2016

Cloud Adoption Factors in a Specific Business Area: Challenging the Findings of Organisation-Wide Cloud Computing Research

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CLOUD ADOPTION FACTORS IN A SPECIFIC BUSINESS AREA: CHALLENGING THE FINDINGS OF ORGANIZATION-WIDE CLOUD COMPUTING RESEARCH

Completed Research

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Abstract

Existing literature investigates cloud adoption factors and their impact on the decision to adopt cloud services in organizations. These studies consider the decision to adopt cloud services as a horizontal organization-wide decision. In this paper we argue that most of cloud decisions in practice do not regard cloud adoption horizontally across the organization. Rather, they consider cloud adoption with respect to the particular business area in which the cloud service will be introduced. These are the types of decisions we investigate in this paper. Drawing on the cloud adoption literature and Diffusion of Innovation and Organizational Capability theories, we formulate our research model involving factors related to cloud's relative advantage and to organizational innovativeness. Our findings show that cloud's cost-reduction and remote access benefits tradeoff security concerns as the context of cloud adoption becomes specific and demonstrate the relevance of personnel innovativeness in cloud adoption decisions.

1 Introduction

Cloud computing is currently directing businesses towards utility computing by transforming the role of PCs into terminals that are just used for gaining access to data and applications that are available on the internet (Carr 2009). Even though the term 'cloud' has been around for more than half a decade, there is still no universal definition for cloud computing (Oliveira et al. 2014). For the purposes of this paper, we use the definition of Buyya et al. (2009), defining cloud as a set of applications brought to the users as services which are provided by hardware and software systems installed in outsourced datacentres (Buyya 2009). Cloud comprises three layers, Infrastructure-As-A-Service (IaaS), Platform-As-A-Service (PaaS) and Software-As-A-Service (SaaS) (Liu et al. 2011).

Current research on business decisions about cloud computing has focused on cloud adoption factors. Specifically, it focuses on identifying factors influencing cloud computing adoption decision or testing the impact of a predefined set of factors on the intention to adopt cloud (Chinyao et al. 2011; Morgan et al. 2013; Oliveira et al. 2014). This line of research builds on the extensive tradition of the IS adoption literature on Diffusion of Innovation and its extensions. Most of these studies address cloud adoption as organisation-wide decisions. In other words, they focus on examining the impact of adoption factors on the decision to adopt cloud in the organisation as a whole (macro-level) without relating this decision to any particular business area of the organisation (micro-level). Despite the notable insights derived by the cloud adoption literature so far, recent reviews of cloud computing research underline the lack of empirical and theoretical depth in the existing results (Asatiani 2015; Schneider 2014; Yang 2012).

Although the conclusions of existing research converge, to some extent, on the factors influencing the adoption decisions, conclusions on certain factors (e.g. security) are contradictory. For example, numerous studies identify security concerns to be important for cloud computing decisions whereas some other studies indicate that security concerns do not have a significant impact on the decision to adopt cloud (Lewandowski 2013; Polyviou 2015). One key difference between studies identifying security concerns as influential and those identifying them as not influential, is that the latter considers cloud adoption with respect to a specific business area rather as a horizontal IS decision to the organisation. For example, Polyviou et al. (2015), address the impact of cloud adoption factors (cost reduction, remote access, security concerns) on the decision to adopt cloud-enabled payroll services (i.e. in the human resources (HR) business area).

Addressing cloud adoption factors at organisational-wide level is problematic, since the cloud service's value-perception by the decision maker may change if the benefits and risks become more specific based on the context in which the cloud service will be employed. This study focuses on examining the impact of factors on the decision to adopt cloud when considering cloud adoption with respect to a specific business area. Through the lenses of Diffusion of Innovation and Organisational Capability theories as well as the findings of existing literature, in Section 2 we build our research model comprising the concepts of relative advantage (cost reduction, remote access, security concerns) and organisational innovativeness (personnel innovativeness, managerial innovativeness). Following a quantitative approach that required participants to select a specific business area based on which answers to the core questions of the survey were provided, our research model has been tested. Section 3 outlines the methodological approach followed. Section 4 analyses the results arising by our study and Section 5 elaborates on the findings and discusses implications of this study. Section 6 summarises the paper and provides possible future research avenues.

2 Background

2.1 Theoretical background

According to the theory of diffusion of innovation, innovation is an idea, practice or technology that is new to an organization which is considering its adoption (Rogers 1995). Diffusion of innovation occurs when the new idea is spread to organisations through certain channels (e.g. media channels) over time. After becoming aware of the innovation by gaining initial knowledge about it, organisations are expected to develop an attitude towards it (favourable or unfavourable) and then to form a decision towards the innovation adoption (i.e. decide whether to adopt or reject it). At this decision stage, the organisation's decision makers, seek for reasons justifying why the innovation should be adopted. As an innovation's adoption decision usually involves a high level of uncertainty, decision makers look for information or means that could assist them in evaluating the innovation and increase their understanding about the innovation's potential consequences. In other words, decision makers attempt to explore the potential advantages and disadvantages that are associated with the adoption of the innovation in order to gain information about how the innovation's adoption could positively influence the organization and construct their rationale accordingly. To this end, literature on innovation diffusion explains how information about the consequences of an innovation can contribute on its adoption decision and the extent of the diffusion. One of the characteristics of the innovation influencing the decision for or against its adoption according to Rogers (1995) is its relative advantage. Rogers (1995: 212) defines relative advantage as the degree to which the innovation is perceived as a better idea compared to the one it supersedes.

Successful innovations usually form an s-shaped graph of diffusion which illustrates the diffusion level with respect to time (Rogers 1995). As cloud is still considered as an innovation (i.e. at first half of the diffusion of innovation curve), the adoption of cloud is also relevant for the capability of an organisation to view the benefits of the technology before of the competition. This also links to the willingness of the organisation to transform through the adoption of cloud technologies (Venters et al., 2012). To this end, we introduce the theory of organisational capability as a commentary lens for our study. The organisational capability theory builds on the idea that the essence of organisational capability is the result of integrating individuals' specialised knowledge to build value for the organisation (Grant 1996). The theory of organisational capability can provide an alternative lens for understanding organisational decisions as well as the approaches organisations choose to deal with different types of organisational problems support (Gold et al. 2001). It argues that organisational capabilities build on both the desire of the organisation to constantly gain competitive advantage and the constraint of change in structural change. To this end, new innovative structures are adopted if they are able to help the organisation in utilizing its capabilities to realise value. Liu et al. (2008) identify major organisational capabilities influencing organisational structure, among them innovation. Innovative organisations are considered as more likely to adopt new technological innovations are they hold the relevant competences to do so (e.g., mind-set, skills, technical expertise etc.). Such competences as directly related to the level of innovativeness of the organisation's staff members, including both management and personnel of other expertise (e.g. technical).

Both Diffusion of Innovation and Organisational Capability theories have been widely used for the adoption of new innovative technologies. Existing research has successfully employed Diffusion of Innovation theory for the adoption of IS innovations in the past (Chau et al. 1997; Kuan et al. 2001). At the same time, Organisational Capability theory has also been used to frame previous studies addressing the adoption of new technologies which have been predecessors of cloud computing such as grid-computing or organizational virtualization (Liu 2008; Messerschmidt et al. 2013). The theory provides significant direction for understanding the impact of the organisation's innovativeness on the decision to adopt cloud. To this end, we consider these theories as complementary for understanding cloud adoption decisions in the frame of our study.

2.2 Cloud adoption literature

Adoption of cloud computing is one of the most prominent and popular research topics so far recorded in the non-technical literature of cloud computing (Asatiani 2015; Hoberg 2012; Yang 2012). Initially cloud adoption was concerned with the identification of the advantages and disadvantages of cloud computing or the understanding of the consumer preferences on cloud computing (Anandasivam et al. 2010; Giessmann et al. 2012; Janssen et al. 2011; Polyviou et al. 2014a). The most dominant approach for tackling cloud adoption and its relevant decision making, focuses on factors that impact cloud adoption (Hsu et al. 2014; Low et al. 2011). Specifically, existing studies focus on identifying cloud adoption factors or testing the impact of a set of factors on the intention to adopt (Hsu et al. 2014; Low et al. 2011).

Up to now, Diffusion of Innovation theory (DOI) (Rogers 1995) has been widely employed for addressing cloud computing adoption whereas many research studies have attempt to complement DOI with other theories. For example, some studies have combined Diffusion of Innovation with the Technology-Organisation-Environment (TOE) framework (Alshamaila et al. 2013; Morgan et al. 2013; Oliveira et al. 2014), whereas Lian et al. (2014), have combined DOI theory with Human- Technology-Organisation-Environment model (HOT-fit) to frame their study. Oliveira et al. (2014), integrate some elements of DOI theory with TOE framework to address the impact of certain cloud adoption factors in the manufacturing and services industry. Similarly, Alshamaila et al. (2013), use TOE framework and DOI theory so as to frame the results of their qualitative study on cloud adoption factors. Lian et al. (2014), incorporate the relative advantage concept of DOI theory into the HOT-fit model so as to test their hypotheses. We consider studies that employed DOI and/or other theories so as to examine relationships between the factors and cloud adoption to be closely related to our work.

Existing literature on cloud computing adoption mainly addresses cloud adoption to the organisation as whole (macro-level). This literature helps us gain notable insights concerning cloud adoption factors. Some of the outstanding factors impacting cloud adoption are relative advantage (Alshamaila et al. 2013; Hsu et al. 2014; Lian et al. 2014; Low et al. 2011; Morgan et al. 2013; Oliveira et al. 2014; Saedi 2013), cost-reduction (Gupta et al. 2013; Khajeh-Hosseini et al. 2010; Köhler et al. 2010; Lewandowski 2013; Morgan et al. 2013), remote access (Gupta et al. 2013; Repschlaeger et al. 2012; Saedi 2013), security concerns (Chau et al. 1997; Feuerlicht et al. 2012; Gupta et al. 2013; Janssen et al. 2011; Köhler et al. 2010), management support (Alshamaila et al. 2013; Benlian 2009; Low et al. 2011; Whitley et al. 2013), CIO innovativeness (Alshamaila et al. 2013; Lian et al. 2014). Closer to the research aim of this paper is research that investigates the adoption of cloud computing with respect to a specific business area (micro level) or usage. For example, Lewandowski (2013), focused on the factors influencing the adoption of ERP SaaS and Polyviou et al. (2015) studied factors that affect cloud-enabled payroll systems. Among their findings, Lewandowski et al. (2013) underline that security concerns is not an influential factor for the adoption of ERP SaaS. Polyviou et al. (2015) define cloud's relative advantage into remote access, reduction of cost and security concerns. The study shows, inter alia, that remote access has a significant impact on the adoption of cloud-enabled payroll systems whereas it identifies that reduction of cost and security concerns are significant. We notice that the conclusion of these studies diverge to some extent to the conclusions of studies that have addressed the adoption of cloud services by the organisation as a whole.

Existing research has made notable progress in enhancing and expanding our understanding of cloud adoption. Several studies have considered specific segments of the cloud computing market. For example, some focused on cloud adoption in certain industries (e.g. Oliveira et al. (2014) on manufacturing and industries sector, Lian et al. (2014) on healthcare sector). Others addressed certain firm sizes (e.g. Alshamaila et al. (2012) on SMEs, Repschlaeger et al. (2013) on start-ups). Despite these segmentation efforts, the analysis of these studies investigated cloud adoption at the organisation-wide level (macro-level). To-date, very few studies have considered cloud adoption factors in specific business areas (micro-level) or usage (Lewandowski 2013; Polyviou 2015).

The findings of existing literature that has addressed cloud adoption at macro or micro organisational levels (e.g. HR business area) indicate that factors influencing cloud computing adoption may diverge between the two. The objective of this study is investigate the generalisability of these indications regardless of the type of business area. Hence, the research question of this paper is the following:
What are the factors influencing cloud adoption when adopting cloud services in a specific business area?

2.3 Hypotheses development

The research model of this study builds on the Diffusion of Innovation and Organisational Capability theories by including the concepts of relative advantage and organisational innovativeness. To define cloud's relative advantage, this study adopts the definition of Polyviou et al. (2015) and hence it considers cloud's relative advantage in terms of cost reduction, remote access and security concerns. Using the approach of Messerschmidt et al. (2013), it defines organisational innovativeness in terms of managerial and personnel innovativeness.

To formulate our hypotheses concerning these concepts, we draw on the findings of cloud adoption literature as well as on the results of preliminary qualitative study that has been conducted by the authors of this paper. The respondents of the preliminary study were senior decision makers (typically CIOs or equivalent role) familiar with their organizations' cloud adoption decision making process. Organizations were heterogeneous from a spectrum of domains, sizes (micro, SMEs, large, very large) and European countries (Germany, France, U.K., Austria, Greece, Poland, Italy, Belgium) with 24 organizations represented. The interview agenda included introductory questions about the profile of the organization, the role of respondent and the use of cloud services. It then required the participants to describe the cloud adoption decision making process followed in their organisations and the factors that have influenced the decision to adopt cloud (positively and negatively).

2.3.1 Relative advantage

Numerous studies have incorporated the relative advantage concept in their research (Alshamaila et al. 2013; Hsu et al. 2014; Khajeh ‐ Hosseini 2012; Lian et al. 2014; Low et al. 2011; Morgan et al. 2013; Repschlaeger et al. 2012). However, each of these studies has taken a different approach for the factors grouped under this concept. Some of these studies (Abdollahzadegan et al. 2013; Lian et al. 2014; Low et al. 2011) have taken a general approach for relative advantage as provided by studies of previous technologies (Moore et al. 1991). Other studies have dismantled relative advantage into more specific constituents that are relevant to the cloud technology in particular (Oliveira et al. 2014; Polyviou 2015). For example, Oliveira et al. (2014) interpret relative advantage in terms of cost benefits and security concerns, whereas in Polyviou et al. (2015) relative advantage includes cost benefits and security concerns and also remote access as a third factor grouped under cloud's relative advantage. As discussed earlier, Polyviou et.al (2015) addressed the adoption of cloud services in the HR business area. Since this study aims at generalising part of the results of this study concerning cloud's relative advantage we adopt the same interpretation for cloud's relative advantage.

Cost savings is one of the major factors influencing the decision to adopt of cloud computing. As Asatiani (2014) concludes, cost advantages for cloud adoption are identified as an influential factor for cloud adoption in more than 80% of the studies conducted so far. Along the same lines, Lewandowski et al. (2013) confirm cost-reduction as important factor influencing the decision to adopt SaaS ERP. Our preliminary study also indicates reduction of cost is one of the factors catalysing the decision to adopt. In some cases interviewees could even easily denote the cost savings expected: "With the previous solution, for each new store we had to purchase a new license [of the system] which cost 500

euros vs 30 euros which is the cost of the new [cloud-enabled] solution" [director of retail chain].This leads to the first hypothesis of our study:

H1: Perceived cost reduction positively influences intention to adopt cloud in a specific business area

Although the concept of remote access existed before the release of cloud technology (e.g. via VPN), cloud technology is the one that has widely cultivated the desire for remote access to computing services through any device, anywhere, anytime. Existing research on adoption factors at macro level identify remote access as an important factor influencing the adoption (Chau et al. 1997; Janssen et al. 2011; Köhler et al. 2010). Similarly, Polyviou et al. (2015) also identify this factor as a significant factor for the decision to adopt of cloud-enabled payroll systems. The results of our preliminary qualitative study support the view that remote access as an important factor for cloud adoption. Interviewee quotes related to remote access highlight the need for mobility (i.e., access from any place, any device) as the basic trigger of their decision to adopt cloud computing e.g., "it is accessible from anywhere. Hence employees could even work from home without being obliged to stay in their offices" [quote of chief information officer in public sector], "As we had now developed cloud [CRM] solutions, the clinical visitor is on his/her way, he can input the visits, he can view his schedule without having to prepare it in advance the previous night, without having to spent 2-3 hours in the evening on this. He/she can do it on the field or while waiting" [IT officer in international pharmaceutical organisation]. The second hypothesis of our study is therefore articulated as follows:

H2: Perceived possibility for remote access positively influences intention to adopt cloud in a specific business area

The deployment of cloud services implies that the data of the organisation is stored, processed and handled by an external provider in a multi-user environment (Joint et al. 2009). This releases additional security concerns to the organisation as sensitive data may be stored at a third-party datacentre and thus this concern may act as a barrier towards cloud adoption (Feuerlicht et al. 2012; Gupta et al. 2013; Janssen et al. 2011; Köhler et al. 2010; Lian et al. 2014; Oliveira et al. 2014; Polyviou et al. 2014b). Despite this conclusion, Lewandowski et al. (2013) and Polyviou et al. (2015), addressing the adoption of SaaS ERP and cloud-enabled payroll system respectively conclude that security concerns do not have an impact on the adoption decision. Findings at macro and micro organisational level concerning security concerns are contradictory, while reviews of cloud adoption literature indicate that most of the literature refers to security concerns as one of the major barriers to cloud computing adoption (Asatiani 2015). Hence, we hypothesize that:

H3: Security concerns negatively influence intention to adopt cloud in a specific business area

Organisational Innovativeness

As highlighted by existing studies beyond the benefits or risks that the technology brings to the organisation, the innovation characteristics of the organisation need to be accounted for, so as to gain more holistic and meaningful conclusions (Oliveira et al. 2014). Hence, guided by Organisational Capability theory in this paper we introduce the concept of organisational innovativeness (personnel innovativeness, managerial innovativeness) for understanding part of cloud adoption decisions. Organisational innovativeness is associated to the individual's (leader) or/and organisational characteristics to explore and adopt innovations earlier than other members of the same social context or industry (Rogers 1995). The innovativeness of the organisation is expressed in previous studies (e.g. Lian et al (2014) in terms of the human dimension of cloud computing adoption. Lian et al. (2014) interpreted organisational innovativeness in terms of the innovation competences of the CIO (CIO innovativeness), whereas others relate organisational innovativeness to managerial support (Low et al. 2011; Morgan et al. 2013). As revealed throughout our preliminary interview studies, both personnel and managerial are important for supporting the decision to adopt. Personnel innovativeness could be linked to the innovativeness of the CIO to discover and suggest the adoption of cloud technologies "I tend to now think

myself as a pioneer. But then when I talk to vendors, about what we are doing they start to talk to me about what they want to sell and discover 'yes we are already doing that'[…] I am often surprised, basically, the things they are offering are the things we've done. So I guess we must be a little bit ahead of the curve." [CIO of national association]. But, managerial innovation is associated to the innovative mind-set of the rest of the high level executives (e.g. CEO, CFO etc.) to support the adoption of innovative concepts in the organisation "Yes, I would say that the fact that we are the only company in the business area using cloud services for this purpose, is an innovation. Afterwards, in some business area will be able to innovate in the business areas of retail and CRM. We will be able to use advance loyalty schemes, which will be electronically automated and will function through a mobile app" [director of retail chain]. Based on these conclusions, we derive the fourth and fifth hypotheses for our study relevant to organisational innovativeness:

H4: Personnel innovativeness positively influences intention to adopt cloud in a specific business area

H5: Managerial innovativeness positively influences intention to adopt cloud in a specific business area

2.3.2 Control variables

Existing literature on cloud adoption has used organisation size as one of its segments. To this end, we include organizational size as one of the control variables of our model. Since the target audience were Greek companies we consider organisational size only in terms of numbers of employees. We do not consider annual turnover as another indicator of organizational size since we consider this factor to be affected by the current economic situation of the country. In addition, industry type has also been accounted as another segment for previous studies and hence we include industry type as one of the control variables in our model. Finally, since our study aims at addressing several business areas, we also control for type of business area. The following section provides an overview of the methodology followed for conducting the study.

3 Research Methodology

The study followed a quantitative methodology to test the proposed hypotheses using the firm as the unit of analysis. A survey was used as the instrument through which the hypotheses were tested. The questions employed for our survey are listed in Appendix 1 of this paper. To relate the questions about factors and intention to adopt cloud in a certain business area, at the beginning of the survey respondents were requested to choose one business area among a list of various business areas (i.e. Customer Care, Sales, Marketing, Production, Finance, Product Development, Supply Chain, Human Resources). More specifically, they were required to choose the business area of the business which their firm is likely to adopt cloud or have adopted cloud services. After providing their choice, respondents were asked to answer questions about the impact of certain factors on the decision to adopt cloud services in the business area previously chosen. The relevant question in the survey can be found in Appendix 1.

The respondents targeted were mainly Chief Information Officers (or equivalent role), whereas in cases of firms of smaller sizes the Director or CEO participated in the survey. We consider this audience as the most appropriate for responding to our survey since CIOs are usually the leading decision maker for technology decisions. The sample population included Greek firms of several sizes and of several different business areas. The survey was available online through the use of an online survey tool (Qualtrics). To collect the responses, an initial email inviting participants to respond to the online survey was delivered. Afterwards, a couple of reminding emails followed, as well as follow-up phone calls in order to remind participants to respond. Each company was asked to respond to the questionnaire only once. Responses were collected from March 2015 to June 2015. Out of the 1530 emails, a

total of 74 valid questionnaires were collected. The response rate of the respondents invited to participate in the study was 4,8% which is typical for studies targeting senior managers via emailed survey.

3.1 Measurement & Scale development

To examine the impact of certain factors on the intention to adopt cloud services in a specific business area, the research model included only first-order constructs. As discussed in the previous section, these constructs are associated to diffusion of innovation theory (relative advantage) and organisational capability theory (organisational capability theory). More specifically, the cost reduction, remote access desire and security concerns constructs are grouped under cloud's relative advantage whereas managerial and personnel innovativeness are grouped under organisational innovation.

Items were adapted from existing studies. Reduction of cost in the proposed model was measured using three items based on Premkumar et al. (1999) and the responses were provided in a seven-point Likert-type scale with endpoints Strongly Agree (1), Strongly Disagree (7) (Premkumar et al. 1999). The ability to access the system remotely from anyplace, anytime was measured through three items based on Polyviou (2015). Relevant answers were provided in seven-point Likert-type scale with endpoints Strongly Disagree (1), Strongly Agree (7). The impact of security concerns was measured through the items arising by existing literature (Oliveira et al. 2014). Responses for this construct were measured in seven-point Likert-type scale with endpoints Not At All (1), Very Much (7). Personnel innovativeness is relevant to the innovativeness of the staff members of the company (particularly the CIO in our case), to explore and propose new technologies. Personnel innovativeness as measured using four items as adopted by Messerschmidt et al. (2012) through a seven-point Likert-type scale with endpoints Strongly Disagree (1), Strongly Agree (7). Managerial innovativeness relevant to the innovativeness of other high-level executives was also measured using three items and a seven-point Likert-type scale for the answers (Messerschmidt et al. 2013).
The target audience was mainly Greek native speakers. Hence, all items were translated in the respondents' native language (Brislin 1970). The translation of the questions was done by one of the authors whereas the other authors reviewed the translated items and suggested changes where necessary. The questionnaire was initially pre-tested with professionals from the IT industry (cloud providers) and then it was piloted using five executives holding CIOs or related roles.

4 Results

4.1 Descriptive Statistics

The research model and hypotheses were tested using SPSS tools so as to generate descriptive statistics relevant to our model. The mean and standard deviation values are listed in Table 1. For testing the research model, Structural Equation Modelling (SEM) was used. Since our sample size is small and the research aim is to explain the variance, Partial Least Squares (PLS) method was considered as the appropriate analysis technique (Smith et al. 1997). Relevant conditions for PLS usage were fulfilled since our sample size was larger of ten times the largest number of formative indicators used to measure a construct (Hair et al. 2011). To run our PLS analyses, the Smart-PLS software was used. Bootstrapping was set to 1000 re-samples bootstrapping and case-wise deletion of incomplete samples. As explained earlier, at the beginning of the survey participants were requested to select one business area which could benefit the most from a potential adoption of cloud services. The choices of the participants in terms of business areas are illustrated in Table 2.

Table 1 – Descriptive Statistics

Construct	Mean	St. Deviation
Reduction of Cost	3.87	1.84
Remote Access	5.51	1.59
Security Concerns	5.15	2.00
Personnel Innovativeness	5.13	1.06
Managerial Innovativeness	5.02	1.56

Table 2 – Percentages of business areas chosen by participants

Business area Chosen	Mean
Customer Care	26%
Sales	21%
Marketing	4%
Production	3%
Finance	4%
Product Development	16%
Supply Chain	7%
Human Resources	1%
Other	19%

4.2 Measurement Model Validation

The measurement model's validity was tested using several statistical techniques. Following the testing approaches of existing literature, we have tested our measurement model for internal consistency, convergent validity and discriminant validity (Fornell et al. 1981). Since the Cronbach's alpha indicators for all the constructs were larger than 0.07, we could conclude that all the constructs satisfied the internal consistency requirement (Nunnally et al. 1994). Furthermore, testing for convergent validity (all items which measure a specific construct correlate) was also concluded as adequate. Following Fornell and Lacker (1981), average variance extracted (AVE) for all of our constructs was greater than 0.5 (Fornell et al. 1981). Finally, the square roots of each factor's AVE were evaluated as greater than its correlations between it and the rest of other factors (Gefen et al. 2005). Hence, we concluded that the test for discriminant validity was successful. The results of the above analyses summarising the validity of our measurement model are included in Appendix 2. After ensuring that our measurement model met the necessary criteria, we proceeded to the structural validation stage.

