision: the drivers of innovation adoption decisions. *Enterprise Information Systems, 8*(2), 279-308.

Clark, T. D., Zmud, R., & McCray, G. (1995). The outsourcing of information services: Transforming the nature of business in the information industry. *Journal of Information Technology, 10*(4), 221–237.

Cooper, R. B., & Zmud, R. W. (1990). Information technology implementation research – a technological diffusion approach. *Management Science, 36*(2), 123-139.

Cordella, A., & Willcocks, L. (2012). Government policy, public value and IT outsourcing: The strategic case of ASPIRE. *The Journal of Strategic Information Systems, 21*(4), 295-307.

Corrocher, N. (2003). The diffusion of Internet telephony among consumers and firms: current issues and future prospects. *Technological Forecasting and Social Change, 70*(6), 525–544.

Cui, L., & Jiang, F. (2012). State ownership effect on firms' FDI ownership decisions under institutional pressure: a study of Chinese outward-investing firms. *Journal of International Business Studies, 43*(3), 264-284.

Currie, W., & Seltsikas, P. (2001). Delivering Business Critical Information Systems Through Application Service Providers: The Need for a Market Segmentation Strategy. *International Journal of Innovation Management, (5:3)*, 323-349.

Cyert, R. M., & March, J. (1963). A behavioral theory of the firm. *University of Illinois at Urbana-Champaign's Academy for Entrepreneurial Leadership Historical Research Reference in Entrepreneurship. Englewood Cliffs, NJ, 2.*

Damanpour, F., & Schneider, M. (2006). Phases of the adoption of innovation in organizations: Effects of environment, organization and top Managers1. *British Journal of Management, 17*(3), 215-236.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science, 35*(8), 982-1003.

De Loof, L. A. (1995). Information systems outsourcing decision making: A framework, organizational theories and case studies. *Journal of Information Technology, 10*, 281–297.

Dibbern, J. (2004). The sourcing of application software services. *Physica-Verlag, New York*.

Dibbern, J., Chin, W. W., & Heinzl, A. (2012). Systemic determinants of the information systems outsourcing decision: A comparative study of German and United States firms. *Journal of the Association for Information Systems, 13*(6), 1.

Dibbern, J., Goles, T., Hirschheim, R., & Jayatilaka, B. (2004). Information systems outsourcing: A survey and analysis of the literature. *Database for Advances in Information Systems, 34*(4), 6-102.

Dibbern, J., & Heinzl, A. (2009). Outsourcing of information systems functions in small and medium sized enterprises: A test of a multi-theoretical model. *Business & Information Systems Engineering, 1*(1), 101-110.

DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American sociological review*, 147-160.

DiMaggio, P. J., & Powell, W. W. (2000). The iron cage revisited institutional isomorphism and collective rationality in organizational fields. *Advances in strategic management, 17*, 143-166.

DiRomualdo, A., & Gurbaxani, V. (1998). Strategic intent for IT outsourcing. *Sloan Management Review, Summer*, 67-80.

Dwivedi, Y. K., Papazafeiropoulo, A., Ramdani, B., Kawalek, P., & Lorenzo, O. (2009). Predicting SMEs' adoption of enterprise systems. *Journal of Enterprise Information Management, 22*(1/2), 10-24.

Espadas, J., Molina, A., Jiménez, G., Molina, M., Ramírez, R., & Concha, D. (2013). A tenant-based resource allocation model for scaling Software-as-a-Service applications over cloud computing infrastructures. *Future Generation Computer Systems, 29*(1), 273-286.

Fan, M., Kumar, S., & Whinston, A. B. (2009). Short-term and long-term competition between providers of shrink-wrap software and software as a service. *European Journal of Operational Research, 196*(2), 661-671.

Fichman, R. G. (2004). Going beyond the dominant paradigm for information technology innovation research: Emerging concepts and methods. *Journal of the Association for Information Systems, 5*(8), 11.

Fornell, C., & Bookstein, F. L. (1982). Two structural equation models: LISREL and PLS applied to consumer exit-voice theory. *Journal of Marketing Research*, 440-452.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research (JMR),* 39-50.

Garvin, D. (1993). Building a Learning Organization. Harvard Business Review, *71*, pp. 78-91.

Gatignon, H., & Robertson, T. (1989). Technology diffusion: An empirical test of competitive effects. *Journal of Marketing, 53*(1), 35–49.

Gefen, D., & Straub, D. (2005). A practical guide to factorial validity using PLS-Graph: Tutorial and annotated example. *Communications of the Association for Information systems, 16*(1), 5.

Gefen, D., Wyss, S., & Lichtenstein, Y. (2008). Business familiarity as risk mitigation in software development outsourcing contracts. *MIS Quarterly, 32*(3), 531-551.

Gewald, H., & Dibbern, J. (2009). Risks and benefits of business process outsourcing: A study of transaction services in the German banking industry. *Information & Management, 46*(4), 249-257.

Ghobakhloo, M., Arias-Aranda, D., & Benitez-Amado, J. (2011). Adoption of e-commerce applications in SMEs. *Industrial Management & Data Systems, 111*(8), 1238-1269.

Gibbs, L. J., & Kraemer, K. L. (2004). A cross-country investigation of the determinants of the scope of e-commerce use: An institutional approach. *Electronic Markets, 14*(2), 124-137.

Globerman, S. (1975). Technological Diffusion in Canadian Tool and Die Industry. *Review of Economics and Statistics, 57*(4), 428-434.

Glover, J., Champion, D., Daniels, K., & Dainty, A. (2014). An Institutional Theory perspective on sustainable practices across the dairy supply chain. *International Journal of Production Economics, 152*, 102-111.

Goldman, R., & Gabriel, R. P. (2005). Innovation Happens Elsewhere Open Source as Business Strategy. San Francisco: Morgan Kauffman Publishers.

Gonzalez, R., Gasco, J., & Llopis, J. (2006). Information systems outsourcing: A literature analysis. *Information & Management, 43*(7), 821-834.

Gonzalez, R., Gasco, J., & Llopis, J. (2010). Information systems outsourcing reasons and risks: a new assessment. *Industrial Management & Data Systems, 110*(1-2), 284-303.

Gonzálvez-Gallego, N., Molina-Castillo, F.-J., Soto-Acosta, P., Varajao, J., & Trigo, A. (2015). Using integrated information systems in supply chain management. *Enterprise Information Systems, 9*(2), 210-232.

Goo, J., Kishore, R., Rao, H., & Nam, K. (2009). The role of service level agreements in relational management of information technology outsourcing: An empirical study. *MIS Quarterly, 33*(1), 119.

Goode, S., Lin, C., Tsai, J. C., & Jiang, J. J. (2015). Rethinking the role of security in client satisfaction with Software-as-a-Service (SaaS) providers. *Decision Support Systems, 70*, 73-85.

Goscinski, A., & Brock, M. (2010). Toward dynamic and attribute based publication, discovery and selection for cloud computing. *Future Generation Computer Systems, 26*(7), 947-970.

Grover, V. (1993). An empirically derived model for the adoption of customer-based interorganizational systems. *Decision Sciences, 24*(3), 603–640.

Grover, V., Cheon, M. J., & Teng, J. T. C. (1996). The effect of service quality and partnership on the outsourcing of information systems functions. *Journal of Management Information Systems, 12*(4), 89-116.

Gwebu, K. L., Wang, J., & Wang, L. (2010). Does IT outsourcing deliver economic value to firms? *The Journal of Strategic Information Systems, 19*(2), 109-123.

Hage, J. (1980). *Theories of organizations: Forms, process and transformation*. New York: John Wiley & Sons.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). Multivariate Data Analysis. Upper Saddle River, NJ: Prentice-Hall.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *The Journal of Marketing Theory and Practice, 19*(2), 139-152.

Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science, 40*(3), 414-433.

Hall, J., & Liedtka, S. (2005). Financial performance, CEO compensation, and large-scale information technology outsourcing decisions. *Journal of Management Information Systems, 22*(1), 193–222.

Han, H.S., Lee, J.-N., & Seo, Y.-W. (2008). Analyzing the impact of a firm's capability on outsourcing success: A process perspective. *Information & Management, 45*(1), 31-42.

Heart, T. (2010). Who is out there?: exploring the effects of trust and perceived risk on saas adoption intentions. *ACM SIGMIS Database, 41*(3), 49-68.

Heikkilä, J.P. (2013). An institutional theory perspective on e-HRM's strategic potential in MNC subsidiaries. *The Journal of Strategic Information Systems, 22*(3), 238-251.

Henseler, J., Ringle, C., & Sinkovics, R. (2009). The use of partial least squares path modeling in international marketing. *Advances in International Marketing (AIM), 20*, 277-320.

Hong, S., Thong, J. Y., & Tam, K. Y. (2006). Understanding continued information technology usage behavior: A comparison of three models in the context of mobile internet. *Decision Support Systems, 42*(3), 1819-1834.

Hong, W., Chan, F. K., Thong, J. Y., Chasalow, L. C., & Dhillon, G. (2014). A Framework and Guidelines for Context-Specific Theorizing in Information Systems Research. *Information Systems Research, 25*(1), 111.

Hosmer, D. W., & Lemeshow, S. (1980). A goodness-of-fit test for the multiple logistic regression model. *Communications in Statistics, A10*, 1043-1069.

Hosmer, D. W., & Lemeshow, S. (2000). Applied Logistic Regression (Vol. 2nd ed.): Willey.

Hsu, P.F., Kraemer, K. L., & Dunkle, D. (2006). Determinants of E-Business Use in U.S. Firms. *International Journal of Electronic Commerce, 10*(4), 9-45.

Hu, Q., Hart, P., & Cooke, D. (2007). The role of external and internal influences on information systems security–a neo-institutional perspective. *The Journal of Strategic Information Systems, 16*(2), 153-172.

Iacovou, C. L., Benbasat, I., & Dexter, A. (1995a). Electronic data interchange and small organizations: adoption and impact of technology. *MIS Quarterly, 19*(4), 465–485.

Iacovou, C. L., Benbasat, I., & Dexter, A. (1995b). Electronic data interchange and small organizations: adoption and impact of technology. *MIS Quarterly, 19*(4), 465–485.

IDC. (2006). Outsourcing de TI e BPO em Portugal - Análise , Previsões e Quotas de Mercado , 2005 – 2009.

IDC. (2012). Worldwide SaaS and Cloud Software 2012–2016 Forecast and 2011 Vendor Shares.

IDC. (2015). Worldwide SaaS and Cloud Software 2015–2019 Forecast and 2014 Vendor Shares. Retrieved 18 February 2016

Ifinedo, P. (2011). An empirical analysis of factors influencing Internet/e-business technologies adoption by SMEs in Canada. *International Journal of Information Technology & Decision Making, 10*(04), 731-766.

Ifinedo, P. (2011). An empirical analysis of factors influencing Internet/E-Business technologies adoption by SMEs in Canada. *International Journal of Information Technology & Decision Making, 10*(4), 731-766.

Illegems, V., Verbeke, A., & S'Jegers, R. (2001). The organizational context of teleworking implementation. *Technological Forecasting and Social Change, 68*(3), 275-291.

Im, I., Kim, Y., & Han, H.-J. (2008). The effects of perceived risk and technology type on users' acceptance of technologies. *Information & Management, 45*(1), 1-9.

Inkpen, A. (1996). Creating knowledge through collaboration. *California Management Review, 39*(1), 123-&.

Jansen, J. J., Van Den Bosch, F. A., & Volberda, H. W. (2006). Exploratory innovation, exploitative innovation, and performance: Effects of organizational antecedents and environmental moderators. *Management Science, 52*(11), 1661-1674.

Janssen, M., & Joha, A. (2011). *Challenges for adopting cloud-based software as a service (saas) in the public sector.* Paper presented at the ECIS.

Jasperson, J. S., Carter, P. E., & Zmud, R. W. (2005). A comprehensive conceptualization of post-adoptive behaviors associated with information technology enabled work systems. *MIS Quarterly, 29*(3), 525-557.

Johnson, R. E., Rosen, C. C., & Djurdjevic, E. (2011). Assessing the impact of common method variance on higher order multidimensional constructs. *Journal of applied psychology, 96*(4), 744.

Jones, S., Wilikens, M., Morris, P., & Masera, M. (2000). Trust requirements in e-business. *Communications of the ACM, 43*(12), 81-87.

Jula, A., Sundararajan, E., & Othman, Z. (2014). Cloud computing service composition: A systematic literature review. *Expert Systems with Applications, 41*(8), 3809-3824.

Ke, W., Liu, H., Wei, K. K., Gu, J., & Chen, H. (2009). How do mediated and non-mediated power affect electronic supply chain management system adoption? The mediating effects of trust and institutional pressures. *Decision Support Systems, 46*(4), 839-851.

Kern, T., Lacity, M. C., & Willcocks, L. (2002). Netsourcing: Renting Business Applications and Services over a Network. New York: Prentice-Hall.

Kern, T., Willcocks, L. P., & Lacity, M. C. (2002). Application service provision: Risk assessment and mitigation. *MIS Quarterly, 1*(2), 113-126.

Khandwalla, P. (1970). *Environment and the organization structure of firms*. McGill University, Montreal: Faculty of Management.

Kim, S., & Garrison, G. (2010). Understanding users' behaviors regarding supply chain technology: Determinants impacting the adoption and implementation of RFID technology in South Korea. *International Journal of Information Management, 30*(5), 388-398.

Kim, W., Lee, J. H., Hong, C., Han, C., Lee, H., & Jang, B. (2012). An innovative method for data and software integration in SaaS. *Computers & Mathematics with Applications, 64*(5), 1252-1258.

Kimberly, J., & Evanisko, M. (1981). Organizational Innovation - The Influence of Individual, Organizational, and Contextual Factors on Hospital Adoption of Technological and Administrative Innovations. *Academy of Management Journal, 24*(4), 689-713.

Kostova, T. (1999). Transnational transfer of strategic organizational practices: A contextual perspective. *Academy of Management review, 24*(2), 308-324.

Kuan, K. K. Y., & Chau, P. Y. K. (2001). A perception-based model for edi adoption in small businesses using a technology-organization-environment framework. *Information & Management, 38*(8), 507-521.

Kung, L., Cegielski, C. G., & Kung, H.J. (2015). An integrated environmental perspective on software as a service adoption in manufacturing and retail firms. *Journal of Information Technology*, 30(4), 352-363.

Lacity, M., Hirschheim, R., & Willcocks, L. (1994). Realizing outsourcing expectations. *Information Systems Management, 11*(4), 7-18.

Lacity, M. C., Feeny, D., & Willcocks, L. P. (2003). Transforming a back-office function: Lessons from BAE systems' experience with an enterprise partnership. *MIS Quarterly Executive 2*(2), 86-103.

Lacity, M. C., Khan, S., Yan, A. H., & Willcocks, L. P. (2010). A review of the IT outsourcing empirical literature and future research directions. *Journal of Information Technology, 25*(4), 395-433.

Lacity, M. C., Khan, S. A., & Willcocks, L. P. (2009). A review of the IT outsourcing literature: Insights for practice. *Journal of Strategic Information Systems, 18*, 130–146.

Lancelot Miltgen, C., Popovič, A., & Oliveira, T. (2013). Determinants of end-user acceptance of biometrics: Integrating the "Big 3" of technology acceptance with privacy context. *Decision Support Systems, 56*, 103-114.

Lee, G., & Xia, W. (2010). Toward agile: an integrated analysis of quantitative and qualitative field data. *MIS Quarterly, 34*(1), 87-114.

Lee, M. (2009). Factors influencing the adoption of internet banking: An integration of TAM and TPB with perceived risk and perceived benefit. *Electronic Commerce Research and Applications, 8*(3), 130-141.

Lee, S.G., Chae, S. H., & Cho, K. M. (2013). Drivers and inhibitors of SaaS adoption in Korea. *International Journal of Information Management, 33*(3), 429-440.

Lee, S., & Kim, K. (2007). Factors affecting the implementation success of Internet-based information systems. *Computers in Human Behavior, 23*(4), 1853–1880.

Lee, S., Park, S. B., & Lim, G. G. (2013). Using balanced scorecards for the evaluation of "Software-as-a-service". *Information & Management, 50*(7), 553-561.

Lemeshow, S., & Hosmer, D. W. (1982). The use of goodness-of-fit statistics in the development of logistic regression models. *American Journal of Epidemiology, 115*, 92-106.

Leonard-Barton, D. (1995). Wellsprings of Knowledge: Building and Sustaining the Sources of Innovation. Boston: Harvard Business School Press.

Levin, S., Levin, S., & Meisel, J. (1987). A Dynamic Analysis of the Adoption of a New Technology - The Case of Optical Scanners. *Review of Economics and Statistics, 69*(1), 12-17.

Levitt, B., & March, J. G. (1988). Organizational learning. *Annual Review of Sociology*, 319-340.

Li, H., & Liu, Y. (2014). Understanding post-adoption behaviors of e-service users in the context of online travel services. *Information & Management, 51*(8), 1043-1052.

Li, Y. H. (2008). *An empirical investigation on the determinants of e-procurement adoption in chinese manufacturing enterprises.* Paper presented at the International Conference on Management Science & Engineering (15th), California, USA.

Liang, H., Saraf, N., Hu, Q., & Xue, Y. (2007). Assimilation of enterprise systems: the effect of institutional pressures and the mediating role of top management. *MIS Quarterly, 31*(1), 59-87.

Liang, H., Wang, J.J., Xue, Y., & Cui, X. (2016). IT outsourcing research from 1992 to 2013: A literature review based on main path analysis. *Information & Management, 53*(2), 227-251.

Lieberman, M. B., & Montgomery, D. B. (1988). First-mover advantages. *Strategic Management Journal, 9*(S1), 41-58.

Lin, H., & Lin, S. (2008). Determinants of e-business diffusion: A test of the technology diffusion perspective. *Technovation, 28*(3), 135-145.

Lindell, M. K., & Whitney, D. J. (2001). Accounting for common method variance in cross-sectional research designs. *Journal of applied psychology, 86*(1), 114.

Linder, J. (2004). Transformational outsourcing. *Sloan Management Review, 45*(2), 52–58.

Liu, H., Ke, W., Wei, K. K., Gu, J., & Chen, H. (2010). The role of institutional pressures and organizational culture in the firm's intention to adopt internet-enabled supply chain management systems. *Journal of Operations Management, 28*(5), 372-384.

Loh, L., & Venkatraman, N. (1992a). Determinants of information technology outsourcing: A cross-sectional analysis. *Journal of Management Information Systems, 9*(1), 7-24.

Loh, L., & Venkatraman, N. (1992b). Diffusion of information technology outsourcing: Influence sources and the Kodak effect. *Information Systems Research, 3*(4), 334.

Low, C., Chen, Y., & Wu, M. (2011). Understanding the determinants of cloud computing adoption. *Industrial Management & Data Systems, 111*(7), 1006-1023.

Lyytinen, K., & Damsgaard, J. (2011). Inter-organizational information systems adoption–a configuration analysis approach. *European Journal of Information Systems, 20*(5), 496-509.

Mahowald, R. P., & Connor, G. S. (2012). Worldwide SaaS and Cloud Software 2012–2016 Forecast and 2011 Vendor Shares. International Data Corporation (IDC).

Majumdar, S. (1995). The Determinants of Investment in New Technology - An Examination of Alternative Hypothesis. *Technological Forecasting and Social Change, 50*(3), 153-165.

Malhotra, N. K., Kim, S. S., & Patil, A. (2006). Common method variance in IS research: A comparison of alternative approaches and a reanalysis of past research. *Management Science, 52*(12), 1865-1883.

Mann, A., Kauffman, R. J., Han, K., & Nault, B. R. (2011). Are there contagion effects in information technology and business process outsourcing? *Decision Support Systems, 51*(4), 864-874.

Martín, S., López-Catalán, B., & Ramón-Jerónimo, M. A. (2012). Factors determining firm´s perceived performance of mobile commerce. Industrial Management & Data Systems *112 (6)*, 946-963.

Martins, R., & Oliveira, T. (2014). Information Systems Outsourcing, the Umbrella Term for e-Business Strategic Management Sourcing: Service Comparison *Handbook of Strategic e-Business Management* (pp. 687-705). Springer.

Martins, R., Oliveira, T., & Thomas, M. A. (2013). *Comparing information systems Outsourcing between human resource and finance.* Paper presented at the 2013 8th Iberian Conference on Information Systems and Technologies (CISTI) (pp. 1-6). IEEE.

Martins, R., Oliveira, T., & Thomas, M. A. (2015). Assessing Organizational Adoption of Information Systems Outsourcing. *Journal of Organizational Computing and Electronic Commerce, 25*(4), 360-378.

Martins, R., Oliveira, T., & Thomas, M. A. (2016). An empirical analysis to assess the determinants of SaaS diffusion in firms. *Computers in Human Behavior, 62*, 19-33.

Martocchio, J. J., & Frink, D. D. (1994). A review of the influence of group goals on group performance. *Academy of Management Journal, 37*(5), 1285-1301.

Mata, F., Fuerst, W., & Barney, J. (1995). Information technology and sustained competitive advantages: A resource-based analysis. *MIS Quarterly, 19*(4), 487-505.

McDaniel, M. A., Rothstein, H. R., & Whetzel, D. L. (2006). Publication bias: A case study of four test vendors. *Personnel Psychology, 59*, 927-953.

McFarlan, F. W., & Nolan, R. L. (1995). How to Manage an IT Outsourcing Alliance. *Sloan Management Review, 36*(2), 9-23.

McGowan, M. K., & Madey, G. R. (1998). Adoption and implementation of electronic data interchange. In E. M. R.J. Larson (Ed.), *Information Systems Innovation and Diffusion: Issues and Directions*. London: Idea Group.

McHall, T. (2011). Gartner says worldwide software as a service revenue is forecast to grow 21 percent in 2011. *Gartner. com. Gartner. http://www.gartner. com/it/page. jsp*.

Mishra, A. N., Konana, P., & Barua, A. (2007). Antecedents and consequences of internet use in procurement: an empirical investigation of US manufacturing firms. *Information Systems Research, 18*(1), 103-120.

Misra, S. C., & Mondal, A. (2011). Identification of a company's suitability for the adoption of cloud computing and modelling its corresponding Return on Investment. *Mathematical and Computer Modelling, 53*(3–4), 504-521.

Mora-Monge, C. A., Azadegan, A., & Teich, J. (2010). Effective benchmarking of innovation adoptions: A theoretical framework for e-procurement technologies. *Benchmarking: An International Journal, 17*(4), 472-490.

Ngai, E. W. T., Cheng, T. C. E., Au, S., & Lai, K. (2007b). Mobile commerce integrated with RFID technology in a contained depot. *Decision Support Systems, 43*(1), 62–76.

Nonaka, I. (1991). The Knowledge-Creating Company. *Harvard Business Review, 69*(6), 96-104.

Nyrhinen, M., & Dahlberg, T. (2007). *Is transaction cost economics theory able to explain contracts used for and success of firm-wide it-infrastructure outsourcing?* Paper presented at the System Sciences, 2007. HICSS 2007. 40th Annual Hawaii International Conference on (pp. 240a-240a). IEEE.

Oliveira, T., & Dhillon, G. (2015). From adoption to routinization of B2B e-Commerce: understanding patterns across Europe. *Journal of Global Information Management (JGIM), 23*(1), 24-43.

Oliveira, T., & Martins, M. F. (2010a). Firms patterns of e-business adoption: evidence for the European Union-27. *The Electronic Journal Information Systems Evaluation, 14*(1), 47-56.

Oliveira, T., & Martins, M. F. (2010b). Understanding e-business adoption across industries in European countries. *Industrial Management & Data Systems, 110*(8-9), 1337-1354.
Oliveira, T., & Martins, M. F. (2011). Literature review of information technology adoption models at firm level. *The Electronic Journal Information Systems Evaluation, 14*(1), 110-121.
Oliveira, T., Thomas, M., & Espadanal, M. (2014). Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors. *Information & Management, 51*(5), 497-510.
Pan, M., & Jang, W. (2008). Determinants of the adoption of enterprise resource planning within the technology-organization-environment framework: Taiwan's communications. *Journal of Computer Information Systems, 48*(3), 94-102.
Park, J.H. (2014). The effects of personalization on user continuance in social networking sites. *Information Processing & Management, 50*(3), 462-475.
Park, S. C., & Ryoo, S. Y. (2013). An empirical investigation of end-users' switching toward cloud computing: A two factor theory perspective. *Computers in Human Behavior, 29*(1), 160-170.
Picoto, W. N., Bélanger, F., & Palma-dos-Reis, A. (2014). An organizational perspective on m-business: usage factors and value determination†. *European Journal of Information Systems, 23*(5), 571-592.
Pinsonneault, A., & Kraemer, K. L. (1993). Survey research methodology in management information systems: an assessment. *Journal of Management Information Systems*, 75-105.
Podsakoff, P. M., MacKenzie, S. B., Lee, J.Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of applied psychology, 88*(5), 879.
Powell, W. W., & DiMaggio, P. J. (1991). *The New Institutionalism in Organizational Analysis*: University of Chicago Press.
Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior research methods, 40*(3), 879-891.
Premkumar, G., Ramamurthy, K., & Nilakanta, S. (1994). Implementation of electronic data interchange. *Journal of Management Information Systems, 11*(2), 157-186.
Premkumar, G., & Roberts, M. (1999). Adoption of new information technologies in rural small businesses. *Omega-International Journal of Management Science, 27*(4), 467-484.
Qu, W. G., Pinsoneault, A., & Oh, W. (2011). Influence of industry characteristics on information technology outsourcing. *Journal of Management Information Systems, 27*(4), 99-128.
Quadros, R., Furtado, A., Bernardes, R., & Franco, E. (2001). Technological innovation in Brazilian industry: An assessment based on the Sao Paulo innovation survey. *Technological Forecasting and Social Change, 67*(2-3), 203-219.
Quinn, J. B. (2000). Outsourcing innovation: The new engine of growth. *Sloan Management Review, 41*(4), 13-28.
Quinn, J. B., & Hilmer, F. G. (1994). Strategic Outsourcing. *Sloan Management Review, 35*(4), 43-55.
Ramdani, B., Kawalek, P., & Lorenzo, O. (2009). Predicting SMEs' adoption of enterprise systems. *Journal of Enterprise Information Management, 22*(1/2), 10-24.
Ringle, C. M., Sarstedt, M., & Straub, D. (2012). A critical look at the use of PLS-SEM in MIS Quarterly. *MIS Quarterly (MISQ), 36*(1).
Ringle, C. M., Wende, S., & Will, S. (2005). SmartPLS 2.0 (M3) Beta, Hamburg.

Roca, J. C., & Gagné, M. (2008). Understanding e-learning continuance intention in the workplace: A self-determination theory perspective. *Computers in Human Behavior, 24*(4), 1585-1604.
Rogers, E. (2003). *Diffusion of innovations* (5 ed.). New York: Free Press.
Rogers, E. M. (1983). *Diffusion of innovations*. New York: The Free Press.
Rogers, E. M. (1995). Diffusion of innovations (Fourth Edition ed.). New York: Free Press.
Rogers, E. M. (2010). *Diffusion of innovations*: Simon and Schuster.
Ryans, A. B. (1974). Estimating consumer preferences for a new durable brand in an established product class. *Journal of Marketing Research*, 434-443.
Saeed, K. A., & Abdinnour-Helm, S. (2008). Examining the effects of information system characteristics and perceived usefulness on post adoption usage of information systems. *Information & Management, 45*(6), 376-386.
Saeed, K. A., & Abdinnour, S. (2013). Understanding post-adoption IS usage stages: an empirical assessment of self-service information systems. *Information Systems Journal, 23*(3), 219-244.
Sanders, N. R., Locke, A., Moore, C. B., & Autry, C. W. (2007). A multidimensional framework for understanding outsourcing arrangements. *The Journal of Supply Chain Management*, 43(4), 3-15.
Schneider, S., & Sunyaev, A. (2014). Determinant factors of cloud-sourcing decisions: reflecting on the IT outsourcing literature in the era of cloud computing. *Journal of Information Technology*, 31(1), 1-31.
Scott, W. R. (2000). *Institutions and Organizations* (2nd ed.). Thousand Oaks: Sage Publications.
Shaikh, A. A., & Karjaluoto, H. (2015). Making the most of information technology & systems usage: A literature review, framework and future research agenda. *Computers in Human Behavior, 49*, 541-566.
Sharma, M. K. (2009). Receptivity of India's small and medium-sized enterprises to information system adoption. *Enterprise Information Systems, 3*(1), 95-115.
Sharma, S. (1996). *Applied multivariate techniques*: New York. John Wiley & Sons, Inc.
Shin, D. H. (2009). An empirical investigation of a modified technology acceptance model of IPTV. *Behaviour & Information Technology, 28*(4), 361-372.
Slaughter, S. A., & Ang, S. (1996). Employment outsourcing in information systems. *Communications of the ACM, 39*(7), 47–54.
Slovic, P., & Peters, E. (2006). Risk perception and affect. *Current directions in psychological science, 15*(6), 322-325.
Soares-Aguiar, A., & Palma-dos-Reis, A. (2008). Why do firms adopt e-procurement systems? Using logistic regression to empirically test a conceptual model., *IEEE Transactions on Engineering Management, 55*(1), 120-133.
Sobol, M. G., & Apte, U. (1995). Domestic and global outsourcing practices of America's most effective IS users. *Journal of Information Technology, 10*(4), 269-280.
Starbuck, W. H. (1976). *Organizations and their environments*. Institute of Management. Chicago: Rand McNally.
Straub, D. W. (1989). Validating instruments in MIS research. *MIS Quarterly*, 147-169.
Suarez, F. F., Cusumano, M. A., & Kahl, S. J. (2013). Services and the business models of product firms: An empirical analysis of the software industry. *Management Science, 59*(2), 420-435.
Subashini, S., & Kavitha, V. (2011). A survey on security issues in service delivery models of cloud computing. *Journal of Network and Computer Applications, 34*(1), 1-11.
Sultan, N. A. (2011). Reaching for the “cloud”: How SMEs can manage. *International Journal of Information Management, 31*(3), 272-278.

Susarla, A., Barua, A., & Whinston, A. B. (2009). A Transaction Cost Perspective of the "Software as a Service" Business Model. *Journal of Management Information Systems, 26*(2), 205-240.

Susarla, A., Barua, A., & Whinston, A. B. (2010). Multitask agency, modular architecture, and task disaggregation in SaaS. *Journal of Management Information Systems, 26*(4), 87-118.

Swanson, E. B., & Ramiller, N. C. (2004). Innovating mindfully with information technology. *MIS Quarterly*, 553-583.

Teo, H. H., Wei, K. K., & Benbasat, I. (2003). Predicting Intention to Adopt Interorganizational Linkages: An Institutional Perspective. *MIS Quarterly, 27*(1), 19-49.

Thomas, M., Costa, D., & Oliveira, T. (2015). Assessing the role of IT-enabled process virtualization on green IT adoption. *Information Systems Frontiers*, 1-18.

Thong, J. Y. L. (1999). An integrated model of information systems adoption in small businesses. *Journal of Management Information Systems, 15*(4), 187-214.

To, M., & Ngai, E. (2006). Predicting the organisational adoption of B2C e-commerce: An empirical study. *Industrial Management & Data Systems, 106*(8), 1133-1147.

Tornatzky, L. G., & Fleischer, M. (1990). *The Processes of Technological Innovation*. Lexington: Lexington Books.

Tornatzky, L. G., & Klein, K. J. (1982). Innovation characteristics and innovation adoption-implementation: a meta-analysis of findings. *Engineering and Management, 29*(1), 28–45.

Tsai, M.C., Lee, W., & Wu, H.C. (2010). Determinants of RFID adoption intention: evidence from Taiwanese retail chains. *Information & Management, 47*(5), 255-261.

Utterbac, J. (1974). Innovation in Industry and Diffusion of Technology. *Science, 183*(4125), 620-626.

Van der Heijden, H. (2003). Factors influencing the usage of websites: the case of a generic portal in The Netherlands. *Information & Management, 40*(6), 541-549.

Vatanasombut, B., Igbaria, M., Stylianou, A. C., & Rodgers, W. (2008). Information systems continuance intention of web-based applications customers: The case of online banking. *Information & Management, 45*(7), 419-428.

Venkatesh, V., & Bala, H. (2012). Adoption and impacts of interorganizational business process standards: Role of partnering synergy. *Information Systems Research, 23*(4), 1131-1157.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 425-478.

Venkatesh, V., Thong, J. Y., Chan, F. K., Hu, P. J. H., & Brown, S. A. (2011). Extending the two-stage information systems continuance model: incorporating UTAUT predictors and the role of context. *Information Systems Journal, 21*(6), 527-555.

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012a). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly, 36*, 157-178.

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012b). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of thechnology. *MIS Quarterly, 36*, 157-178.

Wang, C.H., Chen, K.Y., & Chen, S.C. (2012). Total quality management, market orientation and hotel performance: The moderating effects of external environmental factors. *International Journal of Hospitality Management, 31*(1), 119-129.

Wang, C. (2014). Antecedents and consequences of perceived value in Mobile Government continuance use: An empirical research in China. *Computers in Human Behavior, 34*, 140-147.

Wang, Y.M., Wang, Y.S., & Yang, Y.F. (2010). Understanding the determinants of RFID adoption in the manufacturing industry. *Technological Forecasting and Social Change, 77*(5), 803-815.

Watjatrakul, B. (2005). Determinants of IS sourcing decisions: A comparative study of transaction cost theory versus the resource-based view. *The Journal of Strategic Information Systems, 14*(4), 389-415.

Webster, J., & Watson, R. T. (2002). Analyzing the past to prepare for the future: Writing a literature review. *MIS Quarterly* (pp. xiii-xxiii).

Wejnert, B. (2002). Integrating Models of Diffusion of Innovations: A Conceptual Framework. *Annual Review of Sociology, 28*, 297-326.

Winkler, T. J., & Brown, C. V. (2013). Horizontal allocation of decision rights for on-premise applications and software-as-a-service. *Journal of Management Information Systems, 30*(3), 13-48.

Wu, F., Mahajan, V., & Balasubramanian, S. (2003). An analysis of e-business adoption and its impact on business performance. *Journal of the Academy of Marketing Science, 31*(4), 425-447.

Wu, W.W. (2011a). Developing an explorative model for SaaS adoption. *Expert Systems with Applications, 38*(12), 15057-15064.

Wu, W.W. (2011b). Mining significant factors affecting the adoption of SaaS using the rough set approach. *Journal of Systems and Software, 84*(3), 435-441.

Wu, W.W, Lan, L. W., & Lee, Y.T. (2011). Exploring decisive factors affecting an organization's SaaS adoption: A case study. *International Journal of Information Management, 31*(6), 556-563.

Xin, M., & Levina, N. (2008). *Software-as-a-service model: Elaborating client-side adoption factors.* Paper presented at the Proceedings of the 29th International Conference on Information Systems, R. Boland, M. Limayem, B. Pentland,(eds), Paris, France.

Xu, S., Zhu, K., & Gibbs, J. (2004). Global technology, local adoption: a cross-country investigation of Internet adoption by companies in the United States and China. *Electronic Markets, 14*(1), 13-24.

Yang, H.L., & Lin, S.L. (2015). User continuance intention to use cloud storage service. *Computers in Human Behavior, 52*, 219-232.

Yang, Z., Sun, J., Zhang, Y., & Wang, Y. (2015). Understanding SaaS adoption from the perspective of organizational users: A tripod readiness model. *Computers in Human Behavior, 45*, 254-264.

Yiu, C. S., Grant, K., & Edgar, D. (2007). Factors affecting the adoption of Internet banking in Hong Kong—Implications for the banking sector. *International Journal of Information Management, 27*(5), 336-351.

Yoon, T. E., & George, J. F. (2013). Why aren't organizations adopting virtual worlds? *Computers in Human Behavior, 29*(3), 772-790.

Zhu, D. H., Chang, Y. P., Luo, J. J., & Li, X. (2014). Understanding the adoption of location-based recommendation agents among active users of social networking sites. *Information Processing & Management, 50*(5), 675-682.

Zhu, K., Dong, S. T., Xu, S. X., & Kraemer, K. L. (2006). Innovation diffusion in global contexts: Determinants of post-adoption digital transformation of European companies. *European Journal of Information Systems, 15*(6), 601-616.

Zhu, K., Kraemer, K., & Xu, S. (2003). Electronic business adoption by European firms: A cross-country assessment of the facilitators and inhibitors. *European Journal of Information Systems, 12*(4), 251-268.

Zhu, K., Kraemer, K., Xu, S., & Dedrick, J. (2004). Information technology payoff in e-business environments: An international perspective on value creation of e-business in the financial services industry. *Journal of Management Information Systems, 21*(1), 17-54.

Zhu, K., & Kraemer, K. L. (2005). Post-adoption variations in usage and value of e-business by organizations: Cross-country evidence from the retail industry. *Information Systems Research, 16*(1), 61-84.

Zhu, K., Kraemer, K. L., & Xu, S. (2006). The process of innovation assimilation by firms in different countries: A technology diffusion perspective on e-business. *Management Science, 52*(10), 1557-1576.

Zhu, Q., & Sarkis, J. (2007). The moderating effects of institutional pressures on emergent green supply chain practices and performance. *International Journal of Production Research, 45*(18-19), 4333-4355.

Zhu, Z., Hsu, K., & Lillie, J. (2001). Outsourcing – A strategic move: The process and the ingredients for success. *Management Decision, 39*(5), 373 – 378.

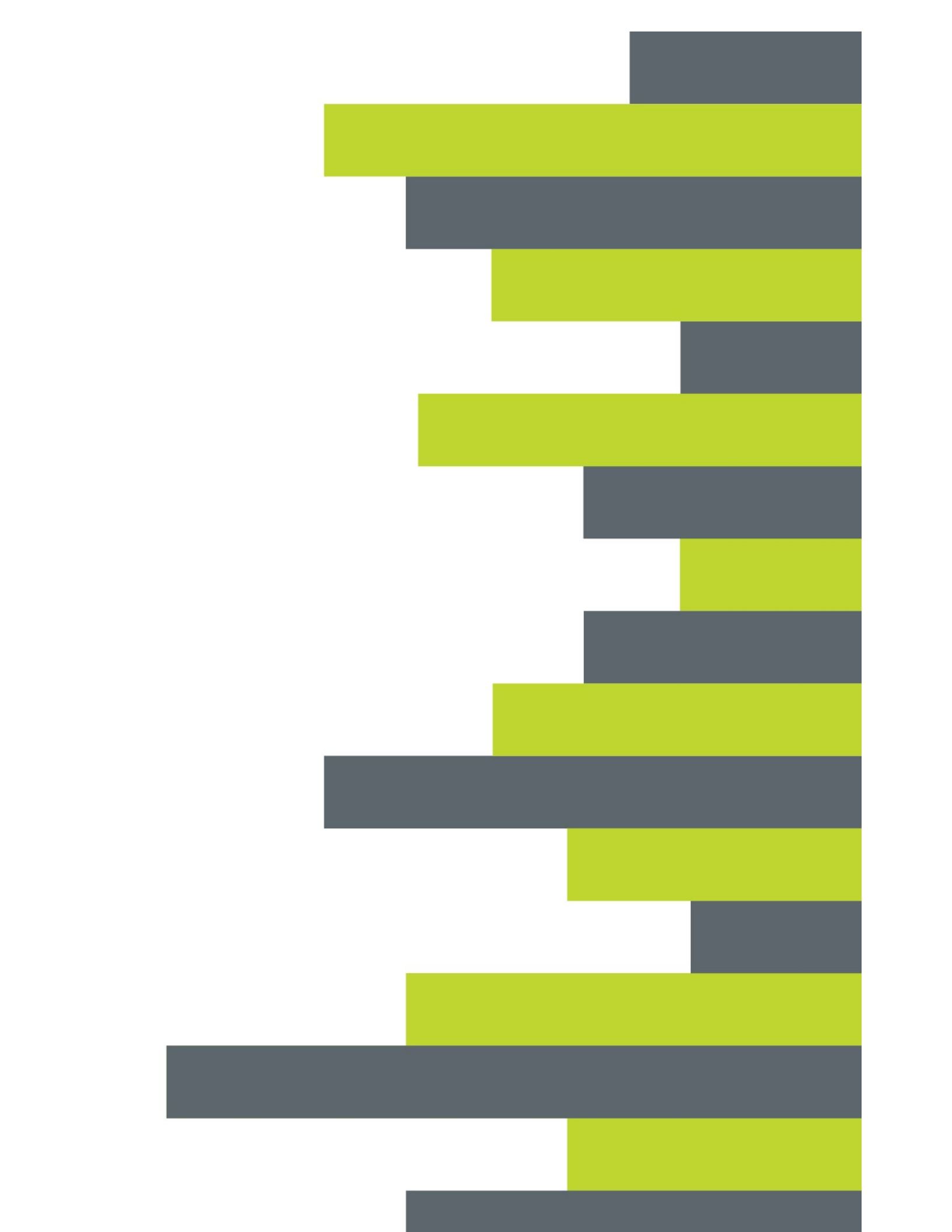
Zorrilla, M., & García-Saiz, D. (2013). A service oriented architecture to provide data mining services for non-expert data miners. *Decision Support Systems, 55*(1), 399-411.

APPENDIX A (CHAPTER 6)

Constructs	Path	Coef.	T-Value
Cost savings	Cost -> RA	0.608***	12.992
	Cost -> SaaSi	0.104***	2.910
	Cost -> SaaSa	0.066**	2.264
	Cost -> SaaSr	0.026	0.781
Security concerns	Security -> RA	-0.113	1.529
	Security -> SaaSi	-0.019	1.341
	Security -> SaaSa	-0.012	1.174
	Security -> SaaSr	-0.005	0.570
Relative advantage	RA -> SaaSi	0.171***	2.996
	RA -> SaaSa	0.108**	2.281
	RA -> SaaSr	0.043	0.789
Compatibility	Comp -> SaaSi	-0.018	0.295
	Comp -> SaaSa	-0.019	0.370
	Comp -> SaaSr	0.005	0.076
Complexity	CX -> SaaSi	-0.129***	2.639
	CX -> SaaSa	-0.057	1.197
	CX -> SaaSr	-0.058	1.198
Technology competence	TC -> SaaSi	0.172**	2.581
	TC -> SaaSa	0.206***	3.099
	TC -> SaaSr	0.123	1.575
Top management support	TMS -> SaaSi	0.260***	3.555
	TMS -> SaaSa	0.187***	2.889
	TMS -> SaaSr	0.218***	3.039
Coercive pressures	CP -> SaaSi	-0.001	0.023
	CP -> SaaSa	0.286***	4.846
	CP -> SaaSr	0.111	1.628
Normative pressures	NP -> SaaSi	0.246***	3.709
	NP -> SaaSa	0.224***	3.983
	NP -> SaaSr	0.280***	3.809
Mimetic pressures	MP -> SaaSi	0.077	1.244
	MP -> SaaSa	0.041	0.614
	MP -> SaaSr	0.099	1.509
Intention to adopt SaaS (evaluation)	SaaSi -> SaaSa	0.437***	6.314
	SaaSi -> SaaSr	0.195***	4.242
SaaS adoption	SaaSa -> SaaSr	0.447***	5.968

Note: *p<0.10; **p<0.05; ***p<0.001

Cost savings (Cost); Security concerns (Security); Relative advantage (RA); Compatibility (Comp); Complexity (CX); Technology competence (TC); Top management support (TMS); Coercive pressures (CP); Normative pressures (NP); Mimetic pressures (MP); Intention to adopt SaaS (SaaSi); SaaS adoption (SaaSa); SaaS routinization (SaaSr). All loadings presented with an absolute value greater than 0.5.



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