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FACTORS AFFECTING CLOUD COMPUTING ADOPTION IN EMERGING MARKETS (IZMIR, TURKEY)

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ABSTRACT

FACTORS AFFECTING CLOUD COMPUTING ADOPTION IN EMERGING MARKETS (IZMIR, TURKEY)

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Cloud computing has embraced IT infrastructure solutions to companies. However, companies need to investigate success, potential challenges, requirements, consequences, risks, decision guidance, and business models of cloud computing adoption. With the increasing amount of data all over the world, cloud computing adoption is a process of taking into consideration for each type of companies (production or service, companies driving in national or international and micro companies, small and medium companies or large companies) in each type of countries (developed or developing countries) to gain benefits from its provided benefits such as industrial 4.0 elements in terms of big data, internet of things and artificial intelligence and to keep pace with the industrial and sectoral era in the competitive environment. Cloud providers provide cloud services such as IaaS (Infrastructure as a service), PaaS (Platform as a service) and SaaS (Software as a service) and deploy them into Private cloud, Public cloud, Community Cloud or Hybrid Cloud.

This research aims to understand the perception of company types on cloud computing adoption and investigate the factors affecting cloud computing adoption in Izmir, the city of Turkey.

The perception of cloud computing adoption is examined with descriptive analysis. Cloud computing adoption (CCA) is made as a dependent variable in confirmatory factor analysis. In this paper, the factors affecting cloud computing adoption are a relative advantage (RA), security concerns (SC), cost savings (CS), compatibility (COMP), and complexity (COMPX) adopted from DOI theory. Technological readiness (TR), top management support (TMS), firm size (FS), regulatory support (RS), and competitive pressure (CP) adopted from TOE theory.

The descriptive analysis results show that working collaboratively with remote is the most important reason for adopting. On the other hand, business processes adoption issues and security concerns are the important barriers of cloud computing adoption in Izmir. The confirmatory factor analysis results show that complexity (COMPX) and top management support (TMS) directly affect cloud computing adoption. Relative advantage (RA) and Compatibility (COMP) affects complexity (COMPX). Technological Readiness (TR) and Competitive Pressure (CP) also affect Top Management Support (TMS). This research contributes to companies by building a decision-making model for the companies for CC adoption. Through descriptive analysis of benefits and challenges of cloud computing and confirmatory factor analysis of the factors that affect the adoption decisions in Izmir, Turkey, the study will also provide comprehensive and value-added data for the researches and businesses at the same sectors.

Keywords: cloud computing adoption, descriptive analysis, confirmatory factor analysis, DOI (Diffusion of Innovation) theory, Technological, Organizational, and Environmental (TOE) Model.

ÖZ

GELİŞMEKTE OLAN PİYASALARDA BULUT BİLİŞİM ADAPTASYONUNU ETKİLEYEN KRİTİK FAKTÖRLER (İZMİR, TÜRKİYE)

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Bulut bilişim, işletmelere bilgi işlem altyapı çözümleri sunmaktadır. Ancak, şirketler bulut bilişimi adapte ederken kendine uygun başarı, potansiyel zorlukları, ihtiyaçları, sonuçları, riskleri, şirket içi karar yönünü ve iş modelini araştırma ihtiyacı duymalıdır. Dünyada veri artışıyla beraber, bulut bilişim adaptasyonu üretim, hizmet, ulusal pazarda çalışan, uluslararası pazarda çalışan, mikro ölçekli işletmeler, küçük ve orta ölçekli şirketler ve büyük ölçekli şirketler tarafından göz ardı edilmemesi gereken bir süreçtir. Gelişen endüstriyel rekabet ortamında bu süreçlerin gelişmesi, işletmelere sanayi 4.0'ın elementleri olan büyük veri, nesnelerin interneti ve yapay zekâ uygulamalarından daha çok faydalanmasını sağlayacaktır. Bu teknolojiyi adapte etmek için de bulut sağlayıcılar altyapı, platform ve yazılım hizmetlerini; özel, genel, topluluk ya da hibrit bulut ortamında işletmelerin ihtiyacına göre yayınlamaktadır.

Bu araştırma, bulut bilişimin adaptasyonu ile ilgili işletmelerin algısını anlamayı ve Türkiye'nin İzmir ilinde bulut bilişimin benimsenmesini etkileyen faktörleri araştırmayı amaçlamaktadır.

Bulut bilişimin adaptasyonu algısı açıklayıcı analiz ile incelenmiştir. Bulut bilişim adaptasyonu (CCA), doğrulayıcı faktör analizinde bağımlı değişken olarak kullanılmıştır. Bağımsız değişkenler, Yeniliğin Yayılma Teorisi (DOI) teorisinden

elde edilen faktörler göreceli avantajlar (RA), güvenlik endişeleri (SC), maliyet tasarrufu (CS), uyumluluk (COMP) ve karmaşıklıktır (COMPX). Teknolojik, Örgütsel ve Çevresel (TOE) teorisinden elde edilen faktörler teknolojik hazırlık (TR), üst yönetim desteği (TMS), firma büyüklüğü (FS), yasa düzenleyici destekler (RS) ve rekabet baskısıdır (CP).

Elde edilen açıklayıcı analiz sonuçlarına göre, uzaktan çalışabilirlik, İzmir'deki buluta geçen şirketler için bulut bilişime adaptasyonun en önemli sebebiyken; iş süreçleri uyum sorunu ve güvenlik kaygıları, İzmir'de buluta geçmeyen şirketlerin karşılaştıkları en önemli sorunlar olarak göze çarpmaktadır.

Elde edilen doğrulayıcı faktör analizi sonuçlarına göre, karmaşıklık (COMPX) ve üst yönetim desteğinin TMS), bulut bilişime adaptasyonda (CCA) doğrudan etkisi bulunmaktadır. Göreceli avantajlar (RA) ve uyumluluk (COMP), karmaşıklık (COMPX) faktöründe doğrudan etkisi vardır. Teknolojik hazırlığın (TR) ve rekabet baskısının (CP), üst yönetim desteğine (TMS) doğrudan etkisi bulunmaktadır.

Bu araştırmada, bulut bilişime adaptasyon için bir karar alma modeli oluşturarak işletmelere katkıda bulunması hedeflenmektedir. Bulut bilişimin faydalarının ve zorluklarının, sektördeki işletmeler ve akademi için kapsamlı ve katma değerli veriler sağlaması amaçlanmıştır.

Anahtar Kelimeler: bulut bilişim adaptasyonu, açıklayıcı faktör analizi, doğrulayıcı faktör analizi, Yeniliğin Yayılma Teorisi (DOI), Teknolojik, Örgütsel ve Çevresel (TOE) Teorisi.

TEXT OF OATH

I declare and honestly confirm that my study, titled "FACTORS AFFECTING CLOUD COMPUTING ADOPTION IN EMERGING MARKETS (IZMIR, TURKEY)" and presented as a PhD thesis, has been written without applying to any assistance inconsistent with scientific ethics and traditions. I declare, to the best of my knowledge and belief, that all content and ideas drawn directly or indirectly from external sources are indicated in the text and listed in the list of references.

Can Saygıner

Signature

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June 01, 2020

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LIST OF ABBREVIATIONS

ANOVA	: Analysis of Variance.
ANT	: Actor Network Theory.
AVE	: Average Variance Extracted.
CCA	: Cloud Computing Adoption.
CFA	: Confirmatory Factor Analyses.
CIO	: Chief Information Officer.
CP	: Competitive Pressure.
CR	: Composite Reliability.
CS	: Cost Savings.
CSP	: Cloud Service Provider.
COMP	: Compatibility.
COMPX	: Complexity.
CRM	: Customer Relational Management.
CPU	: Central Processing Unit.
DOI	: Diffusion of Innovation.
ERP	: Enterprise Resource Planning.
FS	: Firm Size.
HOT-FIT	: Human Organization Fit Model
IaaS	: Infrastructure as a Service.
IS	: Information System.
ICT	: Information and Communication Technology.
LC	: Large Companies. :
MC	: Micro Companies.
MCDA	: Multi Criteria Decision Approach.
NIST	: National Institute of Standard Technology.
NVIVO	: A Software Program Used For Qualitative and Mixed-Methods Research.
PaaS	: Platform as a Service.

PDA : Personal and Digital Assistant.
PEOU : Perceived Ease of Use.
PEST : Political, Environmental, Social and Technological.
PU : Perceived Usefulness.
RA : Relative Advantage.
RS : Regulatory Support.
SaaS : Software as a Service.
SLAs : Service Level Agreement.
SMARTPLS : Smart Partial Least Square.
SMC : Small and Medium Companies.
SPC : Security and Privacy Concerns.
SPSS : Statistical Package for Social Sciences.
SRMR : Standardized Root Mean Squared Residual.
SWOT : Strength, Weakness, Opportunities and Threats.
TAM : Technology Acceptance Model.
TMS : Top Management Support.
TOE : Technological, Organizational and Environmental.
TRA : Theory of Reasoned Action.
TR : Technological Readiness.
UK : United Kingdom.
US : United States.
UTAUT : Unified Theory of Acceptance and Use of Technology.
VM : Virtual Machine.

1. CHAPTER INTRODUCTION

1.1. INTRODUCTION

Due to the aiming to increase revenues and decrease costs in businesses general, there is a tendency to minimize ICT costs. ICT infrastructure cost is one of the most challenges of ICT adoption decisions. There are several decisions companies made based on their ICT needs and budget. Cloud computing adoption has recently become a phenomenon for the last 10 years. Its predecessor technology was traditional computing that enables the company to manage and maintain all its information and communication technologies on its own. The company purchases applications, platforms, and infrastructures and integrate them into the company network that they developed on their own. With the advancement of the internet in the last few years, this trend has changed that all computing products are rented and are managed by cloud providers. This gives companies the ability to position faster as a time to market and focus on their products. Cloud provider interaction increases the level of services more scale and develops the applications more flexible. The company becomes to obtain an ability to demand to increase the number of users, increase CPU (central processing unit) power, increase memory, increase bandwidth power of the internet, change server configurations, use operating systems, use applications as cloud computing services. However, this cloud provider interaction has also brought the technical and business benefits as well as external risks, including the security of data holding in memory concerns, heavy contracts with cloud providers, and changing variable costs. However, cloud computing adoption is an inevitable process for each type of companies such as micro-companies (MC), small and medium companies (SMCs) and Large Companies (LCs), each type of sectors such as manufacturing and service due to the future needs of artificial intelligence and data analytics in big data to survive and holding the market shares in the competitive market. Specifying compliance, interoperability standards, and legacy system integration with the current cloud computing adoption have become in an IT architectural plan to sustain the company's IT enhancements. Governments should also encourage cloud providers to feel companies safe over decision making and its implementation periods for CC adoption. In this context, cloud providers should offer an IT framework, including cloud service solutions according to their business requirements for distinct sectors, company sizes, and market scope of companies.

1.2. RESEARCH PURPOSES

Today, the distributed software in companies, the increase in the number of data integration for distinct software, the unknowledge or unqualified of IT departments of companies raise the problem of data integrity in storage sizes and it causes companies to shift towards services that contain storage and infrastructure services as well as platform and software services. In this context, cloud computing plays an important role in increasing productivity by using on-demand storage, shared virtualized hardware, and software resources. Besides, sharing and collaboration of data, ease of access of data, updating and repairing systems, uninterrupted technical support for maintenance, low cost, rapid improvements in security and confidentiality, the contribution of companies to the strategic management focus and efficient operations, workloads and tasks requirements show that cloud computing is an indispensable technology today.

This research aims to understand the reasons of adopting cloud computing for cloud adopters and the reasons of not adopting cloud computing for non-cloud adopts of production, service sectors, companies driving in the national market, companies driving in the international market, micro companies, small and medium companies and large companies making recommendations based on companies' perceptions on the issue and understand the critical factors for adopting cloud computing in Izmir, Turkey.

1.3. THEORETICAL FRAMEWORK

Cloud Computing adoption has become competitive for businesses in most sectors, the scope of the market for companies and firm sizes such as production, service sectors, companies driving in the national market, companies driving in the international market, micro companies, small and medium companies, and large companies. Due to an increase in data integrity, complexity, cost savings, and security issues of IT infrastructures, cloud computing adoption are especially one of the most important challenges for ICT use. Various factors affect the intention of cloud computing use.

This research consists of two stages, the first stage is a quantitative study of Cloud computing adoption in Turkey and has a descriptive approach to understand the cloud users' perception of reasons of cloud computing use and the non-cloud users' perception of not reasons of cloud computing use. The second stage is a quantitative study of Cloud computing adoption in Turkey and has a confirmatory analysis approach to examine the innovation-decision theory factors and external factors for effective decisions of companies in Izmir, Turkey using DOI and TOE models combination.

Primary data are collected through in-depth surveys from company owners or ICT staff for the company. The first stage's secondary data are collected from the lists of authors in Table 6 and Table 7. The second stage's secondary data are collected from Oliveira, Thomas and Espadanal, (2014)'s research.

The research process consists of five stages. Firstly, The research started with a literature review adapted the questionnaires from Table 6, Table 7, and Oliveira, Thomas and Espadanal, (2014). Secondly, the research later continues by conducting a survey for data collection in Google Forms. Close-ended questionnaires with a five-point Likert scale and dichotomous (yes/no) questionnaires are used. The random sampling technique is used to gather personal and company data from SPSS for the descriptive analysis and factors data from SmartPLS for the confirmatory analysis. Thirdly, results are derived from two stages in research. Fourthly, discussions are gathered from obtained results for two stages in research. Fifth and the last, recommendations are stated from obtained results and gathered discussions for two stages in the research

1.4. RESEARCH QUESTIONS

Research questions of this research are those in below:

1. What is the perception view of cloud adopters and non-cloud adopters of the production sector, service sector, companies driving in the national market, companies driving the international market, micro companies, small and medium

companies, and large companies for the decision making process Cloud Computing adoption by descriptive analysis

2. What are the critical innovation decision making and external factors of cloud computing adoption derived from Diffusion of Innovation (DOI) factors and Technological, organizational, and environmental (TOE) on Cloud Computing adoption by confirmatory factor analysis?

1.5. RESEARCH SIGNIFICANCE

Academic research on the adoption of cloud computing is widely applied in the US, Europen countries, and Australia and is rarely applied in South America, Asia, and Africa. Researches in Turkey about cloud computing adoption are at the beginning and lack of innovation theories level. There is also not a specific study on benefits and challenges (decision of adopting or not adopting) of cloud computing adoption in Izmir Companies. Therefore, this research measures the perceived thoughts about cloud computing adoption and factors influencing cloud computing adoption.

- There is not a specific study on cloud computing adoption, specifically to Izmir. This research discovers the IT landscape of Turkey and offers frameworks for companies and cloud providers to work collaboratively in a reliable environment.
- There is not a specific study on benefits and challenges (decision of adopting or not adopting) of cloud computing adoption in Izmir Companies. This research also contributes to increasing the awareness of government bodies, cloud providers, and companies to create a healthy environment for an effective IT infrastructure.
- There is not a divided study such as adopters and non-adopters by distinct sectors in Izmir and Turkey. The research creates close interaction among cloud companies and non-cloud companies by sector, company size, and market type to find the appropriate solution for the decision-making processes of companies in Izmir.
- This research prevents companies from the vagueness of cloud computing adoption to avoid skeptical, biased thoughts and doubts.

As a result, this research is a guide to how government policies and regulations take part in a cloud provider and company collaboration by finding the investors and stakeholders from outside and inside of the country.

1.6. RESEARCH LIMITATION

The research mainly contributes to give companies an ability to determine cloud computing adoption or not. However, this research firstly has been made in a specific region of Turkey. Besides, this research secondly investigates the sector into two areas to interpret which factors of cloud computing adoption are important. The sectors can be detailly categorized into more parts like banking, law firms, and hospital as service sector and textile manufacturing, cotton manufacturing, and packaging manufacturing and oil and renewable energy manufacturers. Thirdly, product types of cloud computing are very generalized as the respondees answered the most famous cloud provider's product such as Dropbox, Amazon EC2, and Google GSuite, etc. Many local cloud providers can be put in the survey. Fourth and the last, this research contributes not to show a framework of developed countries because Izmir is chosen as a sample that is located in the developing country, Turkey.

1.7. THESIS STRUCTURE

Summary of seven chapters:

In Chapter One, Introduction, Theoretical Framework, Research Questions, Research Significance, and Research Limitation are presented.

In Chapter Two, Cloud Computing, Background of Cloud Computing, Definition of Cloud Computing, Characteristics of Cloud Computing, Concepts of Cloud Computing, Playground of Cloud Computing in Turkey

In Chapter Three, Cloud Computing Adoption Theories, Diffusion of Innovation Theory, Technological Organizational and Environmental (TOE) Framework, Integrated Diffusion of Innovation Theory and Technological Organizational and Environmental (TOE) Framework, Other Cloud Computing Adoption Theories are examined.

In Chapter Four, Research Model and Research Hypothesis are presented

In Chapter Five, Results of Descriptive Analysis, Results of DOI Theory Constructs, Results of TOE Theory Constructs, and Results of the Integrated DOI Theory and TOE Theory Constructs are displayed. In Chapter Six, Discussion is made. In Chapter Seven, the Conclusion is made.

2. CHAPTER LITERATURE REVIEW

2.1. CLOUD COMPUTING

Over the last decade, cloud computing has recently emerged as a new phenomenon, an innovation, a disruptive, utility, new evolution, and modern development in the information technology (IT) industry. However, it is not a new technology that offers the integration of the already existing technologies such as grid computing like an electricity Buyya et al. 2008; Zhang *et al.*, 2010), virtualization using computer power over an internet (Priyadarshinee *et al.*, 2016),(Vaquero, 2019), autonomic computing (Ado *et al.*, 2017) that offers automatic resource provisioning for various services and utility computing(Garcés *et al.*, 1999; Iyer, 2014b), Irshad et al. , 2015) with a bill metering system. These strive to transform the information and communication technology (ICT) from traditional computing to cloud computing as it enables companies to focus on their core businesses in contrast to non-core activities by reducing costs, becoming more productive, increasing operational efficiency without maintaining and upgrading system (Youseff, Butrico and Da Silva, 2008; Yang and Tate, 2012). However, cloud computing adoption' market entry to Turkey is at low levels, in comparison with US and Western European countries. Thus, it is important to examine the reasons of enthusiasm, unwilling and indecisive of companies in distinct sectors by understanding factors influencing cloud computing adoption.

2.2. BACKGROUND OF CLOUD COMPUTING

In-house computing is a former and mainstream technology that companies have built their network system with applications. They implement, maintain, and upgrade these systems according to the companies without outsourcing them. Computers are only connected to the same network that is known as the first computer-computer interaction in the 1970s. In the 1980s, client/server trend has been increased to build traditional mainframe systems by buying hardware for companies. In the 1990s, a virtual private network trend has been raised by internet package offers of telecommunication sectors. In the 2000s, along with high-speed broadband services and web services involvement, companies have built remote computing services and started working as home offices. In the 2010s, the growth of evolving high capacity networks and low-cost computers has increased the trends of virtualization and service-oriented architecture. Hence, the companies' IT department has become a significant change from uncentralized control to centralized control. Their application changed from licensed to rent. Hardware in companies became not belongs to the company's property. Qualified IT departments replaced with high qualified end-users. Companies have become dependent on the cloud provider's instructions. As a result, switching costs, integration costs, calculating the return of investment (ROI) are essential parts for company^s investment plans over cloud computing. In short, in business, companies concentrate on focusing on the market by considering cost-effectiveness to sustain their market share for their sector.

Cloud computing is mainly described as the infrastructure of information technology (IT) departments settled in the manufacturers, firms, or offices or outside of the manufacturers, firms or offices with centralized control of cloud providers. It has internet-based computing services that rent from cloud providers based on the needs of servers, storage devices, CPU and bandwidth use, tools such as operating systems, software, and applications. This caused the dependency of cloud providers, data migration issues difficulty in the case of changing your service provider. Hence, cloud computing provides an opportunity for companies to just focus on the market and cost-effectiveness by neglecting to form an experienced IT department with the least experienced users' needs in businesses.

Deciding in-house computing and cloud computing depends on top managers' decisions, competitive environment, laws in countries, the complexity of business operations, culture, norms of countries, and the perceived advantages of companies over cloud computing. Yang and Tate (2012) declared that the main benefits and challenges of cloud computing are economical and technical. Economical benefits and hindrances are mentioned by business perspective studies of cloud computing. Technical benefits and challenges are also discussed by (Avram, 2014; Jones, 2015; Okan, Hacaloglu, and Yazici, 2016). Besides, there is helpful analysis such as SWOT analysis and PEST analysis as a guide in decision making for the industry. SWOT analysis was made by (Masrom and Rahimli, 2015; Odeh, Warwick and Garcia-Perez, 2015; Adrees, Omer and Sheta, 2016). PEST analysis was made by Antoo et. al (2015) to examine the external factors of cloud computing.

In the business market, benefits and challenges studies categorized into countries by developed, developing countries or regions, company sizes by SMEs or others, sectors by public or private, and sectors by manufacturing or service. Firstly, researches mainly focused on developed countries. It has been examined by El-Gazzar and Wahid (2015); Adrees, Omer and Sheta, (2016), developing countries by Ahmad and Waheed (2015); Senyo, Effah, and Addae (2016); Yuvaraj (2016) and the regions by D Mas'adeh (2016) about Middle Eastern Countries; Dahiru and Abubakar (2018) from cross-continental countries. Secondly, there are various studies on company sizes. The researches are applied mainly to small-medium enterprises (SMEs) by Pathan *et al.* (2017); Wambugu and Ndiege (2018); Domun and Bheemul (2018). The others related to all enterprises are worked by Gutierrez, Boukrami, and Lumsden (2015); Nkhoma and Dang (2015). Thirdly, cloud computing in public sectors was studied by (Xi, 2014; El-Gazzar and Wahid, 2015; Ali, Soar, and Yong, 2016). Cloud computing in private sectors was studied by Tehrani and Shirazi (2014), Oliveira, Thomas and Espadanal, (2014) and Bhuyan and Dash, (2018). Fourthly, there are several studies related to manufacturing (Tehrani and Shirazi, 2014); (Oliveira, Thomas and Espadanal, 2014); (Kalghatgi and Sambrekar, 2015)) as well as service sectors (Ble *et al.*, 2016; Sabi *et al.*, 2016; Hartmann *et al.*, 2017).

Cloud computing adoption is one of the main challenges of the IT departments of companies. Understanding the cloud computing environment is also significant for companies to utilize the benefits and overcome the challenges. Marston *et al.*, (2011), Durao *et al.* (2014) generally investigated the characteristics, model services, and deployment models of cloud computing. Yang and Tate, (2009) and Susanto, Almunawar, and Kang (2012) provide a general understanding of cloud computing to utilize the benefits for the future.

To overcome the challenges, there are general important issues addressed by Dillon, Wu, and Chang (2010), Yang and Tate (2012), and Jothipriya and Akila (2016). Security concerns are the major issues pointed by Ackermann *et al.* (2012)

and Jajodia *et al.* (2014). Dahiru, Bass, and Allison (2015) and Cusack, (2016) expressed that trust issue is an important issue for cloud computing adoption. Legal issues are one of the most important issues. Timmermans *et al.* (2010), Hu and Bai (2014) and de Bruin and Floridi (2017) claimed that ethical issues are considered as a significant reason for cloud computing adoption. Adoption risk issues are discussed by Priyadarshinee *et al.* (2016) and Bannerman (2010). Top management and institutional pressures are the major concerns of cloud computing adoption (Steele and Guzman, 2016; Johansson and Muhic, 2017). Pricing concerns ought to be specified to adopt cloud computing effectively (Hsu, Ray, and Li-Hsieh, 2014; Mazrekaj, Shabani, and Sejdiu, 2016).

Entrepreneurs have a clear understanding of cloud computing that informs businesses, governments, and IT companies. This term discussed by entrepreneurs involving in the Cloud computing market. The founder of Apple, Steve Job's speech on Worldwide Developer Conference in 1997 about cloud computing is that storing data in servers will be a better idea than the local hard discs to be in business fast in the next 17 years (Lum, 2016). The founder of Microsoft, Bill Gates explained that cloud computing will offer super-computation by using quantum in businesses in the next 6-10 years (Ranger, 2016). Larry Ellison, Oracle Boss, opposed the perceived effects of cloud computing that this technology already used and IT people redefined the name of cloud computing as a charismatic brand for markets(Marston *et al.*, 2011). Jeff Bezos, CEO of Amazon, stated that "*More and more people are using the cloud, and building more things, and will in the future."* (Furrier, 2017,1). Alibaba's owner declared that *we strongly believe that every business in the future will be powered by the cloud. We are very happy to build this cloud infrastructure in the new digital era and support all the businesses going digital.* (Udemans, 2018,1)

2.3. DEFINITION OF CLOUD COMPUTING

There has been no specific definition of cloud computing until 2007 (von Laszewski *et al.*, 2010; Bento and Bento, 2011). The first technical definition of cloud computing is specified by Youseff, Butrico, and Da Silva, (2008) that is merged with grid computing, virtualization, autonomic computing, and utility computing. Since 2008, there has been a narrower definition of cloud computing. The general popularly first comprehensive definition declared by National Institute of Standard Technology (NIST) is that *"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.* (Mell and Grance, 2011, 6)*".* Priyadarshinee *et al.* (2017) described cloud computing as the fifth utility after gas, power, phone, and water.

Business definitions mainly contribute to show what cloud computing provides for individuals and organizations. Business definitions include data, hardware, software, resources, pay-per-use service, internet, virtualization, utility computing, grid computing, service level agreement, and automation as shown in Table 1.

Table 1. Business Definitions of Cloud Computing, Source: Author

Business Definitions	**Data**	**Hardware**	**Software**	**Resources**	**Pay-per-use Service**	**Internet**	**Virtualization**	**Utility Computing**	**Grid Computing**	**Service Level Agreement**	**Automation**
(Bento and Bento, 2011)	X	X	X			X	X				
(Lele, 2019)	X	X	X				X				X
(Youseff, Butrico and Da Silva, 2008)	X	X	X				X	X	X		
(Marston *et al.*, 2011)	X		X		X		X				
(Leimeister *et al.*, 2010)			X	X	X	X					
(Al-Dhuraibi *et al.*, 2018)				X				X			
(Brynjolfsson, Hofmann and Jordan, 2010)	X	X	X	X	X			X			
(Zhang *et al.*, 2010)	X		X	X	X			X	X		
(Mell and Grance, 2011)	X	X	X	X	X	X	X	X	X	X	X
(Armbrust *et al.*, 2009)	X	X	X	X	X						
(Yang and Tate, 2012)	X	X	X	X		X					
(Hoberg, Wollersheim and Krcmar, 2012)	X	X	X	X		X	X	X			
(AlZain *et al.*, 2012)	X	X	X	X		X					
(Leimeister *et al.*, 2010)	X	X	X	X	X	X	X	X	X		
(Son *et al.*, 2011)	X	X	X		X	X					
(Cusumano, 2010)			X		X						

Cloud computing was described as data of companies that were held in datacenters (Youseff, Butrico, and Da Silva, 2008; Armbrust *et al.*, 2009). Applications delivered as services over online and hardware were defined by Leimeister *et al.* (2010) and Son *et al*. (2011). Cloud computing was introduced as providing software online (Mell and Grance, 2011; Son *et al.*, 2011). Cloud is a pool of easily usable and accessible resources such as hardware, development platforms, and/or services (Armbrust *et al.*, 2009; Brynjolfsson, Hofmann and Jordan, 2010). The pool of services is delivered as a pay-per-use model online (Yang and Tate, 2009; Marston *et al.*, 2011). Internet-based applications were delivered as a service derived by Leimeister *et al.* (2010) and Bento and Bento (2011). Cloud computing contains virtualized resources of hardware, software, and IT infrastructure (Bento and Bento, 2011; Lele, 2019). Cloud computing is referred to as utility computing in businesses as the service being sold for utility (Youseff, Butrico, and Da Silva, 2008; Zhang *et al.*, 2010). Cloud computing is referred to as grid computing from a technical perspective like an electricity billing meter system (Zhang *et al.*, 2010; Mell and Grance, 2011). Service level agreement of cloud computing is the process of negotiating a contract between businesses and cloud providers (Mell and Grance, 2011). Cloud computing is the automation of IT solutions for businesses (Mell and Grance, 2011; Lele, 2019).

2.4. CHARACTERISTICS OF CLOUD COMPUTING

These existing technologies brought to form the characteristics of cloud computing. Essential NIST characteristics of cloud computing are on-demand self-service, broad network access, resource Pooling, rapid elasticity, and measured service (Mell and Grance, 2011).

On-demand self-service is one of the characteristics of cloud computing. All computing capabilities of businesses were done with assistance without human interaction (Bento and Bento, 2011; Stieninger and Nedbal, 2014). Cloud computing generally named pay-per-use service especially in businesses (Shimba, 2010; Janssen and Joha, 2011; Ma, 2012). Some named a pay as you go model in computing (Khan and Ahmed, 2001; Pallis, 2010; Marston *et al.*, 2011). On-demand service delivery to resources is mentioned by (Griebel *et al.*, 2015; Yassin and Alnidawy, 2015; Khan and Ullah, 2016). Memory, CPU time, data transfer, network bandwidth, and applications are the on-demand resources of businesses (Hernández *et al.*, 2015). These services enable businesses to obtain the high capacity IT Infrastructure at reasonable costs via providers (Hernández *et al.*, 2015).

Broad network access is the second characteristic of cloud computing. Internet connection availability is essential for businesses to obtain these resources (Moravcik *et al.*, 2017; Al-Dhuraibi *et al.*, 2018; Alajmi *et al.*, 2018). Device access to businesses is important to access resources such as laptops, mobiles, tablets, PDAs, and workstations (Ahmad and Waheed, 2015; Eweoya and Daramola, 2015). As a result, broad network access enables complete mobility for users in businesses to work anywhere at any time through different devices (Velte, Velte, and Elsenpeter, 2009; Bento and Bento, 2011).

Resource Pooling is the third characteristic of cloud computing. The multi-tenancy model of cloud computing was built to serve multiple businesses by pooling resources (Trigueros-Preciado, Pérez-González, and Solana-González, 2013). Location of independent storage was mentioned by Gallaugher and Ransbotham (2010) and Timmermans *et al.* (2010) to store business data without any authorization of businesses to control data and knowing where the data is. Hence, Resources in the cloud service pooled to increase the efficiency of data storing in businesses.

Rapid elasticity is the fourth characteristic of cloud computing. The scalability of resources is essential for businesses to scale up or down the systems (Kadhim *et al.*, 2018; Lele, 2019). Griebel *et al.* (2015) emphasized that scaling up and down is important for businesses to dynamically adapt to computing demands. Virtual machines, resource utilization, and resource allocations take a priority part of rapid elasticity for businesses to improve resource utility (Dai *et al.*, 2009; Tripathi and Nasina, 2017).

Measured service is the fifth and last characteristic of cloud computing. Monitoring, controlling, and reporting resources built to obtain transparency between cloud providers and businesses. Storing data, central processing, bandwidth, and staffs' user accounts managed to leverage resource utilization for users (El-gazzar, 2014). Bill metering capability is the attribute of measured service and integrated with the accounting system of the businesses. Auditing and confirming the usage aligned with the service level agreement or contract between cloud providers and businesses (Eweoya and Daramola, 2015; Seifu *et al.*, 2017).

Non-NIST characteristics of cloud computing consist of four main aspects: resource design, resource delivery, resource usage, and resource payment (Son *et al.*, 2011b). Firstly, Resource design has a service-orientation attribute that provides IT service commoditization, on-demand service, and technology abstraction. Secondly, resource delivery has delivered over the internet that the important characteristics are availability and internet technology engagement. Thirdly, resource usage has a flexible use of shared service that includes computing utility, elasticity, and scalability. Finally, resource payment has a pay-per-use billing that contains subscription models for CPU hours, memory, data transferred, or data stored, and the use of applications of businesses.

NIST- oriented and Non-NIST oriented characteristics of cloud computing are listed in Table 2.

Table 2. Characteristics of Cloud Computing by NIST Oriented and Non-NIST Oriented, Source:(Mell and Grance,2011)

Characteristics of CC		**Definitions**	**Authors**
NIST oriented	On-Demand Self Service	Gives an ability to provide resources (networks, servers, storage, applications, and services) without human intervention	(Bento and Bento, 2011; Marston *et al.*, 2011; Mell and Grance, 2011; Stieninger and Nedbal, 2014)
	Broad Network Access	Gives an ability to access resources from remote devices such as laptops, mobiles or tablets	
	Resource Pooling	Gives an ability to share resources such as storage, serves with multiple consumers	
	Rapid Elasticity	Gives an ability to scale up and down services	
	Measured Service	Gives an ability to monitor, control and report resources with time-measuring capabilities between suppliers and the provider	
Non-NIST oriented	Security, Usability, Scalability, Service quality, Cost		(Youseff, Butrico and Da Silva, 2008; Armbrust *et al.*, 2009; Brynjolfsson, Hofmann and Jordan, 2010; Cusumano, 2010; Leimeister *et al.*, 2010; Zhang *et al.*, 2010; Son *et al.*, 2011; Lele, 2019)

2.4.1. CHARACTERISTICS OF CLOUD COMPUTING BY SERVICE MODEL

Cloud Computing Service Models are significant to know which service model is needed to confirm the demands of their business processes.

SaaS is an application-based on-demand service model that hosted on the service provider's cloud infrastructure that data and infrastructure of businesses are under control with an only cloud service provider (Etro, 2009). Cloud users in businesses use SaaS services without installation, management, and licensing needs (Alhammadi, 2016). Reducing operation costs is the key advantage of SaaS applications (Alhammadi, 2016). No up-front cost investment, shortening the time of application availability, technical aspects such as development, deployment, and testing and managing aspects such as maintaining, upgrading, backing up, and security are major duties of CSP (Alhammadi, 2016). As a result, these tasks cause the businesses to focus on their core businesses by eliminating testing, managing, maintaining, upgrading, backing up, and security and operation costs concerns.

PaaS is an operating system, storage, and network-based on-demand service model (Etro, 2009). Cloud users in businesses use PaaS services to develop and deploy their applications. Qualified and good IT staff in businesses needed to use PaaS services to manage software management tasks in terms of the type of application lifecycle management, Application Programming Interfaces supported and data and application management such as programming language choose and data logging (Alhammadi, 2016). Hence, these activities enable businesses to build the technical capabilities of businesses.

IaaS is a virtual machine (VM), storage, and CPU based on-demand service model (Etro, 2009). Cloud users in businesses use IaaS services without owning the physical infrastructure and responsibility of maintenance (Alhammadi, 2016). Qualified and high levels of IT staffs in businesses needed to use IaaS services to manage physical infrastructure tasks (Alhammadi, 2016). As a result, these activities enable businesses to build infrastructure capabilities of businesses.

SaaS, PaaS, and IaaS models of cloud computing are listed in Table 3.

Table 3. Characteristics of Cloud Computing by Service Model, Source:(Mell and Grance, 2011)

Service Model	**Definitions from (Mell and Grance, 2011)**	**Authors**	**Services**
SaaS	The on-demand application provided by web browsers as a client interface for various client devices via the Internet such as CRM services and cloud-based storage and sharing services	(Greenberg *et al.*, 2009; Erdogmus, 2009; Marston *et al.*, 2011; Bento and Bento, 2011; Oliveira, Thomas, and Espadanal, 2014; Bildosola *et al.*, 2015; Seifu *et al.*, 2017; Kalghatgi and Sambrekar, 2015; Akande et. al 2013; Mazrekaj, Shabani and Sejdiu, 2016; Vidhyalakshmi and Kumar, 2016; Kassahun and Sharma, 2016; Khan and Al-Yasiri, 2016; Tripathi and Nasina, 2017; Paredes-Gualtor *et al.*, 2018; Shakir, Hammood, and Kh. Muttar, 2018)	Impel CRM**,** Salesforce.com **,** and Microsoft Dynamics as CRM services; Dropbox and Skydrive as a cloud-based storage and sharing services
PaaS	On-demand platform as providing platform resources in terms of software development frameworks and operating system support such as web and application development tools and database to support the delivery of custom applications.	(Oliveira, Thomas and Espadanal, 2014; Kassahun and Sharma, 2016; Mazrekaj, Shabani and Sejdiu, 2016; Deil and Brune, 2017; Tripathi and Nasina, 2017)	Microsoft Azure, Google App Engine, Amazon EC2 cloud platforms, and IBM SmartCloud
IaaS	On-demand infrastructure term as providing computing infrastructure such as servers, data storage, processing, memory, overall network bandwidth.	(Oliveira, Thomas and Espadanal, 2014; Almabhouh, 2015; Karkonasasi *et al.*, 2016; Kassahun, 2016; Khan and Al-Yasiri, 2016; Mazrekaj, Shabani and Sejdiu, 2016)	Amazon EC2 servers, Google Servers

2.4.2. CHARACTERISTICS OF CLOUD COMPUTING BY DEPLOYMENT MODEL

After having determined the desired cloud service model, each company should then decide which cloud service provider deployment model is appropriate for them to adapt to serve their resources, business processes, and organizational structure.

According to NIST (2011), the cloud service model deployed into four categories to consider what type of applications, platforms, and infrastructures are applied to a specific company in Table 4 mentioned below.

Public, on the Premise cloud, is known as a deployment model that is open and accessible to the public with cloud service provider management (Susanto, Almunawar, and Kang, 2012). It has less cost mentioned by (Singh, 2012; Hernández *et al.*, 2015) and a less secure system expressed by (Salah Hashim and Bin Hassan, 2015), compared with another deployment model. The public cloud can guarantee flexibility and easy access for users (Susanto, Almunawar, and Kang, 2012; Thakur *et al.*, 2014). However, malicious attacks can emerge frequently (Susanto, Almunawar, and Kang, 2012; Umaeswsari and Shanthini, 2014). Information leak can appear as a threat (Mohd Yusoff, 2013; Coppolino *et al.*, 2017). Data archiving is mostly used in businesses.

Private, off-premise cloud, is described as a deployment model that strictly closed to the public with organization management of resources and applications including deployment, customization, operations, and maintenance (Susanto, Almunawar, and Kang, 2012). It is believed that the private cloud is more secure and more costly than a public cloud (Dhawan, 2017; Domun and Bheemul, 2018b). It is also different from the public cloud in that it has customized features that give accessibility to users in the company as well as stakeholders (Susanto, Almunawar, and Kang, 2012). An application providing mostly held in a private cloud in businesses.

Hybrid, on-premise, or off-premise, cloud clarified as a mixture of public, private, and community cloud (Srilakshmi, Veenadhari, and Pradeep, 2013; Priyadarshinee *et al.*, 2016). It has also a portability function of data and applications easily in case of cloud provider changes (Priyadarshinee *et al.*, 2016; Tripathi and Nasina, 2017). It contains a maximum cost saving of the public cloud's feature with outsourcing and maintains a high level of control data and applications of private cloud's feature. Data archiving and application providing can both be held in a hybrid cloud.

A community cloud is known as maintaining the business resources and applications for a group or organization that has a common interest such as storage, security, and compliance (Susanto, Almunawar and Kang, 2012; Hiran *et al.*, 2018). Educational cloud and the governmental cloud can be shared among universities and governmental bodies around the world for research and governmental services purposes.

Here are the advantages and disadvantages of public cloud and private cloud and the future challenges of hybrid cloud in Table 4.

Table 4. Characteristics of Cloud Computing by Deployment Model, Source: (Mell and Grance, 2011)

Deployment Models	Definition of Mell and Grance, (2011)	Authors	Advantages and Disadvantages by (Srilakshmi, Veenadhari and Pradeep, 2013)
Public On-Premise Cloud	Defined as a technology that has cloud service and its infrastructure, made publically available to organizations, businesses, and industries, owned by more than one cloud provider.	(Armbrust *et al.*, 2009; Janssen and Joha, 2011; Marston *et al.*, 2011; Mcafee, 2011; Mell and Grance, 2011)	**Advantages** ➢ Reduce Costs ➢ Improve Cashflow ➢ Universal accessibility ➢ Application and data backed up automatically **Disadvantages** ➢ Lack of Control ➢ Perceived Weaker Security
Private Off Premise Cloud	A technology has a cloud infrastructure that is private, is available to a single organization, administered by the organization or a third party and is either on or off the premises.		**Advantages** ➢ Greater Control ➢ More Security ➢ Higher Performance ➢ Customizable **Disadvantages** ➢ High Costs ➢ Power, control, cooling maintenance ➢ The capacity of Datacenters
Hybrid On-Premise or Off-Premise Cloud	A technology that has cloud services and its infrastructure is combined with two or more clouds, including public, private, or community, and it is administrated by the organization or a third-party service provider and is either on or off-premises.		**Advantages** ➢ Cost savings ➢ Business Agility
Community On-Premise or Off-Premise Cloud	A technology that has cloud services and its infrastructure shared by multiple organizations with common interests, requirements, or considerations, and managed by a cloud provider.	(Janssen and Joha, 2011; Marston *et al.*, 2011; Mell and Grance, 2011)	

2.5. CONCEPTS OF CLOUD COMPUTING

According to Stieninger and Nedbal, (2014), success factors, potential and challenges, requirements, consequences, risks, decision guidance, business models, and provider topics are the key elements researches of cloud computing adoption. The concept focus of cloud computing is shown below in Table 5.

Table 5. Concept Focus of Cloud Computing

	Success factors	**Potential and challenges**	**Requirements**	**Consequences**	**Risks**	**Decision guidance**
(Armbrust *et al.*, 2009)		**X**				
(Brynjolfsson, Hofmann and Jordan, 2010)						
(Creeger, 2009)	**X**	**X**	**X**	**X**		
(Cusumano, 2010)				**X**		
(Garrison, Kim, and Wakefield, 2015)	**X**	**X**	**X**			
(Lele, 2019)		**X**				
(Katz, 2009)						
(Hoberg, Wollersheim and Krcmar, 2012)		**X**		**X**		
(Leimeister *et al.*, 2010)				**X**		
(Marston *et al.*, 2011)		**X**				**X**
(AlZain *et al.*, 2012)					**X**	
(Iyer, 2014)	**X**	**X**				
(Son *et al.*, 2011)		**X**		**X**		**X**

2.5.1. SUCCESS FACTORS OF CLOUD COMPUTING

Success factors of cloud computing were classified by business-oriented, employee-oriented, and both (Iyer, 2014; Creeger, 2009; Garrison, Wakefield, and Kim, 2015).

From a business-oriented perspective, Khan and Al-Yasiri (2016) and Okan, Hacaloglu, and Yazici (2016) mentioned the success of focus on the core business to reach a faster time to market. Erdogmus (2009), Etro (2009), and Yang and Tate (2009) also expressed the cost reduction to lower the upfront costs and increase the revenue. (Iyer, 2004). Garrison, Kim, and Wakefield, 2015) classified three key factors: the trusted relationship between customers and cloud providers, focusing on core competence and success of economics with economies of scale that is business-oriented. (Abdollahzadehgan *et al.*, 2014) pointed out the top management critical success factors and categorized them into four categories: management of information systems human resource, vision and commitment clarity for positive innovation environment, knowledge of the capabilities and limitations of cloud-based services, and forming reasonable objectives and plans. (Abdollahzadehgan *et al.*, 2014) also divided the firm size critical success factors for SMEs into two groups: flexibility advantages of SMEs, the ability of cloud computing for the creation of companies, and new products to develop market share, grow sales turnover and raise profitability. Especially for start-ups, avoiding capital expenditure is an advantage to obtain the cost of invest in producing products, instead of the cost of investing in the new technology. For large companies (LC), organizational resource needs for financial technical and human resources, expertise needs, know-how needs increases the requirement of cloud computing for large companies but causes failures of adopting. Hence, these enable SMEs to raise the ability to compete with large enterprises locally and internationally. These enable LCs to decrease the complexity of business processes but increase the level of risks.

From an employee-oriented perspective, Avram (2014) and Jones (2015) asserted that access to IT resources is important for raising user involvement in businesses. Okan, Hacaloglu, and Yazici (2016) expressed that scalability, accessibility, flexibility, and agility/ adaptability are success factors to deploy fast in case of requirements arise without minimum service provider interaction. Cost minimization, reliability, flexibility, and availability are important success elements to use cloud computing (Astri, 2015). Abdollahzadehgan *et al.* (2014) also divided the technological readiness critical success factors for SMEs into five groups: Reducing infrastructure management, reducing IS cost, data availability, reduction of software maintenance, technical skills of IS staff with the knowledge and experiences of IT human resources.

Creeger (2009) focused as an employee-oriented that the users of cloud computing should also be acknowledged but the adoption process also makes the employees a hesitation in case of losing employment. Iyer (2014) considered assessing both business and employee-oriented that concerns with the costs and the planing the future value of cloud computing adoption for companies.

From the literature, cost reduction, feeling insecure of the cloud provider, and scalable easily are selected for descriptive analysis from the success factors of cloud computing.

2.5.2. POTENTIAL AND CHALLENGES OF CLOUD COMPUTING

The potential and challenges of cloud computing were explained by Iyer and Henderson(2014), Lele (2019). Trigueros-Preciado, Pérez-González, and Solana-González (2013) categorized potential and challenges into five categories: Security, availability, and quality of service, vendor lock-in, the control loss of data and data privacy, confidentiality and law requirements.

For security, Armbrust *et al.* (2009) classified the potential and challenges for data loss and software security. For availability and quality of service, Garrison, Kim, and Wakefield (2014) stated that mobility and collaboration are important potential and challenges of cloud computing adoption. For vendor lock-in, (Hoberg, Wollersheim, and Krcmar, 2012) explained the potentials for the behaviors among cloud service providers and companies. For the control loss of data and data privacy, cloud provider and company lock-in and reliability issues were also addressed as a challenge by Marston *et al.* (2011). For confidentiality and law requirements, (Marston *et al.*, 2011; Iyer, 2014) mentioned IT security and compliance issues as a major challenge. As a result, these potential and challenges of cloud computing adoption lead to a faster time to market, scalability of services, and flexible applications to reach success factors of cloud computing.

From the literature, feeling insecure about cloud providers and concerns about the regulation and laws are selected for descriptive analysis from the potential and challenges of cloud computing.

2.5.3. REQUIREMENTS OF CLOUD COMPUTING

Requirements of cloud computing were expressed by (Garrison, Kim, and Wakefield (2014) and Creeger (2009). Cloud computing is classified into three requirements: fast internet access requirements, qualified end-user requirements, and top management requirements. For fast internet access requirements, Garrison, Kim, and Wakefield (2014) affirmed that broadband policies and technical policies are important to reduce internet connection loss. For qualified end-user requirements, adoption policies are important by training employees in businesses (El-gazzar, 2014; Giyane and Buckley, 2015).

For top management requirements, attitudes towards costs were examined by (Hoberg, Wollersheim, and Krcmar, 2012; Johansson and Muhic, 2017). The total cost of ownership was examined by (Mitrovic, Development, and Xi, 2014). The cost of IT service delivery was specified by (Nkhoma and Dang, 2015). Implementation and maintenance cost was assessed by (Badie *et al.*, 2016). Cost-effective computing was considered by (Hoberg, Wollersheim, and Krcmar, 2012; Bulla, Hunshal, and Mehta, 2016). A cost-benefit analysis was examined by (Yang and Tate, 2009; Nkhoma and Dang, 2015). Benefit-cost-opportunity-risk was assessed by(Lee and Hanh, 2013). Attitudes towards pricing were considered by (Mitrovic, 2014; Alismaili *et al.*, 2016). Ibrahimi (2017) provided a general understanding of pricing mechanisms for SaaS, PaaS, and IaaS. (Son *et al.*, 2011) mentioned about subscription fee in general. Hoberg, Wollersheim, and Krcmar, (2012) formed a pricing model and distinguished among fixed fees and pay-per-use. For legal requirements, Roche (2014) introduced the general legal needs of cloud computing. Uncertain jurisdiction for Internet activities was studied by Cheng and Lai (2012) and Charlebois et al. (2016) due to geographically distributed cloud datacentres. For ethics requirements, businesses and cloud providers provide a need for moral, justice, and utilitarian attributes(Timmermans *et al.*, 2010). For trust requirements, transparency was found an important requirement among businesses and cloud providers (Repschlaeger *et al.*, 2013; Skolmen and Gerber, 2015). Public auditability and compliance need are mentioned by (Wang et al., 2010b). For privacy requirements, Katzan (2010) emphasized the importance of business and personal information data storing in remote data centers managed by third-party cloud providers. Ryan (2011) underlined that cloud providers need to give information about how the company’s data is used in a clear policy. For adoption requirements, Misra and Mondal (2011) prepared an ROI (Return on Investment) model for companies to determine the suitability of adopting cloud computing.

Dahiru, Bass, and Allison (2015) and El-Gazzar et al. (2016) also highlighted the inhibitors of cloud computing adoption. Besides, Dahiru, Bass, and Allison (2015b) exhibited the enablers and benefits of the adoption of cloud computing.

From the literature, satisfying risk and quality requirements, interoperability, concerns about the benefit of cloud computing, and feeling insecure of cloud providers are selected for descriptive analysis from the requirements of cloud computing.

2.5.4. CONSEQUENCES OF CLOUD COMPUTING

Consequences of cloud computing were mentioned by Creeger (2009) and Cusumano (2010). Consequences of adoption are also considered before or within adoption to make appropriate arrangements on time (Leimeister *et al.*, 2010; Hoberg, Wollersheim, and Krcmar, 2012). Increased scalability is a consequence of cloud computing adoption(Cusumano, 2010; Hoberg, Wollersheim, and Krcmar, 2012) for resource usage. Increased agility is another consequence of adopting cloud computing(Creeger, 2009). Cost reduction is one of the most important consequences of adopting cloud computing (Leimeister *et al.*, 2010; Hoberg, Wollersheim, and Krcmar, 2012). Decreased IT infrastructure complexity is emphasized as a consequence of (Leimeister *et al.*, 2010). These consequences of cloud computing lead to an increase in the developed alignment of business and IT in companies.

From the literature, increasing productivity in business processes, security, cost reduction, and easy scalability are selected for descriptive analysis from the consequences of cloud computing.

2.5.5. RISKS OF CLOUD COMPUTING

Risks of cloud computing were introduced by Ackermann *et al.* (2012) and AlZain *et al.* (2012). AlZain *et al.* (2012) differed the risks of a single cloud from multi-cloud. (Ackermann *et al.*, 2012) emphasized the six perceived IT security risks that were confidentiality, integrity, availability, performance, accountability, and maintainability. For confidentiality, leaking data from internal system data, leaking data from the cloud provider, and eavesdropping communication were indictors of confidentiality. For integrity, data modification in the internal system, accidental modifications or manipulations at provide side and accidental modifications of transferred data affected integrity. For availability, loss of data access, data loss at the provider side, discontinuity of the service, insufficient availability of the system, and attacks against availability were the important indicators of availability. For performance, network performance, performance issues of internal systems, and limited scalability caused performance failures. For accountability, access without authorization, identity theft, and insufficient user separation were the risk issues of accountability. For maintainability, incompatible business processes, incompatible with new technologies, limited data import and insufficient maintenance increased the maintenance risks of cloud computing adoption. Risks of cloud computing are categorized into three levels: Data integrity, data intrusion, and service availability for cloud security and cloud storage (AlZain *et al.*, 2012). The idea of creating multi-cloud is emerged by (AlZain *et al.*, 2012) to build high data integrity, data intrusion, and data availability with a secure system. Hence, technical IT infrastructures must be built-in businesses by qualified IT technicians to form the most effective well-equipped system.

From the literature, business process adoption issues, high costs, concerns about security, and competitiveness are selected for descriptive analysis from the risks of cloud computing.

2.5.6. DECISION GUIDANCE OF CLOUD COMPUTING

Decision guidance is an important aspect of cloud computing adoption (Marston *et al.*, 2011; Son *et al.*, 2011a). A wide range of applications is helpful for companies to obtain the guidance of cloud computing (Stieninger and Nedbal, 2014). Son *et al.* (2011) investigated the effects of cloud computing adoption on market returns. Marston *et al.* (2011) also developed an analysis of technical, operational, and organizational limitations of cloud computing adoption before used.

Cloud computing is generally investigated as a business model aspect by Brynjolfsson, Hofmann, and Jordan (2010**).** Brynjolfsson, Hofmann, and Jordan (2010) examined cloud computing as an electricity utility model. (Iyer, 2014) built a cloud computing model from a cloud provider perspective.

Cloud computing adoption researches are investigated by cloud provider aspects (Katz, 2009). Katz (2009) also asserted that mega data centers are built by Google, Microsoft, and Amazon to increase the energy-efficient strategies in terms of increasing cold water circulation containers instead of the air-conditions rooms. Hence, these provider aspects build an efficient model for companies.

Decision guidance to adopt cloud computing is formed below, derived from the consequences of cloud computing, requirements of cloud computing, and success factors of cloud computing in literature.

Table 6. The Reasons for Deciding Cloud Computing

REASONS	ADOPTED	AUTHOR
Increasing Productivity in Business Processes	Consequences of Cloud computing	(Marston et al., 2011; Alharbi, Atkins and Stanier, 2016; Mas'adeh, 2016)
Cost Reduction	Success Factors of Cloud computing, Consequences of Cloud computing	(Marston et al., 2011; Abu-shanab, 2014; Singh and Tripathi, 2016)
Satisfying Risk and Quality Requirements	Requirements of Cloud computing	(Okan, Hacaloglu and Yazici, 2016; Kyriakou et al., 2017; Pyae, 2018)
Security	Consequences of Cloud computing	(Marston et al., 2011; Abu-shanab, 2014; Singh and Tripathi, 2016)
Working Collaboratively from Remote	Requirements of Cloud computing	(Alhammadi et. al, 2013; Masrom and Rahimli, 2014; Eweoya and Daramola, 2015)
Trust of Cloud Providers	Success Factors of Cloud computing	(Shimba, 2010; El-Gazzar and Wahid, 2015)
Easy Scalability	Success Factors of Cloud computing, Consequences of Cloud computing	(Venters and Whitley, 2012)

Decision guidance not to adopt cloud computing is listed from the potential and challenges of cloud computing and risks of cloud computing showed below.

Table 7. The Reasons for Not Deciding Cloud Computing

REASONS	ADOPTED	AUTHOR
Business Process Adoption Issues	Risks of Cloud Computing	(Loukis and Kyriakou, 2015)
High Costs	Risks of Cloud Computing	(Mazrekaj, Shabani and Sejdiu, 2016; Ibrahimi, 2017)
Concerns about the Benefits of Cloud Computing	Requirements of Cloud Computing	(Avram, 2014)
Concerns about Security	Risks of Cloud Computing	(Kulkarni et al., 2012; Khan and Al-Yasiri, 2016; Altobishi et. al, 2018)
Competitiveness	Risks of Cloud Computing	(Karkonasasi et al., 2016; Senyo, Effah and Addae, 2016)
Feeling Insecure of Cloud Provider	Success Factors of Cloud computing, Requirements of Cloud computıng	(El-Gazzar, 2015)
Concerns about the Regulation and Laws	Potential and Challenges of Cloud Computing	(Khajeh-Hosseini, Sommerville and Sriram, 2010)

2.6. PLAYGROUND OF CLOUD COMPUTING IN TURKEY

The Cloud computing market in Turkey has a sharp growth of 37.03% between 2014 and 2019 (Technavio, 2018). According to Technavio (2018), cloud providers are dominated by Google, IBM, Koç Systems, and SAP. Amazon Web Services, HP, MedNautlilus, Microsoft, Oracle, Rackspace, and salesforce.com are prominent cloud providers in Turkey (Technavio, 2018). The market challenge of Turkey is the growth of regulations and geographic limitations (Technavio, 2018). (Güner and Sneiders, 2014) also declared that a lack of knowledge and technical infrastructure of the region in terms of power supply and broadband is the main challenge of adoption. Besides, (Akar and Mardiyan, 2016) stated that legislation and regulations are important concerns to increase security and privacy to adopt cloud computing in Turkey. Datacenter evolution is the market trend for cloud providers to support the company's IT infrastructures.

According to Deloitte (2019), Turkey is ranked as 10th in Europe and 20th globally in terms of overall information and communication technologies (ICT) sector. Technoparks have a huge role in cloud computing adoption for companies.

The number of technoparks and their total revenues increased at 17.4% and 23.1%, respectively (Deloitte, 2019).

Value-added activities of ICT are service, software, and hardware. Between 2014 and 2019, the number of services increased from 16% to 21%. The number of software increased from 36% to 41%. The number of hardware decreased from 48% to 38% (Deloitte, 2019). This reduction of hardware and the growth of service showed that companies in Turkey tended to adopt cloud computing today, tomorrow, or in the future. Deloitte's (2019)'s research also supported that cloud computing will be the most impact in technological areas in Turkey in the next year, the second most impact of technological areas in Turkey in the next five years just behind artificial intelligence. As a result, even cloud computing adoption is at an early age, there is a growing trend in the number of technoparks growth, cloud services growth, and hardware reduction for IT infrastructure.

According to the Software Alliance (2018), data privacy, security, cybercrime, intellectual rights, international harmonization of rules, promoting free trade and ICT readiness, and broadband deployment are six criteria for assessing the landscape of cloud computing. Germany, Japan, and United States takes 1st, 2nd and 3rd, which Turkey is 16th country in the world by following these criteria: data privacy (17th), security (9th), cybercrime (18th), intellectual rights (23rd), international harmonization of rules (19th), promoting free trade and ICT readiness and broadband deployment (15th). (Directive, Framework, and Text, 2020).

In data privacy, article 24 of the Turkish Civil Code also asserts that a person whose civil rights are violated can claim protection. A draft law concerning the protection of personal data in Turkey has been under development.

Insecurity, signing the convention on cybercrime and personal data protection law was adopted in 2015 and 2016, respectively that they enable to build a trusted environment for customers in cloud services.

In cybercrime, Turkey has draft laws and regulations but has a lack of intellectual property sections in the laws that makes Turkey at an early stage.

In intellectual property rights, Turkey is under the European Union's Free Trade agreement that means the market entry for international providers is easy. However, price opportunities to 20 % for domestic providers are a disadvantage for international cloud providers to invest in the cloud computing landscape in Turkey. Draft laws and copyright laws protect companies in Turkey.

In international harmonization of rules, they are needed for data portability in interoperable applications to increase accessibility. Turkey has barriers over tariffs and trade for e-commerce, online software, and applications.

In promoting free trade, there is an e-government and strategy plan for citizens. Besides, there are two initiatives to develop a government cloud infrastructure for small and medium companies (SMC) support. Payment and security settlement system Data localization is also not free in Turkey. Turkey's E-Payment Law (Law No 6493 on Payment and Security Settlement Systems, 2013) requires companies providing e-payment services to conduct all of their data processing in Turkey.

In IT readiness and broadband deployment, Turkey's national broadband strategy is only in the early stages of development conducted by The Information and Communications Technologies Authority (ICTA). The government should make comprehensive broadband plans with 4G operators and contact with known cloud providers such as Google, Microsoft, SAP, and Oracle to make investment plans for Turkish companies. The proportion market share of DLS operators increased to 25% from 2015 to 2018.

3. CHAPTER CLOUD COMPUTING ADOPTION THEORETICAL FRAMEWORK

DOI, DOI, Fit Viability Model (FVM), DOI with HOT-fit (Human-Organization Technology-fit) model, TOE (Technological, organizational and environmental) framework, DOI & TOE, UTAUT, TAM, TRA, TOE& TAM and TAM, TRA and DOI are the theories that are widely used in cloud computing adoption. There is a theoretical framework for cloud computing adoption listed below in Table 8.

Table 8. Theoretical Framework Used to Examine Cloud Computing Adoption

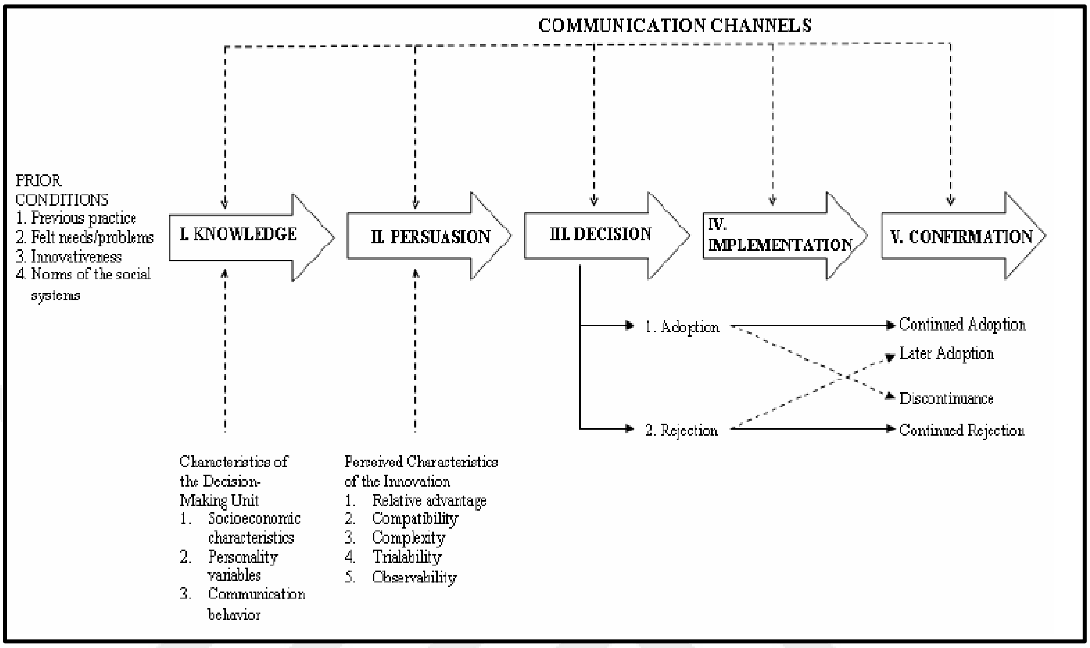
DOI	Relative Advantage, Compatibility, Complexity, Trialability, Observability, Uncertainty, Geo-Restriction, Security Concerns, Cost Savings	Implementation Success or Technology Adoption	(Sallehudin, Razak and Ismail, 2015; Charlebois et al., 2016; Hassan, Mohd Nasir, and Khairudin, 2017)
DOI- Fit Viability Model (FVM).	Fit- Characteristics of cloud computing adoption. Viability- Decision-makers, Cost reduction and IT readiness factors, Organization Support	To understand the fit and viability of cloud computing to perform their jobs and would further enhance the benefits of cloud computing in their organizations for managers.	(Mohammed, Ibrahim, and Ithnin, 2016; Tripathi and Nasina, 2017; Singh and Tripathi, 2016; Alajmi *et al.*, 2018)
DOI with HOT-fit (Human-Organization Technology-fit) model	Human, Organization, Technology Fit- Characteristics of cloud computing adoption.	To explore the factors impacting the cloud computing adoption decision	(Lian, Yen and Wang, 2014; Bhuyan and Dash, 2018b; Lynn *et al.*, 2018)

TOE (Technological, organizational and environmental) framework	Organizational context Technological context Environmental context	To explore the factors impacting the cloud computing adoption decision	(Ahmad & Waheed, 2015; Alshamaila et al., 2013; Gutierrez et al., 2015; Hassan et al., 2017; Karkonasasi, Baharudin, Esparham, & Mousavi, 2016; Kyriakou, Maragoudakis, Loukis, & Themistocleous, 2017)
DOI & TOE	Organisational context Technological context Environmental context	To explore the factors impacting the cloud computing adoption decision	(Oliveira, Thomas and Espadanal, 2014; Amini and Bakri, 2015; Alismaili *et al.*, 2016; Alkhalil, Sahandi and John, 2017; Deil and Brune, 2017; S., 2017; Bhuyan and Dash, 2018a)
UTAUT	Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions	Behavioral Intentions	(Mathur and Dhulla, 2014; Giyane and Buckley, 2015; Salah Hashim and Bin Hassan, 2015)
TAM	Perceived Usefulness Perceived Ease of Use	Behavioral Intention to Use System Usage	(Moh *et al.*, 2015; Yuvaraj, 2016; Arpaci, 2017; Ali, Gongbing and Mehreen, 2018; Ali, Wood-Harper and Mohamad, 2018)
TRA	Attitude toward Behaviour Subjective Norm	Behavioral Intention	(Widjaja and Chen, 2012)
TOE & TAM	TAM- Perceived Usefulness Perceived Ease of Use		(Mas'adeh, 2016; Raut, Priyadarshinee and Jha, 2017)
TAM, TRA, and DOI	Attitude toward Behaviour Subjective Norm	Behavioral Intention Behavior	(Shiau and Chau, 2016)

3.1. DIFFUSION OF INNOVATION THEORY

Rogers (1983, 161) defined innovation-decision process as: *"the process* *through which an individual or other decision-making unit passes from first knowledge of innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and confirmation of this decision".*

Figure 1. A Model of Five Stages in the Innovation-Decision Process (Rogers, 1983).



Diffusion of Innovation (DOI) theory was pioneered by Rogers (1983) as shown in Figure 1 that expresses the five processes of knowledge, persuasion, decision, implementation, and confirmation as innovation-decision process theory for the social system environment, including time and communication channel context. Pesl Murphrey and Dooley (2010) asserted that the perception of people is far more significant than the technical barrier that is affecting technology implementation or use. Hall and Hord (2001) also stated that understanding the perception of people should be focused instead of appearing the validity of the perceptions.

Diffusion is categorized into five categories: innovator, early adopters, early majority, late majority, and laggards (Rogers, 1983). The implementation and confirmation processes of innovators are fast that might not obtain economical or social benefits (Rogers, 1983). Early adopters investigated the innovation of innovators and had to build trust for the decision that can gain economical or social benefits (Rogers, 1983). Late adopters or laggards are traditional that consider as a skeptical but had to make a decision for their competitiveness and survive (Rogers, 1983). Rogers's (1983)'s study explained that 2,5%, 13,5%, 34,0%, 34,0%, and 16,0%

of companies are at innovators, early adopters, early majority, late majority, and laggards category, respectively.

The first innovation process of DOI is knowledge. (Rogers, 1983) stated that media and interpersonal contact has highly affected on person's opinion and judgment. These effects are also influenced by social system norms in the social environment (Rogers, 1983). Tariq, Pangil, and Shahzad (2017) explained that these effects change the decision to adopt or not adopt at the knowledge stage.

The second innovation process of DOI is persuasion. Perceived characteristics of innovation presented at the persuasion stage: relative advantage, compatibility, complexity, trialability, and observability (Rogers, 1983).

Peshin et al. (2009) defined relative advantage, compatibility, complexity, trialability, and observability as follows.

- Relative advantage is the ratio of expected benefits and costs of adoption of an innovation that measures the system's ability of economical profitability, low initial cost-saving time or effort, decreasing the discomfort, and obtaining awarded.
- Compatibility is the ratio of which the innovation is consistent with past experiences. Complexity is the degree to which an innovation is difficult to understand and use.
- Trialability is the ratio of which the system is used on a limited basis or in installments.
- Observability is the degree to which the innovation can be observed or invisible among companies.

A high relative advantage and high compatibility for innovation can positively affect the rate of diffusion. In contrast, observability and trialability can cause risk and may increase the adopters' uncertainty about technology (Fichman and Kemerer, 1993). Nevertheless, (Parker and Castleman, 2014) suggested it would not be useful to integrate DOI with other theories as this theory did not present any evidence of how attitude evolves into an adoption or rejection decision without considering the social context. This theory only illustrates how certain innovations diffuse in social systems.

There are three DOI studies of cloud computing adoption. One of the studies has been made to Malaysian small and medium companies (SMCs) by Hassan and Nasir (2017). It was a quantitative-based survey that was asked 137 mid-to-senior level of executives in Malaysian SMEs and designed a factor analysis approach to assess factors affecting the adoption. The second of studies has been investigated through genomics research by Charlebois et al. (2016) to Germany. It was a qualitative survey that was asked 20 semi-structured interviews with genomic researchers, cloud service providers, and patient advocates to understand how key stakeholders manage the various ethical and legal issues while adopting cloud computing in Canada, Germany, Spain, UK, US east and US west. The third and the last one is Sallehudin, Razak, and Ismail (2015)'s research made through the public sector of Malaysia. It was a survey of 730 IT officers for Malaysian ministries and government bodies. According to Hassan and Nasir (2017), finding are complexity has a negative influence on cloud computing adoption. However, Hassan and Nasir (2017) don't prove that relative advantage and compatibility of the system has a positive and negative influence on cloud computing adoption, respectively. Besides, Charlebois et al. (2016)'s work on the project about cloud computing adoption claimed that cost savings and security concerns are major barriers or concerns over cloud computing adoption. Moreover, Sallehudin, Razak, and Ismail (2015) expressed that the relative advantage of the system and compatibility of staff hugely affects cloud computing adoption. Complexity and trialability are not significantly found important for cloud computing adoption in public organizations. Hence, findings showed that cost savings and security concerns for projects were likely to affect adoption. Compatibility for staff is more likely to affect cloud computing adoption in public organizations. System complexity is more likely to affect cloud computing adoption in SMEs. Observability in DOI is not measured by any research because the background experience of using and adopting is new.

There are additional DOI constructs with the fit viability model (FVM). There are two studies of DOI with the HOT-fit model that are (Tripathi and Nasina, 2017; Alajmi *et al.*, 2018b). Tripathi and Nasina (2017)'s research was a multicase analysis approach and had a 34 questionnaire to explore the application of the fit- viability model (FVM) in 4 multinational software companies in the US and India. Alajmi *et al.* (2018)'s research had an e-learning based cloud computing adoption for higher education institutions in Oman. The fit framework examines the characteristics of cloud computing adoption. The viability framework monitors the prediction of the expected future of cloud computing. In the fit framework, Alajmi *et al.* (2018) investigated relative advantage, compatibility, and complexity factors as a characteristic basis. Tripathi and Nasina (2017) investigated task characteristics, technology characteristics of cloud computing adoption performance. In the viability framework, decision-makers, cost reduction, and IT readiness factors were seen as predicting cloud computing for the future (Alajmi *et al.*, 2018). Economic feasibility, IT infrastructure, Organization Support were applied to predict the future of cloud computing. The results of Tripathi and Nasina (2017) and Alajmi *et al.* (2018) showed that there are four cases to adopt cloud computing. A company, which has a high fit and viability, has a possibility of cloud computing implementation. On the other hand, a company, which has a high fit and low viability, is less likely to adopt cloud computing that needs organizational restructuring due to the lack of top management support. A company, which has high viability and low fit, means that company needs to find alternative solutions to adopt cloud computing. A company, which has low viability and low fit, means that the company should forget to adopt cloud computing.

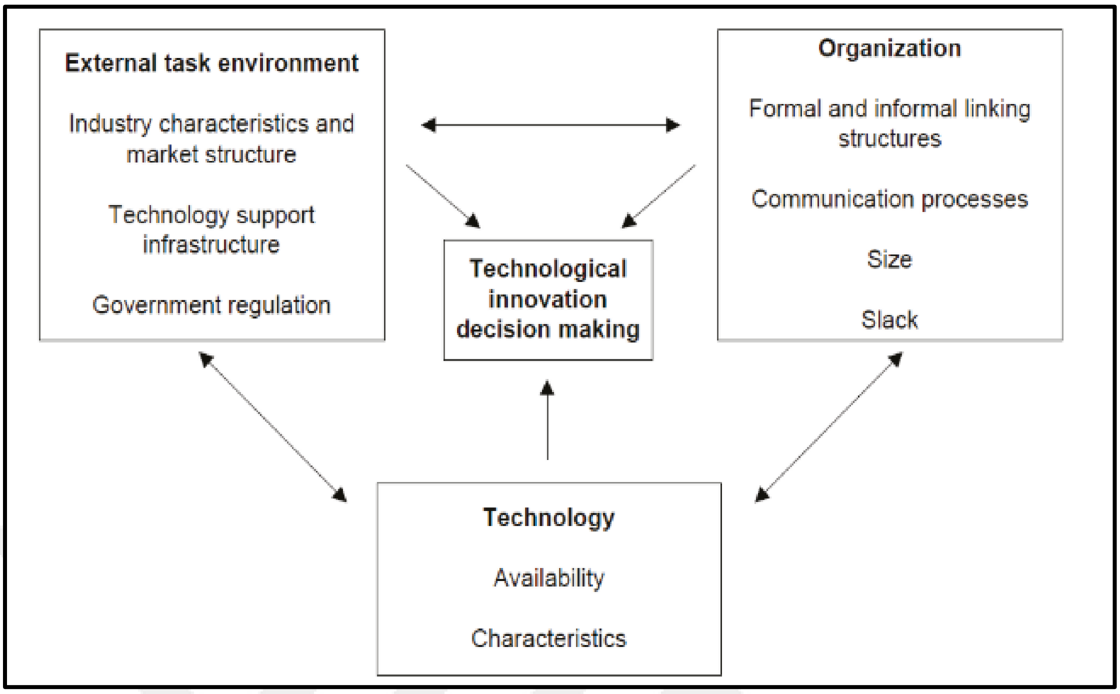
There are additional integrated constructs called DOI with HOT-fit (Human-Organization Technology-fit) model. There are three studies of DOI with HOT-fit model that are (Lian, Yen and Wang, 2014; Alharbi, Atkins and Stanier, 2016; Lynn *et al.*, 2018)

Lian, Yen, and Wang (2014) did an exploratory factor analysis approach to 60 hospitals to make an adoption model in Taiwan. In the human framework, CIO innovativeness and perceived technical competence were examined by Lian, Yen, and Wang (2014) for Taiwanese hospitals. Alharbi, Atkins, and Stanier (2016) made ANOVA research to assess factors whether the factors are significantly different from each other or not in Saudi Arabia. Internal expertise, CIO innovativeness, and Prior technology experience were applied by Alharbi, Atkins, and Stanier (2016) for Saudi healthcare organizations. Lynn *et al.* (2018) made a t-test and the logistic regression analysis to explore the key factors affecting cloud computing adoption decisions with 619 decision-makers for high-performance computing in Irish companies. Innovativeness, IT competence, and high-performance computing competence were assessed by Lynn *et al.* (2018) in Irish companies. In the organizational framework, relative advantage, top management's support, adequate resource, and benefits were examined by Lian, Yen, and Wang (2014). Attitude toward change and top management support were examined by Alharbi, Atkins, and Stanier (2016). Top management support, resources, indirect benefits, and cost savings were examined by Lynn *et al. (*2018). In the technological framework, data security, complexity, compatibility, and cost were investigated by Lian, Yen, and Wang (2014). Relative advantage, compatibility, and technology readiness were applied by Alharbi, Atkins, and Stanier (2016). Compatibility, security, and complexity were assessed by Lynn *et al.* (2018). In the environmental framework, government policy and perceived industry pressure were examined by (Lian, Yen, and Wang, 2014). Business ecosystem partners' pressure, external expertise, and regulation compliance were examined by Alharbi, Atkins, and Stanier (2016). There is not an environmental study by Lynn *et al.* (2018). In the business framework, As a result, the findings are (Lian, Yen and Wang, 2014) stated that data security costs from technological and perceived technical competence from humans were ranked as three important factors affecting cloud computing adoption for Taiwanese hospitals. Soft financial analysis, hard financial analysis from business, and relative advantage from technology were ranked as three significant factors for cloud computing adoption for Saudi healthcare organizations (Alharbi, Atkins and Stanier, 2016). Innovativeness from humans, compatibility, and complexity from technology was ranked as three important factors affecting cloud computing adoption in Irish companies (Lynn *et al.*, 2018). As a result, technological and human factors have important effects on cloud computing adoption. Environment and organization were less likely to decide to adopt cloud computing.

3.2. TECHNOLOGICAL ORGANIZATIONAL AND ENVIRONMENTAL (TOE) FRAMEWORK

Technological Organizational and Environmental (TOE) Framework is often used as a significant indicator in the Cloud computing adoption theories (Nkhoma & Dang, 2015a; Pathan et al., 2017; Rasheed, 2014). TOE framework explained technological innovation decision making derived by technology in terms of availability and characteristics, the organization in terms of formal and informal linking structures, communication processes, size and slack and external task environment in terms of market structure, technology support infrastructure and government regulation as shown in Figure 2.

Figure 2.TOE Framework proposed by (Lippert, K. & Govindrajulu, 2006): Tornatzky, L. and Fleischer, M. (1990)



There are several studies adopted the TOE framework. Al-Hujran *et al.* (2018) did a qualitative research approach to identify the main challenges of services by six in-depth interviews for developing countries.

Ahmad and Waheed (2015) formed qualitative exploratory research and analyzed with the NVIVO tool for implementing a successful cloud environment in the IT and Telecom sector for developing countries.

Alshamaila, Papagiannidis, and Li (2013) did qualitative exploratory research by conducting the semi-structured interview from 15 different SMEs in the northeast of England to contribute SMEs to a competitive advantage over large enterprises (LE).

Bhuyan and Dash (2018a) built quantitative exploratory research to 250 companies and did a multiple regression analysis for Indian hospitals to increase the awareness of issues of adoption. Karkonasasi *et al.* (2016) formed a quantitative ANOVA analysis to 41 companies by asking 25 questionnaires survey for Malaysian SMEs. Gutierrez, Boukrami, and Lumsden (2015) applied a quantitative-based study including logistic regression analysis through 257 mid-to-senior level business and IT professionals to determine the factors affecting managers' decisions in UK organizations. Hassan *et al.* (2017) did quantitative research through 90 Malaysian SMEs in the service sector to examine the importance of top management support and employee knowledge on cloud computing adoption. Pathan *et al.* (2017b) made multiple regression and confirmatory factor analysis (CFA) to test the cloud computing adoption model in Pakistani SMEs. Akhusama and Moturi (2016) applied regression analysis to 33 CRM and SaaS users for the Kenyan insurance sector.

3.2.1. Technological

The technological aspect of the TOE framework refers to both availability and characteristics of the technologies as shown in figure 1. Relative Advantage, Observability, Compatibility, Trialability, and Complexity of Innovation diffusion theory can be adapted into the TOE Framework in a Technological framework (Bhuyan (and Dash, 2018a). Relative advantage is the first concern over cloud computing adoption (Hassan *et al.*, 2017; Pathan *et al.*, 2017). Complexity is the second concern over cloud computing adoption(Pathan *et al.*, 2017). Compatibility is the third factor of cloud computing adoption(Senyo, Effah, and Addae, 2016; Pathan *et al.*, 2017; Lynn *et al.*, 2018). Uncertainty and trialability is the fourth and fifth influencing factor in cloud computing adoption(Alshamaila, Papagiannidis, and Li, 2013). Cost and Security factor has been added by (Oliveira, Thomas, and Espadanal, 2014; Sallehudin, Razak and Ismail, 2015). An uncertainty factor of cloud computing adoption has been applied by (Alshamaila, Papagiannidis, and Li, 2013; Alismaili *et al.*, 2016). Geo-restriction is put as a factor by (Alshamaila, Papagiannidis, and Li, 2013).

In the technological framework perceived relative advantage, security, privacy, trust, and compatibility found significantly important in Jordanian companies and cloud providers (Al-Hujran *et al.*, 2018). Perceived relative advantage selected as technological factors in ceramic and cement sectors in Germany, France, Italy, Poland, Spain, and the UK and perceived relative advantage influenced cloud computing adoption(Kyriakou *et al.*, 2017a). Ahmad and Waheed (2015) explored IT and Telecom companies of developing countries and found that technological factors such as online games, data backup, social media, remote access, storage, and ease of use affect cloud computing adoption. Alshamaila, Papagiannidis, and Li (2013) investigated different SMEs' in northeast England and found that except competitive pressure, relative advantage, compatibility, complexity, trialability, observability, uncertainty, geo-restriction, security concerns, and cost savings influence cloud computing adoption. Bhuyan and Dash (2018a) stated that technical barriers had a significant impact on cloud computing adoption in Indian hospitals. Karkonasasi *et al.* (2016) asserted that security and privacy and reliability of the cloud were significant factors in Malaysian SMEs, whereas, cost-saving and improved flexibility were the least important factors. Gutierrez, Boukrami, and Lumsden (2015) explored that complexity has directly affected the adoption of UK SMEs. Hassan *et al.* (2017) examined the perceived benefits of adoption for Malaysian SMEs in the service sector. Pathan *et al.* (2017b) applauded that relative advantage, compatibility, complexity affected CC adoption for Pakistani SMEs. Akhusama and Moturi (2016) affirmed that characteristic of available CC Technology was hugely impacting CC adoption in the Kenyan insurance sector. Hence, Technological advantages of CC, the complexity of the technology of CC, technological compatibility of users of CC in companies are factors of CC adoption for technology framework. There are intersects and divides of applying the technological framework and DOI theory. Relative advantage, complexity, compatibility are the most used for assessing the technological framework that was adopted from DOI theory. Technological readiness is the most widely used technological factor adopted from the TOE framework. It can be concluded that security, privacy and relative advantage (perceived advantages and barriers) were important for developed countries as well as developing countries. Geo-restriction and trade partner pressure was only important for developed countries. Cost savings, security concerns, reliability of the technology, and technical barriers were significant barriers to technical aspects of adoption for SMEs.

3.2.2. Organizational

The organizational aspect of the TOE framework refers to the formal and informal linking structures, communication processes, size, and slack as shown in figure 1.

In the organizational framework, Al-Hujran *et al.* (2018) applauded that culture, top management support, characteristics of CEOs, and integration requirements were applied through Jordanian companies and integration requirements were accepted. Kyriakou *et al.* (2017a) reported top management support and firm size as organizational factors but did not find significantly important for ceramic and cement sectors in six European countries. Ahmad and Waheed (2015) stated that knowledge management, CRM, document collaboration, and licensing were significant organizational factors and all accepted for IT and Telecom companies of developing countries. Alshamaila, Papagiannidis, and Li (2013) expressed that firm size, top management support, and innovativeness before IT experience significantly affected adoption for English SMEs. Bhuyan and Dash (2018a) acknowledged that human resources and finances influenced the adoption in Indian hospitals. Karkonasasi *et al.* (2016) asserted that top management support was a significant factor in Malaysian SMEs. Gutierrez, Boukrami, and Lumsden (2015) asserted that top management support, firm size, and technological readiness were selected as organizational factors for UK SMEs but technological readiness was only organizationally significant. Hassan *et al.* (2017) contended that top management support and IT resources were assessed as organizational factors but IT resources were found important factors for organizational aspects in Malaysian SMEs. Pathan *et al.* (2017b) applauded that managerial support and firm size influenced the adoption as an organizational context in Pakistani SMEs. Akhusama and Moturi (2016) asserted that **the** structures and processes of e-client critically affected the adoption in the organization in the Kenyan insurance sector. As a result, the technological readiness factor frequently accepted for all companies. Top management support and firm size rarely specified as an acceptable factor for developed countries than for developing countries. Organizational aspects such as integration requirements and innovativeness prior IT experience were important for developed countries. For developing countries, human resources and finances were important.

3.2.3. Environmental

The environmental aspect of the TOE framework refers to the industry characteristics and market structure, technology support infrastructure, and government regulation, as illustrated in Figure 1.

In the environmental framework, regulatory framework and service level agreement (SLAs) contractual agreements were identified as environmental factors but were not proved by Al-Hujran *et al.* (2018) for Jordanian companies.

Competitive pressure and trading partner pressure were selected as environmental factors and none of them was supported by Kyriakou *et al.* (2017a) for ceramic and cement sectors in six European countries. Ahmad and Waheed (2015) explained that awareness, user training, and electricity shortfall were found as affecting the adoption from an environmental aspect in IT and Telecom companies of developing countries. Market scope, supplier computing support, competitive pressure, and industry type were described as environmental factors but competitive pressure was the only one that was not supported in English SMEs (Alshamaila, Papagiannidis, and Li, 2013). Bhuyan and Dash (2018a) identified legal and regulatory as a neutral effect for Indian hospitals. (Karkonasasi *et al.*, 2016) clarified that competitive pressure and trading partner pressure were the least significant factor in comparison with technological and organizational factors in Malaysian SMEs. Gutierrez, Boukrami, and Lumsden (2015) acknowledged that trading partner pressure was supported by UK SMEs. External pressure was considered as important factors by (Hassan *et al.*, 2017). (Pathan *et al.*, 2017b) presented competitive pressure and regulatory support as an important factor in Pakistani SMEs. (Akhusama and Moturi, 2016) asserted that clients, competitors, and regulations were significantly important from the environmental aspect for insurance sector in Kenya. Hence, competitive pressure, and regulatory support were rarely accepted factor for companies in developing countries. Environmental factors are the least proved in comparison with technological and organizational factors.

3.3. INTEGRATED DOI AND TECHNOLOGICAL ORGANIZATIONAL AND ENVIRONMENTAL (TOE) FRAMEWORK

There is an integrated framework of the DOI and TOE model to explore, assess, and determine the factors and barriers of cloud computing adoption (Amini and Bakri, 2015).

In Indian private hospitals, Bhuyan and Dash (2018a) applied a quantitative-based study including a confirmatory factor analysis to 189 IT implementation and user experts. Bhuyan and Dash (2018a) asserted that relative advantage, compatibility, and complexity were assessed and all were accepted for DOI theory. Technology readiness selected as a technological framework of TOE theory and was proved that it significantly affected the adoption. Top management and organizational size influenced as the organizational framework of TOE theory and were proved. Competitive pressure was introduced as an environmental factor and was not supported.

In UK companies, Alkhalil, Sahandi, and John (2017) did a quantitative and qualitative based 6 based question interview to 12 interviewees, exploratory and confirmatory factor analysis to form the decision model to migrate through cloud computing. Alkhalil, Sahandi, and John (2017) reported that relative advantage, complexity, trialability, and probable risks were investigated and all supported except trialability determinant. Compatibility and firm size were selected as technological determinant and compatibility were only supported. Technology readiness, internal social network, external social network, and top management support were specified as organizational determinants and internal social network and top management support were found significantly important. Increasing provider’s configuration, regulation, uncertainty regarding the market were selected as environmental determinants and were not supported.

In Portuguese companies, Oliveira, Thomas, and Espadanal (2014) applied quantitative confirmatory factor analysis and multiple regression analysis from 369 firms in Portugal companies for the manufacturing and service sector. Oliveira, Thomas, and Espadanal (2014) asserted that unlike security concerns, cost savings, relative advantage, complexity and cost savings, relative advantage, and complexity were only supported. Technology readiness was the only determinant of the technological framework and accepted. Top management support and firm size were also the determinants of the organizational framework and both were accepted. Competitive pressure and regulatory support of environmental frameworks were not accepted. For the manufacturing sector, cost savings, relative advantage, and technology readiness factors are significantly important for the adoption. For the service sector, cost savings, complexity, technology readiness, top management support and firm size have a huge influence on the adoption.

In Saudi university hospitals, Almubarak (2017) designed a qualitative and quantitative model approach to 4 Saudi university hospitals and applied ANOVA and sidak tests to analyze the factors influencing the adoption. Almubarak (2017) acknowledged that relative advantage and compatibility of DOI theory were found important for CC adoption. Decision maker's contexts such as Innovator's innovativeness and Innovater's knowledge in IT were accepted as important determinants. Top Management Support and organizational readiness were found significantly important determinants. Environmental factors such as competitive pressure and regulations and rules were not accepted.

In Australian SMEs, Alismaili *et al.* (2016) did a qualitative multi-criteria decision Approach (MCDA) from 15 organizations to rank the criteria affecting the cloud computing adoption. Alismaili *et al.* (2016) affirmed that security and privacy and cost savings were found significantly important for CC adoption. Competitive pressure was the only factor that not considered as affecting CC adoption.

In German SMEs, Deil and Brune (2017) formed a qualitative semi-structured interview design from 16 German SMEs, using the MAXQDA 11Plus software tool for PaaS users. For PaaS, Deil and Brune (2017) stated that Relative advantage, complexity, and compatibility were important determinants of DOI theory. Technological readiness and fast broadband internet access were selected as technological determinants and fast broadband internet access was the only supported factor. From an organizational aspect, top management support, support of non-it employees, and firm size were selected as determinants and top management support was the only determinant to be accepted. Competitive pressure and regulatory support of environmental factors were not supported.

In Malaysian SMEs, Amini and Bakri (2015) did a secondary research analysis from literature. Amini and Bakri (2015) expressed that relative advantage, compatibility, security concerns, cost savings were significant determinants of DOI theory. Technology readiness was an important factor in the technological framework for cc adoption. Top manager support was a significant factor in an organizational framework**.** Competitive pressure and regulatory support were supported.

When DOI and TOE were integrated, it was concluded that environmental factors of CC adoption were usually not found significantly important. Technological support and top management support were significantly important determinants from an organizational aspect. From the technological aspect, technological readiness was determined significantly important. From DOI theory, the relative advantage was usually an important determinant. Compatibility and complexity sometimes were accepted or not. Security concerns and cost savings are also supported or not. From a sectoral perspective, legal, regulatory support, and competitor regulatory are important determinants of adoption. From research-based projects, cost savings and security concerns are important factors of the adoption. From the SMEs perspective, ease of use is important.

3.4. OTHER THEORIES OF CLOUD COMPUTING ADOPTION

There are several adoption theories widely used for assessing factors of cloud computing adoption.

UTAUT (Unified Theory of Acceptance and Use of Technology) is a theory to assess the behavior intention towards cloud computing adoption. Performance expectancy, effort expectancy, social influence, and facilitating conditions are the determinants of UTAUT. Mathur and Dhulla (2014) made a quantitative correlation analysis approach for Indian accountants to understand the perception and behaviors accountants. Perception and behaviors of cloud computing adoption were accepted except gender and experience. Giyane and Buckley (2015) did a quantitative descriptive analysis of 128 Zimbabwean students in 4 universities to determine the perception and behaviors of students. Security, privacy, and limited bandwidth facilities were the most important concerns over cloud computing adoption for users. Salah Hashim and Bin Hassan (2015) applied regression analysis and investigated the perception and behaviors of students of 312 students, academic staff, and non-academic staff in 1 Iraqi university with a quantitative approach. Effort expectancy, social influence, security, and trust had a huge influence on the adoption of students.

Technology acceptance theory (TAM) is a user-oriented theory to find behavioral intention to use system usage. Perceived usefulness and perceived ease of use are the determinants of TAM. (Ali, Wood-Harper and Mohamad, 2018) explored the behavioral effects of adoption for English higher Institutions in an exploratory approach. The study of Ali, Wood-Harper, and Mohamad (2018) inferred that ease of use highly affects the adoption in English higher education. Moh *et al.*, (2015) did secondary research from literature. (Moh *et al.*, 2015) found that cost-effectiveness was significant for the adoption in Jordanian firms. Ali, Gongbing, and Mehreen (2018) formed a quantitative-based confirmatory factor analysis research through

322 university students for SaaS services. In Chinese academia, knowledge sharing, knowledge application, and learnability highly affect the perceived usefulness. Perceived self-efficiency and perceived enjoyment highly affect the perceived ease of use(Ali, Gongbing, and Mehreen, 2018). Yuvaraj (2016) did a descriptive survey gaining data from 28 central universities of India. (Yuvaraj, 2016) also asserted that the scalability and availability of computing resources and return on time affect perceived usefulness. Security and privacy risks and perceived ease of use influence attitudes towards cloud computing in libraries to intend non-adoption vs adoption in Indian libraries. Security and Privacy Policies awareness highly affects intention to use cloud computing. A concern of information privacy highly affects the trust of cloud computing use in Taiwan (Yuvaraj, 2016).

The theory of reasoned action (TRA) is a model to assess the behavior of adoption. Subjective norms and attitudes toward behavior are the determinants of TRA. Widjaja and Chen (2012) developed a quantitative-based descriptive model to 201 users in Taiwan. According to Widjaja and Chen (2012), information security, privacy concern doesn't have a significant relationship with attitudes. Trust issues were addressed as factors of intention to use cloud computing.

TAM and TOE is an integrated approach to assess factors impacting cloud computing. perceived importance. (Mas'adeh, 2016) did a confirmatory factor survey through 329 top, middle-level IT managers, and IT employees in the Middle East Firms. Mas'adeh (2016) analyzed the perceived importance of Jordan, Saudi Arabia, and the United Arab Emirates for adoption and found that relative advantage, compatibility, complexity, organizational readiness, top management commitment, and training and education were important for usefulness, ease of use and importance. Raut, Priyadarshinee, and Jha (2017) did a quantitative confirmatory factor analysis survey to education, manufacturing, service, healthcare sectors. In Indian organizations, risk and trust resulted as the barriers for cloud computing adoption (Raut, Priyadarshinee and Jha, 2017).

TAM and DOI are integrated theories to assess the intention to adopt cloud computing and the actual use of cloud computing. (Sabi *et al.*, 2016) did a general quantitative-based survey about the adoption of African education. Sabi *et al.* (2016) surveyed Subsaharan African Universities and found that technological factors such as risk and data security negatively influenced the intention to adopt cloud computing. The actual use determinants of cloud computing such as ease of use and usability were not supported. Gangwar, Date, and Ramaswamy (2015) made quantitative, exploratory, and confirmatory analysis research to 280 respondents to India. In Indian companies, Gangwar, Date, and Ramaswamy (2015) found that relative advantage, compatibility, complexity, organizational readiness, top management commitment, and training and education were supported for perceived ease of use (PEOU) and perceived usefulness (PU) and competitive pressure and trading partner support directly affects the adoption.

TAM, TRA, and DOI is an integrated model to understand the behavioral intention to use cloud computing. Shiau and Chau (2016) did a quantitative confirmatory factor analysis approach through 478 Chinese lab students. According to Shiau and Chau (2016), in Chinese lab classrooms, ease of use and usability of TAM was not found significantly important. Attitude toward behavior, subjective norms of TRA were found significantly important. Relative advantage, compatibility, and trialability of DOI were found important.

4. CHAPTER METHODOLOGY

This paper's main research objective is to exhibit the perception of cloud computing based on sector, market type, and company size and find the effects of factors on cloud computing adoption by companies in Izmir, the city of Turkey. More specifically, our research questions aim to examine which factors and to what extent each of these factors influences the cloud adoption decision making by companies.

The unit of analysis is at the organization level in Turkey. The respondents are IT decision-makers or entrepreneurs of companies in Izmir. Data is collected from companies from mid-2018 to early 2019 in Izmir by doing an online questionnaire with Google Forms. There are 43 questionnaires set for respondents

11 questionnaires were set for descriptive analysis results. 8 questionnaires were common questions that reported respondents profiles of companies and demographic information of companies. The rest of the 3 questionnaires performed the questionnaire path into two following steps for cloud adopters and non-cloud adopters. For cloud adopters, the types of cloud service models, the number of cloud applications used, and the reasons for adopting cloud computing were asked. One separate additional set of three different questions were asked to cloud adopter group. The first question was a one-option-multiple choice question; the second question was a multiple-option-multiple choice question (all three options were allowed); the third question was a multiple-option-multiple choice question (three options out of 7 choices were allowed).

For non-cloud adopters, the phase of the business for planning cloud computing adoption, the expected time range of the business for planning cloud computing adoption, and the reasons for not adopting cloud computing were asked. The first question was a one-option-multiple choice question; the second question was also one-option-multiple choice question the third question was a multiple-option-multiple choice question (three options out of 7 choices were allowed).

32 questionnaires were set for confirmatory factor analysis results to measure 10 factors. Questionnaires were responded by both cloud adopters and non-cloud adopters. 19 questionnaires out of 32 were asked for the DOI model. Relative advantage (RA), security concerns (SC), cost savings (CS), compatibility (COMP), and complexity (COMPX) had 5, 3, 3, 4, and 4 question items, respectively. 13 questionnaires out of 32 were asked for the TOE model. Top management support (TMS), technological readiness (TR), competitive pressure (CP), firm size (FS), and regulatory support(RS) had 3, 3, 3, 2, and 2 items. The questionnaires were listed for relative advantage (RA), security concerns (SC), cost savings (CS), compatibility (COMP), complexity (COMPX), top management support (TMS), technological readiness (TR) and competitive pressure (CP) listed between Table 13 and 17, and between Table 21 and 25.

The random sampling method has been used to specify companies in Izmir. 506 companies obtained from the Izmir Chamber of Commerce and Aegean Chamber of Commerce was emailed to gather data. Out of 176 companies responded validly.

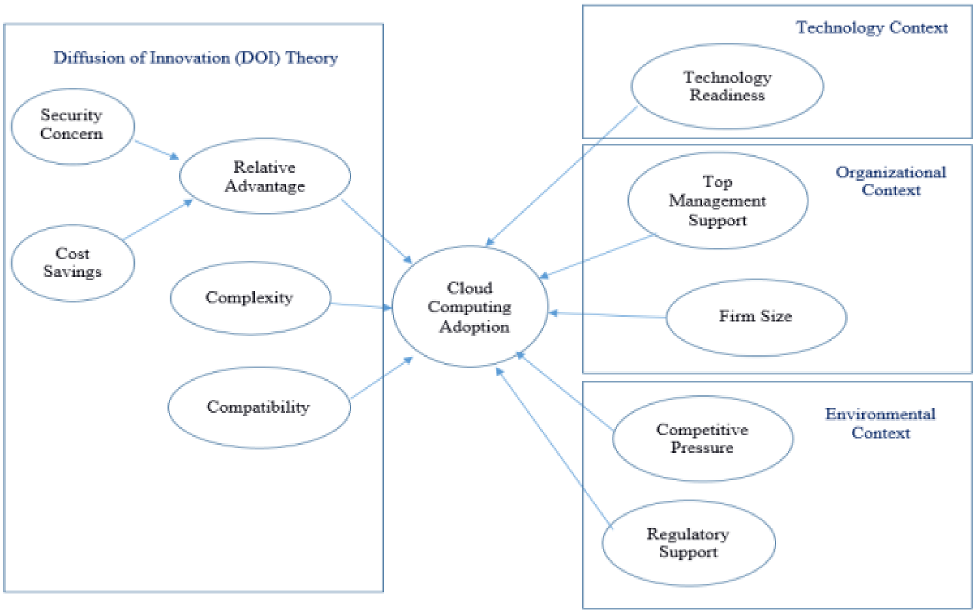
Structural Equation Modelling (SEM) was used to assess the research model. Confirmatory factor analysis technique was applied to obtain the results of the hypothesis. SmartPLS 3.0 software was used to gather data empirically. Firstly, reliability and validity tests were measured for measurement model 1 and measurement model 2 to apply to the structural model. Secondly, after reliable and valid factors were assessed, CR (t) values were either higher or less than +-1.96. Those exceeding 1.96 were accepted factors. Finally, the fit model was set and it is shown in Table 3 with correlation matrices.

4.1. RESEARCH MODEL

(1) relative advantage, (2) cost savings, (3) security concerns, (4) compatibility (5) complexity (6) technology readiness, (7) top management support, (8) firm size, (9) competitive pressure, and (10) regulatory support. (2) cost savings and (3) security concerns are described as mediating variables of relative advantage (1) for cloud computing adoption. All factors, except complexity and competitive pressure, have a positive influence on the adoption of cloud computing. Figure 3

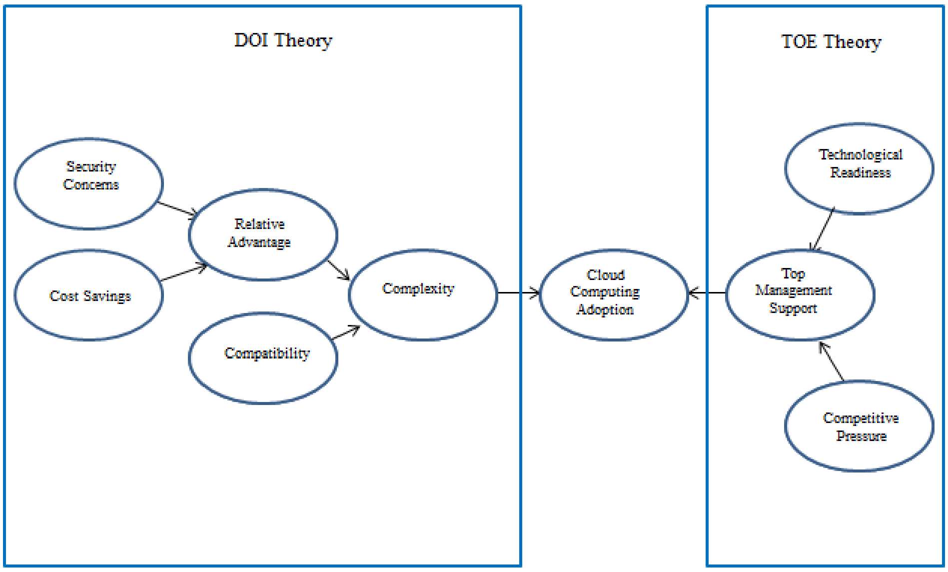
indicates the conceptual model proposed in this paper adapted from Oliveira, Thomas, and Espadanal (2014) in Figure 3.

Figure 3. Adapted from (Oliveira, Thomas, and Espadanal, 2014).



A proposed model for the study was presented in Figure 3. The relevant independent variables in the model are security concerns, cost savings, relative advantage, compatibility, and complexity for the DOI model. Other relevant independent variables in the model are technological readiness, competitive pressure, and top management support for the TOE model. The dependent variable is cloud computing adoption.

Figure 4. Proposed Model Adapted from Oliveira, Thomas, and Espadanal (2014)



An adapted model was transformed into the proposed model as shown in Figure 4 due to the business environment difference between Portugal and Turkey. The hypothesis derived from an adapted model and the proposed model was the same as H1A, H1B, H3 for DOI theory, and H4 for TOE theory. H1, H2, H4A, and H4B were obtained from the proposed model based on the business ecosystem in Turkey. The hypothesizes of Firm size (FS) and Regulatory support (RS) were excluded from the model due to the T value that is not within range.

4.2. RESEARCH HYPOTHESIS

Hypothesizes are derived from Oliveira, Thomas, and Espadanal (2014)' s model. 8 out of 10 hypotheses were accepted in the proposed model shown in Figure 4. The hypothesis is as follows:

H1. Relative advantage will negatively influence the complexity.

H1A. Security and Privacy Concerns will negatively influence the relative advantage.

H1B. Cost savings will positively influence the relative advantage.

H2. The compatibility will negatively influence the complexity.

H3. Complexity will negatively influence cloud computing.

H4. Top management support will positively influence cloud computing.

H4A. Technological readiness will positively influence top management support.

H4B. Competitive pressure will positively influence top management support.

Firm size and regulatory support were excluded from the proposed model. Firm size FS2 question item (The number of annual business volume) of firm size was not answered due to the confidential information. The RS2 question item (The laws and regulations that exist nowadays are sufficient to protect the use of cloud computing) of regulatory support was misinterpreted by the respondents.

4.2.1. RELATIVE ADVANTAGE (RA)

Relative advantage is defined as *“The degree to which an innovation is perceived as being better than the idea it supersedes”* Rogers (1983). Economic profitability, social prestige, and benefits of technology are expressed as the degree of relative advantage. Oliveira, Thomas, and Espadanal (2014) argue that business productivity, business operations, and tasks perform, an opportunity for this disruptive technology are the important indicators of relative advantage. Alshamaila, Papagiannidis, and Li (2013), Oliveira, Thomas, and Espadanal (2014) and Sallehudin, Razak and Ismail (2015) found relative advantage significantly important for English SMEs, Portuguese companies and Malaysian public sector, respectively. However, Charlebois et al. (2016) and Hassan and Nasir (2017) opposed the effects of the perceived relative advantage on cloud computing adoption in the Genomics project in Germany and Malaysian SMEs. In this research, the relative advantage of businesses decreases the chances of complexity, thus the first hypothesis is:

H1. Relative advantage will negatively influence the complexity.

4.2.2. SECURITY AND PRIVACY CONCERNS (SPC)

Security and privacy concerns are described as *“The degree to which cloud computing is perceived as being more secure than other computing paradigms”*(Rogers, 1983). Security and privacy concerns are important as social aspects of relative advantage(Rogers, 1983). Data security concerns for companies, data security concerns for customers, and privacy concerns are important indicators of security and privacy concerns(Oliveira, Thomas, and Espadanal, 2014). Charlebois et al. (2016) and Lynn *et al.* (2018) proved that perceived security and privacy concerns affect cloud computing adoption in genomics research in Germany and Irish companies, respectively. Sallehudin, Razak, and Ismail (2015), Alharbi, Atkins, and Stanier (2016) and Pathan *et al.* (2017a) claimed that perceived security and privacy concerns were not likely to affect the adoption in Malaysian public sector, health organizations in Saudi Arabia and Pakistani SMEs, respectively. In this context, this construct also considers the privacy and confidentiality of data of businesses. I believe higher levels of security and privacy have a positive effect on relative advantage, therefore in the context of cloud computing, the following hypothesis is derived:

H1A. Security and Privacy Concerns will negatively influence the relative advantage.

4.2.3. COST SAVINGS (CS)

Cost of cloud computing is defined as "*the degree to which decision-makers perceive the total cost of using cloud computing lower than other computing paradigms*"(Rogers, 1983). Cost-saving is important as economical attributes of relative advantage(Rogers, 1983). Total cost includes fixed costs such as initial investment, variable costs such as systems maintenance and upgrade, and training costs(Tehrani and Shirazi, 2014). The comparison of benefits and costs trade-off, energy, and environmental costs and maintenance costs are the indicators of cost savings (Oliveira, Thomas, and Espadanal, 2014). I think that the low cost of services has a positive impact on relative advantage. Therefore, the following hypothesis is developed. Alajmi *et al.* (2018), Bhuyan and Dash (2018b), and Lynn *et al.* (2018) proved that cost savings affect cloud computing adoption in the education sector in Umman, Indian hospitals, and Irish companies. Oliveira, Thomas, and Espadanal, (2014) and Sallehudin, Razak, and Ismail (2015) opposed the effects of the perceived cost savings on cloud computing adoption in Portuguese companies and Malaysian public sector.

H1B. Cost savings will positively influence the relative advantage.

4.2.4. COMPATIBILITY (COMP)

Compatibility is defined as *"the degree to which cloud computing is perceived as consistent with the existing values, experience, and needs of companies"* (Rogers, 1983). Roger (1983) also declared that sociocultural values and beliefs with previously introduced ideas, or with client needs for the innovation are primary concerns from a compatibility perspective over cloud computing adoption. Fitting the workstyle of company, fitting with business operations, and the current technology, being compatible with the company's corporate culture and value system, and being compatible with existing software and hardware in the company are the indicators of compatibility(Oliveira, Thomas, and Espadanal, 2014). Deil and

Brune (2017), Bhuyan and Dash (2018b) and Lynn et al. (2018) proved that compatibility affects cloud computing adoption. On the other hand, Oliveira, Thomas, and Espadanal (2014), Alismaili et al. (2016), and Hassan and Nasir (2017) claimed that perceived compatibility was not likely to affect the adoption. In this context, I believe that cloud computing's compatibility with the work environment has a positive impact on complexity, therefore the related hypothesis is as follows:

H2. The compatibility will negatively influence the complexity.

4.2.5. COMPLEXITY (COMPX)

Complexity is described as *"the degree to which cloud computing is perceived as being relatively difficult to understand and use"* (Rogers, 1983). Clarity and simplicity are a primary concern from a complexity perspective over a cloud computing adoption (Rogers, 1983). Taking much time and effort to learn and much time to finish tasks are barriers to complex aspects of cloud computing adoption(Tehrani and Shirazi, 2014). The cloud computing use of mental effort, difficulty, the complexity of business operations, and complex employees of the firm are indicators of complexity (Oliveira, Thomas, and Espadanal, 2014). Gangwar, Date, and Ramaswamy (2015), Gutierrez, Boukrami, and Lumsden (2015) and Alkhalil, Sahandi, and John (2017) were found the complexity significantly important. However, Sallehudin, Razak, and Ismail (2015) and Hassan and Nasir (2017) opposed the perceived complexity effects on cloud computing adoption in the Malaysian public sector and Malaysian SMEs. Consequently, I think that cloud computing's complexity for staff harms adoption of cloud computing, therefore the related hypothesis is as follows:

H3. Complexity will negatively influence cloud computing adoption.

4.2.6. TOP MANAGEMENT SUPPORT (TMS)

Top Management Support is defined as *"the decision-makers who influence the adoption of innovation"* (Lai, Lin, and Tseng, 2014). Moh *et al.* (2015) emphasized the role of top management support in the initiation, implementation, and adoption of technologies. Long-term core vision, core missions, act to change, higher assessments of individual self-efficacy, support in overcoming barriers, and resistance to change are important to understand the perceived effects of top management support on the adoption. Top management supports the implementation of cloud computing, strong leadership, and engagement in the implementation process, and risk-taking involvement financially and organizationally are the indicators of top management support (Oliveira, Thomas, and Espadanal, 2014). Alkhalil, Sahandi, and John (2017) and Deil and Brune (2017) inferred that top management supports highly affects the adoption, based on English SMEs and German SMEs, Malaysian SMEs, and Indian Private hospitals. Gutierrez, Boukrami and Lumsden (2015), Kyriakou *et al.* (2017b) and Al-Hujran *et al.* (2018) proved that top management support is not significantly important, based on UK companies, ceramic and cement sectors in six European countries (Germany, France, Italy, Poland, Spain, and the UK) and UK companies and Malaysian SMEs, respectively. To sum up, the hypothesis is as follows.

H4. Top management support will positively influence cloud computing adoption.

4.2.7. TECHNOLOGICAL READINESS (TR)

Technological Readiness is described as "*technology characteristics availability in the organization for the adoption of technology*"(Oliveira, Thomas, and Espadanal, 2014). Technological structures such as installed network technologies and ent systems and the specialized human resources such as employees with computer skills and IT specialists are included to question technology characteristics availability of the adoption(Oliveira, Thomas, and Espadanal, 2014). The percentage of employees who have Internet access, awareness of how the company can use IT to support operations and IT specialists and the ability of IT decision-makers' skills to implement cloud computing are the indicators of technological readiness (Oliveira, Thomas, and Espadanal, 2014)**.**

(Oliveira et al., 2013; Oliveira, Thomas, and Espadanal, 2014; Hassan *et al.*, 2017) found that technological readiness was found significantly important, based on Portuguese companies, Portuguese firms, and Malaysian SMEs. On the other hand, Alkhalil, Sahandi, and John (2017) and Deil and Brune (2017) opposed the perceived technological readiness effects on cloud computing adoption, based on English SMEs and German SMEs. From literature, the level of knowledge and expertise available within the organization is important to adopt cloud computing. Hence, the related hypothesis is as follows:

H4A. Technological readiness will positively influence top management support.

4.2.8. COMPETITIVE PRESSURE (CP)

Competitive pressure is described as “the level of pressure felt by the firm from competitors within the industry” (Oliveira, Thomas, and Espadanal, 2014). Perceived idea of using it for competitiveness, under pressure situation of a company, and competitors' usage over cloud computing are the indicators of competitive pressure. Gangwar, Date, and Ramaswamy (2015) and Hassan *et al.* (2017) reported that there is a significant relationship between competitive pressure and the adoption, based on Indian companies and Malaysian SMEs. Oliveira, Thomas, and Espadanal (2014) and Alismaili, Li, and Shen (2016) claimed that competitive pressure is not significantly important, based on Portuguese companies and Australian SMEs. To sum up, the hypothesis is as follows.

H4B. Competitive pressure will positively influence top management support.

4.2.9. FIRM SIZE (FS)

Firm size is considered to be one of the main factors affecting innovation(Pathan *et al.*, 2017a; Chulkov, 2018). Oliveira et al. (2011) made a comparative approach to larger and smaller organizations that larger organizations can provide resources, skills, experience for successful adoption, whereas small organizations can be flexible to adapt the actions to the environment changes. (Alhammadi, 2016) clarified that the cost model of cloud computing enables small organizations to adopt successfully. The number of company employees and annual business volume is the indicator of firm size(Oliveira, Thomas, and Espadanal, 2014).

Alshamaila, Papagiannidis, and Li (2013) affirmed that firm size has significant importance on the adoption, based on the findings of English SMEs. However, Gutierrez, Boukrami, and Lumsden (2015), Hassan *et al.* (2017), and Kyriakou *et al.* (2017a) opposed the perceived firm size effects on cloud computing adoption, based on UK companies, Malaysian SMEs and ceramic and cement sectors in six European countries. In this research, firm size is not considered as a factor.

4.2.10. REGULATORY SUPPORT (RS)

Regulatory support is considered as the laws and regulations of the government to promote and protect firms(Nkhoma and Dang, 2015). Legal protection availability in the country and law protection availability in the country are the indicators of regulatory support(Oliveira, Thomas, and Espadanal, 2014). (Amini and Bakri, 2015; Pathan, *et al.*, 2017a; Bhuyan and Dash, 2018a; Akhusama and Moturi, 2019) affirmed that regulatory support has significant importance on the adoption, based on the findings of Malaysian SMEs, Pakistani SMEs, Indian private hospitals, and Kenyan Insurance Companies. Oliveira, Thomas, and Espadanal (2014) and Alkhalil, Sahandi, and John (2017) proved that regulatory support is not significantly important, based on Portuguese companies and UK companies, respectively. In this research, regulatory support is not considered as a factor.

5. CHAPTER RESULTS

5.1. DESCRIPTIVE ANALYSIS

Data results of respondents' features characteristics in Table 9 showed that 65.9% and 34.1% of respondents were male and female, respectively. 47.7%, 26.7%, 10.2%, 9.7%, and 5.7% of respondents were graduate, postgraduate, vocational school, high school, and doctorate, respectively. Aged between 26-35 was at 44.3%. Aged between 36-50 was at 33.5%. Aged between 50-65 was at 13.6%. Aged between 18-25 was at 7.9%. Aged above 65 was at 0.6%. Work experience between 6 and 10 years was at 31.3%. Work experience between 3 and 5 years was at 22.7%. Work experience between 11 and 20 years was at 22.7%. Work experience of more than 21 years was at 10.8%.

Table 9. Respondents Features Characteristics (N=176)

Demographic Features	Frequency	Percent
Gender		
Male	116	65,9
Female	60	34,1
Total		
Educational Level		
High School	17	9,7
Vocational School	18	10,2
Graduate	84	47,7
Postgraduate	47	26,7
Doctorate (Ph.D.)	10	5,7
Age of the Respondents		
18-25	14	7,9
26-35	78	44,3
36-50	59	33,5
50-65	24	13,6
65 above	1	0,6
Industry-Specific Work Experience		
2 Years and below	23	13,1
3-5 Years	40	22,7
6-10 Years	55	31,3
11-20 Years	39	22,7
More than 21 Years	19	10,8

Data results of company characteristics in Table 10 illustrated that 56.3% of companies were cloud adopters. 44.2% of companies in the production sector was cloud adopters. 60.2% of companies in the service sector were cloud adopters. 52.4% of companies driving in the national market was cloud adopters. 62.0% of companies driving in the international market were cloud adopters. 45.5% of micro-size companies (MSC) was cloud adopters. 62.2% of small and medium-sized companies (SMC) was cloud adopters. 63.9% of large companies (LC) was cloud adopters. On the other hand, data results of company characteristics in Table 10 exhibited that 43.7% of companies were non-cloud adopters. 55.8% of companies in the production sector was non-cloud adopters. 39.8% of companies in the service sector were non-cloud adopters. 47.6% of companies driving in the national market was non-cloud adopters. 38.0% of companies driving in the international market were non-cloud adopters. 54.5% of micro-size companies (MSC) was non-cloud adopters. 37.8% of small and medium-sized companies (SMC) was non-cloud adopters. 36.1% of large companies (LC) was non-cloud adopters.

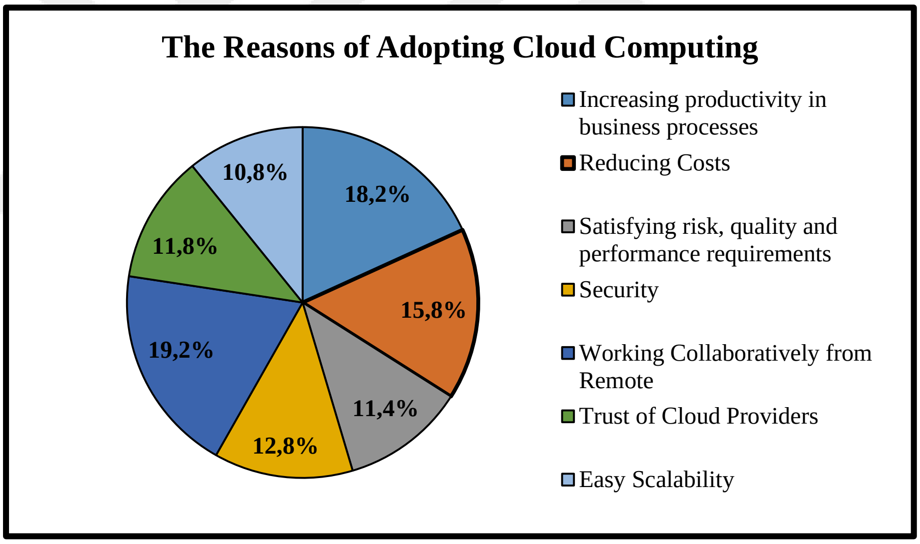
Table 10.Company Characteristics

Company Features	Frequency	Percent
IT Decision		
Cloud Adopter	99	56,3
Non-Cloud Adopter	77	43,7
Sector		
Production Sector	43	24,4
Cloud Adopter	*19*	*44,2*
Non-Cloud Adopter	*24*	*55,8*
Service Sector	133	75,6
Cloud Adopter	*80*	*60,2*
Non-Cloud Adopter	*53*	*39,8*
Market Scope		
National	105	59,7
Cloud Adopter	*55*	*52,4*
Non-Cloud Adopter	*50*	*47,6*
International	71	40,3
Cloud Adopter	*44*	*62,0*
Non-Cloud Adopter	*27*	*38,0*
Size		
Micro Size (1-9)	66	37,5
Cloud Adopter	*30*	*45,5*
Non-Cloud Adopter	*36*	*54,5*
Small Medium Size (10-249)	74	42
Cloud Adopter	*46*	*62,2*
Non-Cloud Adopter	*28*	*37,8*
Large Size (250 and above)	36	20,5
Cloud Adopter	*23*	*63,9*
Non-Cloud Adopter	*13*	*36,1*

5.1.1. CLOUD ADOPTERS AND NON-CLOUD ADOPTERS IN EMERGING MARKET OF IZMIR

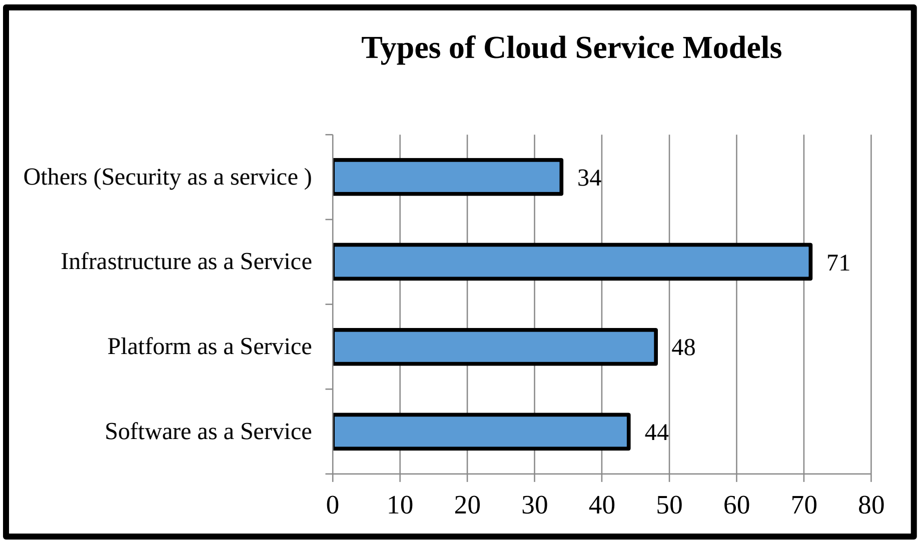
In Izmir, cloud adopters generally adopted cloud computing because the primary reason is working collaboratively from remote and latter increasing productivity in businesses by 19.2%. Secondly, increasing productivity in businesses is important to adopt cloud computing by 18.2%. Thirdly, reducing costs also tend to the adopters to determine cloud computing adoption by 15.8%. Security reasons are important to adopt cloud computing by 12.8%. Trust of cloud providers tends the adopters to determine cloud computing adoption by 11.8%. Satisfying risk, quality, and performance requirements reasons are important to adopt cloud computing by 11.4%. Easy scalability is a less likely reason to adopt cloud computing by 10.8% as shown in Figure 5.

Figure 5. The Reasons for Adopting Cloud Computing



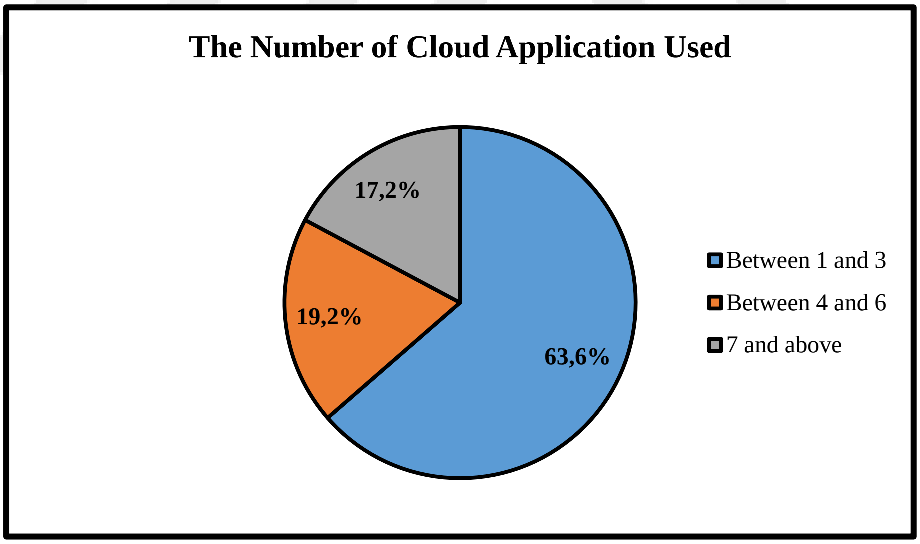
As shown in Figure 6, IaaS is by far the most cloud service used with 71 companies in the market of Izmir. PaaS and SaaS are averagely used by companies in Izmir with 48 and 44 companies, respectively. Other services such as security as services are less likely to be used with 34 companies in the district of Izmir.

Figure 6. Types of Cloud Service Models



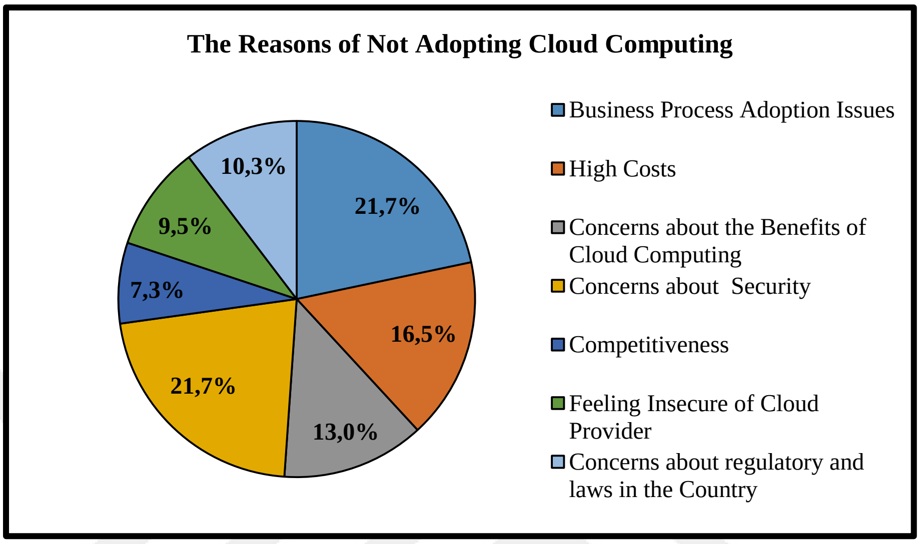
As illustrated in Figure 7, cloud adopters are by far more likely to adopt cloud computing by 63.6% in between 1 and 3 years. On the other hand, cloud adopters are less likely to adopt by 19.2% between 4 and 6, and by 17.2% in 7 years and above.

Figure 7. The Number of Cloud Application Used



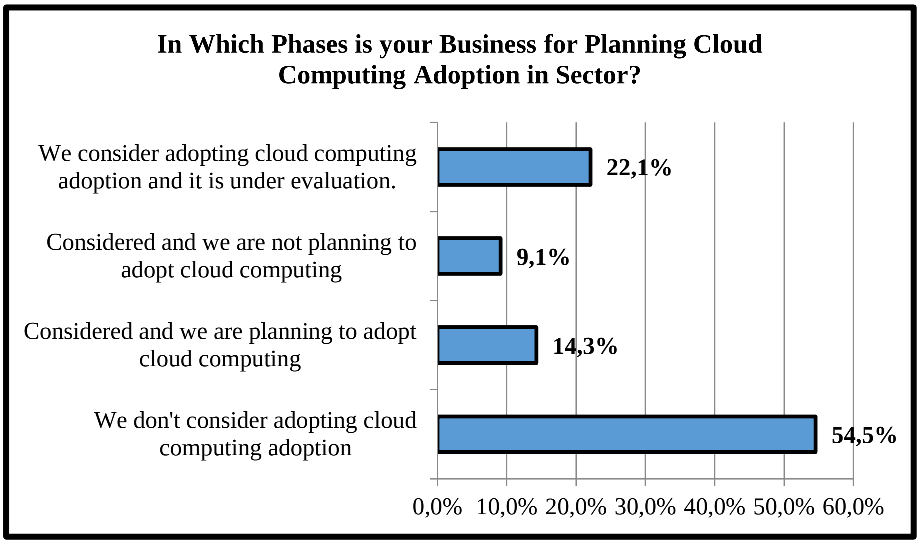
In Figure 8, Non-cloud adopters generally do not adopt cloud computing because of firstly working collaboratively from remote by 21.7% and the latter increasing productivity in businesses and concerns about security by 21.7% in Izmir. Thirdly, high costs also tend the adopters to determine cloud computing adoption by 16.5%. Fourthly, concerning the benefits of cloud computing is another reason why companies do not adopt cloud computing by 13.0%. Fifthly, concerning regulations and laws in Turkey is the reason why companies do not adopt cloud computing by 10.3%. Feeling insecure of cloud providers and competitiveness are less likely reasons to adopt cloud computing by 9.5% and 7.3%, respectively as shown in Figure 8.

Figure 8. The Reasons for Not Adopting Cloud Computing



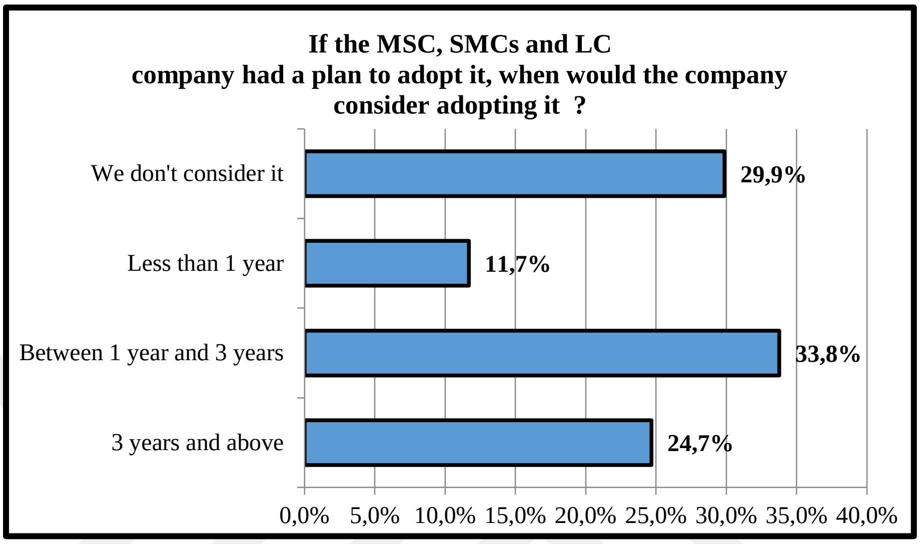
As shown in Figure 9, non-cloud adopters are by far do not consider adopting cloud computing by 54.5%. Some non-cloud adopters are in the process of cloud computing adoption by 22.1%. Non-cloud adopters considered and planned to adopt cloud computing are by 14.3%. Non-cloud adopters considered but did not plan to adopt cloud computing is by 9.1%.

Figure 9. In Which Phases are your Business for Planning Cloud Computing Adoption in Sector?



In Figure 10, Non-cloud adopters will expect to adopt cloud computing firstly between 1 and 3 years by 33.8% and latter not considering by 29.9%. On the other hand, non-cloud adopters are less likely to adopt in less than 1 year by 11.7% and 3 years and more by 24.4%.

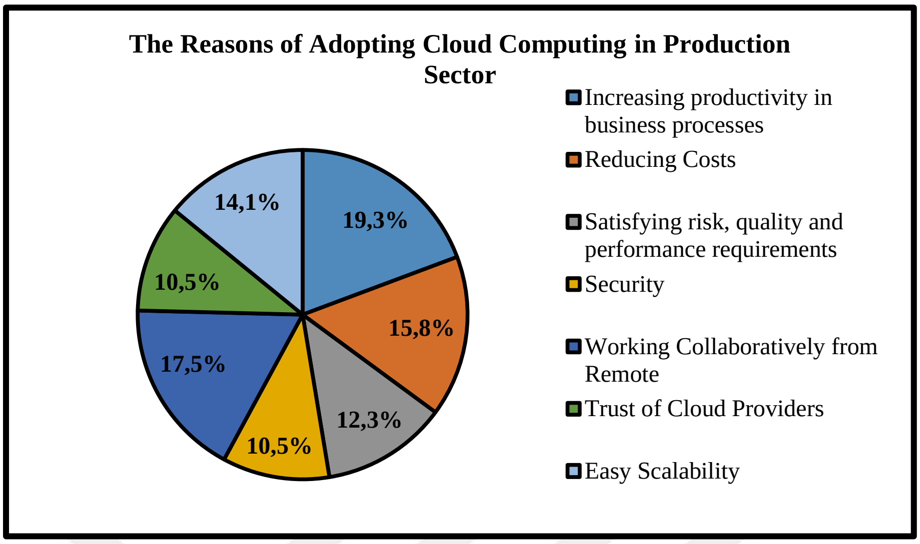
Figure 10. If the MSC, SMCs, and LC Company had a plan to adopt it, when would the company consider adopting it?



5.1.2. CLOUD ADOPTERS IN PRODUCTION SECTOR AND SERVICE SECTOR

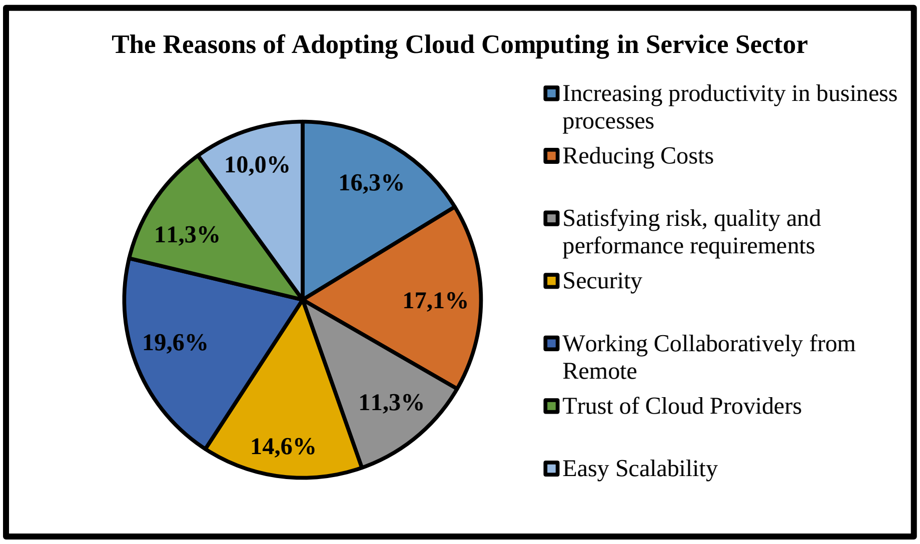
In the production sector, in Figure 11, cloud adopters are more likely to adopt cloud computing due to the fact they believe that cloud computing increases productivity in business processes by 19.3%. Working collaboratively from remote areas is the second reason for adopting cloud computing by 17.5%. Reducing cost is the third reason for adopting cloud computing by 15.8%. Easy scalability (14.1%), satisfying risk, quality and performance requirements (12.3%), the trust of cloud providers (10.5%), and security (10.5%) are the least important reason why manufacturing companies adopt cloud computing.

Figure 11. The Reasons for Adopting Cloud Computing in the Production Sector.



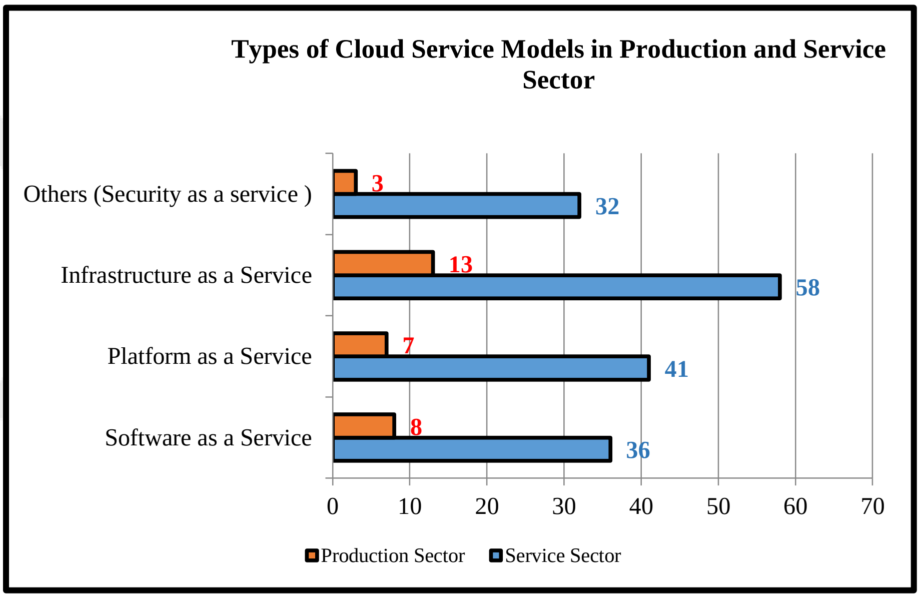
In the service sector, as shown in Figure 12, working collaboratively from remote is the most important reason why companies adopt cloud computing by 19.6%. Reducing cost is the second reason for adopting cloud computing by 17.1%. Increasing productivity in business processes is the third reason for adopting cloud computing by 16.3%. Security (14.6%), the trust of cloud providers (11.3%), satisfying risk, quality and performance requirements (11.3%), and easy scalability (10.0%), are the least important reason why service companies adopt cloud computing.

Figure 12. The Reasons for Adopting Cloud Computing in Service Sector.



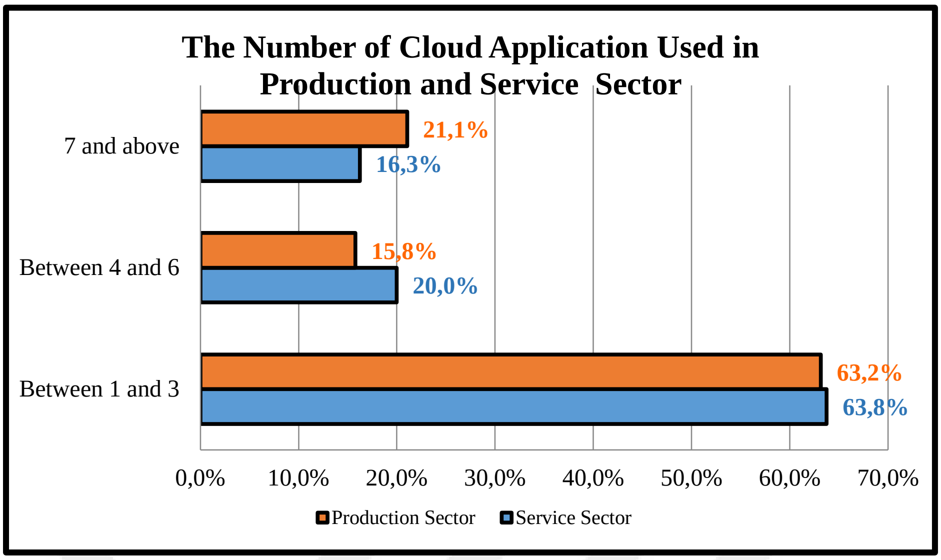
In the production sector, as illustrated in Figure 13, 19 out of 43 companies use 31 cloud services. In other words, 1 adopter approximately uses 1.63 cloud services. The most used is IaaS with 13 services. The second most used is SaaS with 8 services. The third most used is Paas with 7 services. The last service is the others with 3 services, including additional security. On the other hand, in the service sector, 80 out of 133 companies use 167 cloud services. The most used is IaaS with 58 services. The second most used is SaaS with 41 services. The third most used is PaaS with 36 services. The last service is the others with 32 services, including additional security.

Figure 13. Types of Cloud Service Models in Production and Service Sector



In the production sector, as shown in Figure 14, 12 out of 19 adopter companies use between 1 and 3 services. 4 out of 19 companies use 7 services and above. 3 out of 19 companies use between 4 and 6 services. Whereas, in the service sector, 51 out of 80 adopter companies use between 1 and 3 services. 16 out of 80 companies use between 4 and 6 services. 13 out of 80 companies use 7 services and above.

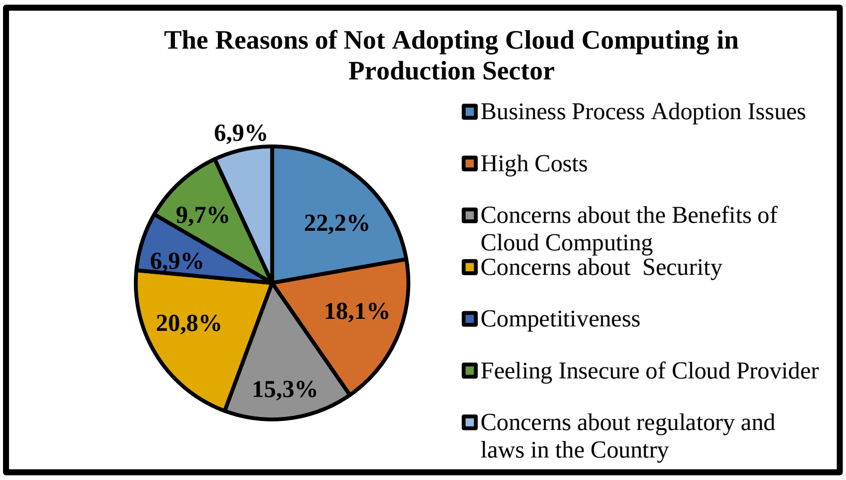
Figure 14. The Number of Cloud Application Used in the Production and Service Sector.



5.1.3. NON-CLOUD ADOPTERS IN SERVICE SECTOR AND PRODUCTION SERVICES

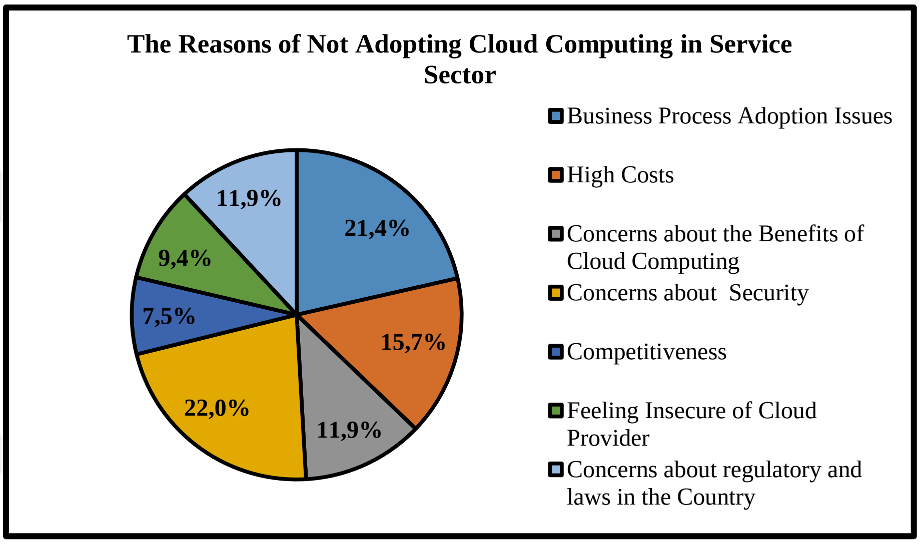
In the production sector, as exhibited in Figure 15, non-cloud adopters are not likely to adopt cloud computing because companies have mostly concerns over business processes adoption issues by 22.2%. Concerning security is one of the important concerns of 20.8%. High costs are the third concerns over cloud computing by 18.1%. Concerning about the benefits of cloud computing (15.3%), feeling insecure of cloud provider (9.7%), concerns about regulatory and laws in the country (6.9%) and competitiveness (6.9%) are by far the least the reason why manufacturing companies don't adopt cloud computing.

Figure 15. The Reasons for Not Adopting Cloud Computing in the Production Sector.



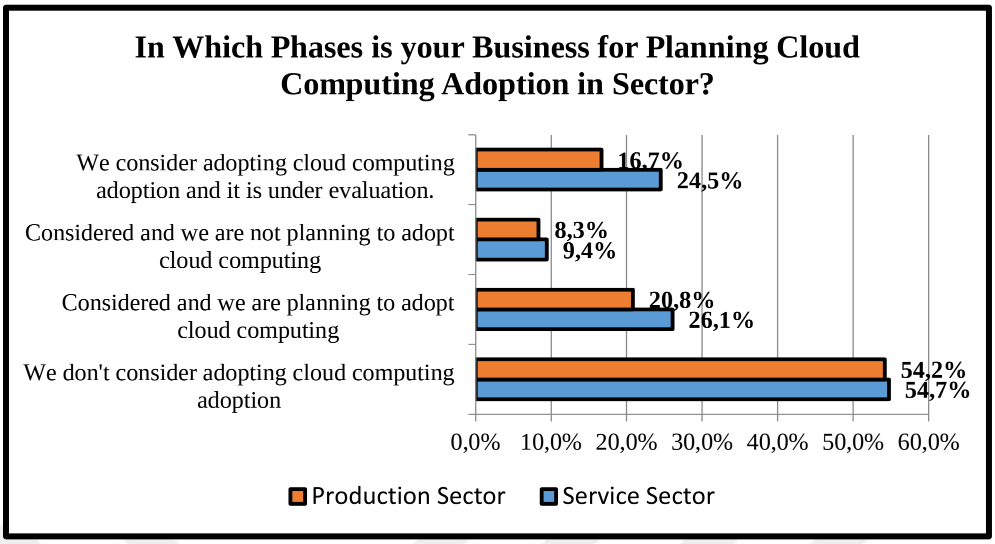
In the service sector, as illustrated in Figure 16, concerns about security (22.0%) are the most reason why cloud computing is not adopted by non-cloud companies. Business process adoption issue (21.4%) is the second reason for not adopting cloud computing High costs (15.7%) is the third reason for not adopting cloud computing. Concerns about the benefits of cloud computing, (11.9%) concerns about the regulatory and laws in the country (11.9%), feeling insecure of cloud provider (9.4%) and competitiveness (7.5%) are by far the least the reason why service companies do not adopt cloud computing.

Figure 16. The Reasons for Not Adopting Cloud Computing in Service Sector.



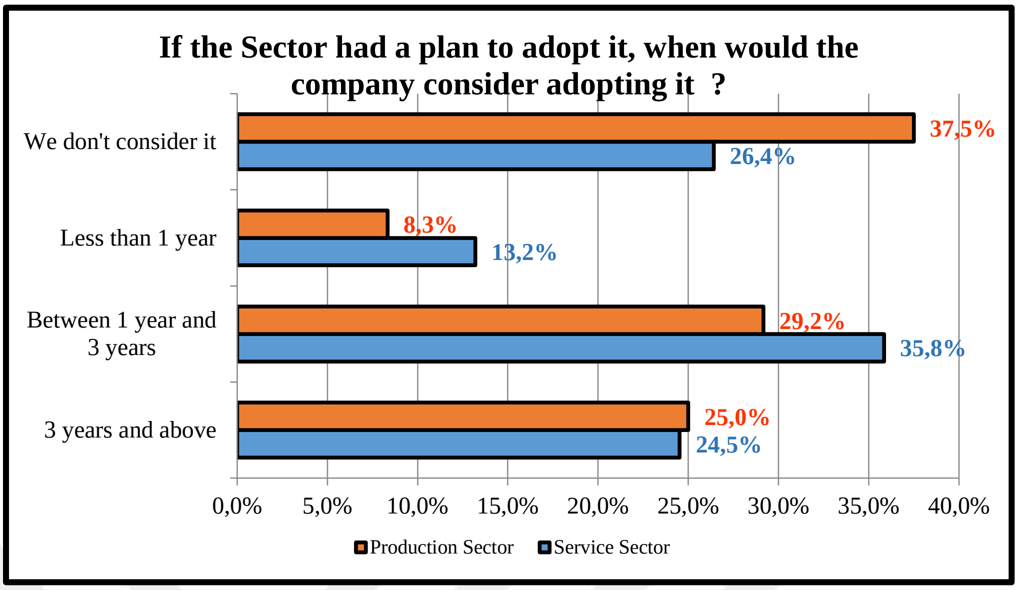
In the production sector, as shown in Figure 17, 54.2 % of non-cloud adopters do not consider adopting cloud computing. 45.8% of non-cloud adopters at least consider adopting in the future. 16.7 % of non-cloud adopters are in the cloud computing adoption process. 20.8 % of non-cloud adopters will expect to adopt cloud computing. 8.3% of non-cloud adopters considered but do not plan to adopt cloud computing. However, 54.7 % of non-cloud adopters in the service sector do not consider adopting cloud computing. 45.3 % of non-cloud adopters at least consider adopting in the future. 24.5 % of non-cloud adopters are in the cloud computing adoption process. 26.1 % of non-cloud adopters will expect to adopt cloud computing. 9.4 % of non-cloud adopters considered but do not plan to adopt cloud computing.

Figure 17. In Which Phases are your Business for Planning Cloud Computing Adoption in Sector?



In the production sector, as illustrated in Figure 18, 37.5% of non-cloud adopters restated that they do not consider adopting cloud computing. 29.2% of non-cloud adopters confirmed that they will consider adopting cloud computing in between 1 year and 3 years. 25% of non-cloud adopters asserted that they will consider adopting cloud computing in 3 years and above. 8.3% of non-cloud adopters confirmed that they will consider adopting cloud computing in less than 1 year. On the other hand, in the service sector, 35.8% of non-cloud adopters confirmed that they will consider adopting cloud computing in between 1 year and 3 years. 26.4% of non-cloud adopters restated that they do not consider adopting cloud computing. 24.5% of non-cloud adopters asserted that they will consider adopting cloud computing in 3 years and above. 13.2% of non-cloud adopters confirmed that they will consider adopting cloud computing in less than 1 year.

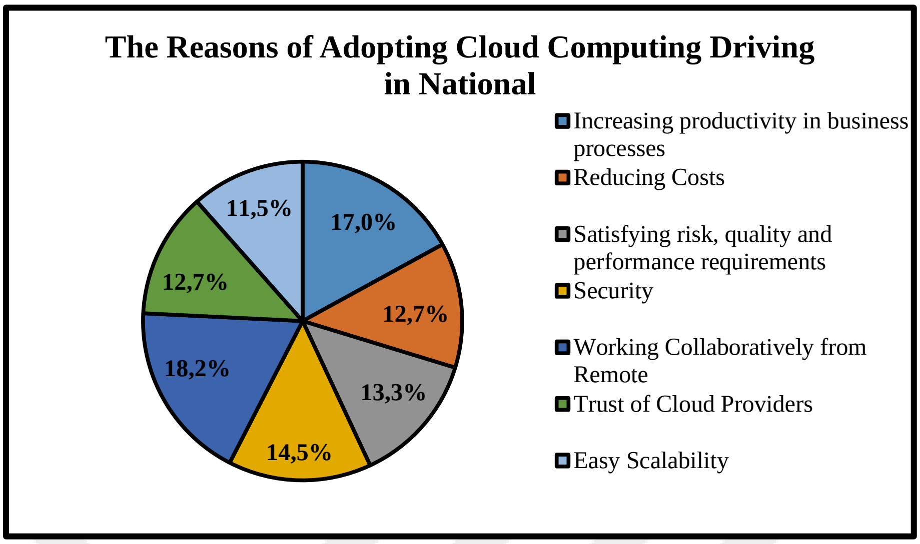
Figure 18. If the Sector had a plan to adopt it, when would the company consider adopting it?



5.1.4. CLOUD ADOPTERS DRIVING IN NATIONAL AND INTERNATIONAL MARKETS

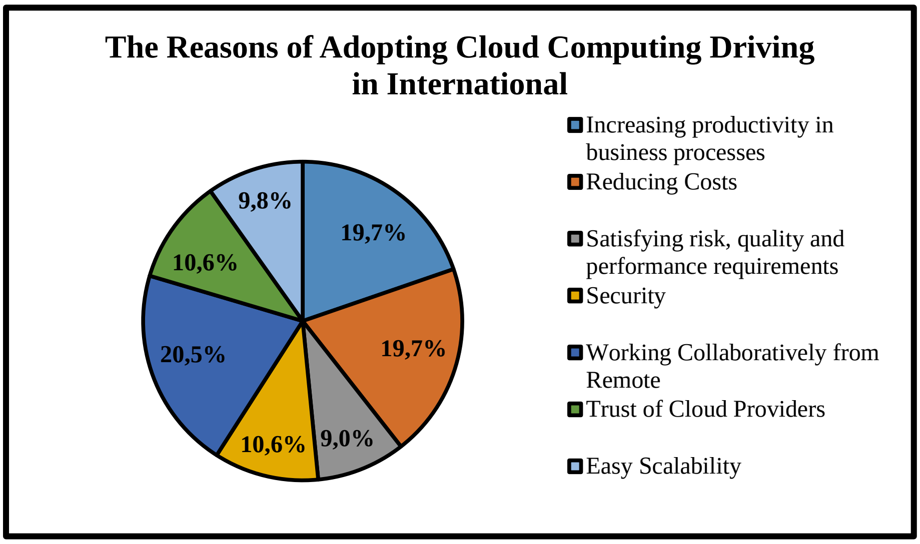
In companies driving in the national market, as shown in Figure 19, working collaboratively from remote is the most important reason why companies adopt cloud computing by 18.2%. Behind working collaboratively from remote, Increasing productivity in business processes is the second reason for adopting cloud computing by 17%. Security from inside of the company is the third reason for adopting cloud computing by 14.5%. Satisfying risk, quality, and performance requirements, reducing costs, the trust of cloud providers, and easy scalability are the least important reason why companies driving in the national market adopt cloud computing by 13.3%, 12.7%, 12.7%, and 11.5%.

Figure 19. The Reasons for Adopting Cloud Computing in Companies Driving National.



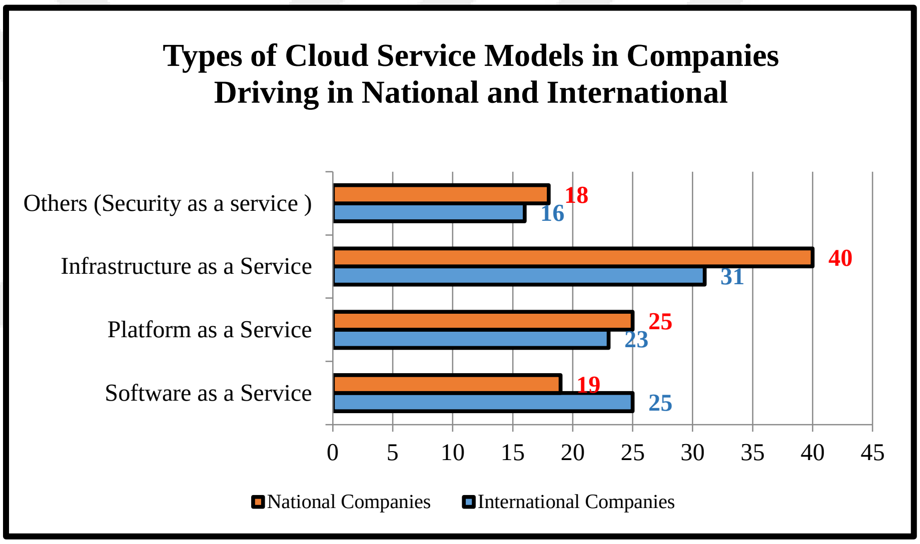
In international companies, as exhibited in Figure 20, cloud adopters are more likely to adopt cloud computing due to the fact they believe that working collaboratively from remote (20.5%), increasing productivity in business processes (19.7%) and reducing costs (19.7%) is the most important reason of adopting cloud computing. Trust of cloud providers (10.6%), security (10.6), easy scalability (9.8%), and satisfying risk, quality, and performance requirements (9.0%) are the least important reason why companies driving in the international market adopt cloud computing.

Figure 20. The Reasons for Adopting Cloud Computing in Companies Driving International.



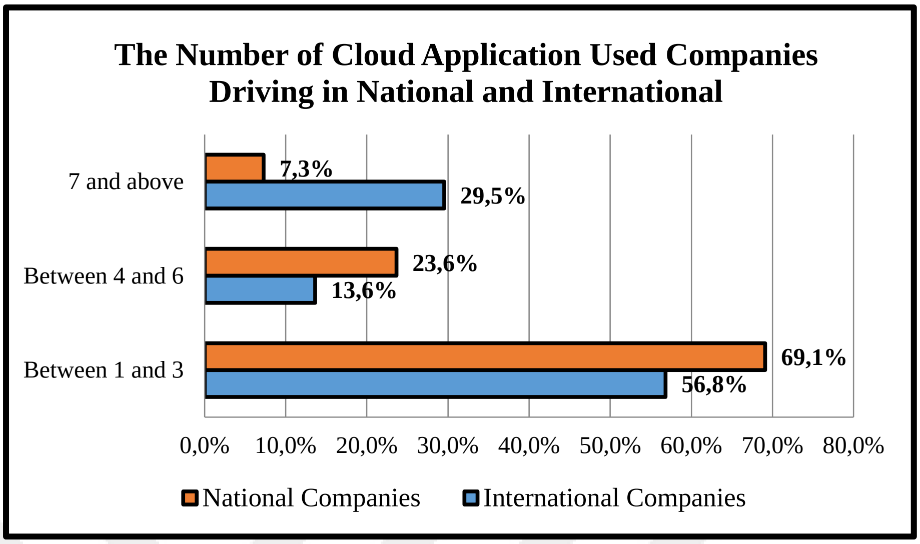
In companies driving in national, as illustrated in Figure 21, 55 out of 105 companies use 102 cloud services. In other words, 1 adopter approximately uses 1.85 cloud services. The most used is IaaS with 40 services. The second most used is PaaS with 25 services. The third most used is Saas with 19 services. The last service is the others with 18 services, including additional security. On the other hand, in international companies, 44 out of 71 companies use 95 cloud services. In other words, 1 adopter approximately uses 2.15 cloud services. The most used is IaaS with 31 services. The second most used is SaaS with 25 services. The third most used is PaaS with 23 services. The last service is the others with 16 services, including additional security.

Figure 21. Types of Cloud Service Models in Companies Driving National and International.



In companies driving in national, as shown in Figure 22, 69.1% of adopter companies use between 1 and 3 services. 23.6% of adopter companies use between 4 and 6 services. 7.2% of adopter companies use 7 services and above. Whereas, companies driving in international, %56.8 of adopter companies use between 1 and 3 services. 29.5% of adopter companies use 7 services and above. 13.6% of adopter companies use between 4 and 6 services.

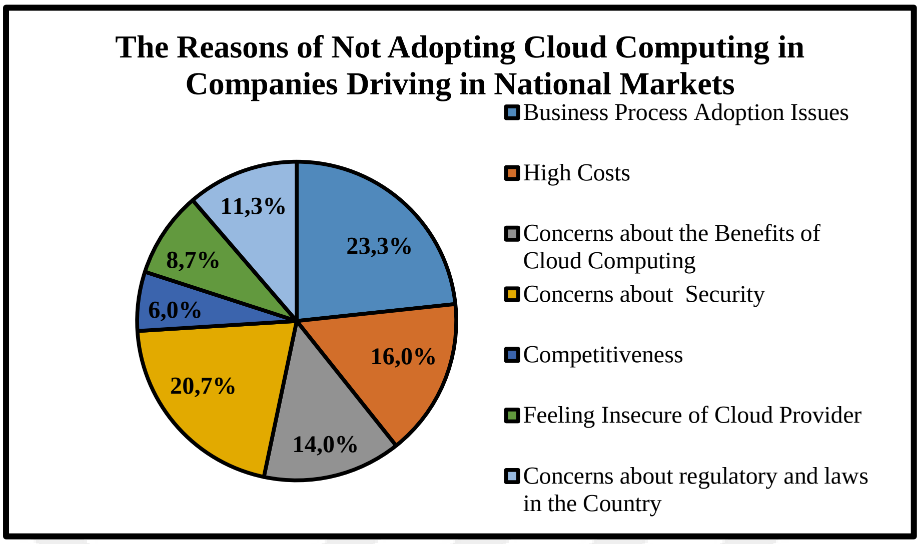
Figure 22. The Number of Cloud Application Used in Companies Driving National and International.



5.1.5. NON CLOUD ADOPTERS IN COMPANIES DRIVING NATIONAL AND INTERNATIONAL

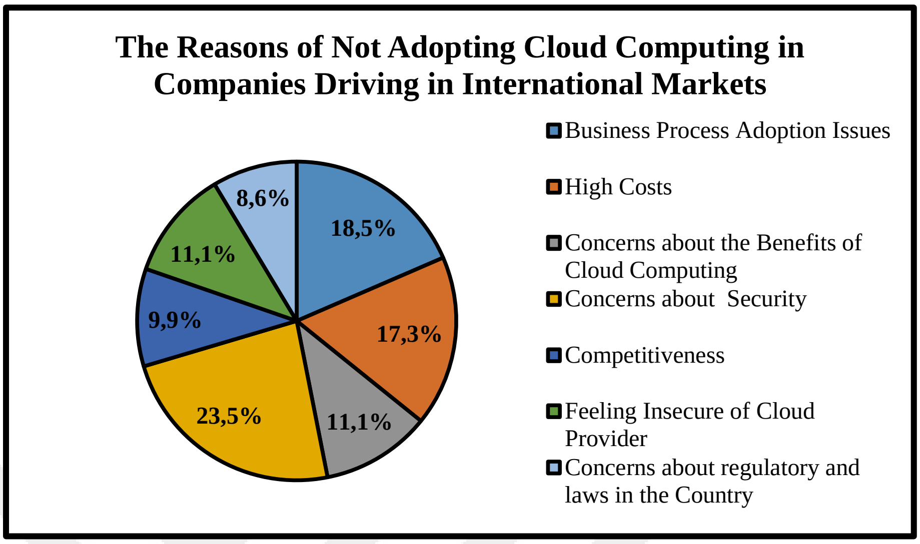
In national companies, as illustrated in Figure 23, concerning business processes adoption issues (23.3%) are the most important reason why non-cloud companies do not adopt cloud computing. Behind business processes, adoption issues, concerning the security of technology (20.7%) is one of the important concerns. High costs (16.0%) is the third concerns over cloud computing. There is a considerable amount of doubts concerning the benefits of technology (14.0%) and concerns about regulatory and laws in the country (11.3%) for national companies. Concerns about feeling insecure about cloud providers (8.7%) and competitiveness (6.0%) are by far the least the reason why manufacturing companies do not adopt cloud computing.

Figure 23. The Reasons for Not Adopting Cloud Computing in Companies driving in National Markets.



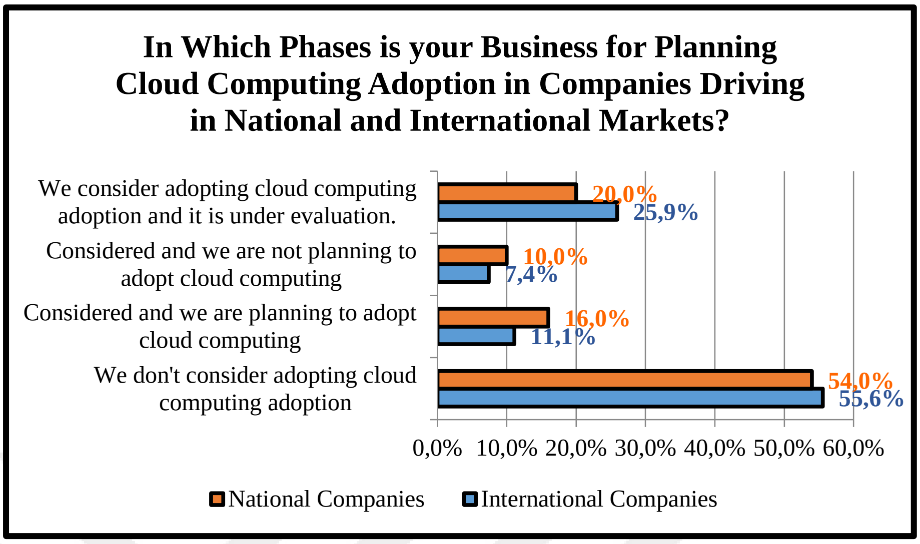
In companies driving in the international market, as illustrated in Figure 24, concerns about security (23.5%) are the most reason why cloud computing is not adopted by non-cloud companies. After concerns about security, the business process adoption issue (18.5%) is the second reason for not adopting cloud computing. High costs (17.3%) are the third reason for not adopting cloud computing. There is a considerable amount of doubts over concerns about the benefits of cloud computing (11.1%) and feeling insecure about the cloud provider (11.1%). Competitiveness (9.9%) and Concerns about the regulatory and laws in the country (8.6%) are by far the least the reason why companies driving in the international market do not adopt cloud computing.

Figure 24. The Reasons for Not Adopting Cloud Computing in Companies Driving in International Markets.



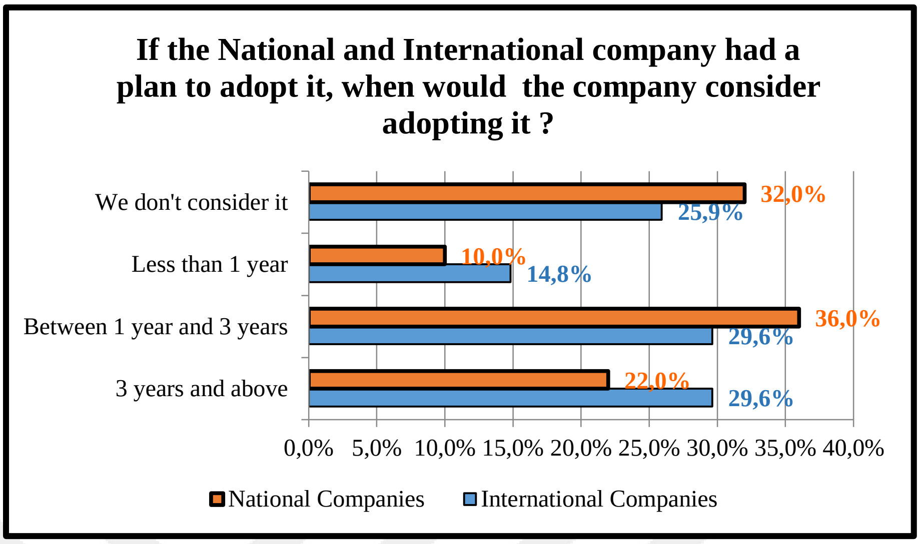
Companies driving in national markets, as exhibited in Figure 25, 54 % of non-cloud adopters do not consider adopting cloud computing. 46 % of non-cloud adopters at least consider adopting in the future. 20 % of non-cloud adopters are in the cloud computing adoption process. 16 % of non-cloud adopters will expect to adopt cloud computing. 10% of non-cloud adopters considered but do not plan to adopt cloud computing. However, 55.6 % of non-cloud adopters in international markets do not consider adopting cloud computing. 44.4 % of non-cloud adopters at least consider adopting in the future. 25.9 % of non-cloud adopters are in the cloud computing adoption process. 11.1 % of non-cloud adopters will expect to adopt cloud computing. 7.4 % of non-cloud adopters considered but do not plan to adopt cloud computing.

Figure 25. In Which Phases are your Business for Planning Cloud Computing Adoption in Companies Driving in National and International Markets?



Companies driving in national markets, as shown in Figure 26, 36% of non-cloud adopters confirmed that they will consider adopting cloud computing in between 1 year and 3 years. 32% of non-cloud adopters restated that they do not consider adopting cloud computing. 22% of non-cloud adopters asserted that they will consider adopting cloud computing in 3 years and above. 10% of non-cloud adopters confirmed that they will consider adopting cloud computing in less than 1 year. On the other hand, companies driving in international markets, 29.6% of non-cloud adopters confirmed that they will consider adopting cloud computing in between 1 year and 3 years. 29.6% of non-cloud adopters asserted that they will consider adopting cloud computing in 3 years and above. 25.9% of non-cloud adopters stated that they do not consider adopting cloud computing. 14.8 of non-cloud adopters confirmed that they will consider adopting cloud computing in less than 1 year.

Figure 26. If the National and International company had a plan to adopt it, when would the company consider adopting it?



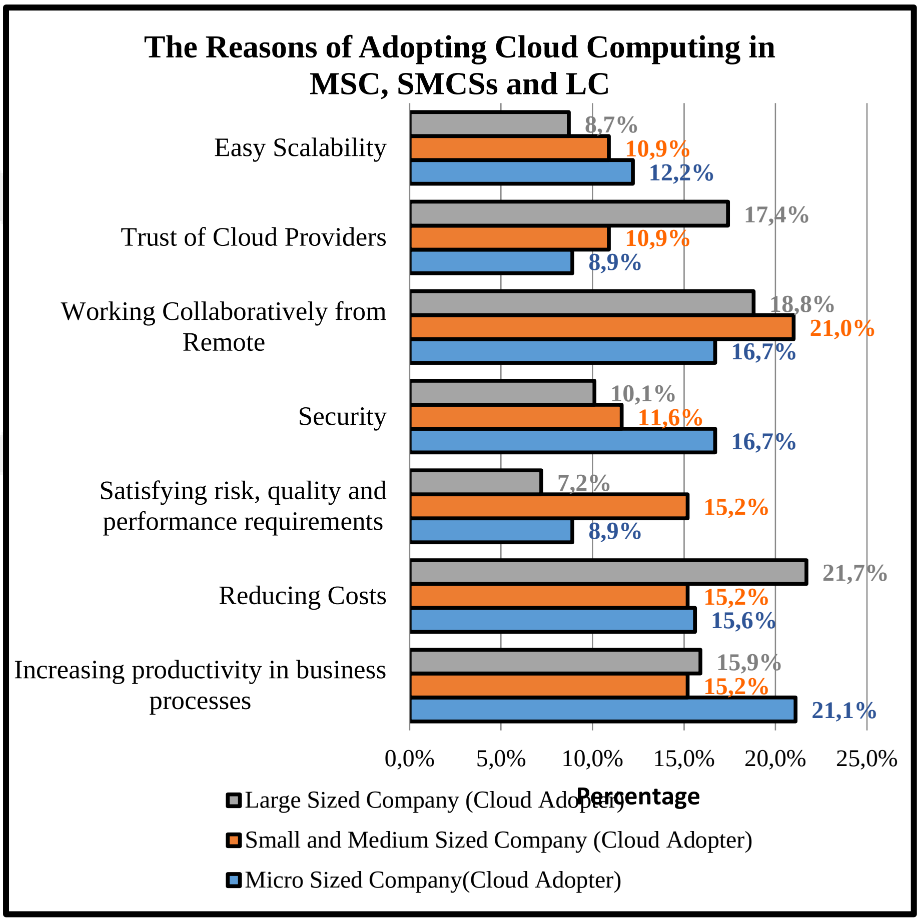
Cloud computing adoption is categorized into three sizes of companies, including micro-size companies, small and medium companies, and large companies.

In micro-sized companies (MSC), as shown in Figure 27, cloud adopters are more likely to adopt cloud computing due to the fact they believe that cloud computing increases productivity in business processes (21.1%). After increasing productivity, working collaboratively from remote areas (16.7%) is the second reason for adopting cloud computing. Security (16.7%) is the third reason for adopting cloud computing. There is a considerable amount of contribution to reducing cost (15.6%) and easy scalability (12.2%). Satisfying risk, quality, and performance requirements (8.7%) and trust of cloud providers (8.9%) are the least important reason why micro-sized companies adopt cloud computing.

In small and medium-sized companies (SMCs), as illustrated in Figure 27, cloud adopters are more likely to adopt cloud computing due to the fact they believe that cloud computing can work collaboratively from remote areas (21.0%). After working collaboratively from remote areas, increasing productivity in business operations (15.2%), satisfying risk, quality and performance requirements (15.2%) and cost reduction (15.2%) are the second reason of adopting cloud computing at the same percentage. There is a considerable amount of contribution of security (11.6%), the trust of cloud providers (10.9%), and easy scalability (10.9%).

In large-sized companies (LC), as exhibited in Figure 27, reducing cost (21.7%) is the most important reason why companies adopt cloud computing. After reducing cost, working collaboratively from remote (18.8%) is the second reason for adopting cloud computing. The trust of cloud providers (17.4%) in business processes is the third reason for adopting cloud computing. There is a considerable amount of contribution to security (10.1%). Easy scalability (8.7%) and satisfying risk, quality, and performance requirements (7.2%) are the least important reason why service companies adopt cloud computing.

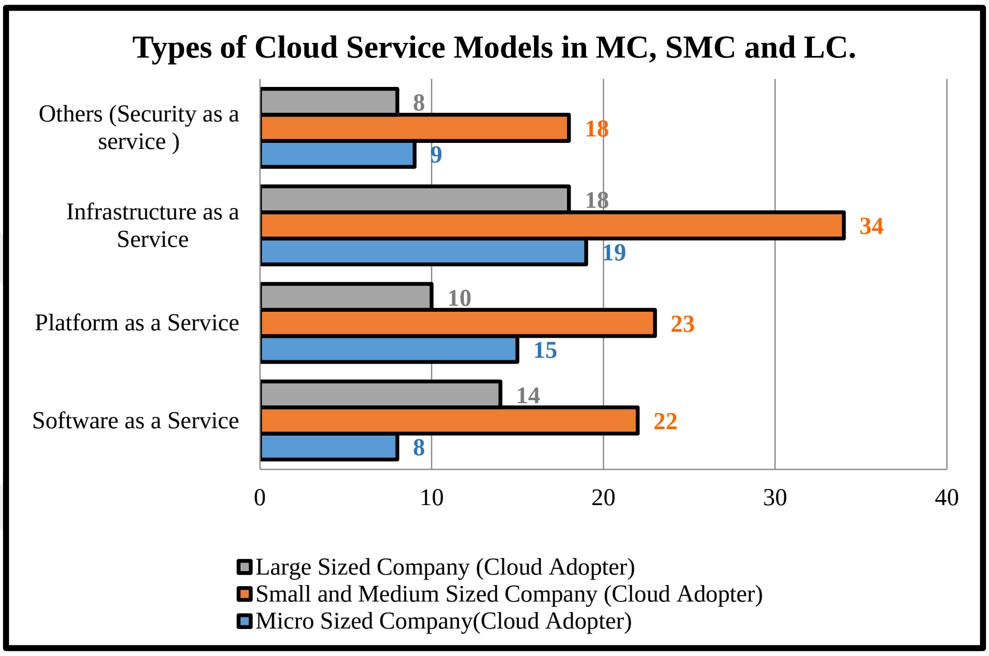
Figure 27. The Reasons for Adopting Cloud Computing in MSC, SMEs, and LC.



In micro-sized companies, as shown in Figure 28, 30 out of 66 companies use 51 cloud services. In other words, 1 adopter approximately uses 1.70 cloud services. The most used is IaaS with 19 services. The second most used is PaaS with 15 services. The third most used are others, including additional security with 9 services. The last service is SaaS with 8 services. On the other hand, in small and medium-sized companies, as shown in Figure 28, 46 out of 74 companies use 107 cloud services. In other words, 1 adopter approximately uses 2.10 cloud services.

The most used is IaaS with 34 services. The second most used is PaaS with 23 services. The third most used is SaaS with 22 services. The last service is the others with 18 services, including additional security. However, in large-sized companies, 23 out of 36 companies use 50 cloud services. In other words, 1 adopter approximately uses 2.17 cloud services. The most used is IaaS with 18 services. The second most used is SaaS with 14 services. The third most used is SaaS with 14 services. The third most used is PaaS with 10 services.

Figure 28. Types of Cloud Service Models in MC, SMC, and LC.



As shown in Figure 29, 80% of adopter companies use between 1 and 3 services. 16.7% of adopter companies use between 4 and 6 services. 3.3% of adopter companies use 7 services and above in micro-enterprises. Whereas, in small and medium companies, 58.7% of adopter companies use between 1 and 3 services. 23.9% of adopter companies use between 4 and 6 services. 17.4% of adopter companies use 7 services and above. On the other hand, in large-sized companies, 52.2 of adopter companies use between 1 and 3 services. 34.7% of adopter companies use 7 services and above. 13% of adopter companies use between 4 and 6 services.

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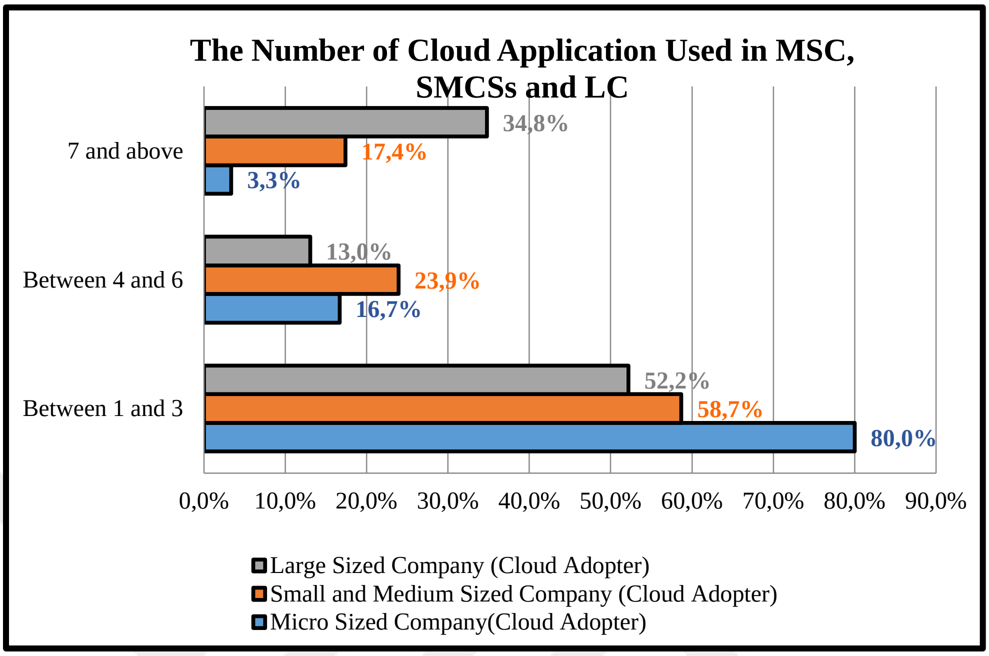
Figure 29. The Number of Cloud Application Used in MSC, SMC, and LC.



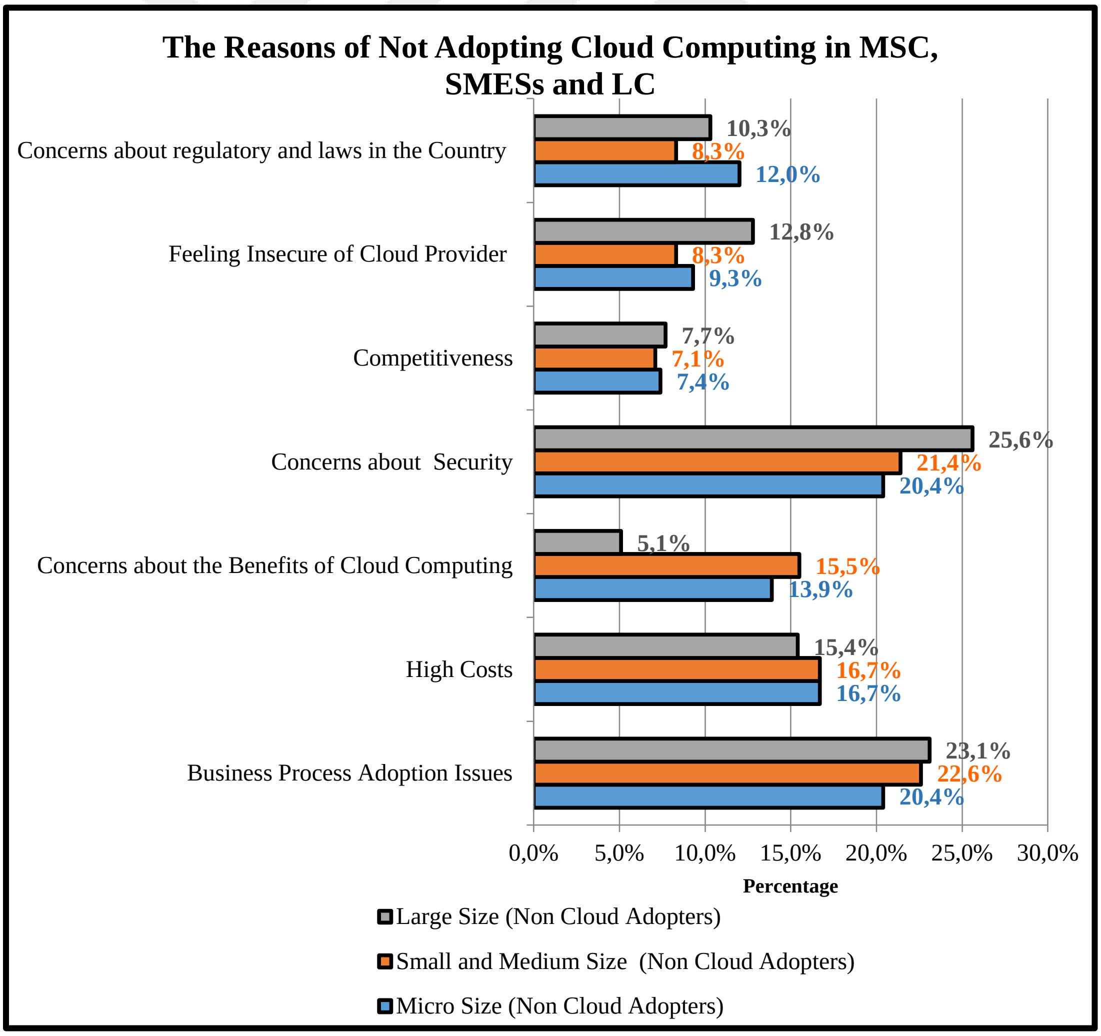
5.1.6. NON CLOUD ADOPTERS BY COMPANY SIZES

As shown in Figure 30, concerns over business processes adoption issues (20.4%) and concerns about security (20.4%) are the most important reason why non-cloud companies do not adopt cloud computing in micro-companies. After concerns over business processes adoption issues and concerns about security, high cost (16.7%) is one of the important concerns. There is a considerable amount of doubts concerning the benefits of technology (13.9%) and concerns about regulatory and laws in the country (12.0%). Feeling insecure with the cloud provider (9.3%) and competitiveness (7.4%) are by far the least the reason why micro companies do not adopt cloud computing.

As illustrated in Figure 30, concerns over business processes adoption issues (22.6%) are the most important reason why non-cloud companies do not adopt cloud computing in small and medium companies. After concerns over business processes adoption issue, concerns about security (21.4%) is one of the important concerns. High costs (16.7%) are the third most important concerns over cloud computing adoption. Concerning the benefits of technology (15.5%) is the fourth most important reason for not adopting cloud computing. Feeling insecure of cloud providers (8.3%), concerns about regulatory and laws in the country (8.3%), and competitiveness (7.1%) are by far the least the reason why small and medium companies do not adopt cloud computing.

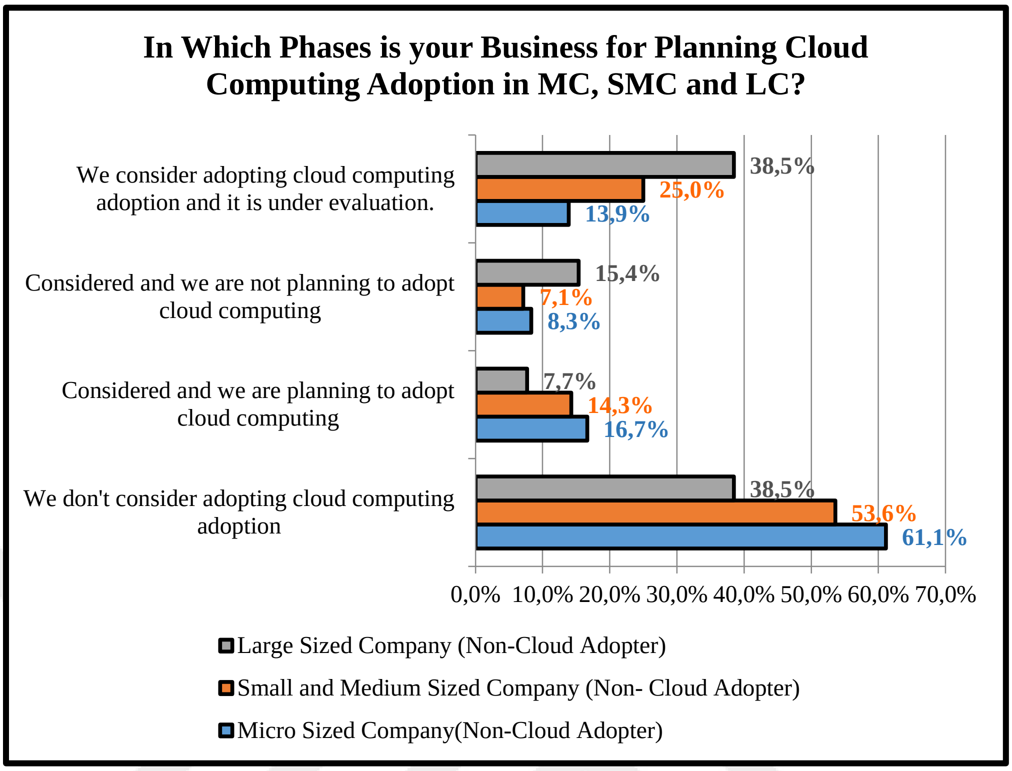
As shown in Figure 30, concerns over security (25.6%) are the most important reason why non-cloud companies do not adopt cloud computing in large companies. After concerns over security, concerns over business processes adoption issue (22.6%) is one of the important concerns. High costs (16.7%) are the third most important concerns over cloud computing adoption. There is a considerable amount of doubts over feeling insecure about cloud providers (8.3%) and concerns about regulatory and laws in the country (8.3%) for large size companies. Competitiveness (7.7%) and concerns about the benefits of cloud computing (5.1%) are by far the least the reason why large size companies do not adopt cloud computing.

Figure 30. The Reasons for Not Adopting Cloud Computing in MC, SMC, and LC.



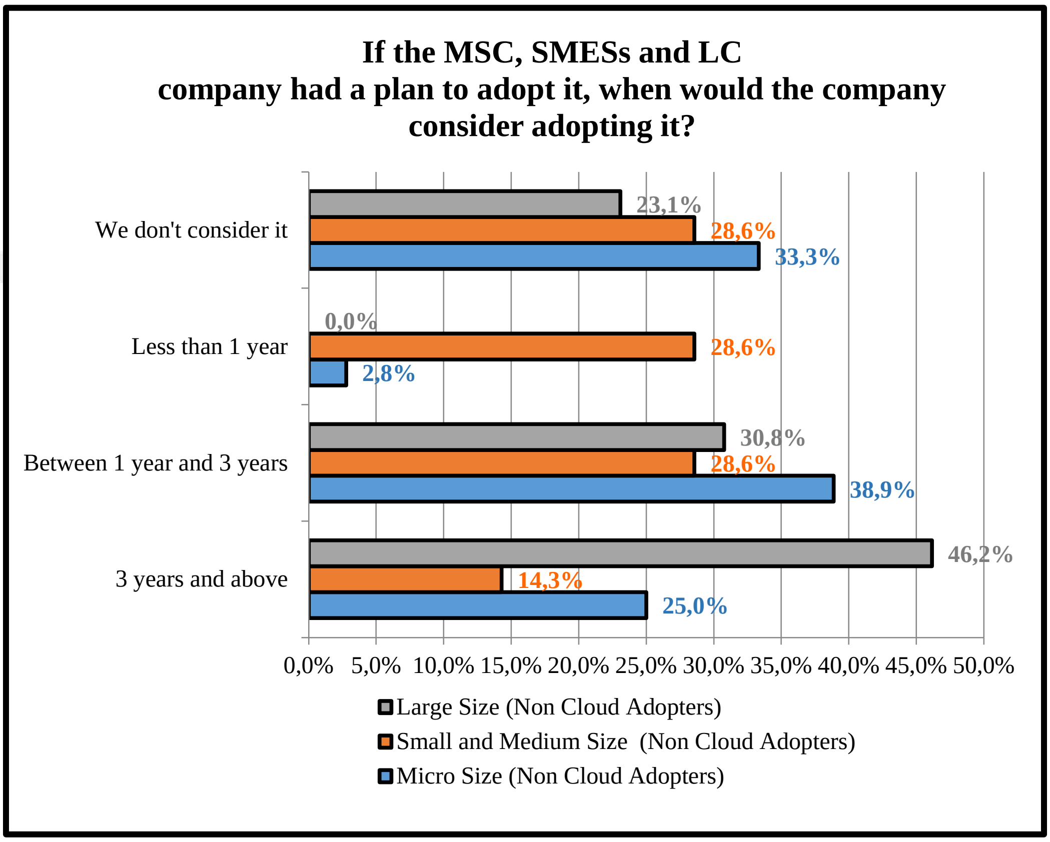
As shown in Figure 31, 61.1 % of non-cloud adopters do not consider adopting cloud computing in micro-companies. 38.9 % of non-cloud adopters at least consider adopting in the future. 16.6 % of non-cloud adopters will expect to adopt cloud computing. 13.8 % of non-cloud adopters are in the cloud computing adoption process. 8.3% of non-cloud adopters considered but do not plan to adopt cloud computing. However, in small and medium companies, 53.5 % of non-cloud adopters do not consider adopting cloud computing. 46.5% of non-cloud adopters at least consider adopting in the future. 25 % of non-cloud adopters are in the cloud computing adoption process. 14.2 % of non-cloud adopters will expect to adopt cloud computing. 7.1% of non-cloud adopters considered but do not plan to adopt cloud computing. On the other hand, in large-sized companies, 38.4 % of non-cloud adopters do not consider adopting cloud computing. 61.6 % of non-cloud adopters at least consider adopting in the future. 38.4 % of non-cloud adopters are in the cloud computing adoption process. 15.3 % of non-cloud adopters considered but do not plan to adopt cloud computing. 7.6 % of non-cloud adopters will expect to adopt cloud computing. Therefore, the percentage of non-cloud adapters that do not consider adopting cloud computing tends to increase from large-sized companies to micro-sized companies.

Figure 31. In Which Phases are your Business for Planning Cloud Computing Adoption in MC, SMC, and LC?



In Figure 32, 38.8% of non-cloud adopters confirmed that they will consider adopting cloud computing in between 1 year and 3 years in middle-sized companies. 33.3% of non-cloud adopters stated that they do not consider adopting cloud computing. 25% of non-cloud adopters asserted that they will consider adopting cloud computing in 3 years and above. 2.7% of non-cloud adopters confirmed that they will consider adopting cloud computing in less than 1 year. However, in small and medium-sized companies, 28.5% of non-cloud adopters confirmed that they will consider adopting cloud computing in less than 1 year. 28.5% of non-cloud adopters confirmed that they will consider adopting cloud computing in between 1 year and 3 years. 28.5% of non-cloud adopters stated that they do not consider adopting cloud computing. 14.2% of non-cloud adopters asserted that they will consider adopting cloud computing in 3 years and above. On the other hand, in large-sized companies, 46% of non-cloud adopters asserted that they will consider adopting cloud computing in 3 years and above. 30.7% of non-cloud adopters confirmed that they will consider adopting cloud computing in between 1 year and 3 years. 23 % of non-cloud adopters stated that they do not consider adopting cloud computing. 0 % of non-cloud adopters confirmed that they will consider adopting cloud computing in less than 1 year. Thus, This shows that non-cloud adopters in micro-companies are more likely to adopt the technology between 1 year and 3 years. Small and medium non-cloud adopters are likely to adopt the technology between now and 3 years. On the other hand, large non-cloud adopters are likely to adopt the technology in 3 years and above.

Figure 32. If the MC, SMC, and LC company had a plan to adopt it, when would the company consider adopting it?



5.2. RESULTS OF CONFIRMATORY FACTOR ANALYSIS

Confirmatory factor analysis was used to assess the research model. SmartPLS 2.0 software was used to gather data empirically. There are two theories: measurement model 1 for the DOI model and measurement model 2 for the TOE model.

5.2.1. FIT MODEL, RELIABILITY AND VALIDITY RESULTS

Validity and reliability measures were obtained to show how accurately the construct reflects what it intends to measure and show the consistency of the results obtained, respectively. Here are the fit model results of the integrated DOI and TOE model shown in Table 11 below. Fit results showed that SRMR value is 0.076 which was less than 0.08 which is a perfect fit (Hu& Bentler, 1999).

Table 11. Fit Model Results

Fit Indıces	DOI (Measurement model 1)	TOE (Measurement model 2)	INTEGRATED DOI and TOE (Structural model)
Chi-Square	508,585	230,427	710,191
SRMR	0.161	0.080	0.076
NFI	0.759	0.749	0.763

Significance at p<0.10 (*), Significance at p<0.05 (**), Significance at p<0.01(***)

The composite reliability (CR) values, as shown in Table 12, describe which the construct indicators indicate the latent construct and they ranged from 0.775 to 1. These indicators exceeded the recommended value of 0.7 (Arifin, 2018). Besides, the average variance extracted (AVE), which reflects the overall amount of variance in the indicators accounted for by the latent construct, ranged between 0.543 and 1. These indicators exceeded the recommended value of 0.5 (Arifin, 2018). Moreover, the Cronbach's alpha, which reflects the overall amount of variance in the indicators accounted for by the latent construct, ranged between 0.715 and 1. These indicators exceeded the recommended value of 0.7 for Cronbach's alpha (Bonett and Wright, 2015). Cronbach's alpha of cost savings indicator is 0.578 but this value is fair to apply for confirmatory factor analysis.

Table 12. Reliability Indicators for Measurement Model 1 and Measurement Model 2 (Average Variance Extracted (AVE), Composite Reliability (CR)) and Cronbach's Alpha of DOI and TOE

	CR	AVE	Cronbach's Alpha
RA	0.918	0.736	0.880
SPC	0.918	0.790	0.871
CS	0.775	0.543	0.578
COMP	0.930	0.768	0.900
COMPX	0.909	0.770	0.851
TMS	0.901	0.752	0.835
TR	1	1	1
CP	0.835	0.631	0.715
CCA	0.970	0.943	0.939

The results of tests indicated that all indicators are validated to apply for the structural model.

5.2.2. DOI THEORY (MEASUREMENT MODEL 1) FACTOR LOADINGS, CORRELATION TABLE, AND PATH ANALYSIS RESULTS

Standardized loadings are considered above the value of 0.7 (Hair *et al.*, 2017). Three items, RA4, CS1, and COMPX2, are excluded from the model to obtain the best fit. Here is the DOI theory's factors mentioned below: Relative advantage (RA), security and privacy concern (SPC), cost savings (CS), compatibility (COMP), complexity (COMPX).

5.2.2.1. Relative Advantage: Factor Loadings

The relative advantage was measured by five items. Relative advantage item 2, item 1, item 3, and item 5 have a strong fit with the standardized loading values of 0.865, 0.855, 0.849, and 0.825, and with the T value of 13.182, 16.914, 14.471 and 6.706 respectively. Standardized loadings showed that relative advantage item 4 has a weak fit which was less than 0,7. RA4 question "The use of cloud computing offers new opportunities" might not be understood by respondents as the content of the question was not clarified. T value showed that these four items are above 1.96, which is used to measure relative advantage factor with a reasonable CR, AVE, and Cronbach's alpha, shown in Table 13. 1 out of 5 questions was eliminated.

Table 13. Relative Advantage: Factor Loadings

	QUEST. ITEMS	ITEM WORDING	INITIAL STANDARDISED LOADINGS	STANDARDIZED LOADINGS	CR (T)
	RA1	Cloud computing allows you to manage business operations efficiently.	0.855	0.864	16.914
	RA2	The use of cloud computing services improves the quality of operations.	0.865	0.885	13.182
	RA3	Using cloud computing allows you to perform specific tasks more quickly.	0.849	0.878	14.471
	RA4	The use of cloud computing offers new opportunities.	0.676		
	RA5	Using cloud computing allows you to increase business productivity.	0.825	0.803	6.706
	ACHIEVED FIT INDICES				
CR	0.918	**AVE**	0.736	**CRONBACH'S ALPHA**	0.880

5.2.2.2. Security and Privacy Concerns: Factor Loadings

Security and Privacy Concerns was measured by three items. Security and Privacy Concerns item 1, item 3, and item 2 have a strong fit with the standardized values of 0.920, 0.880, and 0.866 and with the T value of 15.287, 12.138, and 10.823, respectively. Standardized loadings showed that all items have a strong fit which was more than 0.7. T value showed that these three items are above 1.96, which is used to measure security and privacy concerns factor with a reasonable CR, AVE, and Cronbach's alpha, shown in Table 14. 3 questions were valid and reliable.

Table 14. Security and Privacy Concerns: Factor Loadings

	QUEST. ITEMS	ITEM WORDING	INITIAL STANDARDISED LOADINGS	Standardized LOADINGS	CR (T)
	SPC1	Degree of company's concern with data security on cloud computing.	0.920	0.920	15.287
	SPC2	Degree of concern for customers with data security in cloud computing	0.866	0.866	10.823
	SPC3	Degree of concern about privacy in cloud computing.	0.880	0.880	12.138
	ACHIEVED FIT INDICES				
CR	0.918	**AVE**	0.790	**CRONBACH'S ALPHA**	0.871

5.2.2.3. Cost Savings: Factor Loadings

Cost Savings was measured by three items. Cost Savings item 2 and item 3 have a strong fit with the standardized loading weight values of 0.900 and 0.796 with the T value of 8.395 and 7.264, respectively. Standardized loadings showed that cost savings item 1 have a weak fit with the value of 0.546 which was less than 0.7.

CS1 question "the benefits of cloud computing are greater than the costs of this adoption" was a relative concept for the comparison between the benefits and costs of cloud computing adoption. T value showed that these two items are above 1.96, which was used to measure cost-saving factor with a reasonable CR and AVE, shown in Table 15. 2 questions were valid and reliable

Table 15. Cost Savings: Factor Loadings

	QUEST. ITEMS	ITEM WORDING	INITIAL STANDARDISED LOADINGS	STANDARDIZED LOADINGS	CR (T)
	CS1	The benefits of cloud computing are greater than the costs of this adoption	0.548		
	CS2	With cloud computing, there is a reduction in energy costs and environmental costs	0.875	0.900	8.395
	CS3	Maintenance costs of cloud computing are very low	0.752	0.796	7.264
	ACHIEVED FIT INDICES				
CR	0.838	**AVE**	0.721	**CRONBACH'S ALPHA**	0.622

5.2.2.4. Compatibility: Factor Loadings

Compatibility was measured by four items. Compatibility item 1, item 2, item 4, and item 3 have a strong fit with the standardized loading weight values of 0.909, 0.873, 0.868, and 0.856 and with the T value of 21.922, 14.133, 8.583 and 17.061, respectively. Standardized loadings showed that all items have a strong fit which was more than 0.7. T value showed that these three items are above 1.96, which is used to measure compatibility factor with a reasonable CR, AVE, and Cronbach's alpha, shown in Table 16. 4 questions were valid and reliable.

Table 16. Compatibility: Factor Loadings

	QUEST. ITEMS	ITEM WORDING	INITIAL STANDARDISED LOADINGS	STANDARDIZED LOADINGS	CR (T)
	COMP1	The use of cloud computing fits the work style of the company.	0.909	0.909	21.922
	COMP2	The use of cloud computing is fully compatible with current business operations	0.873	0.873	14.133
	COMP3	Using cloud computing is compatible with your company's corporate culture and value system.	0.856	0.856	17.061
	COMP4	The use of cloud computing will be compatible with existing hardware and software in the company.	0.868	0.868	8.583
	ACHIEVED FIT INDICES				
CR	0.930	**AVE**	0.768	**CRONBACH'S ALPHA**	0.900

5.2.2.5. Complexity: Factor Loadings

Complexity was measured by four items. Cost Savings item 3, item 4, and item 1 have a strong fit with the standardized loading weight values of 0,941, 0,897, and 0,785 and with the T value of 29.244, 14.900, and 5.317, respectively. Standardized loadings showed that complexity item 2 has a weak fit with the value of 0,585 which was less than 0,7. COMPX2 question "the use of cloud computing is frustrating." was an unstructured question for complexity item of cloud computing adoption. T value showed that these three items are above 1.96, which is used to measure complexity factor with a reasonable CR, AVE, and Cronbach's alpha, shown in Table 17. 1 out of 4 questions were eliminated.

Table 17. Complexity: Factor Loadings

	QUEST. ITEMS	ITEM WORDING	INITIAL STANDARDISED LOADINGS	STANDARDIZED LOADINGS	CR (T)
	COMPX1	The use of cloud computing requires a lot of mental effort	0.783	0.780	5.187
	COMPX2	The use of cloud computing is frustrating.	0.536		
	COMPX3	The use of cloud computing is too complex for business operations.	0.933	0.935	19.443
	COMPX4	The skills needed to adopt cloud computing are too complex for employees of the firm.	0.910	0.910	15.830
	ACHIEVED FIT INDICES				
CR	0.909	**AVE**	0.769	**CRONBACH'S ALPHA**	0.851

5.2.2.6.DOI: Correlation Table

Here are the correlation matrices of five factors adopted from the DOI theory shown below in Table 18.

Table 18. DOI: Correlation Table

	RA	SPC	CS	COMP	COMPX	CCA
RA	**1**					
SPC	-0.212	**1**				
CS	0.470	0.045	**1**			
COMP	0.588	-0.295	0.386	**1**		
COMPX	-0.366	0.496	-0.218	-0.370	**1**	
CCA	0.353	-0.349	0.197	0.540	-0.333	**1**

5.2.2.7.Results of DOI: 2nd level of Confirmatory factor analysis

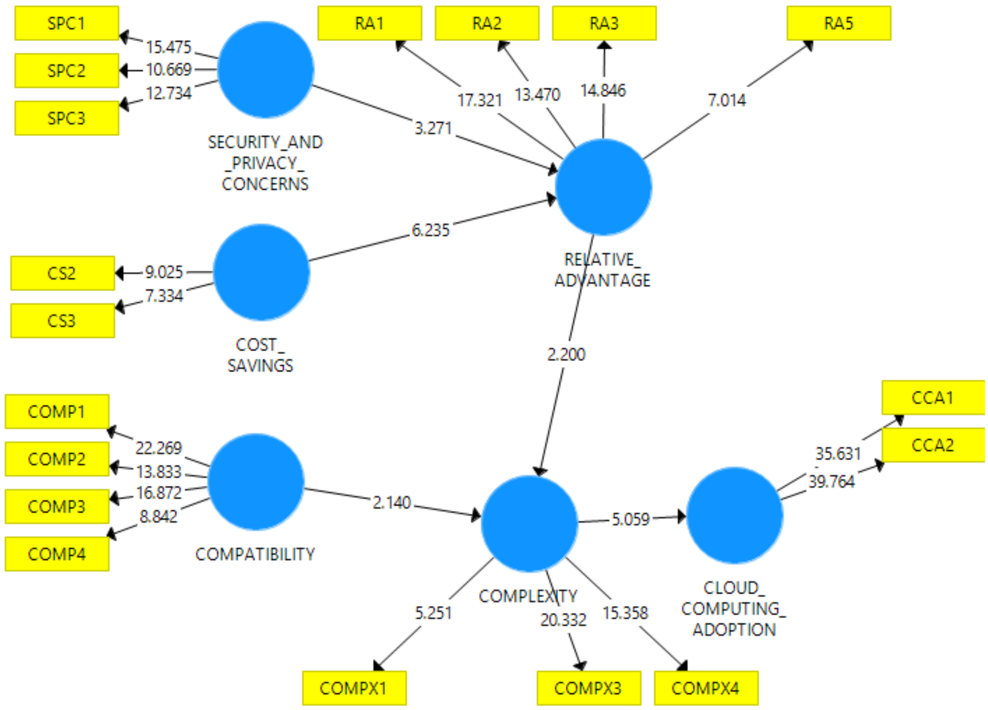
The result of factors in DOI theory showed that 17 out of 19 questionnaires are accepted for the measurement model 1 as shown in Table 19.

Table 19. Results of DOI: 2nd Level of Confirmatory Factor Analysis

	ITEM NUMBER	STANDARDIZED LOADINGS	CR (t)	RESULTS
RA-> COMPX	**4 Items left (5 Items)**	-0.226	2.247	Eligible for Structural Model
SPC-> RA	**3 Items left (3 Items)**	-0.233	3.249	Eligible for Structural Model
CS-> RA	**2 Items left(3 Items)**	0.481	6.342	Eligible for Structural Model
COMP-> COMPX	**4 Items left (4 Items)**	0.472	2.221	Eligible for Structural Model
COMPX-> CCA	**3 Items left (4 Items)**	-0.333	5.235	Eligible for Structural Model

Here is the path diagram of DOI in SmartPLS as shown in Figure 21 below. In Figure 33, Security and privacy concerns and cost savings described above explained 45.4 percent of the variance of Relative Advantage. Cloud computing adoption using DOI and TOE resulted in $R^2 = 0.361$, i.e. the variables described above explained 36.0 percent of the variance of cloud computing adoption.

Figure 33. Path Analysis Results of DOI.



5.2.3. TOE THEORY (MEASUREMENT MODEL 2) FACTOR LOADINGS, CORRELATION TABLE, AND PATH ANALYSIS RESULTS

Standardized (factor) loadings are considered above the value of 0.7 (Hair *et al.*, 2017). Six items, TR1, FS1, FS2, CP2, RS1, and RS2, are excluded from the model to obtain the best fit. Here are the TOE theory's factors mentioned below: Technological readiness (TR), top management support (TMS), firm size (FS), competitive pressure (CP), and regulatory support (RS). Firm size and Regulatory support are excluded factors due to these items' factor loadings are below 0.7.

5.2.3.1. Measurement Model 2 (TOE): Technological Readiness: Factor Loadings

Technological Readiness was measured by three items. Technological

Readiness item 3 and item 2 have a strong fit with the standardized loading weight values of 0.872 and 0.860 and with the T value of 11.799 and 8.941, respectively. Standardized loadings showed that technological readiness item 1 has a weak fit with the value of 0.483 which was less than 0.7. TR1 question "The percentage of employees who have internet access" was filled with 100% internet access from % 60 of companies. This gave the small number of standardized loadings (0.313) in the model as shown in Table 20. T value showed that these three items are above 1.96, which is used to measure the technological readiness factor with a reasonable CR, AVE, and Cronbach's alpha, shown in Table 20. 1 out of 3 questions was eliminated.

Table 20. Technological Readiness: Factor Loadings

	QUEST. ITEMS	**ITEM WORDING**	**INITIAL STANDARDISED LOADINGS**	**STANDARDIZED LOADINGS**	**CR (T)**
	TR1	The percentage of employees who have internet access.	0.313		
	TR2	The company knows how it can be used to support operations.	0.851	0.860	8.941
	TR3	Within the company, there are the necessary skills to implement cloud computing.	0.856	0.872	11.799
	ACHIEVED FIT INDICES				
CR	0.857	**AVE**	0.749	**CRONBACH'S ALPHA**	0.665

5.2.3.2. Measurement Model 2 (TOE): Top Management Support: Factor Loadings

Top management Support was measured by three items. Top management Support item 1, item 3, and item 2 have a strong fit with standardized loading weight values of 0.911, 0.849, and 0.836, and with the T value of 19.348, 15.565, and 11.638, respectively. Standardized loadings showed that all items have a strong fit which was more than 0.7. T value showed that these three items are above 1.96, which is used to measure the top management support factor with a reasonable CR, AVE, and Cronbach's alpha, shown in Table 21. Hence, the top management support factor was in the model

Table 21. Top Management Support: Factor Loadings

	QUEST. ITEMS	ITEM WORDING	INITIAL STANDARDISED LOADINGS	STANDARDIZED LOADINGS	CR (T)
	TMS1	The company's management supports the implementation of cloud computing.	0.905	0.905	21.156
	TMS2	The company's top management provides strong leadership and engages in the process when it comes to information systems.	0.855	0.855	15.333
	TMS3	The company's management is willing to take risks (financial and organizational) involved in the adoption of cloud computing.	0.841	0.841	17.996
	ACHIEVED FIT INDICES				
CR	0.901	**AVE**	0.752	**CRONBACH'S ALPHA**	0.835

5.2.3.3. Measurement Model 2 (TOE): Firm Size: Factor Loadings

In Table 22, Firm size was measured by two items. Firm size item 1 has a strong fit with the standardized loading weight values of 1 and 0. respectively. Standardized loadings showed that technological readiness item 2 has a weak fit with the value of 0 which was less than 0.7. FS1 question “the number of company employees.” was not in the interval of the expected regression weight value. FS2 question “annual business volume” was not obtained because of the financial confidentiality issues of companies. All questionnaires are eliminated. Hence, the firm size factor was not in the model.

Table 22. Firm Size: Factor Loadings

	QUEST. ITEMS	ITEM WORDING	INITIAL STANDARDISED LOADINGS	STANDARDIZED LOADINGS	CR (T)
	FS1	The number of company employees. .	1	0.000	0.000
	FS2	Annual Business Volume	0.000	0.000	0.000
	ACHIEVED FIT INDICES				
CR	0.000	**AVE**	0.000	**CRONBACH'S ALPHA**	0.000

5.2.3.4. Measurement Model 2 (TOE): Competitive Pressure: Factor Loadings

Competitive pressure item 3 and item 1 have a strong fit with the standardized loading weight values of 0.871 and 0.862, respectively. T value showed that these two items are above 1.96, which is used to measure competitive pressure factor with a reasonable CR, AVE, shown in Table 23. Hence, the competitive pressure factor was in the model. All questions were valid and reliable.

Table 23. Competitive Pressure: Factor Loadings

	QUEST. ITEMS	ITEM WORDING	INITIAL STANDARDISED LOADINGS	STANDARDIZED LOADINGS	CR (T)
	CP1	The firm thinks that cloud computing influences competition in their industry.	0.887	0.887	10.932
	CP2	Our firm is under pressure from competitors to adopt cloud computing.	0.700	0.700	4.158
	CP3	Some of our competitors have already started using cloud computing.	0.783	0.783	9.073
	ACHIEVED FIT INDICES				
CR	0.835	**AVE**	0.630	**CRONBACH'S ALPHA**	0.715

5.2.3.5. Measurement Model 2 (TOE): Regulatory Support: Factor Loadings

Regulatory support was measured by two items. Regulatory support item 1 has a strong fit with the standardized loading weight values of 0.992 with the T value of 8.910 and 10.474, respectively. Standardized loadings showed that competitive pressure item 2 has a weak fit with the value of 0.483 which was less than 0.7. T value showed that these three items are above 1.96, which is used to measure competitive pressure factor with a reasonable CR and AVE, shown in Table 4. However, this factor was excluded for the structural model because of the value of Cronbach's alpha which is 0.628 that is below 0.7 as shown in Table 24. RS2 question "The laws and regulations that exist nowadays are sufficient to protect the use of cloud computing" was not obtained in the interval of the expected regression weight value because companies in Izmir are unaware of the laws and regulations in Turkey. All questionnaires ere eliminated. Hence, the regulatory support factor was not in the model.

Table 24. Regulatory Support: Factor Loadings

	QUEST. ITEMS	ITEM WORDING	INITIAL STANDARDISED LOADINGS	STANDARDIZED LOADINGS	CR (T)
	RS1	There is legal protection in the use of cloud computing.	0.992	0.992	0.000
	RS2	The laws and regulations that exist nowadays are sufficient to protect the use of cloud computing.	0.344	0.344	0.000
	ACHIEVED FIT INDICES				
CR	0.000	**AVE**	0.000	**CRONBACH'S ALPHA**	0.628

5.2.3.6. Independent Variable: CCA: Factor Loadings

Cloud Computing Adoption was measured by three items. Cloud Computing Adoption item 2 and item 1 have a strong fit with the standardized loading weight values of 0.973 and 0.969 and with the T value of 33.386 and 29.188, respectively. Standardized loadings showed that all items have a strong fit which was more than 0.7. T value showed that these three items are above 1.96, which is used to measure the cloud computing adoption factor with a reasonable CR, AVE, and Cronbach's alpha, shown in Table 25. Hence, the cloud computing adoption factor was in the model.

Table 25. Cloud Computing Adoption: Factor Loadings

	QUEST. ITEMS	**ITEM WORDING**	**INITIAL STANDARDISED LOADINGS**	**STANDARDIZED LOADINGS**	**CR (T)**
	CCA1	At what stage of cloud computing adoption is your organization currently engaged? Not considering; Currently evaluating; Have evaluated, but do not plan to adopt this technology; Have evaluated and plan to adopt this technology; Have already adopted services. ; Have evaluated and plan to adopt this technology; Have already adopted services,	0.969	0.969	29.188
	CCA2	If you're anticipating that your company will adopt cloud computing in the future. How do you think it will happen? Not considering; More than 7 years; Between 3 and 7 years; Between 1 and 3 years; Less that 1year; Have already adopted	0.973	0.973	33.386
	ACHIEVED FIT INDICES				
CR	0.970	**AVE**	0.943	**CRONBACH'S ALPHA**	0.930

5.2.3.7. TOE: Correlation Table

Here are the correlation matrices of TMS, TR, and CA factors adopted from TOE theory shown below in Table 26.

Table 26. TOE: Correlation Table

	TMS	TR	CA	CCA
TMS	**1**			
TR	0.678	**1**		
CA	0.574	0.372	**1**	
CCA	0.546	0.331	0.379	**1**

5.2.3.8. Results of TOE: 2nd level of confirmatory factor analysis

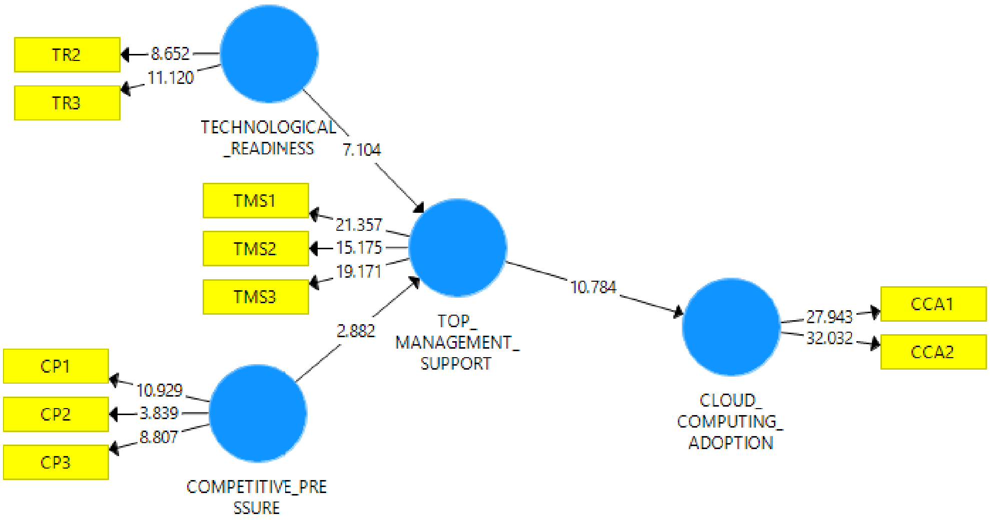
The result of factors in TOE theory showed that 8 out of 13 questionnaires are accepted for the measurement model 2. FS and RS are eliminated due to the no indicator were left for two of them as shown in Table 27.

Table 27. Results of TOE: 2nd Level of Confirmatory Factor Analysis

	ITEM NUMBER	STANDARDIZED LOADINGS	CR (t)	RESULTS
FS->CCA	**0 Items left (2 Items)**	0.000	0.000	Not Eligible for Structural Model
RS-> CCA	**0 Items left (2 Items)**	0.000	0.000	Not Eligible for Structural Model
TR->TMS	**2 Item left (3 Items)**	0.539	7.134	Eligible for Structural Model
CP-> TMS	**3 Items left (3 Items)**	0.373	2.835	Eligible for Structural Model
TMS->CCA	**3 Item left (3 Items)**	0.546	10.725	Eligible for Structural Model

Here is the path diagram of TOE in SmartPLS as shown in Figure 33 below. In Figure 34, the top management support described above explained 37.7 percent of the variance of cloud computing adoption.

Figure 34.Path Analysis Results of the TOE.



5.2.4. INTEGRATED DOI AND TOE THEORY (STRUCTURAL MODEL) REGRESSION WEIGHTS AND FACTOR LOADINGS

In Table 28, cloud computing adoption was measured by eight factors. The complexity with -0,194 coefficient was the mediator of relative advantage and compatibility. Top management support with a 0.491 coefficient was the mediator of technological readiness and competitive pressure. Relative advantage, security concerns, cost savings, compatibility, complexity, technological readiness, competitive pressure, and top management support have a fit with the standard regression weight values of -0.226, -0.233, 0.481, -0.237,- 0.194, 0.491, 0.539 and 0.443.

All hypotheses are supported by the T- value of 2.049, 3.189, 5.814, 2.166, 2.524, 8.188, 7.163, and 7.444, respectively.

Table 28. Results of Integrated DOI and TOE: Constructs for the Structural Model

CONSTRUCTS	Path Coefficients	T- Value	Results
H1- RA-> COMPX	-0.226	2.049**	**SUPPORTED**
H1A- SPC-> RA	-0.233	3.189***	**SUPPORTED**
H1B- CS-> RA	0.481	5.814***	**SUPPORTED**
H2- COMP->COMPX	-0.237	2.166**	**SUPPORTED**
H3- COMPX->CCA	-0.194	2.524**	**SUPPORTED**
H4- TMS-> CCA	0.491	8.188***	**SUPPORTED**
H4A- TR-> TMS	0.539	7.163***	**SUPPORTED**
H4B- CP->TMS	0.443	7.444***	**SUPPORTED**
R^2 0.325			

Integrated DOI and TOE model show that these eight hypotheses are accepted in the structural model shown below.

5.2.4.1. Integrated DOI and TOE: Correlation Table

Here is the correlation matrices of RA, SPC, CS, COMP, COMPX, TMS, TR, CP, and CCA factors adopted from the Structural model (Integrated DOI and TOE) shown below in Table 29. According to Hair *et al.* (2017), there are three ranges of correlation: weak correlation, partial correlation, and strong correlation shown in Table 29.

Table 29. Integrated DOI and TOE: Correlation Table

	RA	SPC	CS	COMP	COMPX	TMS	TR	CP	CCA
RA	**1**								
SPC	-0.234	**1**							
CS	0.610	0.048	**1**						
COMP	0.669	-0.322	0.527	**1**					
COMPX	-0.398	0.549	-0.287	-0.405	**1**				
TMS	0.641	-0.247	0.436	0.839	-0.322	**1**			
TR	0.510	-0.157	0.367	0.765	-0.380	0.905	**1**		
CP	0.431	-0.180	0.398	0.604	-0.093	0.705	0.519	**1**	
CCA	0.395	-0.379	0.273	0.586	-0.356	0.613	0.417	0.452	**1**

(below 0.3: weak, 0.3-0.7: moderate, above 0.7: strong) (Hair et al. (2017))

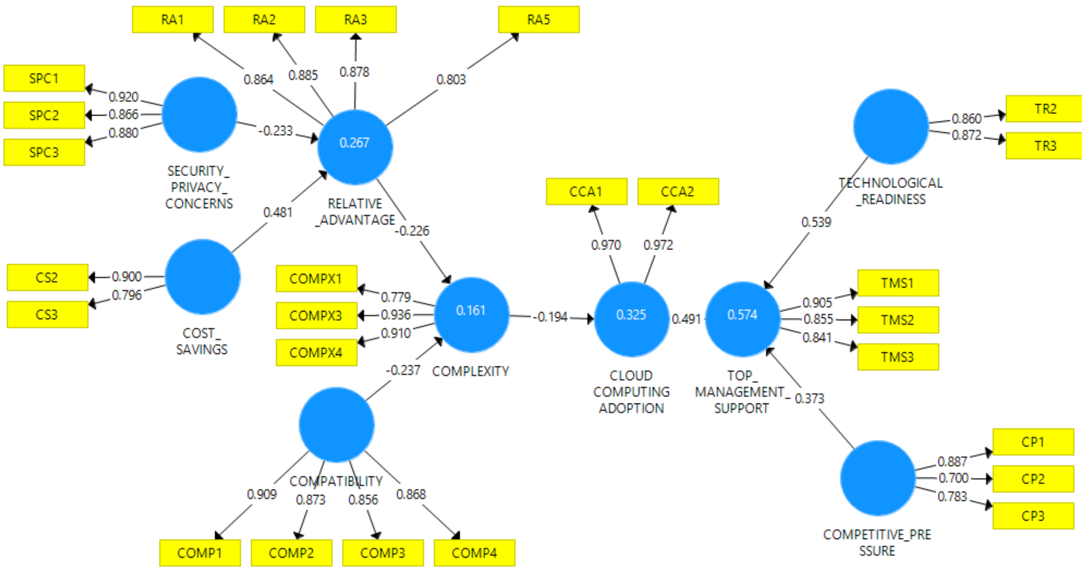
5.2.4.2. Integrated DOI and TOE: Path Analysis Result

Here is the path analysis results of RA, SPC, CS, COMP, COMPX, TMS, TR, CP and CCA factor adopted from Structural model (Integrated DOI and TOE) shown below in Figure 35.

CC adoption using DOI and TOE resulted in R^2= 0.325, i.e. the variables described above in Figure 34 explained 32.5 percent of the variance of CC adoption. Security and privacy concerns (SPC) and cost savings (CS) explained 26.7 percent of the variance of relative advantage (RA). Relative advantage (RA) and compatibility (COMP) explained 16.1 percent of the variance of complexity (COMPX). Technological readiness (TR) and competitive pressure (CP) explained 57.4 percent of the variance of top management support (TMS).

COMPX and TMS are full mediators as the direct effects of RA, SPC, CS, COMP on CCA are not significant. The indirect effect (-0.226*0.194) = -0.047 of RA and (-0.237*0.194) = -0.045 of COMP in DOI is significant. The indirect effect (0.491*0.539) = 0.264 of TR and (0.491*0.373) = 0.338 of CP in TOE is also significant.

Figure 35. Path Analysis Results of DOI& TOE



6. CHAPTER DISCUSSION

6.1. DISCUSSION OF DESCRIPTIVE ANALYSIS

Cloud Computing Adoption in the city of Izmir, Turkey is widespread but is at the early phase.

Cloud Adopters

56.3% of companies started adopting cloud computing but 71% of it is IaaS services, 48% of it is PaaS services, 44% of it is SaaS services and %34 of it is Security as services or other services.

Of 56.3 % of companies, 69.9% of companies are large companies, 62.2% of companies are small and medium companies. 62% of companies are companies driving in the international market. 60.2% of companies are service sector. 55.8% of companies are the production sector. 52.4% of companies are companies driving in the national market. 45.5% of companies are micro-companies.

Cloud Computing Adoption of Distinct Category of Companies by Services

- Most of the cloud adopters are large companies with 69.9%, whereas the least cloud adopters are micro-companies with 45.5%
- The rank of cloud adoption by firm size is firstly large companies, secondly small and medium companies, thirdly micro-companies.
- The service sector tends to adopt cloud computing more than the production sector.
- Companies driving in international markets tend to adopt cloud computing more than companies driving in national markets.

IaaS Adoption

- By categories and firm sizes, large companies are the company type that adopts IaaS the most. The more staff in the company, the more likely IaaS adoption is preferred.

- The service sector is by far more likely to adopt IaaS than the production sector.
- Companies driving in international markets are slightly more likely to adopt IaaS than companies driving in national markets.

PaaS Adoption

- By categories, companies driving in the international market is the company type that adopts PaaS the most.
- Small and Medium companies are the most PaaS adopting by firm sizes. Large Companies are the second of PaaS adopters. Micro companies are also the last of PaaS adopters.
- The service sector adopts PaaS more than the production sector.
- Companies driving in international markets are more likely to adopt PaaS than companies driving in national markets.

SaaS Adoption

- Companies driving in the international market is the company type that adopts SaaS the most.
- Small and Medium companies are the most SaaS adopting by firm sizes. Large Companies are the second of SaaS adopters. Micro companies are also the last of SaaS adopters.
- The service sector adopts SaaS more than the production sector.
- Companies driving in international markets is double more PaaS adopting than companies driving in national markets.

Innovation Adopter Lifecycle of Distinct Category of Companies

As shown in Figure 35, large companies, companies driving in the international market, and service companies are innovators of cloud computing adoption. Companies driving in the national market, small and medium companies, and micro companies are the early or late majority of cloud computing adoption. The production sector is laggards.

Integration needs of Distinct Category of Companies

The integration need of the production sector is the combination of distinct software from one cloud provider because of complex tasks or operations. The integration need of service sector is the combination of distinct software from one or many cloud provider with security as a service because of security concerns

The integration needs of companies driving in the national market are the combination of distinct software from one cloud provider because of complex tasks or operations. The integration needs of companies driving in the international market are a combination of distinct software from one or more cloud providers because of security concerns.

The integration need for micro-companies is distinct software from different cloud providers because of small project tasks. The integration need for small and medium companies is the combination of distinct software from one or many cloud providers if a qualified IT department is set. The integration need for large companies is the combination of one or many software from different cloud providers if a qualified IT department is set.

Service Level Agreement Contracts needs of Distinct Category of Companies

SLA contracts of the production sector, service sector, companies driving the national market, companies driving in the international market, and large companies should be in the subscription pricing model with cloud providers. Small-medium companies can either select a subscription pricing model or pay-per-use model. Micro companies should be in the pay-per-use model.

Cloud Computing Architectural plan for Adoption

The production sector and large companies should build an in-house development team to adapt their IT scenario posed by the cloud provider's API. Companies driving in the national market, companies driving in the international market, small and medium companies, and the service sector can build an in-house development team or can outsource from Cloud Provider. Micro companies should assign a couple of people to adapt to their IT scenario.

Discussions of cloud computing adoption of a distinct category of companies, innovation adopter lifecycle of a distinct category of companies, integration needs of a distinct category of companies, service level agreement contracts needs of a distinct category of companies, and cloud computing architectural plan for adoption are discussed. Distinct types of companies' positions towards cloud computing adoption are shown below.

Non-Cloud Adopters

43.7% of companies didn't adopt cloud computing. Of the 43.7 % of companies, 30.1 % of companies are large companies, 37.8% of companies are small and medium companies. 38% of companies are companies driving in the international market. 39.8% of companies are service sector. 47.6% of companies are companies driving in the national market. 54.5% of companies are micro-companies. 55.8% of companies are the production sector.

The phase of the business for planning cloud computing adoption by Distinct Category of Companies

All distinct categories of companies mostly don't consider adopting cloud computing. Large companies are the only category that the under evaluation of cloud computing adoption is high.

- Micro companies (61.1%) are more likely not to consider adopting cloud computing. All types of companies that are between 38.5% (large companies) - 61.1% (micro-companies) mostly don't consider adopting cloud computing.
- The service sector (26.1%) is more likely to consider and plan cloud computing adoption in the future. All types of companies that are between 7.7% (large companies) - 26.1% (service sector) consider and plan to adopt cloud computing in the future.
- Large companies (15.4%) are more likely to consider but not plan to adopt cloud computing. All types of companies that are between 7.1% (small and medium companies) - 15.4% (large companies) consider and not plan to adopt cloud computing in the future.
- Large companies (38.5%) are most of all company types that they are now in the evaluation process of cloud computing adoption. All types of companies that are between 13.9% (micro-companies) - 38.5% (large companies) consider adopting

cloud computing that is under evaluation in the future.

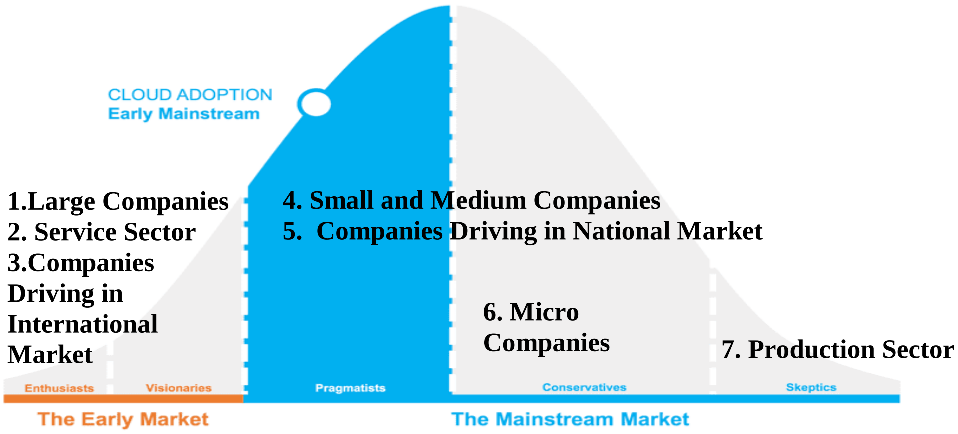
The Reasons for Not Adopting Cloud Computing of Distinct Category of Companies

The production sector and companies driving in the national market will be an innovator if business processes adoption issues are solved. The service sector will be an innovator if security concerns' solutions are guaranteed by cloud providers.

Companies driving in the national market will be an innovator if business processes adoption issues are solved. Companies driving in the international market will be an innovator if competitive pressure is set.

Micro companies will be an innovator if business processes adoption issues are solved and micro-companies can trust regulations and laws in Turkey. Small and medium companies will be innovators if they satisfy their risk, quality, and performance requirements and educate their staff. Large companies will be innovators if they don't feel insecure about cloud providers as shown in Figure 36.

Figure 36. Innovation Adopter Lifecycle of Distinct Companies



6.2. DISCUSSION OF CONFIRMATORY FACTOR ANALYSIS OF STRUCTURAL MODEL (AN INTEGRATED DOI AND TOE MODEL)

Here is the hypothesis of an integrated DOI and TOE theory mentioned below.

H1. Relative advantage will negatively influence the complexity. (Supported)

The more increased advantage and characteristics of cloud computing services obtained by the companies over their old technology, the less complex the company has. On-demand self-service, broad network access, resource pooling, rapid elasticity, measured service, scalability, accessibility of users, agility, robust, security, and cost are important characteristics of cloud computing that decreases complexity.

- Cloud computing gives companies the ability to access as a subscriber or pay-per-user. (On-demand self and measured service)
- Cloud computing gives companies the ability to access software, platforms, and infrastructure from anywhere to anytime by remote devices by typing name and password via the internet. (broad network access)
- Platforms, databases, devices, and networks are shared in a pool in cloud computing so in case of emergency, the cloud provider can fix the problems anytime from remote areas. (resource pooling)
- Cloud computing gives the company ability to scale up or down SaaS, PaaS, and IaaS system according to end user's requirement for software, software developer's requirement for platforms, and ICT technician's requirements for infrastructure. (rapid elasticity and scalability)
- Security updates are done and cryptographic passwords are assigned to the end-users and deleted if necessary for authorization. (accessibility of users and security)
- Integration issues of combining distinct software from different providers have emerged in Izmir. Because of the technical weakness of third party cloud providers and of IT development teams in companies. Data integration issues emerged. (agility and robust)
- Because of internet connection loss, during implementation, data transfer interruption has occurred and data loss and cyberattacks can happen. (broad network access and security)
- Because of the lack of bandwidth power of Turkey, companies in Izmir as well as in Turkey are not willing to adopt cloud computing, especially SaaS

and PaaS.

- Alshamaila, Papagiannidis, and Li (2013) and Sallehudin, Razak, and Ismail (2015) found a relative advantage significantly important for English SMEs and the Malaysian public sector, respectively. However, Charlebois, Palmour, and Knoppers (2016) and Hassan and Nasir (2017) opposed the effects of the perceived relative advantage on cloud computing adoption in the Genomics project in Germany and Malaysian SMEs.
- In Turkey, my thesis found that relative advantage directly affects complexity instead of cloud computing adoption.

H1A. Security and Privacy Concerns will negatively influence the relative advantage. (Supported)

The more security and privacy concerns have for adopting cloud computing, the less increased advantage and characteristics of cloud computing services.

- Data loss concern is a primary issue in Turkey. As data, where it stored, is unknown, companies are skeptical about these perceived benefits of technology. There are options for companies. If they need more security, software, platforms, and infrastructure will be in the private cloud which can be a costly option, and data centers of the company are located internal of companies.
- Shared cloud computing services can be a threat as information can be leaked from cloud providers.
- There will be inadequate authorization allowance from an internal intervention of IT departments. There will be logging mobile phones, home tablets, and home desktop PCs issues that information can be stolen.
- Distributed denial of service attacks can happen that the company of IT department and cloud providers should prevent the risk from purchasing internet of things devices with cryptographic infrastructure and cryptographic passwords, smartphones and Embedded SIM Specification to identify devices on mobile networks.
- Phishing and social engineering attacks can happen and are sent to the staff's emails. In case of clicking on it, the company's information can be disclosed.

- When companies combine distinct software from different providers (multiple cloud providers), there will be integration issues in which companies' databases are not integrated with distinct software from different providers. Even they have backups, data can be deleted or stolen as manual intervention can step in.
- Sallehudin, Razak and Ismail (2015), Alharbi, Atkins, and Stanier (2016) and Pathan, Jianqiu, Akram, Latif, *et al.* (2017) claimed that perceived security and privacy concerns were not likely to affect the cloud computing adoption in Malaysian public sector, health organizations in Saudi Arabia and Pakistani SMEs, respectively. Charlebois, Palmour, and Knoppers (2016) and Lynn *et al.* (2018) proved that perceived security and privacy concerns affect cloud computing adoption in genomics research in Germany and Irish companies, respectively.
- Oliveira, Thomas, and Espadanal (2014) found that security and privacy concerns in Portuguese companies, service companies, and production companies don't affect the relative advantage. My thesis found that security and privacy concerns directly affect relative advantage.

H1B. Cost savings will positively influence the relative advantage. (Supported)

The more cost savings have for adopting cloud computing, the less increased advantage and characteristics of cloud computing services obtain.

There are six phases of cloud computing adoption .

- ***Strategic Decision, Selection of Cloud Computing Services (Between 12 hours and 18 hours) (11.7%)***

  Cloud Types Information for decision making (%0.8) Expenditure of Time

  Initial costs (10.9%)

- ***Evaluation and selection of Cloud provider (Around 30hours) (13.6%)***

  Evaluation and selection of Cloud provider (%10.6) Expenditure of Time

- ***Service Charge IaaS (20.4%)***

  Storage capacity (720 hours) (10.2%): 1000 GB $0.14 per GB

  Computing power (8.5%): For 8 months $0.14 per GB, First two months $0.48 per GB

  Outbound data transfer (%1.7): 199 GB $0.12 per GB

- ***Implementation, configuration, integration and migration (Around 50 hours) (34.0%)***

  Implementation, configuration, integration and migration (%34.0) Expenditure of Time

  $112 per hour

- ***Maintenance and Modifications (2 hours per month) (%16.3%)***

  Maintenance and Modifications (%16.3) Expenditure of Time $112 per hour

- ***System Failure (%4)***

  System failure (%3.6) Expenditure of Time $50 per month

In Turkey, at the beginning implementation, configuration, integration and migration (34%), maintenance and modification costs (%16.3), and selection of cloud provider costs (13.6%) are the key costs considered that increase relative advantage of cloud computing over traditional IT.

In Izmir, there are variable costs the companies should be considered.

- Extra charge for users in SaaS
- Extra chargers for the query, transactions such as database queries in API (Application Programming Interface) in PaaS, Extra charge for every 30 minutes of telephone support in PaaS (3.6%).
- Extra chargers for RAM, storage capacity (10.2%), and outbound or inbound data transfer (1.7%) in IaaS bring to increase variable costs.
- Companies should include upgrade edition (if cloud provider changing or new service features), integration and migration costs in SLA contracts for the future to prevent themselves from surprising costs.

- Alajmi *et al.* (2018), Bhuyan and Dash (2018), and Lynn *et al.* (2018) proved that cost savings directly affect cloud computing adoption in the education sector in Umman, Indian hospitals, and Irish companies. Sallehudin, Razak, and Ismail (2015) opposed the direct effects of the perceived cost savings on cloud computing adoption in the Malaysian public sector.
- Oliveira, Thomas, and Espadanal (2014) found that cost savings in Portuguese companies, service companies, and production companies affect the relative advantage. My thesis found that security and privacy concerns directly affect relative advantage.

H2. The compatibility will negatively influence the complexity. (Supported)

The more compatible our culture and values, the less complexity of the company has.

Compatibility depends on the actors' behaviors, attributes of Governments, Operators, Cloud Providers, Companies in Turkey.

Government

- The government should build trust and transparency among actors of local and international cloud providers, third-party cloud providers, companies, and operators.
- The government should be neutral to control these actors not to allow companies to be a monopoly in each product division (IaaS, PaaS, and SaaS).
- Turkey's public tender law provides a price preference of up to 15 percent for domestic cloud providers Deloitte (2016).
- Commercial Code of Laws, the copyright law, Industrial Property Law is at an early stage to protect fair competition under the establishment of the Turkish Patent and Trademark Office Deloitte (2016).
- The government should conduct government based IT conferences or IT cloud computing product fairs to make Cloud providers and companies meet to increase awareness of the benefits of cloud computing adoption for top managers.
- The government should make comprehensive broadband plans with 4G operators (Turkcell, Türk Telekom, and Vodafone) and contact with known

cloud providers such as Google, Microsoft, SAP, and Oracle to make investment plans for the Turkish market. SaaS use of companies can be expected to be increased in that way.

- Popular known Cloud Providers, Operators (Turkcell, Türk Telekom, and Vodafone) and High-Tech Investors should make competitions and contests for platform software developers to increase the number of high quality of IT employees. PaaS use of companies can be expected to be increased in that way.

Cloud Provider

- Turkish culture, Popular known IT brands (Amazon and Google)dominate the market. Cloud providers should invest entrepreneurs by supporting infrastructure by building incubation centers to Izmir Technoparks. Turk Telekom Incubation in IYTE and Depark in Dokuz Eylul University support new start-ups to increase the competitiveness over the ICT sector
- In Izmir, cloud providers should build interoperable (integrated monitoring control), portable (switch cloud provider if required) and usable (ease of use GUI, integrative Cloud API, and virtual infrastructure solutions) to build secure networks among interfaces, platforms and mobile with an experienced IT team to reach employee fit of tasks.
- There are hesitations of cloud providers to enter the market because of broadband policy and priorities of domestic cloud providers, companies prefer to make more expenses with the least minimum experienced IT support. Companies pay the bill and sign strict SLA contracts. Cloud Providers should be under control by the government by making laws.

Companies

In Izmir, to reduce complexity

- Companies should build an IT team not only for implementation but also for integration and in case of switching the product.
- Sofware capable IT staff, qualified platform developers, and expert technicians can be needed to integrate the whole system.
- Companies should examine the content of the SLA contract with their own IT

team and the cloud provider's team.

- Companies don't tend to work with multi-cloud providers because of integration issues that drive companies unproductive.
- If the integration of distinct services from different cloud providers required, there should be a well-designed cloud implementation plan and IT departments of companies should be educated to integrate the adoption of services.

Deil and Brune (2017), Bhuyan and Dash (2018) and Lynn et al. (2018) proved that compatibility affects cloud computing adoption in German SMEs, Indian hospitals, Irish SMEs. On the other hand, Oliveira, Thomas, and Espadanal (2014), Alismaili et al. (2016), and Hassan and Nasir (2017) claimed that perceived compatibility was not likely to affect the adoption in Portuguese companies, Australian SMEs and Malaysian SMEs.

In Turkey, my thesis found that compatibility directly affects complexity instead of cloud computing adoption.

H3. Complexity will negatively influence cloud computing adoption. (Supported)

The less complexity of the company has, the increased probability of cloud computing adoption has.

- Top managers should build a lack of legacy, high control compliance, and high interoperability standards to their company to decrease complexity.
- SLA contracts serve as both the blueprint and warranty for cloud computing
- SLA contracts should include the details of services to make a clear and apparent understanding of cloud computing implementation.
- SLA includes availability, response times, security/privacy of the data, Disaster Recovery expectations, Location of the data, Access to the data, Portability of the data process to identify problems and resolution expectations, Change Management process, Dispute mediation process, Risk management, Traceable access controls and Exit Strategy with expectations on the provider to ensure a smooth transition
- In Izmir, trialability should be offered to prohibit companies from suffering

costly and timely.

- Portability of the data and exit strategy data is hard in Izmir to change cloud providers. Some compensations make companies cloud provider lock-in
- GUI systems should be developed for SaaS by third-party cloud providers or IT department or both to develop web-based applications for end-users
- Third-party cloud providers or IT departments or both to configure, maintain, and develop the interface for platforms, virtual servers, and applications, integrating with mobile applications for end-users, should develop API systems for PaaS.
- The terminal interface should be developed for IaaS to configure, maintain, and develop an interface for platforms for infrastructures.
- In multi-service use from distinct cloud providers, GUI systems, API systems and terminal interface implementation should be built with decoupled (ayrı) IT groups, operating independently each other for each cloud provider. Afterwards, the company's IT team should integrate these services that high qualified IT departments are needed that can be costly, time-consuming. Business process adoption issues or increasing productivity emerge.
- Oliveira, Thomas and Espadanal (2014), Gangwar, Date, and Ramaswamy (2015), Gutierrez, Boukrami and Lumsden (2015), Alkhalil, Sahandi and John (2017) and my thesis were found the complexity significantly important on the adoption in Portuguese companies, Indian companies, English companies, English SMEs and Izmir companies. However, Sallehudin, Razak, and Ismail (2015) and Hassan and Nasir (2017) opposed the perceived complexity effects on cloud computing adoption in the Malaysian public sector and Malaysian SMEs.

H4. Top management support will positively influence cloud computing adoption. (Supported)

The more top management support of the company has, the increased probability of cloud computing adoption has.

In Izmir, Top management must take part in the process of CC adoption actively and form the IS human resource depending on the company's IT needs.

- The key point is IT managers should be authorized in the decision process. IT staff should be in the process.
- Top management should be aware of the benefits of this technology and specify a clear vision for the company.
- Top management should conduct market analysis (SWOT analysis, PEST analysis)for the adoption and benchmark the competitors (Porter’s 5 competitive forces)to align their businesses
- In Izmir, they are usually consulted by proprietary cloud providers such as Amazon Partners, Cisco Partners, Microsoft Partners, Google Partners, and Salesforce.
- Top management should interview the companies who deal with IT infrastructure and should consult with IT decision-makers of the company for available tools and applications conforming to the company's needs.
- Top management should choose a cloud technology, plan the budget for Cost-Benefit Analysis Return of investment(ROI) Operating Expenditure (OPEX) / Capital Expenditures (CAPEX)) and design the process of adoption and migration with IT decision-makers.
- Top managers should first select the software and secondly set up the servers with recommended hardware requirements. And finally, they should create the routing with the intranet and install a firewall.
- SLA contracts should be negotiable, have a clear understanding, and have more detailed between top management and cloud providers.
- Companies must also know the capabilities and limitations of IT staff. Top management should determine with IT managers together and authorize the appropriate IT staff to the appropriate processes.
- Cloud providers and companies should train the staff based on the specific cloud services which are in use.
- To use traditional IT, companies need to have strong qualified IT staff. To focus on their market, they prefer cloud computing with qualified end-users. The issue in Izmir, companies have a limited IT department. They have to give control of their data and their system to the cloud providers. It causes

strict SLA contracts. As they don't have control, their decision has become in the cloud provider's hand. Top managers should form an IT team and prepare educative programs for IT staff and end-users given by cloud providers.

- Because of the lack of awareness of top management support, financial miscalculations, technical unintegrated human and business operations interaction, companies in Izmir have struggled to adopt cloud computing. Top management in Izmir companies is likely to be strict with famous cloud providers.
- Oliveira, Thomas and Espadanal (2014), Gutierrez, Boukrami and Lumsden (2015), Kyriakou *et al.* (2017) and Al-Hujran *et al.* (2018) proved that top management support is not significantly important, based on the Portuguese manufacturing sector, UK companies, ceramic and cement sectors in six European countries (Germany, France, Italy, Poland, Spain, and the UK) and Jordan companies.
- Oliveira, Thomas, and Espadanal (2014), Alkhalil, Sahandi, and John (2017), Deil and Brune (2017) and my thesis found that top management supports highly affect the adoption, based on the Portuguese service sector and companies, English SMEs, German SMEs, and Izmir companies.

H4A. Technological readiness will positively influence top management support. (Supported)

The more technological readiness of the company and its country has, the increased involvement of top management support.

- Turkey's national broadband strategy is only in the early stages of development conducted by The Information and Communications Technologies Authority (ICTA).
- The government should make comprehensive broadband plans with 4G operators and contact with known cloud providers such as Google, Microsoft, SAP, and Oracle to make investment plans for Turkish companies.
- Because of the lack of broadband deployment, top management in Izmir is skeptical and vagueness about the adoption.
- Top management should consider their fixed broadband subscriptions (as

Gb), broadband data connection speed (as Gb), active mobile broadband subscriptions, and active mobile data connection speed (as Gbps). for data integration, transfer, and portability.

- Internet bandwidth, Fixed Broadband Subscriptions, Broadband Data Connection Speed, Fiber to the home building, Active Mobile Broadband Subscriptions, and Active Mobile Data Connection Speed are at the below-average phase in Turkey.

Internet bandwidth in Turkey (The Software Alliance (2018)) ***(90 out of 234 countries)***

Here is the internet bandwidth in Turkey and the world.

- Internet Bandwidth 59,034 Gbps per internet users in Turkey
- Internet Bandwidth 97,747 Gbps per internet users in the world's average

Fixed Broadband Subscriptions in Turkey (The Software Alliance (2018) ***(17 out of 35 countries)***

Here is the fixed broadband subscription in Turkey and the world.

- Fixed Broadband Subscriptions 12% (9.9 million subscriptions)of the Turkish population (29% increased from 2016). 17.9% of fixed broadband subscriptions are fiber subscription (FttH, FttP and FttB connections)
- DSL (9.6%)
- Fiber (2.3%)
- Cable (0.9%)
- Fixed Broadband Subscriptions 21% of the world's population.

Broadband Data Connection Speed

Here is the broadband data connection speed in Turkey and the world.

- The average speed is 7.56 Mbps in Turkey**. (87 out of 239 countries)**
- The average speed is 12 Mbps in the World
- The average peak broadband connection speed is 50.05 Mbps in **Turkey(89 out of 239 countries)**
- The average speed is 70 Mbps in the world.

Broadband Data Connection Speed

Here is the broadband data connection speed in Turkey and the world.

- Above 4Mbps 76%(**83 out of 239 countries)**
- Above 10Mbps 19% **(85 out of 239 countries)**
- Above 15Mbps 8% **(86 out of 239 countries)**
- Above 25Mbps 2% **(87 out of 239 countries)**

FTTx (Fiber to the business building/ Internet subscriptions) (Fixed Broadband Subscriptions). (9 out of 20 countries)

Here is the fiber to the business building/ ınternet subscriptions in Turkey and the world.

- From 15% in 2014 to 17.6% in 2018 in Turkey 23% in the world

Active Mobile Broadband Subscriptions (82 out of 236 countries)

Here are the active mobile broadband subscriptions in Turkey and the world.

Active Broadband Subscriptions 51% of the Turkish population (19% increased from 2014).

- 51% of Turkey
- 77% in the World

Here is the active mobile data connection speed in Turkey and the world.

Active Mobile Data Connection Speed (33 out of 70 countries)

- 10.3% in Turkey
- 11.0% in the World

Oliveira, Juliomurlick, and Pereira (2013), Oliveira, Thomas and Espadanal (2014) and Hassan *et al.* (2017) found that technological readiness was found significantly important, based on Portuguese companies, Portuguese firms, and Malaysian SMEs.

On the other hand, Alkhalil, Sahandi, and John (2017) and Deil and Brune (2017a) opposed the perceived technological readiness effects on cloud computing adoption, based on English SMEs and German SMEs.

In Turkey, my thesis found that technological readiness directly affects top management instead of cloud computing adoption.

H4B. Competitive pressure will positively influence top management support. (Supported)

The more competitive pressure of the company and its country has, the increased involvement of top management support.

Competitive Environment of IaaS (Miss Majors, 2019)

- There is a high exit barrier percentage for IaaS. There is fierce competition as companies must compete for the same customers and products that similar to other companies.
- There are high integration and migration costs for terminals.
- IaaS has the least bargain power of buyers and has major bargain power of cloud providers as they have high switching costs.

Competitive Environment of SaaS and PaaS (Miss Majors, 2019)

- There is a low exit barrier percentage for SaaS and PaaS. There is the least competition as companies must compete for the different customers, products, and sectors that different sizes of companies.
- There are high integration and migration costs of SaaS for GUI and There are high integration and migration costs of PaaS for API.
- SaaS has a major bargain power of buyers and less bargain of power cloud providers as they have low switching costs.
- PaaS has the least bargain power of buyers and major bargain of power cloud provider as they have high switching cost

In Izmir, top managers should select IaaS providers and check the offers of cloud providers by taking into consideration of same cloud provider’s SaaS and PaaS services. If it is not convenient, check other cloud providers because IaaS is not easy to quit. However, SaaS and PaaS are easy to quit. Choose IaaS provider as a priority as prices can also be higher than PaaS and SaaS.

E-Commerce, e-Business, mobile computing, data mining, internet of things, artificial intelligence, and big data needs gaining from SaaS and PaaS stimulate companies to be in fronts for the competition.

Gangwar, Date, and Ramaswamy (2015) and Hassan *et al.* (2017) reported that there is a significant relationship between competitive pressure and the adoption, based on Indian companies and Malaysian SMEs.

Oliveira, Thomas, and Espadanal (2014) and Alismaili, Li, and Shen (2016) claimed that competitive pressure is not significantly important, based on Portuguese companies and Australian SMEs.

In Turkey, my thesis found that competitive pressure directly affects top management instead of cloud computing adoption.

7. CHAPTER CONCLUSION

As the internet progresses, cloud computing has become one of the most important IT decisions for companies. For companies to position fast in the competitive markets, they outsource infrastructure, platform services, and software services instead of having them within their companies. Based on descriptive analysis, this study makes discussions and recommendations to production, service companies, companies, driving in national markets, companies driving in international markets, micro companies, small and medium companies, and large companies in terms of the steps of cloud adoption based on benefits and drawbacks of CC.

- What is the perception view of cloud adopters and non-cloud adopters companies for the decision making process on Cloud Computing adoption in Izmir?

The answers to research question 1 are mentioned below.

For cloud adopters, reducing costs is the most important reason for adopting cloud computing for large companies in Izmir. Increasing productivity is the most important reason for adopting cloud computing for the production sector and micro companies in Izmir. Work collaboratively from remote is the most important reason for adopting cloud computing for the service sector, companies driving in the national and international market, small and medium companies, and micro companies in Izmir.

For non-cloud adopters, the business process adoption issue is the most important reason for not adopting cloud computing for the production sector, companies driving in the national and international market, large companies, small and medium companies, and micro companies in Izmir. The security concern is the most important reason for not adopting cloud computing for the service sector and companies driving in the international market in Izmir.

- What are the critical innovation decision-making and external factors of Cloud Computing adoption?

Implementation, configuration, integration and migration, maintenance and modifications and system failure affects cost savings that are important to obtain the benefits of the relative advantage of cloud computing over the old system. Data loss concern, Shared cloud computing services, inadequate authorization allowance, Distributed denial of service attacks are Phishing and social engineering attacks security concerns that are important to obtain the benefits of the relative advantage of cloud computing over the old system.

Relative advantage depends on agility, robust, security, and integration issues in Turkey that affect the complexity of cloud computing adoption to build an IT infrastructure strategy. Compatibility depends on the actors' behaviors, attributes of Governments, Operators, Cloud Providers, Companies in Turkey that are important to affect the complexity of cloud computing adoption to build an IT infrastructure strategy. Internet bandwidth and fiber to the business building/ internet subscription affects technology readiness that is important for affecting top management of companies to build an IT infrastructure strategy

Competitive pressure of companies depends on the SaaS, PaaS, and IaaS cloud provider's products and entry-level of the Turkish market that affects the top management of companies to build an IT infrastructure strategy. Planning, analysis, design, implementation, pre-during-after implementation phases of top management support are important for affecting cloud computing adoption of companies to build an IT infrastructure strategy.

Top management support and complexity are the critical innovation decision-making factors of Cloud Computing adoption for companies in Izmir. Competitive pressure has changed according to the region (Gangwar, Date and Ramaswamy, 2015) and (Hassan et al., 2017). Far East countries are more likely to be affected based on Indian and Malaysian companies' study.

Technological readiness is less likely to affect small and medium companies in developed countries based on English SMEs, German SMEs, and Portuguese SMEs of Alkhalil, Sahandi, and John (2017), Deil and Brune (2017), and Oliviera et al (2014), respectively. Top management support is more likely to affect service sector and small and medium companies (Oliveira, Thomas, and Espadanal, 2014), (Alkhalil, Sahandi, and John, 2017) and (Deil and Brune, 2017) based on English SMEs, German SMEs, and Portuguese service sector and companies, respectively.

Complexity is the most accepted factor of DOI and TOE (Oliveira, Thomas, and Espadanal, 2014), (Gangwar, Date and Ramaswamy, 2015), (Gutierrez, Boukrami and Lumsden, 2015) and (Alkhalil, Sahandi, and John, 2017) except public sector according to Sallehudin, Razak and Ismail (2015) based on Malaysian public sector.

Compatibility is more likely to affect developed countries and hospitals based on Deil and Brune (2017), Bhuyan and Dash (2018), and Lynn et al. (2018) in German SMEs, Indian hospitals, and Irish SMEs, respectively.

Confirmatory factor analysis stated that complexity and top management support have a key role in determining cloud computing adoption in Izmir.

In confirmatory factor analysis, this study attempts to find the critical factors affecting cloud computing adoption in the landscape market of Izmir. The results showed that TMS directly affects CC adoption and COMPX negatively affects CC adoption. The companies should take into account of TMS and COMPX to determine which cloud services will be used and where cloud services will be deployed. RA and COMP negatively affect COMPX. TR and CP positively affect TMS.

REFERENCES

Abdollahzadegan, A., Hussin, C., Razak, A., Moshfegh Gohary, M., & Amini, M. (2013). The organizational critical success factors for adopting cloud computing in SMEs. Journal of Information Systems Research and Innovation (JISRI), 4(1), 67-74.

Ackermann, T., Widjaja, T., Benlian, A. & Buxmann, P. (2012). Perceived IT security risks of cloud computing: conceptualization and scale development. Proceedings of the Thirty Third International Conference on Information Systems (ICIS 2012), Orlando (January), 1–20. Available at: http://aisel.aisnet.org/icis2012/proceedings/ISSecurity/3/

Ado Ibrahim, Y., Adamu, A., Abdulrahman, S. M., & Muhammad, A. R. (2017). Autonomic cloud computing: A Review. International Journal of Computer (IJC), 26(1), 99-104. Retrieved from https://www.ijcjournal.org/index.php/InternationalJournalOfComputer/article/view/1022

Adrees, M. S., Omer, M. K. & Sheta, O. E. (2016). Cloud computing adoption in higher education (Sudan as a model): A SWOT analysis. American Journal of Information Systems, 4(1), 7–10. http://doi.org/10.12691/ajis-4-1-2

Ahmad, T., & Waheed, M. (2015). Cloud computing adoption issues and applications in developing countries : A qualitative approach. International Arab Journal of e-Technology. 4(2), 84–93.

Akande, A. O., April, N. A. & Van Belle, J. P. (2013). Management issues with cloud computing. ICCC'13: Proceedings of The Second International Conference on Innovative Computing and Cloud Computing, December 1-2, 2013, Wuhan, China. 119-124. http://doi.org/10.1145/2556871.2556899.

Akande, A. O. & Van Belle, J. P. (2016). The use of software as a service by students in higher education institutions: A systematic literature review. ICEC'16: Proceedings of the 18th Annual International Conference on Electronic Commerce: e-Commerce in Smart connected World, August 17 - 19, 2016, Suwon, Republic of Korea 1, 1-6. http://doi.org/10.1145/2971603.2971604

Akar, E., & Mardikyan, S. (2016). Analyzing factors affecting the adoption of cloud computing : A case of Turkey. KSII Transactions on Internet and Information Systems, 10(1), 18–37. http://doi.org/10.3837/tiis.2016.01.002.

Akhusama, P. M., & Moturi, C. (2016). Cloud computing adoption in insurance companies in Kenya. American Journal of Information Systems, 4(1), 11-16. https://doi.org/10.12691/ajis-4-1-3

Al-Dhuraibi, Y., Paraiso, F., Djarallah, N. & Merle, P. (2018). Elasticity in Cloud Computing: State of the Art and Research Challenges', IEEE Transactions on Services Computing, 11(2), 430–447. http://doi.org/10.1109/TSC.2017.2711009

Al-Hujran, O., Al-Lozi, E. M., Al-Debei, M. M., & Maqableh, M. (2018). Challenges of cloud computing adoption from the TOE framework perspective. International Journal of E-Business Research, 14(3), 77–94. https://doi.org/10.4018/ijebr.2018070105

Alajmi, Q., Arshah, R. A., Kamaludin, A., Sadiq, A. S., & Al-Sharafi, M. A. (2018). A conceptual model of e-learning based on cloud computing adoption in higher education institutions. 2017 International Conference on Electrical and Computing Technologies and Applications, ICECTA, Ral Al Khaimah, United Arab a ve

Aldeen, Y. A. A. S., Salleh, M. & Razzaque, M. A. (2015). A survey paper on privacy issues in cloud computing. Research Journal of Applied Sciences, Engineering, and Technology, 10(3), 328–337. http://doi.org/10.19026/rjaset.10.2495.

Alhammadi, A.(2016). A knowledge management based cloud computing adoption making framework, Ph.D. Dissertation, Staffordshire University, 299 p. http://eprints.staffs.ac.uk/2380/1/Alhammadi_PhD%20thesis.pdf. Accessed 15 December 2019.

Alhammadi, A., Stainer, C., & Eardley, A. (2015). The determinants of cloud computing adoption in Saudi Arabia. Second International Conference on Computer Science & Engineering, 70, 55-57. https://doi.org/10.5121/csit.2015.51406

Alharbi, F., Atkins, A., & Stanier, C. (2016). Understanding the determinants of cloud computing adoption in Saudi healthcare organizations. Complex & Intelligent Systems, 2(3), 155–171. https://doi.org/10.1007/s40747-016-0021-9

Ali, M. B., Wood-Harper, T., & Mohamad, M. (2018). Benefits and challenges of cloud computing adoption and usage in higher education. International Journal of Enterprise Information Systems, 14(4), 64–77. https://doi.org/10.4018/ijeis.2018100105

Ali, O., Soar, J. & Yong, J. (2016). An investigation of the challenges and issues influencing the adoption of cloud computing in Australian regional municipal governments, Journal of Information Security and Applications, 27–28, 19–34. http://doi.org/10.1016/j.jisa.2015.11.006.

Ali, Z., Gongbing, B., & Mehreen, A. (2018). Understanding and predicting academic performance through cloud computing adoption: a perspective of the technology acceptance model. In the Journal of Computers in Education (Vol. 5). https://doi.org/10.1007/s40692-018-0114-0

Alismaili, S., Li, M., Shen, J. & He, Q. (2016). A multi-perspective approach for understanding the determinants of cloud computing adoption among Australian SMEs. ACIS'2015: Proceedings of the 26th Australasian Conference on Information Systems, November 30- December 4, 2015, