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THESIS:

Determinants of Adopting Cloud Computing for Enterprises in Kosovo

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DECLARATION

I hereby declare that I am the sole author of this thesis. All sentences cited in this thesis from other articles and books have been properly cross-referenced.

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DECLARATION

I, Modest Morina, have proofread the thesis entitled Determinants of Adopting Cloud Computing for Enterprises in Kosovo and hereby certify that it conforms to generally acceptable standards for verbiage, spelling and format.

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ABSTRACT

In recent years, cloud computing has been an emerging computing model in the IT industry and is revolutionizing IT infrastructures and flexibility. Many factors influence the adoption of cloud computing. Organizations must carefully evaluate these factors before they take adoption decision. The purpose of this study is to identify factors influencing the cloud computing adoption for companies within the context of Kosovo. To evaluate which determinants influence the adoption of cloud computing, this study describes a research model that is based on the diffusion of innovation (DOI) theory and technology, organization and environment (TOE) framework. Data collected by survey questionnaires from a sample of 32 companies, are used to test and investigate the proposed hypothesis. This research shows that there are some similarities and differences in the factors that affect cloud adoption between technologically developed countries and the ones that are in developing stage.

PARATHËNIE

Viteve të fundit, cloud computing është shfaqur si një model i kompjuterëve në industrinë e tekonologjisë informative (TI) duke bërë revolucion në infrastrukturat e TI-së me fleksibilitetin e tij. Shumë faktorë ndikojnë në miratimin e cloud computing. Organizatat duhet t'i vlerësojnë me kujdes këta faktorë para se të marrin vendimin për adoptimin e cloud computing. Qëllimi i këtij studimi është identifikimi i faktorëve të cilë ndikojnë në adoptimin e cloud computing për kompanitë që operojnë në Republikën e Kosovës. Për të vlerësuar se cilët faktorë / përcaktues ndikojnë në adoptimin e cloud computing, ky studim përshkruan një model kërkimi që bazohet në diffusion of innovation teorinë (DOI) dhe në strukturën technology organization and environment (TOE). Të dhënat e mbledhura nga pyetësorët e anketës nga 32 kompani, janë përdorur për të testuar dhe hetuar hipotezat e propozuara. Hulumtimi vërteton se ekzistojnë disa ngjashmëri dhe dallime tek faktorët që ndikojnë në adoptimin e cloud computing midis vendeve të zhvilluara dhe atyre që janë në fazën e zhvillimit të tekonologjisë.

АПСТРАКТ

Во последниве години, cloud computing е нов компјутерски модел во информациска технологија (ИТ) koja ги револуционизира ИТ инфраструктуриве со флексибилноста. Многу фактори влијаат на донесувањето на одлуkа при посвојување cloud computing. Компании мора внимателно да ги оценаt овие фактори пред да преземаt одлуки. Целта на оваа студија е да се идентификуваат факторите кои влијаат на посвојување cloud computing за компании во контекст на Косово. Да се оценат детерминантиве кои влијаат на донесувањето одлуkа при посвојување cloud computing, оваа студија го опишува истражувачкиот модел кој се базира на diffusion of innovation (DOI) теорија и technology, organization and environment (TOE) рамка. Податоците собрани од анкетата на прашалниkot од 32 компании, се користи за тестирање и да ги испита предложените хипотеза. Истражувањеto покажува дека постојат сличности и разлики во однос на факторите кои влијаат на донесувањето одлуkа при посвојување cloud computing меѓу технолошки развиените земји и оние кои се во развојна фаза.

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1 INTRODUCTION

1.1 Introduction

Cloud computing is not entirely new technology. It has already been used by many people in different ways. Free email services, free office products and many subscription software services are operating for many years. Present cloud computing is renewed by including advantages in virtualization technologies, web technologies, scale out and infrastructure hardware and software technologies [1].

In today's world there are many definitions for Cloud Computing. According to National Institute of Standards and Technology (NIST), cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction [2]. Also cloud computing can be defined as a large pool of easily usable and accessible virtualized resources such as hardware, development platforms, and services [3].

Cloud computing experienced increasing popularity in recent years. Enterprises are rapidly reorienting their Information Technology (IT) strategies to include cloud computing [4]. By lowering IT expenditures, offering real time applications, mobile storages and unlimited computing power, organizations are seeking to achieve business efficiencies [5].

International data corporation (IDC) predict that worldwide spending on public IT cloud services will grow from $16.5 billion in 2009 to over $55 billion in 2014 (Gens, 2010). In return, this can help businesses improve the creation and delivery of IT solutions, by enabling them to access computing services more flexibly at reduced cost [20]. Number of researches in cloud computing is increasing and they are mainly in technical level. However, research on business level aspect of cloud computing is still low [6].

Prior studies have focused on technical and operational issues. Some of the researches have been done to examine direct influence of technological innovation attributes and other contextual elements, although a few studies have addressed the adoption of cloud computing from an organizational level. So far, academic research on adopting cloud computing for private or public companies in Kosovo hasn't been done yet. Motivated by this gap, the research seeks to develop a research model that combines the innovation characteristics (Diffusion of Innovation – DOI), technology organization environment (TOE) and human behavior by using Theory of Reasoned Action (TRA).

This research will address three questions. First, will determine what are the determinants that influence the decision to adopt cloud computing in Kosovo and second, what factors determine the decision of such adoption. As a third question, human behavior and attitude will be investigated for research context.

Data from 32 firms from Kosovo are used to evaluate the research model. Sectors as energy, banking, IT consultancy and service companies were gathered in order to investigate the determinants of cloud computing adoption.

So far academic research on adopting cloud computing for private companies in Kosovo has not been done yet. Kosovo as a new country is facing a transition phase where corporates managed by government are being privatized to foreign investors. The focus of the research is on companies from service sector. Ministries and government sector will be excluded from this research.

1.1 Aims of the Research

Cloud computing is not a solution for all organizations. The purpose of this study is to understand the determinants of adopting cloud computing and its benefits to private companies in Kosovo. So far no studies have been done yet to address the adoption of cloud computing neither for technical or operational issues in Kosovo. Inspired by this lack of information, this study will find out whether it is a benefit or drawback for migrating data centers into Cloud Computing.

First we will investigate the primary strategic issues in adopting cloud computing in organizations. Based on this research, companies will be guided through the process of how to adopt cloud computing in a safe way. This roadmap will help other companies in planning and migration to cloud computing and can be used by technical and non-technical management.

Second, by investigating the determinants mentioned above the outcome of this research will contribute to future investors' decisions who are planning to operate within the country.

From the literature review on cloud computing adoption, several factors are identified which have importance on decision about adopting cloud computing. Based on these factors, hypotheses are developed that describe how the factors affect the adoption of cloud computing.

1.2 Research Question

Determining the factors that influence the adoption of cloud computing is an important and sensitive topic. So far, this topic has not received enough attention from researchers in context of Kosovo. In this study we are going to address the question:

What are the determinants that influence the decision to adopt cloud computing by Kosovo companies?

Determining the factors that influence the decisions to adopt cloud computing allows us to predict the rate of adoption of cloud computing. In doing this, I use the result from companies who intent to adopt cloud computing and we will understand which factors have influence on adoption decision.

1.3 Research Context

Research context of this study is service sector in Kosovo, the youngest country in the world. Its population ranges from 1.8 – 2.4 million and with an area of 10,887 sq km [88]. From 1999 onwards the economic growth of Kosovo could be described as steadily progressing due to the considerable inflow of financial support from different donors, aiming to reconstruct and strengthen the economy and stability of the country after the conflict. In the first couple of years the GDP growth doubled and then gradually slowed down to moderate [89]. Kosovo has the youngest population in Europe, with 46% of the total population up to 18 years old. For a short period, Kosovo has managed to adopt very few important pieces of legislation and a strategic framework to support the government's efforts to regulate, promote and improve the development of the ICT sector in Kosovo. Some of the most important legislative acts that have influenced the progress of the sector are:

- Telecommunications law
- Law on Information Society Services
- Law on Copyright and Related Rights and Law on Scientific Research Activity
- Law on the Protection of Personal Data and Law on Prevention and Fight against Cyber Crime

The country had to build its ICT infrastructure in the last years, which made the government a dominant ICT customer and developed the potential of the local ICT companies to undertake or participate in large scale projects [89].

1.4 Importance of the thesis

The primary goal of this research is to examine and describe principle factors and barriers that influence the adoption of cloud computing in Kosovo, both technical and nontechnical aspects. The research will document conditions to be foreseen by investors who are willing to invest in Kosovo weather to migrate current data centers or adopt cloud computing. Technical, non-technical and financial aspects are explored and based on the findings, recommendations are proposed when applying or migrating cloud computing across the countries. Furthermore, data collected from interview and questionnaires will provide a financial overview of current systems and future growth of data centers. The research may also be useful to IT managers in Kosovo to enrich the decision framework, including cloud adoption strategy, cloud computing service, deployment model selection, and implementation priority.

The topic of cloud computing adoption is a very important and relevant. We address it in a timely manner in the context of Kosovo environment. The results from the thesis will have theoretical and practical contribution. From the theoretical perspective, we will describe the determinants of cloud computing adoption that are relevant for the adopted context (Kosovo). Results should have practical contribution providing directions to the companies for development of ICT strategies involving cloud computing.

Therefore, the importance of this thesis is very high.

2 LITERATURE REVIEW

2.1 Cloud Computing

Cloud computing at the present time is the dominant news topic in the area of IT which has the potential to transform a large part of the IT industry. Developers with innovative ideas for new Internet services no longer require large investment in hardware to deploy services. Companies with large infrastructure can scale their IT infrastructure as quickly as their programs can scale. This elasticity of resources, without paying a premium for large scale, is unprecedented in the history of IT [40].

Cloud computing was defined by the national institute of standards and technology (NIST) as " a model for enabling convenient, on- demand network access to a shared pool of configurable computing resources (e.g., network, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction [22]. Figure 2-1 illustrates the definition of cloud computing.

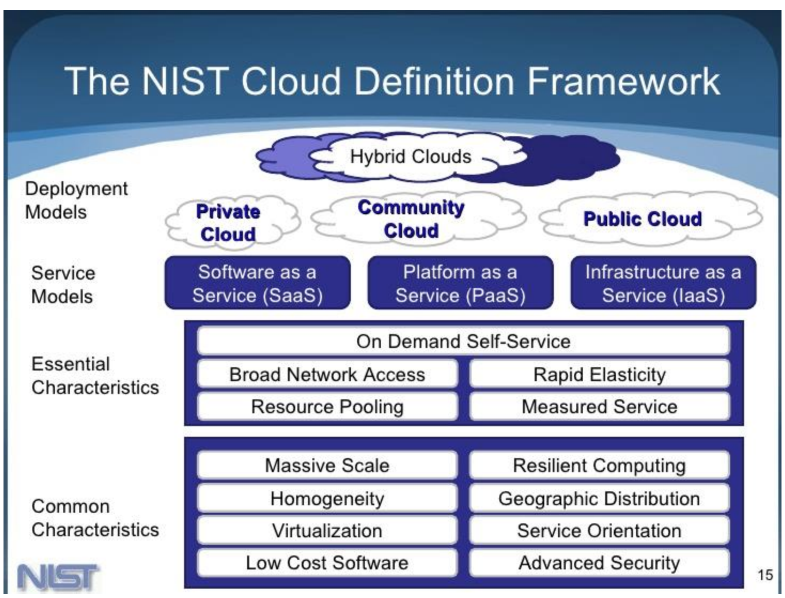

Figure 2-1 Definition of Cloud Computing [23}

Another definition according to Tutorialspoint is "Cloud Computing refers to manipulating, configuring, and accessing the applications online. It offers online data storage, infrastructure and application" [24] p1.

Cloud computing experienced increasing popularity in recent years. Enterprises are rapidly reorienting their Information Technology (IT) strategies to include cloud computing [25]. By lowering IT expenditures, offering real time applications, mobile storages and unlimited computing power, organizations are seeking to achieve business efficiencies [26].

International data corporation (IDC) predict that worldwide spending on public IT cloud services will grow from $16.5 billion in 2009 to over $55 billion in 2014 (Gens, 2010). In return, this can help businesses improve the creation and delivery of IT solutions, by enabling them to access computing services more flexibly at reduced cost [27].

2.2 Cloud Computing Architecture

Cloud Computing architecture contains several cloud components, which are loosely coupled. Resources are delivered through digital network or public internet. Applications are available for users in several ways: via mobile, desktop devices, tablets and other devices. An all over the world well-accepted institution in the Information Technology field is National Institute of Standards and Technology (NIST), which defined the cloud computing. According to the NIST, these are the five specific qualities, four cloud deployment models and three cloud services models that define cloud computing architecture [28]. Figure 2-2 summarize the overall architecture of cloud computing.

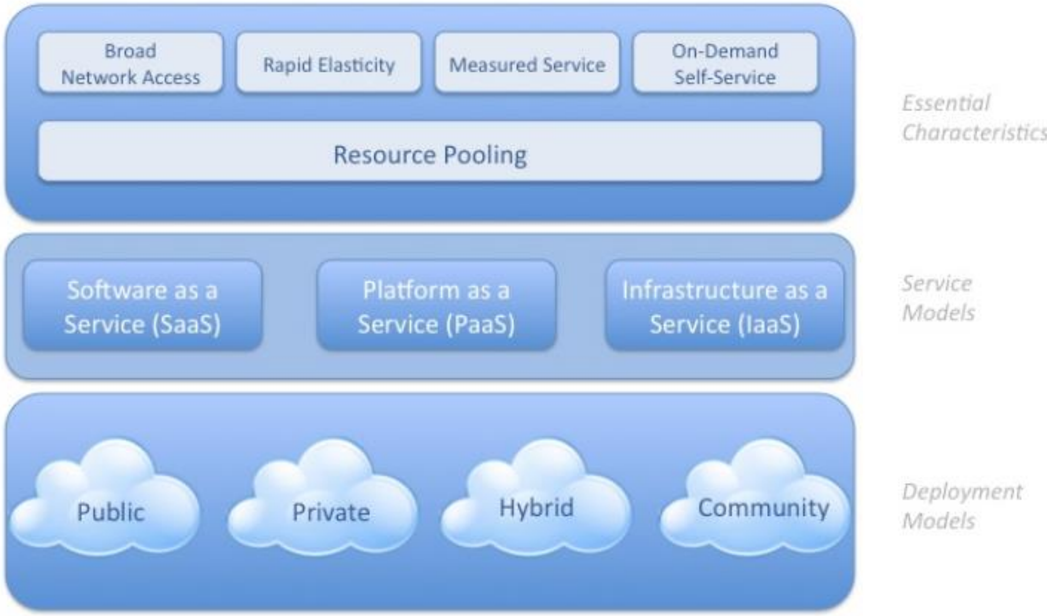

Figure 2-2 Cloud Computing Architecture [28]

However, cloud computing can be divide in two general sections: front end and back and which makes the cloud to work. These ends connect to each other via a network, generally the Internet. The front end refers to the client part (interface and applications that are required to access cloud computing) and the back end refers to a cloud itself (data storage, virtual machines, services, servers etc.)

2.3 Essential Characteristics

Five important characteristics are identified by the NIST to make a distinction between cloud computing from other computing models, which could be categorized as common and essential characteristics [29]. These characteristics are categorized as follow:

2.3.1 On-demand self-service

On-demand self-service - Services such as server time and network storage can be provisioned based on customer needs without human interaction with a service provider [22]. Client can have access to a services and have power to change services such as adding or deleting users and change network storages as needed. Client will be billed based on a usage with a monthly subscription [30].

2.3.2 Broad network access

Broad network access capabilities are available over the network and can be accessed from mobile phones, laptops, office computers and PDAs [1]. This mobility is attractive for businesses because employees can be real time updated with projects, contracts and customers independent whether they are in office or not [30].

2.3.3 Resource pooling

The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a degree of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources, but may be able to specify location at a higher level of abstraction (e.g., country, state, or datacenter). Examples of resources include storage, processing, memory, network bandwidth, and virtual machines. Even private clouds tend to pool resources between different parts of the same organization. [28 p15].

2.3.4 Rapid elasticity

According to NIST services can be provisioned quickly and elastically. Customers can purchase services at any time and quantity when demanded [8]. Nowadays business requires everything that is flexible and scalable that can suit their business needs so they can easily add or remove users, software features, and other resources [30].

2.3.5 Measured service

Cloud system uses metering capability to optimize and control resources such as storage, processing, bandwidth, or active user accounts. Resources that you may use can be monitored and controlled from both your side and your cloud provider's side which provides transparency [28].

2.4 Cloud Service Models

Mell & Grance proposed three service models such as platform-as-a-service (PaaS), software-as-a service (SaaS) and infrastructure-as-a-Service (IaaS) [28]. Before describing types of services, figure 2-3 shows the three technology capabilities and companies that currently are offering those technology solutions.

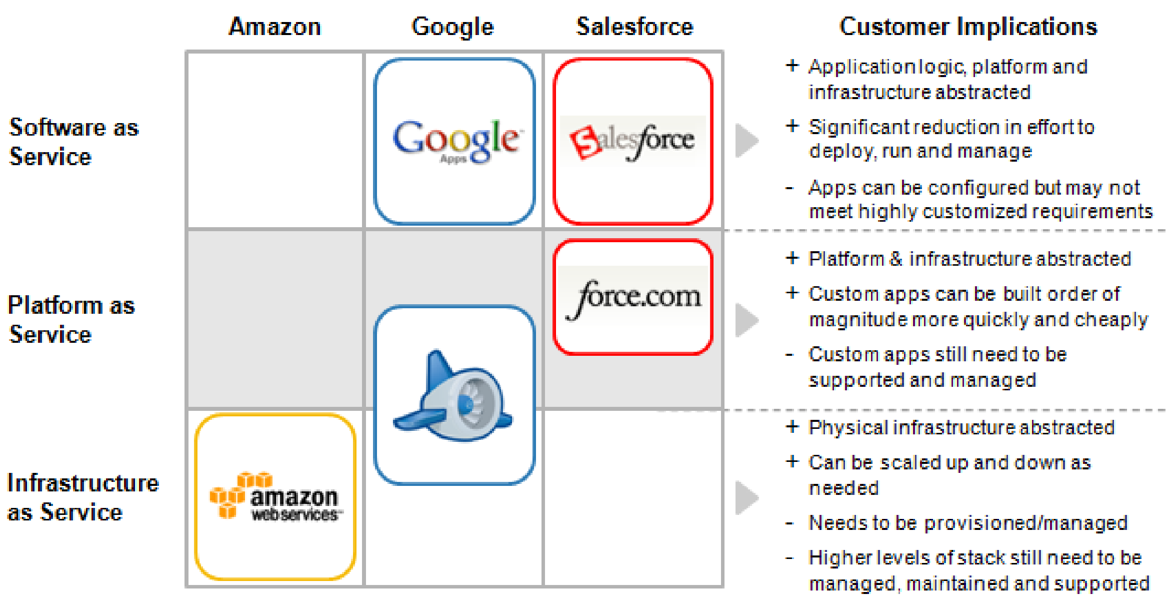

Figure 2-3 Technology Capabilities for Cloud Computing [32]

2.4.1 Software as a Service (SaaS)

SaaS delivers access to certain applications on a cloud over the internet. The applications are accessible from various client devices through a web browser. In SaaS provider controls the cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities [28].

Furthermore, the SaaS decrease the cost since the provider manages and control licensing and software patching. Application is hosted in the cloud which can be accessed from a web and clients can use it on a pay-per-use basis. The customer can have single license for multiple computers running at different locations which reduces the licensing cost [24]. Customer relationship management (CRM) services, Microsoft Office 365 (full Office suite over the internet) and Google docs are the example of SaaS.

2.4.2 Platform as a Service (PaaS)

In PaaS consumer can deploy applications on to the cloud using different languages and tools that can be supported by the provider. Here, consumer does not manage or control cloud infrastructure (network, servers, operating systems and storages), but has a full control on creating applications [28]. They usually provide services and runtime environments for different programing languages.

From a business point of view, PaaS is far more efficient and flexible than ever. Corporates instead of buying new hardware for hosting each different databases, in PaaS those are supported by different virtual machines. The processing power and storage can be dynamically changed based on actual business requirements on demand and as they occur. In addition, different operating systems can be set up into virtual machines [31].

2.4.3 Infrastructure as a Service (IaaS)

IaaS provides capability to consumer to provision processing, storage, networks, and other fundamental computing resources. IaaS uses operating and applications systems to create resources. The consumer does not control the hardware and cloud infrastructure, but they deal with the storage, operating systems and deployed applications and limited control on networking components such as firewalls [21]. IaaS infrastructure relay on virtualization techniques to increasing or reducing resources and scale dynamically based on the clients' request. Virtualization is a common practice on mainframes and is becoming widely available for computer architectures with a low-cost computer chips and commodity hardware [31].

2.5 Deployment Models

According to Armbust clouds can be defined as computers that are networked anywhere in the world together with virtualization and consumer will pay only used resources [33]. Various deployment models are proposed on the cloud computing environments. Access permission or limitation depends on a type or senility of information, business process and organization characteristics. In some corporates where security is high, a more restricted environment may be necessary in order to ensure that only authorized users can use deployed cloud services of certain resources. In the following the types of clouds will be introduced: private cloud, public cloud, community cloud and hybrid cloud [34].

2.5.1 Public Cloud

A public cloud is a deployment model which is used by the general public, in this case the general public is referred to individual users or corporations. The public cloud is owned and managed by a cloud service provider which hosts multiple clients and uses dynamic provisioning. A public cloud is also known as an external cloud. According to Kurtz a public cloud can provide cost savings to an organization. Public cloud can be helpful to organizations by removing the IT maintenance, licensing cost and remote hosting. Organizations must be careful when moving critical applications to a public cloud vendor. Examples of public cloud deployment vendor offerings include Amazon Web Services, Google App Engine, Salesforce .com, and Microsoft Windows Azure [35]. Figure 2-4 shows the public cloud.

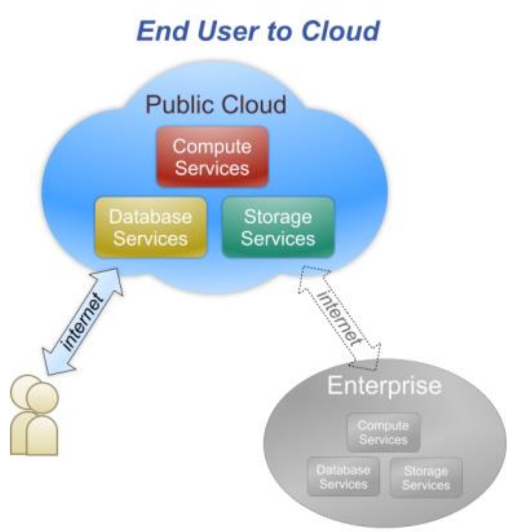

Figure 2-4 Public Cloud [37]

2.5.2 Private Cloud

A private cloud is more suitable for organizations since it offers many benefits comparing to public cloud. More elasticity is offered in private clouds and it is managed within organization. The cloud infrastructure is operated by a single organization or a third-party provider and are often suitable for larger installations [36]. There are some specific characteristics of a private cloud that differentiate it from the traditional IT distributed infrastructure. Firstly, private cloud is commonly dedicated to a single enterprise and is not shared with any other enterprise. Secondly, security is considered to be tighter in a private cloud deployment [35]. Figure 2-5 shows the private cloud.

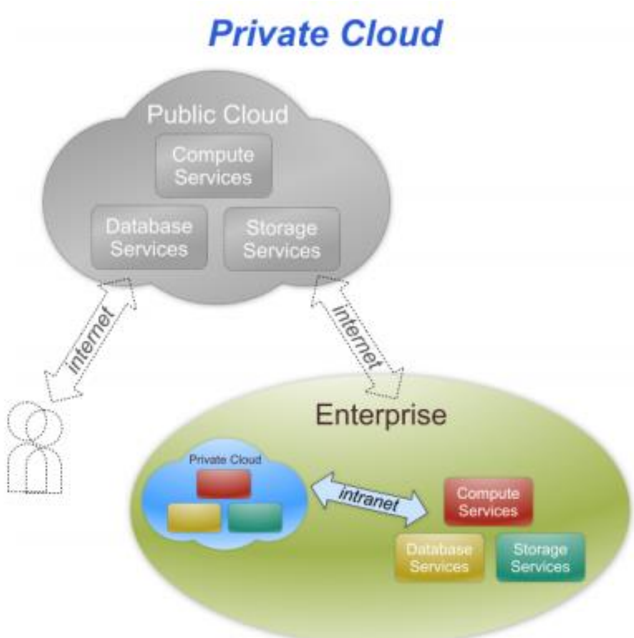

Figure 2-5 Private Cloud [37]

2.5.3 Community Cloud

A community cloud infrastructure is shared by several organizations or group of organizations that have shared interests. It can be managed by participating organizations or a third party and may exist on-premises or off-premises. The United States federal government is one of the biggest users of a community cloud [36]. Figure 2-6 shows the private cloud.

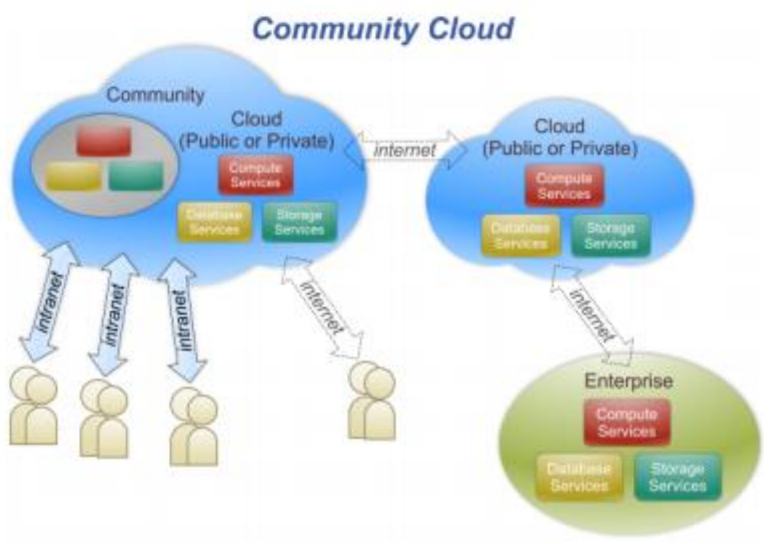

Figure 2-6 Community Cloud [37]

2.5.4 Hybrid Cloud

Hybrid cloud is a model of deployment which combines different clouds such as public and private clouds but their entities remain unique and are bounded together by standardized or proprietary technology [28]. An example of hybrid cloud deployment is when an organization deploys noncritical software applications in the public cloud, while critical business applications are kept in a private cloud.

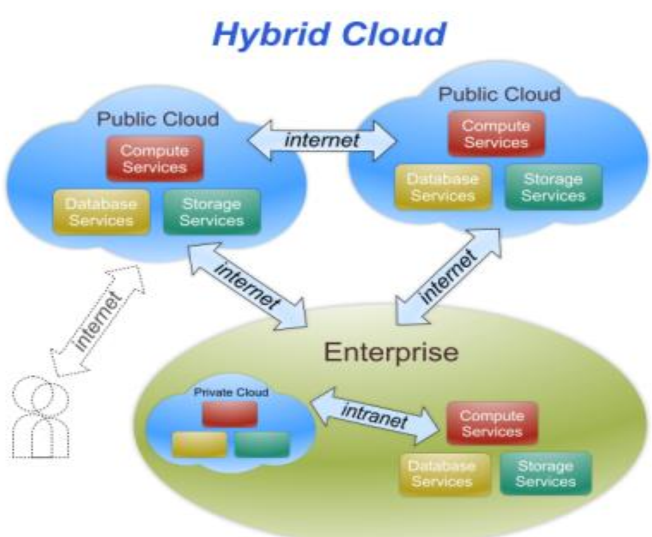

Figure 2-7 Hybrid Cloud [37]

2.6 Security and Privacy

Security is a top concern for companies when considering a migration to the cloud. Companies are used to take care about security in their own data centers by them selfie's, so they need time to adopt on idea of having their data and applications outside of traditional company jurisdictions. To many companies this is a big challenge and concern. With so many migrations of data and applications to the cloud, of course companies are investing in addressing these concerns.

2.6.1 Shared Security Responsibilities

Cloud Service Provider and the Cloud Consumer have different degrees and levels of control over a resources hosted into a cloud. In traditional Information Systems (IT) organizations used to have full control on computing resources and the entire life-cycle of the systems. In cloud computing area provider and consumer build and deploy together the system, and now both parties share responsibilities in order to provide best protection to the system. Different service models imply different degrees of control between Cloud Providers and Cloud Consumers [38].

In SaaS, providers are more responsible for the security and privacy of application services, this implies more for public cloud than a private cloud.

In PaaS, the developers are building their own applications on the platforms provided by the cloud provider. Here, customers are responsible for protecting the applications while the provider's responsibility is isolating the customers' applications and workspaces from one another.

In IaaS the client secures the operating systems, applications, and content. Even if the client role has more responsibility, the cloud provider still must provide some basic, low-level data protection capabilities [39].

2.6.2 Privacy

One of the areas that is excessively affected by cloud computing is privacy. Privacy is the desire of a person to control the disclosure of personal information. If an organization is dealing with personal data, it is required from them to comply with a country's legal structure and ensure appropriate privacy and confidentiality protection. There are many legal issues with cloud especially privacy issues involved in data stored in multiple locations in the cloud. In traditional firms, data use to be stored on company's servers, in cloud data is stored on the service provider's servers, which could be in Europe, Asia, US or anywhere else. Each country has various legal requirements and this leads to cloud computing conflicts. On example is such as European laws that require that an organization know where the personal data in its possession is at all times [41].

2.7 Regulatory Compliance

Beside technical obstacles discussed earlier in literature review, there are also legal requirements that require attention when adopting cloud computing. When organization decides to move their data to cloud they should have in mind technological and security issues, but also legal and regulatory issues. Laws developed by each country should be respected by both parties' client and provider. Depending on the type of business and data stored, organizations may be required to comply with many privacy and security law requirements. Too many requirements may limit service provider choices.

The cloud computing that is using one of the three type's described in section 2.5 Deployment Models: public, community or hybrid cloud models "creates new dynamics in the relationship between an organization and its information, involving the presence of a third party: the cloud provider. This creates new challenges in understanding how laws apply to a wide variety of information management scenarios" [28 p35]. This creates practical challenges in understanding how laws apply to the different parties under various scenarios. Legal issues should be considered regardless of cloud model type, most likely laws are national or international. Customers operating in multiple countries are subject to numerous regulatory requirements [42].

Lock-In Challenges

Each cloud provider offers a proprietary service for operating into their cloud system. Every client when moving to a new cloud provider has to learn provider's technology which takes time and effort to master. In IaaS cloud services are easier, since client's software is installed on provider's platform, but with SaaS or PaaS platforms client must learn provider's specific characteristics such as interfaces and APIs in order to interact and manage these platforms. Another challenge in vendor lock in is when a large amount of data is stored into a cloud, it becomes complicated and expensive to transfer or switch data to other provider.

We can learn from August 8th, 2008 scenario when a cloud provider shut down their service approximately 20,000 paying users were affected and about 45% of customer data was lost [33]. Organizations should plan these risks and costs into account when they are preparing migration of cloud resources.

2.8 Loss of Control

Loss of control factors can be divided into two types: technical and organizational loss of control. Technical loss of control, deals mainly with security factors such as software versions and updates, and technical operations such as backup and restores.

Organizational loss of control is another challenge for organizations especially ones that are in transition phase. Usually a human factor is the one that can create barriers for the transformation to cloud computing. A fear of someone that might lose influence in organization or fear of job loss if the cloud transformation will functionally affect specific positions, and the simple inability to embrace change.

2.9 Data Portability/Integration

Portability is the ability to move an entity from one system to another so that it is usable on destination system, in other words components that are moved to the cloud they are operational. Data should be same format from source to target system. Components that cannot be moved on a cloud, they should remain on in-house systems - interoperability.

Portability is divided into two separate areas: data portability and application portability.

Cloud data portability is the ease way of moving data. Data is transferred from one cloud service to another cloud service, without being required to re-enter the data. In an event of format mismatch, the transformation between them may be simple and straightforward to achieve with commonly available tools.

Application portability is the ability to easily transfer an application or application components from one cloud service to a comparable cloud service and run the application in the target cloud service [43].

2.10 Cost

Analyzing a move to the cloud, the cost of using cloud system is often compared to the cost of buying equipment operating in-house. The answer generated from this comparison is irrelevant from situations. Example: if a company is planning to operate on a project with time period of several months, then is ok to have in-house equipment and software. Large organizations which usually plan ahead for several years, cloud computing cost can be more beneficiary to them.

A senior enterprise architect, Rick Pittard, a senior enterprise architect at a global 100 corporations, has been investigating this issue to better understand this analysis. He found out that" ‘‘Hardware costs for short-term projects, up to two years, are less expensive than purchasing and operating our own. Systems that will operate for longer than two years may be more cost effective to operate in-house.’’ Companies often forgot to add all direct and indirect costs [31 p95].

There are many different cloud provider offerings on the market, and their prices are different. This creates doubt and makes it difficult to estimate the benefits of not moving to cloud computing. The doubt is usually for non-technical employees within organizations.

2.11 Adoption Models

Technology adoption has been studied from different fields in the last five decades. Adoption refers to "the stage in which a technology is selected for use by an individual or an organization" [61] while the term diffusion refers to a process in which an “innovation is communicated through certain channels over time among the members of social system” [11].

There are nine theories and models of studding the process of adopting new technologies. The nine major theories of this field are Diffusion of Innovations (DOI), Technology Organization and Environment Framework (TOE), Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Theory of Planned Behaviour (TPB), Combined TAM and TPB (c-TAM-TPB), Social Cognitive Theory (SCT), Model of PC Utilization (MPCU) and Motivation Model (MM).

Two theories are commonly used in innovation diffusion and adoption studies in organizations. They are the Diffusion of Innovations (DOI) theory [11] and Technology Organization and Environment Framework (TOE) [62]. Other popular theories are not considered in this research because they pertain to author's choice.

DOI is a theory developed by Rogers in 1962 and has developed the innovation diffusion model to explain how an innovation spread through a society. This model has been used widely to explain the acceptance or rejection of IT innovations in an organization or society. DOI explains and predicts the adoption decision based on factors that are related to the technology. TOE uses technological aspects of the diffusion process and non-technological aspects such as environmental and organizational factors [63].

2.11.1 Diffusion of Innovation (DOI) Theory

DOI is a theory of communication which has been studied widely from various disciplines for different types of products, services and ideas. Three authors such as Bass (1969), Moore (1995) and Rogers (2003) are the mainstream types of research in DOI, which latter has received more attention [79]. It is a well-known adoption model used in Information Systems (IS) research [50]. It suggested five attributes that explain the adoption of innovations. They are defined as:

- *Relative Advantage,* the extent to which an innovation is better than the previous generation
- *Compatibility,* the degree to which an innovation can be assimilated into the existing business processes, practices, and value systems
- *Complexity,* how difficult it is to use the innovation
- *Observeability,* extent to which the innovation is visible to others
- *Trialability,* the ease of experimenting with the innovation

DOI is known on the characteristics of the technology and the users' perceptions of the innovation while on the other hand an organization is a more complex entity then individuals themselves. According to Rogers, innovation is a communication process which uses various channels within the social system. Main three factors which influence the adoption of innovations within the organizations are: leadership attitude toward change, organizational structure and external characteristics [11].

2.11.2 Technology-Organization-Environment (TOE) framework

The technology–organization–environment (TOE) framework is described in Tornatzky and Fleischer's. The Processes of Technological Innovation (1990) proposed this framework to explain how the firm context influences the adoption and implementation of innovations [80]. It accounts for three features of an organization that influence the adoption of innovation and are posed to influence technological innovation. These three elements are the technological context, the organizational context and the environmental context.

The technology context includes internal and external technologies that are relevant to the organization, both technologies that are already in use by the organization and those that are not currently in use but are available on the market. The existing technologies which are already in place have important role in adoption process because they set a broad limit on the scope and pace of technological change that a firm can undertake [81]. Innovations that exist on the market but are still not used also influence the adoption process by showing an organizations way in which technology can enable them to evolve and adapt [80].

The organizational context refers to the characteristics and resources of the firm, including organizational structure, firm size, managerial structure, the amount of resources, and the process of communication among employees [80].

The environmental context includes the structure of the industry, the presence or absence of technology, service providers, market elements, competitors, and the regulatory environment [17].

These three elements present constraints and opportunities for technological innovation that influence the firm's level of technological innovation.

2.11.3 Combining DOI and TOI

Many researchers have called for approaches that combine more than one theoretical perspective to understand the IT adoption of innovative new technologies [82]. DOI and TOE have been widely used in IT adoption studies, and have achieved consistent empirical support. In many ways, the TOE perspectives intercept with the innovation characteristics identified by Rogers, therefore TOE is combined with DOI to strengthen the theory and is well recognized [82]. DOI's organizational characteristics include the same measures as TOE's organization context [83]. These two theories differ between each other. TOE does not specify the role of individual characteristics such as top management support, therefore DOI suggests incorporating top management support in the organization context. Another difference is that DOI does not consider the impact of the environmental context, while the TOE framework helps to provide a more comprehensive perspective for understanding IT adoption by including the technology, organization, and environment contexts [18].

2.11.4 Related literature on cloud computing adoption

DOI and TOE have extensively been used by scholars from different fields. Majority of the studies aim to confirm the validity of the model. Bellow, table 2-1 summarizes some of many studies in which DOI and TOE is used and they are classified by the dependent variable they measure.

Theory	Dependent Variable	Source	Construct								
			Security Concerns	Cost Savings	Compatibility	Complexity	Relative Advantage	Technology Readiness	Top Management Support	Competitive Pressure	Regulatory Support
TOE	Intention to adoption cloud computing	[83]	X	X	X	X					
DOI and TOE	Cloud computing adoption	[70]		X	X	X	X	X	X	X	
TOE	Cloud computing adoption	[84]			X	X	X	X	X	X	
DOI	Cloud computing adoption	[64]			X	X					
DOI	Cloud computing adoption	[85]			X	X	X				
TOE	E-business adoption	[86]			X					X	
TOE	Knowledge management and enterprise systems adoption	[75]			X	X	X		X	X	
DOI and TOE	E-business use	[18]	X	X	X	X	X	X		X	

Table 2-1Model constructs from DOI and TOE framework [17]

3 RESEARCH FRAMEWORK AND HYPOTHESIS

3.1 Research Model

In order to study the intention of adopting cloud computing in context of Kosovo, conceptual model is used for this study. By combining the innovation characteristics of cloud computing TOE framework, with DOI we are addressing a model that links the DOI innovation characteristics to the TOE context. According to this model, ten factors influence the decision to adopt cloud computing. These factors are (1) security and privacy concerns, (2) cost savings, (3) compatibility, (4) complexity, (5) relative advantage, (6) technology readiness, (7) top management support, (8) competitive pressure and (regulatory support). These factors are grouped into two main categories, DOI and TOI factors. Hypotheses H1 - H5 correspond to the DOI innovation characteristics that influence the adoption of cloud computing. Hypotheses H6 – H10 are related to the technology, organizational and environmental contexts that may constrain or facilitate the adoption of cloud computing. Figure 3-1 depicts the conceptual model proposed in this paper.

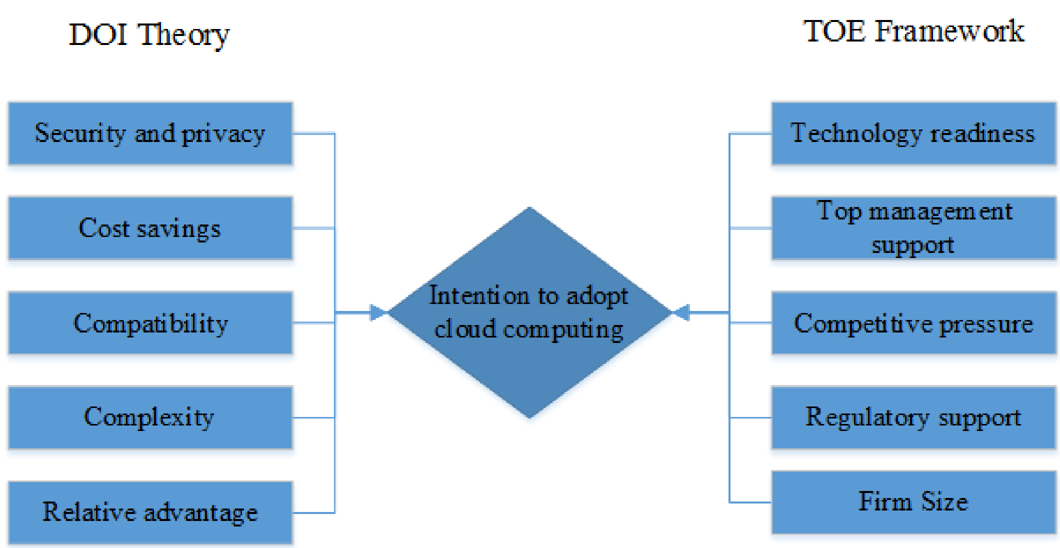

Figure 3-1 Conceptual Model

3.2 Hypothesis

There is a plethora of articles that propose determinants of the cloud services adoption, dependent on the industry. We present a small part of that research that is relevant for our case. We focus on the following determinants: security, technical issues, compatibility, cost saving, company size, complexity, government support and competitive pressure.

Security, defined as a set of control-based technologies and policies designed to adhere to regulatory compliance rules and protect information, data applications and infrastructure associated with cloud computing use [7], is found to be strong determinant [8,9].

H1: Security concerns negatively influence cloud computing adoption.

Cloud computing is known as an opportunity for innovation, for decreasing IT costs, and reducing the total cost of computing [5]. Cloud Computing provides latest technologies and provides opportunity to companies to focus on their core businesses instead of technology changes. By adopting cloud computing, companies can reduce IT expenses without performing system maintenance, licenses, patches and system upgrades. Another factor which has impact on cost saving is reducing infrastructure cost and decrease energy consumption [13].

H2: Cost savings positively influence cloud computing adoption.

Compatibility is defined as “the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters” [11, p15]. From a technical perspective, when considering transition to a cloud, it is important to address which cloud solutions are compatible with existing systems [12].

H3: Compatibility has a positive impact on cloud adoption.

Complexity is another factor. Technology that is difficult to understand and use is considered to be complex. In other words, if it takes too much time and effort to be learned or users spend too much time and effort to perform their normal duties, that technology is considered to be complex. Cloud computing solutions can be challenging for companies that have lack of IT specialists and technology expertise. For example, integration of real time application to a cloud may require level of expertise that is not available within the firm.

H4: Complexity will negatively influence cloud computing adoption.

Relative advantage is the ‘‘degree to which an innovation is perceived as being better than the idea it supersedes’’ [11]. Innovations that have a clear advantage in creating strategic effectiveness in organizations such as increasing sales and operational effectiveness in reducing operational costs, have a greater incentive for adoption [87]. Therefore, if the benefits of the technology exceed existing practices and processes [46], the merits will positively influence its adoption.

H5: Relative advantage will positively influence cloud-computing adoption.

Technical issues such as complexity of existing infrastructure and data centers, portability, real time applications and vendor lock-in have been identified as possible barriers to the adoption of cloud computing [10].

H6: Technology Readiness positively influence cloud computing adoption.

Top management support plays an important role in cloud computing adoption because it is the primary decision maker on allocating the resources, the integration of services, and the re-engineering of processes [70]. Top management that recognizes the benefits of cloud computing will likely allocate the planed budged, provide necessary resources and will be engaged on entire process of migration. When top management fails to recognize the benefits of cloud computing to the business, they will also be against its adoption.

H7: Top management support will positively influence cloud computing adoption.

Competitive pressure is the level of competition among firms in the specific industry that the company operates in [19]. Adopting new technology is often a strategy to compete in market. By adopting cloud computing, firms can improve operational processes, be first in a market and have the most accurate data.

H8: Competitive pressure positively influence cloud computing adoption.

Government policy is another important factor that affects the decision making in adopting cloud computing. Companies operating in countries where government policies are restrictive, have a low level of technology adoption. Therefore, countries should have regulatory support to encourage the assimilation of IT innovation by firms [18]. The impact of laws and regulations can be critical in adopting cloud computing. It depends on countries, but regulations can have positive effect (encouraging) or negative effect (discouraging) businesses from adopting cloud computing. For example, legislators in the United States and the European Union member states have specific mandates to protect organizational and private data. When a government requires businesses to comply with cloud-specific standards and protocols, firms will be more willing to adopt cloud computing [17].

H9: Regulatory support positively influences cloud computing adoption.

Company size is another important factor that can influence the adoption of cloud computing. In practice large companies have advantages over the small ones because they have more budget, resources and can afford greater risk in adopting newer technologies [14, 15]. Small firms have less tolerance in investing and they try to keep their cost under control. Also smaller companies hesitate in investing on newer technologies [16].

H10: Firm size positively influence cloud computing adoption.

The goal is to check which determinants are relevant and the most important for cloud computing adoption. Based on the literature review, we have stated the above hypotheses.

4 RESEARCH METHODOLOGY

4.1 Introduction

This thesis main research objective is to study the cloud computing adoption determinants by enterprises in Kosovo. More specifically, research questions' goal is to check which factors influence the cloud adoption decision making. In order to complete this study, a mix method is used in this thesis in order to get the right conclusion.

I have used mixed method for this research, the survey was based on two types of approaches. The first type of research was a questionnaire, focused on technical staff and was conducted via email and social networks. The second type was interviewing IT Managers and top level Management which was conducted on site.

As the aim of the survey was to understand the determinants for adopting cloud computing, the targeted respondents were employees from IT departments, on a managerial and non-managerial positions, business managers and information technology managers. Technical staff were preferred due to their understanding of technology and needs of organizations, while business managers due to their experience and their decision making positions in organizations, in procurement and funding of IT projects. Convenience sampling was used from each organization and several persons were target respondents. Total number of respondents is 81.

Because the questionnaire was administered in Kosovo, and most of the respondents speak English fluently, there was no need to translate the questionnaire or interview questions.

4.2 Research Methodology

There are three type of research design: qualitative, quantitative, and mixed methods. Certainly, the three approaches are not as discrete as they first appear. Qualitative and quantitative represent different ends on a continuum [53]. Mixed methods research belongs in the middle of these two methods because it incorporates elements from qualitative and quantitative approaches.

Bazeley [55] defines mixed method as a research method which involves the use of more than one approach or a method of design which deals with data collection and analysis within a single program of study. During the study program, mix method integrates different approaches to get the right conclusion [55].

For this research I used mixed method approach since I wanted to get the right conclusion, not only having numbers (quantitative), or using open-ended questions (qualitative interview questions). By combining these two methods the overall strength of a study is greater than either qualitative or quantitative research [54].

Sequential explanatory strategy was used in this research. The intend of this two-phase, sequential mixed method study is to research the cloud computing adoption determinants and check which factors influence the cloud adoption decision making for enterprises in Kosovo. In the first phase, quantitative research on hypothesis was performed over a questionnaire to check relationship between Intention to adopt cloud computing (dependent) and Security, Cost Savings, Compatibility, Complexity, Relative Advance, Technology Readiness, Top Management Support, Competitive Pressure and Regulatory support (independent) variable with 81 participants from technical staff. Information from first phase was explored for further in depth explanation with interviews which was performed with managerial staff by interviewing them individually at the site. The reason to follow up with qualitative research in the second phase was to better understand and explain the quantitative results and explore more on adoption decision for Kosovo environment. The steps of this strategy are pictured in Figure 4-1 [56].

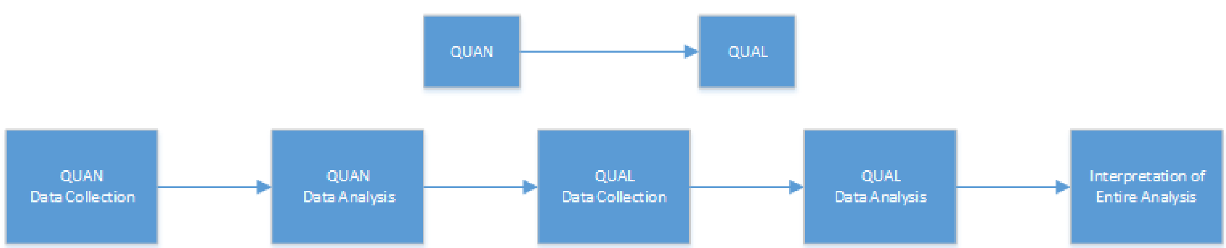

Figure 4-1 Sequential explanatory strategy [56]

4.3 Data Collection

Data collection procedure of this research is based on survey (questionnaire and interview). Eight versions of questionnaires were developed and the final version was sent to participants by email. Questionnaire was designed based on a five point Likert-type scale. Questions asked from participants are adapted from already published papers and journals which are related to cloud computing. In addition to adapted questions, I developed several questions which are specific to cloud computing to the context of country – Kosovo.

An online version of the questionnaire was emailed to qualified individuals in 47 companies in Kosovo. The target respondents where individuals from the firms who are familiar with cloud computing. A total of 81 responses were received over a period of five months, from beginning of September 2016 to January 2017. Respondents came from various sectors: energy, banking, IT Services and other service industries. During the first two months we received 64 valid responses. A follow up email was sent to those who didn't respond on a first call. On a second call we received 17 valid responses, for a combined total of 81 respondents from 32 companies. Around 90% of target respondents responded to my calls. This percentage is due to the facts that, some of the respondents didn't reply to my call.

Second phase of the research was conducting interviews with managerial staff. With Companies that were interviewed, a semi structured interview was conducted. This gave me an opportunity to understand the initial interviewee's view on the cloud computing without guiding him/her to a specific model. Interview was done by visiting a research site and conducting an interview in which the individual is allowed to talk openly about a company's future plans for cloud computing with predetermined questions.

4.4 Sampling and Sample Design

Sampling is a process of selecting "“a portion, piece, or segment that is representative of a whole” [57] and is an important step in research because it helps to inform the quality of conclusions done by researcher that flows from the underlying findings. In this study qualitative and quantitative research techniques are combined and sampling schemes are designed for both the qualitative and quantitative research components of this study.

As a population of interest, a group of IT department employees and people who are involved in IT technologies especially experienced users were defined. Moreover, the respondents were from specific positions such as: network administrators, infrastructure administrators, server administrators, application developers, head of information system, chief of information technology office, senior positions and directors.

Convenience sampling was used on this research since selected participants where easily accessible and member population were conveniently available to the researcher.

Sampling design can be categorized in two different types, the representation basis and the element selection technique [58]. On the representation basis, the sample may be probability sampling or it may be non-probability sampling.

Probability sampling is also known as 'random sampling' or we can say a lottery method in which individual units are picked up by some mechanical process. Results obtained from this technique or random sampling can be assured in terms of probability and we can measure error estimation. These methods are suitable for large scale studies and are considered as the best technique of selecting a representative sample [58].

Non-probability sampling is sampling procedure where the organizer of the inquiry purposively chooses the particular units of the universe for constituting a sample on the basis that the small mass that they select out of a huge one will be typical or representative of the whole. Performing non-probability sampling can be considerably less expensive than doing probability sampling [58].

In this study, the non-probability sampling method was chosen since we are going to analyze and distribute results to IT experts and employees involved with technology. From the non-random sampling design, in this research we used expert sampling to collect data from the employees as experts from the particular areas. We need to understand the determinants for adoption of cloud computing for enterprises in Kosovo, and for this reason only experts from IT or who are involved in a daily operations or decision making are chosen for expert sampling.

The profile of the sampling is shown in Table 4-1. Profile of Sampling.

Sample characteristics (N=81)

By Industry			By respondent's position		
Energy/Utilities	26	31.3%	Information Technology	24	28.9%
Financial Services/Banking	9	10.8%	Manager	10	12%
Government	1	1.2%	IT Director	4	4.8%
Information Technology	23	27.7%	IT Data Center	4	5.1%
Telecommunications	14	16.9%	IT Network Management	13	15.7%
Professional, Technical and Business Services	3	3.6%	IT Applications Developer	12	14.5%
Wholesale Distribution and Services	1	1.2%	IT Security Officer	3	3.6%
Other	3	3.6%	Executive Management	2	2.4%
Construction	1	1.2%	Operations	4	4.8%
Education	2	2.4%	Other	7	8.4%

Table 4-1 Profile of Sampling

4.5 Developing the Questionnaire

After extended literature review, the questionnaire was developed which aimed to capture respondents' opinion about migration to cloud computing, and factors that may influence in adoption decision. The first draft of questionnaire consisted of 48 questions, while on the final version we reduced it to 42 in order make it user friendly to respondents.

Questions were developed based on file point Likert-type scale on an interval level ranging from "strongly disagree", "disagree, "neutral", "agree" to "strongly agree". These are the most used survey formats and surveys with scale item should be at least five and preferably seven categories [59]. Majority of questions were adapted for this research from already published journals or articles and references accordingly. Some of the questions where specifically designed for this study by the author itself.

Questionnaire is divided into two parts. Part A (demographic information) includes 9 questions which covers interviewer's gender, age, education level, experience, industry, job title, decision maker, company size and annual sales volume of the company. Part B (opinion related to adoption of cloud computing) consist of 42 questions divided into nine factors which aimed to understand the drivers for intention of adoption decision.

Before launching the pilot test, the questionnaire was reviewed by a Professor with PhD title and two masters' candidates for clarity of questions and evaluate the content validity of the questionnaire. Based on the review several questions where edited and adapted for Kosovo context.

Appendix A describes the development and design of the questionnaire and the source.

4.5.1 Pilot Test

Pilot test is a pretest or preliminary test which is used to evaluate a sample of people from the survey population, who will respond to questionnaire. It serves as an address rehearsal before a major study and they are usually conducted well in advance of the survey so that more substantial changes to questionnaire or procedures can be made [60].

Having confidence on results of the study, we have assured that the questionnaire consistently measures what it purports to measure, in other words the questionnaire must be both valid and reliable. Therefore, we have conducted content validity and face validity of the questionnaire. On the first part we discussed whether the domain of cloud computing adoption has been adequately covered. We also discussed that questions are representative of the domain of IT field. With the same group of respondents face validity was conducted to measure the subjective judgment on the operationalization of a questionnaire. At this stage measure of reading ability and read through the questions was conducted to decide that it seems understandable.

A pilot questionnaire was given to a group of five subject matter expert (SME). They all had rich work experience on IT and understood the needs of organizations to adopt new technologies. Besides answering the online survey questionnaire, I had a 15-minute meeting per each one in this pilot group. The goal was to confirm the clarity of the questions and they are understandable from everyone. Also the average time to complete the survey questionnaire was measured during the pilot testing.

4.5.2 Results

The initial result received from this pilot group was that the scales are reliable and questions are valid. Data gathered from a pilot test is analyzed with Statistical Package for Social Sciences. Statistics addresses the entire statistical analysis process (SPSS). Reliability test, exploratory factor analysis, descriptive, multiple regression analysis and inter correlation was checked between items.

4.6 Questionnaire Survey results

In this survey, 93 invitation links from google form were sent to the participants over email and social networks. Convenience sampling was used for sampling, most of the respondents were known to the author from previous projects or colleges. The survey lasted for five months and received a total of 81 responses, with 81 questionnaires fully completed. Survey questions were designed with mandatory respond field on all questions, in order to avoid any missing data. Respondents were chosen from different cities of Kosovo.

5 RESULTS

5.1 Introduction

This chapter presents analysis of the data gathered from the survey according to the research model. The purpose of this study is to conduct a regression analysis to examine the cloud computing adoption intent of Kosovo companies. This chapter begins with a brief description of demographic statistics, descriptive statistics, then proceeds with explanatory factor analysis and to the final study details including regression analysis results. Finally, a brief summary of statistical findings is provided to conclude the chapter.

Data were collected based on responses of Kosovo companies from different sectors. In this research the proposed model was tested based on 32 companies and 81 respondents. There were no missing data on questionnaires was designed where the proceeding to the next screens was restricted by filling all fields on the current screen.

Data were exported to Microsoft Excel from Google Forms questionnaire and after that Statistical Package for the Social Sciences (SPSS) software was used to analyze them. Finally, the results of logistic regression and our hypothesis testing are discussed.

5.2 Demographic Statistics

In this section demographic characteristics of the respondents are summarized in several tables according to gender, age, level of education, industry field and job role.

Table 5-1 displays the demographics of the respondents in the study sorted by gender with sorted percentage of answers by male and female. 14.8% are female participants, whereas 85.2% are male.

Respondents are categorized and analyzed in four different ranges of age. Statistics shows that 16% of respondents where between age of 18 – 25 years, 44.4% of respondents between age of 26 -35 years, 33.3% of respondents between age of 36 -50 years, and 6.2% above 51 years old. Table 5-1 displays results of statistics sorted by age.

The 81 respondents are analyzed by the reference of their earned education degree which are categorized in five levels. The statistics show's that 13.6% of respondents where categorized with high school diploma, 8.6% with college diploma, 49.4% with bachelor's degree, 27.2% with master's degree and one respondent 1.2% with PHD. Table 5-1 displays results sorted by educational level.

Details about job experience of each employee on IT industry are represented on Demographic Table 5-1. Respondents were divided into five groups and statistics show as follows:

4.9% of respondents are new to the IT industry with less than 2 years of experience, 18.5% with 2 -5 years of experience, 27.2% of respondents belongs to category with 6 -10 years of experience, majority of respondents 45.7% are with 11 -20 years of experience in IT field, and 3.7% of respondents are with more than 21 years of experience. Table 5-1 displays results sorted by experience level.

Next we are presenting details of respondents from the industries where they belong. I have included several industries in order to cover more working fields of operations. As we can see from table 5-1, the majority of respondents 30.9% belongs to energy sector, second place takes information technology field with 28.4% and third one is telecommunications with 17.3%. financial services and banking covers 9.9% of respondents, professional, technical and business services covers 3.7%, education with 2.5%, construction, wholesale distribution and services covers 1.2% and finally industries that are not covered on questionnaire are treated as other with 3.6%. Table 5-1 displays results sorted by industry.

According to job title the majority of respondents come from IT positions, as described in Table 5-1. 28.4% of respondents' job title is information technology, 12.3% are IT managers, 4.9% IT directors, 2.5% executive management, 14.8% of respondents' job role is IT network management and same percentage have IT application developers. 6.2% belongs to IT data center job role, 3.7% IT security officer and operations and 8.6% are treated as other job role. Table 5-1 displays results sorted by job role.

Respondents are also treated whether they are personally involved in IT decisions making process within organization or not. 66.7% of respondents are involved in decision making processes and 33.3% are not involved. Table 5-1 displays results sorted by decisions making within organization.

We are going to present results gathered from the survey and categorized by firm size. Respondents are divided into eight group in order to better determine the firm size. 49.9% of respondents come from large companies with more than 500 employees, 19.9% are from companies employing 11-20 employees, 7.4% from 21-30 and between 101-200 employees, 6.2% belongs to a category from 201-500, 2.5% from category of 51 -100 and 1.2% are from a company that employee number ranges less than 5. Table 5-1 displays results sorted by firm size.

Finally, we are presenting yearly sales volume of the company. Respondents are divided into four groups. First group is with earnings up to 10 000 Euro with 7.4%, second group with earnings between 10 001 to 30 000 Euro with 11.1%, on a third group we have zero respondents, and the majority of respondents belongs to a forth group above 100 000 Euro earnings with 74.1%. Table 5-1 displays results sorted by annual sales volume.

Sample Characteristics	Size	Percent		Sample Characteristics	Size	Percent
Gender				**By Job Title**		
Female	12	14.8%		Information Technology	23	28.4%
Male	69	85.2%		Manager	10	12.3%
Total	81	100%		IT Director	4	4.9%
Age				IT Data Center	5	6.2%
18 - 25	13	16.0%		IT Network Management	12	14.8%
26 - 35	36	44.4%		IT Applications Developer	12	14.8%
36 - 50	27	33.3%		IT Security Officer	3	3.7%
Above 51	5	6.2%		Executive Management	2	2.5%
Total	81	100%		Operations	3	3.7%
Education				Other	7	8.6%
				Decisions making within		
High school diploma	11	13.6%		**organization**		
College diploma	7	8.6%		Yes	54	66.7%
Bachelor’s degree	40	49.4%		No	27	33.3%
Master’s degree	22	27.2%		Total	81	100%
PhD	1	1.2%		**Firm Size**		
Total	81	100%		Less than 5	1	1.2%

Sample Characteristics	Size	Percent		Sample Characteristics	Size	Percent
Experience				6 - 10	6	7.4%
Less than 2 years	4	4.9%		11 - 20	19	19.8%
2 to 5 years	15	18.5%		21 - 30	6	7.4%
6-10 years	22	27.2%		31 to 50	1	1.2%
11-20 years	37	45.7%		51 - 100	2	2.5%
More than 21 years	3	3.7%		101 - 200	6	7.4%
Total	81	100%		201 - 500	5	6.2%
By Industry				More than 500	38	46.9%
Energy/Utilities	25	30.9%		**Annual Sales Volume**		
Financial Services/Banking	8	9.9%		Up to €10 000	6	7.4%
Government	1	1.2%		Between €10 001 to €30 000	9	11.1%
Information Technology	23	28.4%		Between €30 001 to €50 000	0	0.0%
Telecommunications	14	17.3%		Between €50 001 to €100 000	6	7.4%
Professional, Technical and Business Services	3	3.7%		Above €100 000	60	74.1%
Wholesale Distribution and Services	1	1.2%		Total	81	100%
Other	3	3.6%				
Construction	1	1.2%				
Education	2	2.5%				

Table 5-1Demographic Statistics

5.3 Descriptive Statistics

Descriptive statistics presents gathered information in a convenient, usable and understandable form. Once the data has been collected, with descriptive statistics we can do calculation of their frequency, measuring means, median, mode or graph them and identify outliers in the distribution of the scores [66].

Table 5-2 represent descriptive analysis of factor score for 44 items. N shows us the number of respondents which in this research is 81. Skewness is OK since all values are between -1 and 1. Kurtosis is relatively OK, since several variables have Kursosis > 1.

Descriptive Statistics

	N	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
SC1	81	3.36	1.004	1.008	-.245	.267	-.631	.529
SC2	81	3.35	1.185	1.404	-.199	.267	-1.038	.529
SC3	81	3.67	1.173	1.375	-.700	.267	-.127	.529
SC4	81	3.88	.980	.960	-.728	.267	-.005	.529
SC5	81	3.42	1.035	1.072	-.230	.267	-.953	.529
SC6	81	3.16	1.145	1.311	-.169	.267	-.707	.529
CS1	81	3.69	.831	.691	-.166	.267	-.478	.529
CS2	81	4.14	.720	.519	-.621	.267	.499	.529
CS3	81	3.93	.919	.844	-.544	.267	-.470	.529
CS4	81	3.43	.999	.998	-.425	.267	-.523	.529
C1	81	3.46	.962	.926	-.349	.267	-.618	.529
C2	81	3.40	.931	.867	-.400	.267	-.626	.529
C3	81	3.54	.775	.601	-.807	.267	-.149	.529
C4	81	3.47	.867	.752	-.256	.267	-.089	.529
CX1	81	2.86	.997	.994	.435	.267	-.900	.529
CX2	81	2.17	.803	.645	.862	.267	1.441	.529
CX3	81	2.31	.769	.591	.757	.267	.359	.529
CX4	81	2.51	.937	.878	.496	.267	-.438	.529
RA1	81	3.91	.693	.480	-.115	.267	-.294	.529
RA2	81	3.73	.689	.475	-.055	.267	-.181	.529
RA3	81	3.69	.846	.716	-.372	.267	-.335	.529
RA4	81	3.91	.794	.630	-.920	.267	1.785	.529
RA5	81	3.48	.910	.828	-.199	.267	-.303	.529
TR1	81	3.90	.894	.800	-.779	.269	.617	.532
TR2	81	3.90	.735	.540	-.036	.267	-.667	.529
TR3	81	3.98	.724	.524	-.570	.267	.617	.529
TR4	81	3.84	.732	.536	-.718	.267	.826	.529
TMS1	81	3.32	.849	.721	-.549	.267	.701	.529
TMS2	81	3.38	.916	.839	-.544	.267	.255	.529
TMS3	81	3.43	.851	.723	-.595	.267	.455	.529
TMS4	81	2.99	.901	.812	-.185	.267	.159	.529
FS1	81	2.23	.912	.832	.729	.267	.318	.529
FS2	81	2.98	1.049	1.099	.117	.267	-.655	.529
CP1	81	3.26	.833	.694	-.257	.267	-.370	.529
CP2	81	2.51	.910	.828	.849	.267	1.105	.529
CP3	81	2.49	.989	.978	.693	.267	.368	.529
RS1	81	2.89	.935	.875	.320	.267	.103	.529

Descriptive Statistics

	N	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
RS2	81	2.79	1.021	1.043	.148	.267	-.402	.529
IACC1	81	3.52	1.606	2.578	-.471	.267	-1.411	.529
IACC2	81	3.25	1.454	2.113	-.094	.267	-1.191	.529
IACC3	81	3.89	.632	.400	-.822	.267	1.887	.529
IACC4	81	3.96	.749	.561	-.671	.267	.709	.529
IACC5	81	3.96	.782	.611	-.418	.267	-.147	.529
IACC6	81	4.15	.709	.503	-.652	.267	.691	.529
Valid N (listwise)	81							

Table 5-2Descriptive statistics- factor scores

In table 5-3 descriptive analysis is performed based on factor scores. Factor scores are obtained by summing all variables that correspond to the factor.

Descriptive Statistics

	N	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Security_Privacy_Concerns	81	17.6667	3.76165	14.150	.008	.267	-.487	.529
Cost_Savings	81	11.4938	1.87832	3.528	-.228	.267	-.170	.529
Compatibility	81	10.3951	2.29499	5.267	-.405	.267	-.455	.529
Complexity	81	6.9877	2.06454	4.262	.611	.267	.445	.529
Relative_Advantage	81	18.7284	3.06599	9.400	-.113	.267	-.171	.529
Technology_Readiness	81	7.8765	1.27850	1.635	-.242	.267	.235	.529
Top_Management_Support	81	13.1235	3.08376	9.510	-.583	.267	.988	.529
Regulatory_Support	81	5.6790	1.80850	3.271	.248	.267	.001	.529
Intention_Adoption	81	11.8148	1.90467	3.628	-.440	.267	.579	.529
Valid N (listwise)	81							

Table 5-3Descriptive statistics - factor scores

5.4 Exploratory Factor Analysis (EFA)

Explanatory factor analysis is a technique whose primary purpose is to define the underlying structure between the variables in the analysis and provides a tool for analyzing correlations among a large number of variables by defining a sets of variables which are known as factors. Factors are highly inter-correlated and present dimensions within the data [65]. The purpose of explanatory factor analysis is to reduce the initial number of variables into a smaller and more manageable set of factors. To assess the underlying structure of the data of this study, we conducted EFA analysis and included 42 variables divided into 10 factors.

5.4.1 Interpreting the Results

Factor Interpretation - is a process where the researcher first evaluates the initial results, then makes a number of judgments in viewing and refining these results. This process is divided in three steps. First the estimate of factor matrix is performed where the initial un-rotated factor matrix is computed, containing the factor loading for each variable of each factor. Second, factor rotation is performed from un-rotated factor solution to achieve the objective of data reduction and find information that offers the most adequate interpretation of the variables under examination. Third - final step is factor interpretation and re specification. In this process the researcher evaluates the rotated factor loadings and determines either to delete variable, employ a different rotation method or extract a different number of factors [65].

Table 5-4 represents the results of rotated component matrix. Principal component analysis has been used as an extraction method, and Varimax with Kaiser Normalization for rotation method. As for coefficient display format, values bellow 0.4 were not displayed and were suppressed. The suppression of loadings less than 0.4 makes interpretation considerably easier. Before rotation 10 factors were identified and were consistent with our conceptual model. Most variables loaded highly onto the first factor and remaining factors didn't load with other factors. After investigating the results of factor analysis, we decided to remove-delete items that have high cross loading or very low loading. Therefore, before rotation there were 44 items, the rotation resulted in deletion of 15 items and deletion of one variable – CP. The mentioned items were deleted since they either had factor loading less than 0.5 or it had high cross loading with other items. Items SC6, CS1,CS4,C4,CX1,TR1,TR4,CP1,CP2,CP3, IACC1,IACC2,IACC6 were deleted from the research, because they had insignificant factor loading.

The results of factor analysis determined nine factors, Security and Privacy, Cost Savings, Compatibility, Complexity, Relative Advantage, Technology Readiness, Top Management Support, Regulatory Support and Intention to Adopt Cloud Computing.

Rotated Component Matrix[a]

	Component								
	1	2	3	4	5	6	7	8	9
SC1				.609					
SC2				.756					
SC3				.653					
SC4				.635					
SC5				.754					
CS2									.579
CS3									.775
C1			.704						
C2			.822						
C3			.868						
CX2						.753			
CX3						.818			
CX4						.655			
RA1		.690							
RA2		.691							
RA3		.770							
RA4		.703							
RA5		.679							
TR2								.837	
TR3								.798	
TMS1	.813								
TMS2	.853								
TMS3	.807								
TMS4	.821								
RS1							.858		
RS2							.870		
IACC3					.765				
IACC4					.850				
IACC5					.726				

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Rotated Component Matrix[a]

	Component								
	1	2	3	4	5	6	7	8	9

a. Rotation converged in 12 iterations.

Table 5-4Rotated Component Matrix

Kaiser-Meyer-Olkin Measure (KMO) is a measure which performs a test whether the variables in our sample are adequate to correlate by using a correlations and partial correlations. In other words, KMO calculates variables whether are highly correlated [66]. The KMO statistics varies between 0 and 1. A value of 0 indicates that the sum of partial correlations is large relative to the sum of correlations. A value close to 1 indicates that patterns of correlations are compact and factor analysis should provide reliable factors. Kaiser (1974) recommends the minimum KMO value should be greater than 0.5 for a satisfactory factor analysis to proceed. The higher the value the better.

By observing the results above our KMO is 0.683, therefore we can proceed with our factor analysis.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.683
Bartlett's Test of Sphericity	Approx. Chi-Square	1218.517
	df	406
	Sig.	.000

Table 5-5KMO and Bartlett's Test

Bartlett's Test of Sphericity can be used to test for the adequacy of the correlation matrix, i.e., the correlation matrix has significant correlations among at least some of the variables [66]. If no relationship between variables is found, then there is no point in proceeding with factor analysis. A p value <0.05 indicates that it makes sense to continue with the factor analysis. Table 5-7 shows us that Bartlett's test is highly significant ($p < 0.001$), and therefore factor analysis is appropriate.

Communalities presents the proportion of variance in each variable accounted for by the common actors. Using a principal components method for factor extraction it can be computed as many factors as there are variables. When all factors are included in the solution, all of the variance of each variable is accounted for by the common factors [66].

Table 5-8 shows the initial extraction. Principal component extraction method has been used for analysis therefore, before extraction communalities are 1. The communalities labelled Extraction reflect the common variance in the data structure. The values under this column indicate the proportion of each variable's variance that can be explained by the principal components. A higher value of variables means better representation in the common factor space, while variables with low values are not well represented. High communalities (> .50%) show that the factors extracted explain most of the variance in the variables being analyzed and low communalities (< .50) mean there is considerable variance unexplained by the factors extracted [66].

By observing Table 5-6 TMS2 has the highest communality value of .894 or we can say that 89.4% of the variance associated with question TMS2 is common. SC1 has the lowest value of .552 respectively 55.2% of the variance. This question is above the minimum range of the cut-off line which is tolerated.

	Initial	Extraction		Initial	Extraction
SC1	1.000	0.552	RA1	1.000	0.677
SC2	1.000	0.766	RA2	1.000	0.726
SC3	1.000	0.604	RA3	1.000	0.736
SC4	1.000	0.632	RA4	1.000	0.622
SC5	1.000	0.631	RA5	1.000	0.68
CS2	1.000	0.643	TR2	1.000	0.775
CS3	1.000	0.781	TR3	1.000	0.783
C1	1.000	0.688	TMS1	1.000	0.745
C2	1.000	0.797	TMS2	1.000	0.894
C3	1.000	0.827	TMS3	1.000	0.753
CX2	1.000	0.773	TMS4	1.000	0.748
CX3	1.000	0.774	IACC3	1.000	0.749
CX4	1.000	0.656	IACC4	1.000	0.85

	Initial	Extraction		Initial	Extraction
RS1	1.000	0.84	IACC5	1.000	0.817
RS2	1.000	0.865			

Table 5-6Communalities

Total Variance Explained section presents the number of common factors computed, the eigenvalues associated with these factors, the percentage of total variance accounted for by each factor, and the cumulative percentage of total variance accounted for by the factors [66].

Before extraction SPSS has identified 29 linear components within the data set, but we have discarded some factors, and in table 5-9 we are going to present only factors extracted with eigenvalues greater than 1. The eigenvalues associated with each factor represent the variance explained by that particular linear component and are displayed the eigenvalue in terms of the percentage of variance. Factor one SC explains 22.758% of total variance. First factor is with relatively large amount of variance whereas the 9th factor IACC explains 3.494% of total variance. In our study nine factors together account for 73.73% of the total variance, with these factors aggregated, and if the percentage of variance is above 60%, that is considered very satisfactory.

The eigenvalues associated with these factors are again displayed in the column labelled *Extraction Sums of Squared Loadings,* and as we can see values in this part are same as values before the extraction, except as mentioned above we have discarded factors 10 to 29. In the final part of table 5-9 labelled *Rotation Sums of Squared Loadings,* the eigenvalues of the factors after rotation are displayed. Rotation has the effect in optimizing the structure of the factors. Values in this table represent the distribution of the variance after the Varimax rotation. Before rotation factor one SC accounted higher variance than the remaining nine (22.758% compared to 10.858%, 9.336%, 8.277%, 6.028%, 5.182%, 4.229%, 3.569%, 3.494%), however after extraction we can see a lower result for only SC 11.56% of variance compared to (11.155, 8.9045, 8.79%, 7.922%, 7.56%, 6.509%, 5.809%, 5.525%).

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
	6.6	22.758	22.758	6.6	22.758	22.758	3.353	11.56	11.56
	3.149	10.858	33.616	3.149	10.858	33.616	3.234	11.15	22.711
	2.707	9.336	42.951	2.707	9.336	42.951	2.582	8.904	31.614
	2.4	8.277	51.229	2.4	8.277	51.229	2.549	8.79	40.405
	1.748	6.028	57.256	1.748	6.028	57.256	2.298	7.922	48.327
	1.503	5.182	62.439	1.503	5.182	62.439	2.192	7.56	55.887
	1.226	4.229	66.667	1.226	4.229	66.667	1.888	6.509	62.396
	1.035	3.569	70.237	1.035	3.569	70.237	1.685	5.809	68.205
	1.013	3.494	73.73	1.013	3.494	73.73	1.602	5.525	73.73

Extraction Method: Principal Component Analysis.

Table 5-7Total Variance Explained

Scree Plot is another approach to examine the variance explained of the factors and eigenvalues. It is a graphical presentation of same results from Table 5-7 (Total Variance Explained). A first factor is with relatively large amount of variance whereas the last factor is the lowest one. On a scree plot the eigenvalues of the factors tend to become quite similar – the difference in eigenvalues between factors gets very small. This way we can find the point on the graph where the eigenvalues stop changing very much [67].

In Figure 5-10 we can find a point where the slope flattens out. Nine factors are above Eigenvalue 1 and those after the point are important.

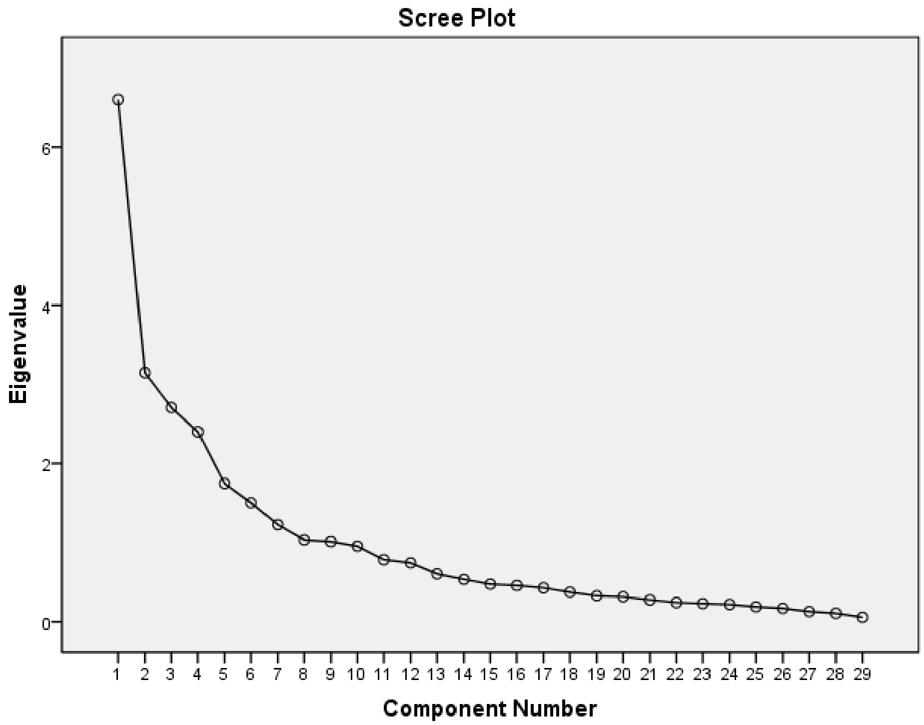

Figure 5-10 Scree Plot

Correlations - is primarily concerned with finding out whether a relationship exists and determines its magnitude and direction. When two variables vary together they are said to be correlated [66]. In other words, correlations measure the score of two variables and how much they vary together and then compare this with how much they vary on their own [67].

According to Ho (2006) correlation coefficient range from -1.0 which is called a perfect negative correlation to positive 1.0 and is known a perfect positive correlation. The closer correlation coefficients get to -1.0 or 1.0, the stronger the correlation is and if it is closer to zero correlation between two variables is weaker [66].

As we can see on table 5-11, there is a correlation between compatibility, complexity and relative advantage with the independent variable – intention to adopt cloud computing.

Correlations

		Security_Privacy_Concerns	Cost_Savings	Compatibility	Complexity	Relative_Advantage	Technology_Readiness	Top_Management_Support	Regulatory_Support	Intention_Adoption
Security_Privacy_Concerns	Pearson Correlation	1	0.216	-0.018	.225*	0.059	0.093	0.076	0.019	-0.065
	Sig. (2-tailed)		0.052	0.874	0.044	0.599	0.41	0.501	0.866	0.567
	N	81	81	81	81	81	81	81	81	81
Cost_Savings	Pearson Correlation	0.216	1	.285**	0.118	.306**	0.213	-0.021	0.18	0.148
	Sig. (2-tailed)	0.052		0.01	0.296	0.006	0.056	0.849	0.108	0.187
	N	81	81	81	81	81	81	81	81	81
Compatibility	Pearson Correlation	-0.018	.285**	1	-0.128	.328**	0.14	.270*	.224*	.383**
	Sig. (2-tailed)	0.874	0.01		0.254	0.003	0.211	0.015	0.045	0
	N	81	81	81	81	81	81	81	81	81
Complexity	Pearson Correlation	.225*	0.118	-0.128	1	-0.21	-0.02	-.371**	.220*	-.398**
	Sig. (2-tailed)	0.044	0.296	0.254		0.06	0.863	0.001	0.049	0
	N	81	81	81	81	81	81	81	81	81
Relative_Advantage	Pearson Correlation	0.059	.306**	.328**	-0.21	1	-0.044	.413**	0.083	.529**
	Sig. (2-tailed)	0.599	0.006	0.003	0.06		0.698	0	0.46	0
	N	81	81	81	81	81	81	81	81	81
Technology_	Pearson Correlation	0.093	0.213	0.14	-0.02	-0.044	1	0.083	.302**	-0.025

Correlations

Readiness	Sig. (2-tailed)	0.41	0.056	0.211	0.863	0.698		0.46	0.006	0.825
	N	81	81	81	81	81	81	81	81	81
Top_Management_Support	Pearson Correlation	0.076	-0.021	.270*	-.371**	.413**	0.083	1	0.034	.372**
	Sig. (2-tailed)	0.501	0.849	0.015	0.001	0	0.46		0.763	0.001
	N	81	81	81	81	81	81	81	81	81
Regulatory_Support	Pearson Correlation	0.019	0.18	.224*	.220*	0.083	.302**	0.034	1	-0.032
	Sig. (2-tailed)	0.866	0.108	0.045	0.049	0.46	0.006	0.763		0.777
	N	81	81	81	81	81	81	81	81	81
Intention_Adoption	Pearson Correlation	-0.065	0.148	.383**	-.398**	.529**	-0.025	.372**	-0.032	1
	Sig. (2-tailed)	0.567	0.187	0	0	0	0.825	0.001	0.777	
	N	81	81	81	81	81	81	81	81	81

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 5-8Correlations

5.5 Reliability

Reliability is an assessment of the degree of consistency between multiple measurements of variable. One form of reliability is measurement of consistency between the responses for an individual at two points in time, and a second and more commonly used measure of reliability is internal consistency. There are two types of series of diagnostic measurement to assess internal consistency. The first one is measuring separate item to correlation (correlation of the item to the summated scale score) and the second type of diagnostics measure is reliability coefficient expressed with Cronbach's alpha. Cronbach's Alpha ranges from 0 for a completely unreliable test to 1 for completely reliable test. The generally agreed upon lower limit for Cronbach's alpha is 0.70, although it may decrease to 0.6 [65].

In this study we have done a measure of the alpha value before and after the EFA analysis and it shown to be .816 before and .792 after the EFA, which makes it a valid value for us to continue with our study of the data. As we can see on table 5-9, number of items before EFA is 44 while in table 5-10 after dimension reduction is 29.

Reliability Statistics Before EFA

Cronbach's Alpha	N of Items
.816	44

Reliability Statistics After EFA

Cronbach's Alpha	N of Items
.792	29

Table 5-9 Reliability Statistics Before and After

Cronbach's Alpha would decrease if any of the items are removed. All items contribute to overall reliability. In this case we decided to remove 15 items since they were not loading correctly, but the result after factor loading has difference of only .024, it dropped our overall reliability to 0.792.

5.6 Regression Analysis

Multiple regression analysis is a statistical technique that can be used to analyze the relationship between a single dependent variable and several independent variables. The main goal of multiple regression analysis is to use the independent variables with already known values in order to predict the single dependent value which is selected by the researcher [65]. This research is predictive study and by doing this research we are going to predict the intention of adopting cloud computing, therefore regression analysis is used to test our hypotheses. Intention to use cloud computing was our dependent variable, while eight factors such as security, cost saving, compatibility, complexity, relative advantage, technology readiness, top management support and regulatory support as an independent variables.

For this regression analysis Hair's sample size rule of thumb has been followed, where the minimum ratio of observations to variables is 5:1, but the preferred ration is 15:1 [65]. In our case we have eight variables with 81 which is 10:1 respondents and meets the requirement of sample size.

First step taken in regression analysis was testing the individual dependent and independent variables, and second action was testing the overall relationship after model estimation.

Stepwise procedure is employed to select variables to estimate the regression model. This method adds predictor variables to the regression that best correlate with the dependent variable, and subtracts predictor variables that have non-significance relationship. It started by adding one independent variable, but as a next step independent variables were added to check or delete variables in the equation that do not fall below the significance threshold. This way I was able to generate a regression equation using only the predictor variables that make a significant contribution for the prediction. Variables relative advantage, complexity and compatibility makes a significant contribution to the prediction of dependent variable IACC. Their significance is less than 0.005.

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Relative Advantage	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	Complexity	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	Compatibility	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a. Dependent Variable: Intention_Adoption

Table 5-10Variables Entered/Removed

By observing the Model Summary table 5-13, using the stepwise method Model 1 includes relative advance, Model 2 includes relative advantage and complexity, whereas Model 3 includes relative advantage, complexity and compatibility.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.529[a]	.279	.270	1.62708	.279	30.625	1	79	.000
2	.605[b]	.366	.349	1.53646	.086	10.594	1	78	.002
3	.638[c]	.407	.384	1.49514	.041	5.371	1	77	.023

a. Predictors: (Constant), Relative_Advantage

b. Predictors: (Constant), Relative_Advantage, Complexity

c. Predictors: (Constant), Relative_Advantage, Complexity, Compatibility

Table 5-11Model Summary

The R Square value in this table shows the amount of variance in the dependent variable that can be explained by the independent variables.

Model 1's relative advance accounts for 27.9% of the variance, model 2 after adding complexity is accounting 34.9% and model 3 with all three variables, compatibility ads on 40.7%. According to Hair (2009) ranges from 1.0 (perfect precondition) to 0.0 (no precondition) [65].

Another measure of predictive accuracy is the expected variation in the predicted values known as standard error of the estimate. In table 5-13 we can see values for three variables mentioned above. Smaller confidence intervals denote greater predictive accuracy [65].

Next table produced by the stepwise method is Anova Table 5-13. ANOVA, tests the significance of each regression model to see if the regression predicted by the independent variables explains a significant amount of the variance in the dependent variable.

ANOVA[d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	81.078	1	81.078	30.625	.000[a]
	Residual	209.145	79	2.647		
	Total	290.222	80			
2	Regression	106.088	2	53.044	22.470	.000[b]
	Residual	184.135	78	2.361		
	Total	290.222	80			
3	Regression	118.094	3	39.365	17.609	.000[c]
	Residual	172.129	77	2.235		
	Total	290.222	80			

a. Predictors: (Constant), Relative_Advantage

b. Predictors: (Constant), Relative_Advantage, Complexity

c. Predictors: (Constant), Relative_Advantage, Complexity, Compatibility

d. Dependent Variable: Intention_Adoption

Table 5-12ANOVA

By observing table 5-14 the Sig values we can see that for Model 1 the relative advantage and intention to adopt scores are significant (p<0.005). Model 2 both relative advantage, complexity and intention to adopt scores are significant (p<0.005). Also and Model 3 relative advantage, complexity, compatibility and intention to adopt scores are significant (p<0.005). We can conclude that the effects would be statistically significant.

Coefficients Table is the next table which gives us the regression equation. It shows us individually the predictor variables to the dependent variable. Since we are using the stepwise method we will be able to see only the selected variables for the final model. Standardized Coefficient Beta gives us the information about how much contribution each independent variable is making for the model.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	5.665	1.126		5.032	.000					
	Relative_Advantage	.328	.059	.529	5.534	.000	.529	.529	.529	1.000	1.000
2	(Constant)	8.334	1.343		6.208	.000					
	Relative_Advantage	.289	.057	.466	5.047	.000	.529	.496	.455	.956	1.046
	Complexity	-.277	.085	-.300	-3.255	.002	-.398	-.346	-.294	.956	1.046
3	(Constant)	7.177	1.399		5.132	.000					
	Relative_Advantage	.247	.059	.398	4.210	.000	.529	.433	.369	.864	1.158
	Complexity	-.265	.083	-.287	-3.189	.002	-.398	-.342	-.280	.952	1.050
	Compatibility	.179	.077	.216	2.317	.023	.383	.255	.203	.889	1.125

a. Dependent Variable: Intention_Adoption

Table 5-13Coefficients

Table 5-15 summarizes the results of our logistic regression. It shows the hypotheses and whether they were statistically supported or not. The results of our regression analysis demonstrate that Relative Advantage, Complexity and Compatibility are statistically significant correlation with Intention to Adopt Cloud Computing. The remaining five factors do not have significant impact on the decision to adopt.

Based on the previous analysis, status of the hypotheses whether they are supported in presented Table 5-16.

Research Hypotheses	*Supported*
H1: Security concerns negatively influence cloud computing adoption	*No*
H2: Cost savings positively influence cloud computing adoption	*No*
H3: Compatibility has a negative impact on cloud adoption	*Yes*
H4: Complexity will negatively influence cloud computing adoption	*Yes*
H5: Relative Advantages positively influence cloud computing adoption.	*Yes*
H6: Technology Readiness negatively influence cloud computing adoption	*No*
H7: Top Management Support positively influence cloud computing adoption	*No*
H8: Regulatory support positively influence cloud computing adoption	*No*

Table 5-14Summary of the Results

6 DISCUSSION

Understanding the determinants of cloud computing is crucial for organizations that are considering its adoption for their business process update, mobility, collaboration and application development. This study analyzes factors that influence intention and acceptance of cloud computing from a multi-theoretical perspective based on diffusion of innovations (DOI) and Technology-Organization-Environment (TOE) framework. Based on results three factors: compatibility, complexity and relative advantage, have significant correlation with the adoption intent for cloud computing technology.

Diffusion of Innovations: From the five DOI characteristics, compatibility (H3) is found to have a positive influence in cloud computing adoption. The influence of compatibility may be explained with profile of the companies that were part of the study and their employees which mainly are IT personnel. Work style preferences and business processes dependent on internet could be a reason for its significance. Many business operations of companies who already use Java or Php based programs or automated systems turn to be more difficult to migrate on cloud, that's why compatibility is an important factor and should not be avoided. Also the acceptance from the employees turns to be very eligible since their company culture does not differ much from cloud computing style work. According to Wang, compatibility is a facilitator of innovations in some studies [68] but in other studies was found to be non-significant [63]. Research results for compatibility are mixed, therefore more research is needed to be done in Kosovo companies from different profiles to reach the final conclusion.

Another DOI factor complexity (H4) is a breaker in adopting cloud computing. In many organizations complexity can be a potential inhibitor because of its relation with change, which usually causes discomfort and frustration on employees [69]. Our findings indicate that complexity is not a process breaker in companies that are part of this research. Young generations and IT personnel seem to be closer with new technologies and changes won't affect them and switching to new applications will be a smooth transition. On the other hand, complexity was found to be insignificant by Low [70]. However, this inconsistency does not mean that organizations think cloud computing adoptions do not have technological complexity. One possible explanation for this being significant is the maturity of IT personnel and awareness of cloud computing technology. The higher the complexity is, chances for adopting cloud computing are lower.

Relative advantage (H5) is another facilitator who has a positive influence on cloud computing adoption. This finding is consistent with similar studies such as Ifinedo and Wang [46, 68]. Organizations that have already adopted cloud services were aware of the benefits of this type of service. The study confirms that organizations are aware of cloud computing and they believe that relative advantage will improve the quality of business operations, improve speed in some of their tasks, increase in productivity and new business opportunities. For instance, cloud scalability and mobility could provide them with more control over their operations. This suggests that companies are more willing to adopt cloud computing when it comes to relative advantage. Although respondents on this survey are IT personnel and are not business-oriented, they think that implementing cloud computing can provide relative advantage to the company that ultimately leads to competitive advantage on the market in Kosovo.

Security and Privacy (H1) concerns are found to be a breaker on cloud computing adoption. Unexpectedly, in this study security and privacy were not found statistically significant. A possible explanation is that respondents are informed very well with the recent advantages in privacy and security techniques, audit logs, monitoring mechanism, and encryption schemes that are providing confidentiality, integrity and security of the data in the cloud environment [17]. Studies performed from 2014, found that security was not a significant factor in cloud computing adoption, this suggest that this was due to improvements in security compared to the earlier phase of cloud computing [71]. This may explain the lack of concern of security and privacy when considering a cloud migration. This finding is consistent with similar studies such as Oliveira [17]. Security and privacy are mandatory attributes without which cloud computing has no future.

Cost savings H2 in our study is not found to be significant in cloud computing adoption. Although in theory cloud computing offers benefits such as reduced operating cost, lower maintenance cost and lower utility expenses. According to Rath cloud computing promises countless benefits [72]. Studies from Garrison and Benlian found that cost savings is a strong driver of the adoption of cloud computing in several industries such as technology, manufacturing, finance, logistics and education [73, 74]. Our study indicates that cost saving is not a factor which influences cloud computing adoption. A possible reason is that majority of respondents are with IT or engineer background, even if they have influence in decision making processes. IT and engineers are mostly concerned with technical issues and they do not pay attention to cost savings, although they are aware of it. More research is needed with manager background respondents to reach the final conclusion.

Technology-Organization-Environment: Technology readiness (H6) in our research is found to be irrelevant in cloud computing adoption decision. This is similar to earlier studies which suggested that organizations with established technology may not necessarily influence cloud computing adoption. Low found that technology readiness to be irrelevant [70]. A possible reason may be respondent's background and their knowledge on cloud technologies. They feel commutable when it comes to insuring infrastructure availability, having adequate IT staff for integration with minimal interruption. Another reason could be firms with already established technological resources such as hardware, software and expertise may not be influenced by migration to the cloud, instead they may extend this for future plans.

Top management support (H7) in this study provides evidence that top management support is irrelevant factor influencing intention of adopting cloud computing. Although top management can influence in adoption process by supporting the project in form of financial and organizational resources and engaging in the process, our research indicates the opposite. This finding is inconsistent with results from previous studies from Ifinedo and Ramdani [46, 75]. A possible explanation could be a lack of knowledge on technologies from top management support or unrecognized value of cloud computing. Another reason could be unstructured organization chart in Kosovo companies, since they have not established tradition in operating, and for this reason top management support is disassociated with IT department. IT thinks that they are the most influential factor. Technical specialists are not aware of the business perspective, but they only discuss through the technical lens. According to Marchewka [78], during a software crisis many IT projects have failed because of a lack of user involvement and incomplete requirement. This has resulted the projects to feed only the ego of the IT staff and not bringing any value to the organization [78].

Competitive pressure (H8) on our study is found to be not significant on adoption decision. The results of competitive factor were not loading correctly and they were with unclear values. For this reason, we decided to remove this factor from our study. A possible reason could be the questions were unclear to the respondents.

Regulatory support (H9) was also found not to be significant in our study. Studies such as Zhu found that regulatory support is a facilitator for the adoption of cloud computing [15]. These differences can be explained by the fact that Governments in technological developing countries play a major role in supporting enterprises in adopting new technology in terms of regulation and initiatives [76, 77]. Results show that respondents are not aware of existing regulations or not enough informed with its content. Governments need to increase the promotion and awareness for these laws and regulations and governments need to offer more encouragement for regulatory support so the companies can accept cloud computing in their operations. Without economic growth and stimulation, advancement in technology, cloud computing standards and regulations may not be sufficient to overcome the barriers to the cloud computing adoption.

Firm size (H10) according to other studies is a predictor of cloud computing adoption. Literature suggests that larger companies have resources to cover the cost and investment risk on new technology [68], whereas smaller firms are short on resources and long term planning. On this study firm size has been measured only on demographic statistics because of the small number of organizations who operate in Kosovo. For this reason, we couldn't define the size of firm as potential predictor of cloud computing adoption.

6.1 Implications

Results of this study have both theoretical and practical contribution. From the theoretical perspective determinants of cloud computing adoption that are relevant for the adopted context (Kosovo) are described, while in practical contribution, they provide to the companies directions for development of ICT strategies involving cloud computing. Under the theoretical part, DOI and TOE factors were extracted. However, factors from TOE did not seem applicable to this study, as my research result showed no significance for the cloud adoption. On the DOI side three factors results showed significance.

Theoretical Implications – This study provides integration of two theoretical frameworks (the DOI and TOE) to develop the research. This model combines innovation characteristics and organizational context of adopting cloud computing. The complete definition of cloud computing of this study, explains the advantages and disadvantages and factors that influence the adoption of cloud computing. This can contribute to IT managers on their initiatives and technology designation. This implication is important to all organizations implementing cloud computing technologies or any organizational change expecting to benefit from cloud solutions.

Based on sample number (n=81), this study evaluates intention of adoption of clod computing within the context of Kosovo. Regression analysis technique has been used to reach the real values. We also found that organizations in context research have different drivers of cloud computing adoption. This proves us that every geographical environment has different variance and cannot be modeled as same in adoption decision.

Practical Implications – Our study results suggest that compatibility, complexity and relative advantage have influence on adoption of cloud computing. On literature review, we stated that cloud computing offers compatibility with current business processes, complexity with existing IT staff and employees and relative advantage in improving quality of operations and new opportunities.

Our findings indicate that cloud computing offers the relative advantage of achieving improvements in company's business processes, quality of operations, task speedup, and increase in productivity and new opportunities.

So far, many organization's concern is resistance to changes in their business operations and new technology. Our study suggest that complexity is an issue for cloud adopting, the more complex the new innovations are, the harder they are learned and accepted by employees. On the other way, cloud computing offers potential of reducing it by automation in the management process. Results suggested us that companies already have the skills needed to adopt cloud computing and can be easily acceptable by employees.

Compatibility should be considered in adoption decision for organizations who intent or are in planning stage. This study shows that the use of cloud computing fits the work style of organizations. There is no concern of migrating current business operations into the cloud and their infrastructure is compatible with service providers.

However, results of our study show that security/privacy, cost savings, technology readiness, top management support and regulatory support are not as significant in adoption of cloud computing within context Kosovo.

This study includes important characteristics describing the nature of cloud computing adoption, which may be useful to IT Managers to evaluate their projects and initiatives in terms of compatibility, complicity and relative advantage.

6.2 Limitations and Future Research

Similar to other studies, this study is not without limitations. Results of the research are obtained from a country with two million inhabitants, which implies that the study reflects only the situation for this country. Another limitation is that sample size was taken from majority of IT personnel. A research which would involve additional managerial profiles can make a better judgment regarding the cloud adoption decision. Also the small sample size is limitation to the study, because of small number of IT employees, it was difficult to reach number of respondents. From theoretical perspective, the possibility of including variables that are not considered in the model could lead to different results.

However, the model proposed in this research provides a basis for further elaborations and extension. Research results for compatibility are mixed, therefore more research is needed to be done in Kosovo companies from different profiles to reach the final conclusion. Complexity has mixed results, therefore more research is needed from different company profiles to reach the final conclusion. Same with top management support, many studies resulted in significance on this factor, but in our research is the opposite. More research is needed from different company profiles to reach the final conclusion. We suggest extending this research model by including the above mentioned limitations, only then we can make a fair judgment on adoption decision model. Therefore, finding context dependency and communalities between different contexts, mediation and moderation should be the next steps for further research.

7 CONCLUSION

In recent years, Cloud Computing is revolutionizing IT infrastructures. It provides features such as flexibility, scalability and cost efficiency. This study integrates the DOI and TOE framework to identify the factors of intention of cloud-computing adoption in Kosovo. This research model was evaluated based on a sample of 32 firms from Kosovo. Ten hypothesis were developed and results indicated that relative advantage, complexity and compatibility have a direct effect on a firm's adoption of cloud computing. When evaluated against the literature on cloud computing adoption, it appears that the study confirms that organizations are aware of cloud computing and they believe that cloud computing will improve the quality of business operations, increase in productivity and new business opportunities. Also we proved that the higher the complexity is, chances for adopting cloud computing are lower. IT Managers can use the findings of this study to support their ICT decision making and can be used as a roadmap in their future plans.

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APPENDIX A

Construct	Code	Adopted Source	Questions from the articles
Security / Privacy concerns	SC1	Luo, Gurung, & Shim, 2010;	Security concerns negatively influence cloud computing adoption
	SC2	Wei-Wen Wu,2011; modifed by author	I am concerned about data security in cloud computing
	SC3	K. Zhu, S. Dong, 2006	The degree to which your company is concerned about the data security over the Internet
	SC4	K. Zhu,Dong,2006; modifed by author	Privacy in cloud computing is a crucial factor for adoption
	SC5	Wei-Wen Wu,2011; modifed by author	I am concerned about privacy in cloud computing
	SC6	Yakov Bart 2005; modified by author	I feel comfortable to give my company's data to cloud service provider
Cost savings	CS1	F. Thiesse, 2011	The benefits of cloud computing are greater than the costs of the intended adoption
	CS2	S. Sangle, 2011	I think cloud computing will reduce energy costs and environmental costs in my company
	CS3	T. Oliviera,2014	I think maintenance costs of cloud computing will be lower than the current costs in my company
	CS4	R. Chapman 2012	With cloud computing adoption number of jobs within IT will decrease
Compatibility	C1	K. Zhu, S. Dong, 2006	The use of cloud computing fits the work style of my company
	C2	P. Ifinedo, 2011	Our current business operations can be easily migrated in cloud computing
	C3	F. Thiesse, 2011	My company's corporate culture and value system can adapt to cloud computing
	C4	T. Oliviera,2014 modified by author	The existing infrastructure compatibility with service provider has strong influence in the decision to adopt cloud computing
Complexity	CX1	P. Ifinedo, 2011	The use of cloud computing requires a lot of mental effort
	CX2	F. Thiesse, 2011	The use of cloud computing is frustrating
	CX3	G. Moore, I. Benbasat, 1991	The use of cloud computing is too complex for our business operations
	CX4	T. Oliviera,2014	The skills needed to adopt cloud computing are too complex for employees in my company

Construct	Code	Adopted Source	Questions from the articles
Relative advantage	RA1	P. Ifinedo, 2011	Cloud computing will allow you to manage business operations in an efficient way
	RA2	M. Ghobakhloo, 2011, modified by author	The use of cloud computing services will improve the quality of operations
	RA3	G. Moore, I. Benbasat, 1991	Using cloud computing will allow me to perform specific tasks more quickly
	RA4	T. Oliviera,2014	The use of cloud computing offers new opportunities
	RA5	T. Oliviera,2014, modified by author	Using cloud computing will increase business productivity in my company
Technology Readiness	TR1	K. Zhu, S. Dong, 2006	The degree to which the majority of my company employees are capable of using Web browsers and intranet is
	TR2	K. Zhu, S. Dong, 2006	The quality of existing IT infrastructure, as measured by related technologies that your company has in place, including local area network (LAN), wide area network (WAN) is
	TR3	P. Ifinedo, 2011, modified by author	Our IT can easily accommodate to support cloud computing operations
	TR4	T. Oliveira, 2014	Within the company there are the necessary skills to implement cloud computing
Top Management Support	TMS1	P. Chwelos, I. Benbasa, 2001	My company's management supports the implementation of cloud computing
	TMS2	Author Itself	I believe my company's top management will provide strong leadership when it comes to cloud computing adoption
	TMS3	Author Itself	I believe my company’s top management will be engaged in the process when it comes to cloud computing adoption
	TMS4	Y. Zhu, Y. Li, 2012	The company’s management is willing to take risks (financial and organizational) involved in the adoption of cloud computing
Competitive pressure	CP1	P. Ifinedo, 2011, modified by author	Adoption of cloud computing will strengthen the position of my company in the market
	CP2	T. Oliveira, 2010	Our firm is under pressure from competitors to adopt cloud computing
	CP3	T. Oliveira, 2010	My company has pressure from the market to start using cloud computing

Construct	Code	Adopted Source	Questions from the articles
Regulatory Support	RS1	K. Zhu, K.L. Kraemer, 2005	My perception is that there is a legal protection for usage of cloud computing in my country
	RS2	S.S. Alam, 2011	My perception is that the laws and regulations that exist in my country are sufficient to protect users' interest
Intention to adopt cloud computing	IACC1	F. Thiesse, 2011	At what stage of cloud computing adoption is your organization currently engaged Have already adopted services, infrastructure or platforms of Cloud Computing Currently evaluating (e.g., in a pilot study) Have evaluated, but do not plan to adopt this technology Have evaluated and plan to adopt this technology Have already adopted services, infrastructure or platforms of cloud computing Not considering
	IACC2	F. Thiesse, 2011	If you're anticipating that your company will adopt cloud computing in the future. When do you think it will happen Have already adopted services, infrastructure or platforms of Cloud Computing More than 5 years Between 2 and 5 years Between 1 and 2 years Less that 1year Not considering
	IACC3	Venkatesh and Bala, 2008	I am willing to perform some of my current tasks through Cloud Computing
	IACC4	Venkatesh and Bala, 2008	I am willing to use cloud applications in the future to improve my job performance
	IACC5	Y. Lu, 2009	I would recommend cloud computing to others in my company
	IACC6	H.Gangawar, 2015	Overall I think that using cloud computing services is advantageous