4.3 Structural Model Validation

With the use of Smart PLS, the strength and significance of the hypotheses were tested. Relevant path coefficients (pc) (or beta values, β) concerning each of the structural paths were extracted to understand the difference that each independent value makes in interpreting the variance of the depended variable. In addition, each hypothesis' significance was examined through bootstrapping analysis. This procedure also lead to the derivation of the t-values (t) and corresponding significance for each relation were derived. Figure 1 illustrates the above attribute values (path coefficients (pc), R_2, t-values (t) and significances) in respect to our model as arising by our PLS analysis.

As illustrated in Figure 1, squared multiple correlations (R^2= 0.532) indicate that there is good explanatory potential for the intention to adopt cloud services in a specific business area concerning the constructs used in our model (i.e. 53.2% is explained through the constructs included in the model). Three

of the hypotheses presented earlier are supported with significance below the 0.05 value. Hypothesis 1 (H1) was confirmed as the results of the analysis show that reduction of cost significantly influences the intention to adopt cloud services in a specific business area. Hypothesis 2 (H2) was confirmed as the results of the study show that the remote access capability offered by the cloud technology, has a significant influence on the intention to adopt cloud services in a specific business area. Hypothesis 4 (H4) is also supported as the results show that personnel innovativeness significant impact on the intention to adopt cloud service in a specific business area ($p<0.05$). Hypotheses 3 and 5 are not supported as the dataset analysis did not indicate significant influence on the adoption intention. The control variables did not reveal any effect on the intention to adopt. In the next section the results presented so far are discussed with reference to existing literature.

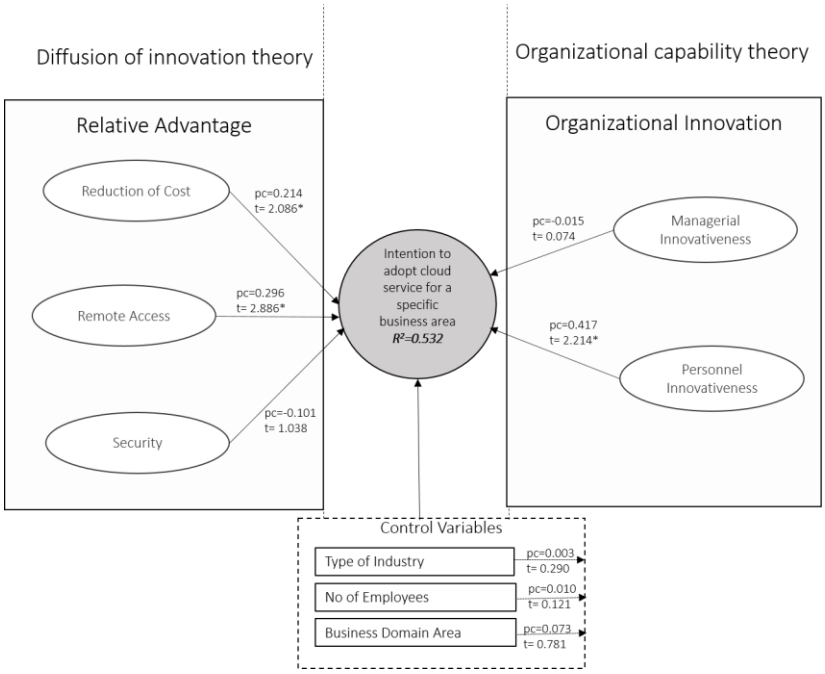

Figure 1-Path model with results (*$p<0.05$)

5 Discussion

This paper was motivated by the need to address cloud adoption factors when it comes to the adoption of cloud services in a specific business area. Through the lens of diffusion of innovation, cloud adoption literature and preliminary interview data, this paper has defined cloud's relative advantage into reduction of cost, remote access, security concerns and generated the related hypotheses (H1-H3). Complementing diffusion of innovation theory with organisational capability theory, we have also introduced personnel innovativeness and managerial innovativeness factors, grouped under the organisational innovativeness concept in this study which led to the derivation of H4 and H5.

First, the study highlighted that cost reduction is an important factor for cloud adoption, even when considering the adoption of cloud services in a specific business area. This finding is aligned with findings of existing research underlining that cost reduction is one of the most important factors influencing the adoption of cloud services in the organisation at macro-level (Gupta et al. 2013; Khajeh-Hosseini et al. 2010; Köhler et al. 2010; Lewandowski 2013; Morgan et al. 2013). However, it partly diverges to conclusions of studies addressing the adoption at micro-level (i.e Polyviou et al. (2015) identified cost reduction as not significant and Lewandowski et al. (2013) identifies the factor as significant). In their paper, Polyviou et al. (2015) justify their finding by noting that for payroll systems, the licences needed by the firm are likely to be standard for each year and hence the on-demand char-

acteristic that relates to the cost-reduction provided by the adoption of cloud services is not very applicable in the HR business area. In this respect, we note that given that only 1% of the respondents chose HR as their business area, this finding is likely to be relevant to the specific business area and hence this allows for the generalisability of our results. However, future research could explore this finding further by focusing on other possible business areas of the business that could have a relatively predictable pattern of the number licences needed. Remote access is another factor, grouped under cloud's relative advantage that has been previously identified as important for cloud adoption decisions. Remote access has been identified as an important factor influencing cloud adoption through previous studies focusing on both macro (Gupta et al. 2013; Repschlaeger et al. 2012; Saedi 2013) and micro (Polyviou 2015) organisational levels. The results of our study, lead to the conclusion that remote access is an important factor influencing cloud adoption at micro-organisational level.

Moreover, according to our results, personnel innovativeness (i.e. CIO innovativeness in our case), has also a significant impact on the decision to adopt cloud services in a specific business area. As discussed earlier, personnel innovativeness relies on the interest of the CIO and other staff members to explore and consider new innovative technologies. We consider that this characteristic directly contributes to making the organisation less sceptical and more open towards new technologies. The cloud adoption literature targeting cloud adoption at the organisation as a whole (Alshamaila et al. 2013) as well as literature addressing the adoption of cloud's predecessors (Messerschmidt et al. 2013), has identified personnel innovativeness factor as influential. Previous studies targeting the adoption of cloud services at micro-level have not incorporated personnel innovativeness in their model. In this respect, our study contributes by demonstrating the personnel innovativeness (i.e. CIO innovativeness) holds a significant impact on the decision to adopt cloud services in a specific business area.

Although aspects related to managerial innovativeness (e.g. management support) seem to be an important factor influencing cloud adoption decisions at macro-level (Alshamaila et al. 2013; Benlian 2009; Low et al. 2011), our study did not evaluate managerial innovativeness as a significant factor for the decision to adopt cloud in a specific business area. The divergence in the results of personnel and managerial innovativeness hypotheses could be interpreted if we consider that personnel (the CIO in our case), is more flexible in taking initiatives and responsibilities when the adoption of cloud does not regard the whole spectrum of the organisation (macro-level), but particular business functions. This makes sense if we consider that organisation-wide cloud adoption decisions are more likely to involve larger risks compared to cloud adoption in specific business areas. Hence it could be argued for cases that the context of adoption has more restricted boundaries (i.e. adoption at micro level), the management is less involved in the decision making, more autonomy is allowed to the CIO and hence managerial innovativeness is not evaluated as relevant. Given this interpretation, we highlight that this finding warrants future research to focus understanding the dynamics of the cloud adoption decision making process in organisations.

Furthermore, this study identified security concerns as not significant. In our study, security concerns was hypothesised to have a negative impact on the decision to adopt cloud services in a specific business area. This hypothesis was based on findings of cloud adoption literature highlighting that security concerns have a significant impact on cloud adoption. As discussed earlier, such studies focused on addressing cloud adoption in the organisation in general and not the adoption of cloud services in a particular business area. According to the results of our study, security concerns do not have a significant influence on the adoption of cloud services when considering the adoption of the service in a specific business area. This could be explained if we account than once decision makers consider the adoption of a cloud service in a particular business area, their perception about the benefits and the risks of the adoption becomes more specific. In this sense, our findings reveal that when considering the adoption of cloud service in a specific business area, decision makers are more likely to trade-off security concerns in view of the expected benefits.

Additional justification for this conclusion could be derived if we recall findings of widely-cited studies in the field of marketing, highlighting that there is a dynamic nature of how customers perceive

value (Flint et al. 2002) and that customer value perception is relevant to the trade-offs between all relevant benefits and risks in a specific-use situation (Flint et al. 1997). Although the marketing literature identifies generic product benefits and risks that influence consumer's choice, it highlights that such benefits may change once a specific consumption activity is considered (Lai 1995). Considering that our study has addressed the impact of key adoption factors on the decision to adopt cloud services in a specific business area, we could conclude that once decision makers consider a specific-use situation, cloud's benefits (i.e. cost reduction and remote access) trade-off any risk concerns that decision makers may have.

Overall, through this paper we have responded to the need to study cloud adoption in more depth (Asatiani 2015), by exploring the impact of adoption factors on the decision to adopt cloud services when considering cloud adoption in a specific business area. Thus, this paper contributes to the cloud adoption literature by demonstrating that there are differences between the factors influencing the adoption of cloud services at macro and micro organisational level. In addition, it contributes by identifying and testing these factors, highlighting the convergences and divergences between cloud adoption factors at macro and micro level and providing justifications where necessary. In this way, our research has highlighted security concerns relevant to cloud adoption are overtaken by cost reduction and remote access benefits when it comes to the adoption of cloud services in a specific business area. Also, the research revealed that although personnel innovativeness has a notable influence on the decision to adopt cloud services at micro-level, managerial innovativeness does not. The synthesis of the above conclusions denotes that as the context of adoption for cloud services becomes more specific, benefits and risks become more obvious and benefits are more likely to counter-balance the risks of cloud adoption and also that as the context becomes more specific. Beyond this contribution, this paper has demostrated the relevance of organisational capability theory, as a complementary lens for understanding cloud adoption decisions.

Beyond the theoretical implications, our study could also provide practical implications for cloud vendors. According to our findings, the benefits of cloud computing e.g., cost reduction, remote access, trade-off the security concerns of the decision maker and catalyse his/her value perception when it comes to the adoption of a cloud services in a specific business area. To this end, this study advices product managers and marketers to shift their campaigns about cloud away from discussing security issues or security assurances provided for their cloud products. In addition, such campaigns should highlight, if possible in measurable terms, the positive impact of the adoption of a cloud service in the context of the specific business area.

This study holds a number of limitations. As the target audience was Greek companies, the study holds the possibility of reflecting the perception of a geographical area and/or certain socio-economic conditions. Additionally, the study did not provide any conclusions concerning specific industry types or organisational sizes. Finally, as it aimed at exploring whether adoption factors change when considering the adoption of cloud at micro rather than macro organisational level, it did not derive conclusions concerning each particular business area.

6 Future work

In this study we demonstrate that factors influencing the decision to adopt cloud computing are different when considering cloud adoption as an organisation-wide decision and as a decision that concerns a specific business area of the organisation. Future studies could focus on further validating the justifications provided by our study, mainly through qualitative studies. For example, the difference on the impact of personnel and managerial innovativeness invites further research to address the dynamics of cloud adoption decision making, especially when considering the adoption of cloud services in a specific business area. Also, as investigating the impact of adoption factors for each particular business area was outside the scope of our study, future studies could focus on evaluating the model for different business areas. Comparing the impact of each factor across each of the business areas is expected to provide insightful findings that will provide valuable theoretical and practical insights.

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APPENDIX 1

Business area selection		Out of the business areas listed below, please choose the one in which your firm would be most likely to consider the adoption of cloud services/has already adopted cloud services: (Customer Care, Sales, Marketing, Production, Finance, Product Development, Supply Chain, Human Resources, Internal Collaboration/Communication)	(Self-Developed)
Please answer the questions below, based on the specific business area you selected in the previous question.			
Reduction of Cost	1	The cost of adoption of adopting a cloud service in the specific business area is far greater than the benefits.	(Premkumar et al. 1999)
	2	The cost of maintenance and support of a cloud service in the specific business area is very high for our business.	(Premkumar et al. 1999)
	3	The amount of money and time invested in training employees to use a cloud service in the specific business area is very high.	(Premkumar et al. 1999)
Remote Access	1	My firm would be interested in having remote access to a cloud service in the specific business area	(Polyviou et al., 2015)
	2	The remote access functionality of the cloud service in the specific business area will improve the effectiveness of the tasks completed by the business area.	(Polyviou et al., 2015)
	3	The remote access functionality of the cloud service in the specific business area will raise the productiveness of the business area	(Polyviou et al., 2015)
Security Concerns	1	Degree of concern of my firm for the security of the cloud service supporting the specific business area	(Oliveira et al. 2014)
	2	Degree of concern of the employees of my firm for the security of data in the cloud service supporting the specific business area	(Oliveira et al. 2014)
	3	Degree of concern of my firm about the privacy of the data in the cloud services supporting the specific business area	(Oliveira et al. 2014)
Personnel Innovativeness	1	We get a lot of support from managers if we want to try new ways of doing things	(Messerschmidt et al. 2013)
	2	In our company. we tolerate individuals who do things in a different way	(Messerschmidt et al. 2013)
	3	We are willing to try new ways of doing things and seek unusual. novel solutions	(Messerschmidt et al. 2013)
	4	We encourage people to think and behave in original and novel ways	(Messerschmidt et al. 2013)
Managerial Innovativeness	1	Key executives of the firm are willing to take risks to seize and explore ‘‘chancy’’ growth	(Messerschmidt et al. 2013)
	2	Senior executives constantly seek unusual and novel solutions to problems	(Messerschmidt et al. 2013)
	3	When our firm sees new ways of doing things. it quickly adopts them	(Messerschmidt et al. 2013)
Intention to Adopt	1	At what stage of adoption is your firm currently engaged regarding the adoption of cloud services in the specific business area?(Not considering; Has evaluated, and does not plan to adopt; Currently evaluating (e.g., in a pilot study); Has evaluated and plans to adopt; Has already adopted such systems)	(Thiesse et al. 2011)
	2	If you are expecting that your firm will adopt cloud services in the specific business area, when do you think it will happen? (Not considering to adopt; In more than 5 years; Within 2-5 years; Within 1-2 years; In less than a year)	(Thiesse et al. 2011)

APPENDIX 2

	Cronbach's Alpha	Composite Reliability	AVE	COS	REA	SEC	PIN	MIN	AD
Reduction of cost (COS)	0.834	0.898	0.747	0.871	0.453	-0.314	0.260	0.286	0.484
Remote access (REA)	0.859	0.912	0.776		0.898	-0.163	0.295	0.485	0.529
Security Concerns (SEC)	0.970	0.980	0.943			0.972	-0.354	-0.305	-0.358
Personnel Innovativeness (PIN)	0.858	0.904	0.703				0.835	0.775	0.584
Managerial Innovativeness (MIN)	0.730	0.847	0.655					0.805	0.485
Intention to adopt cloud service in a specific business area (AD)	0.878	0.943	0.892						0.948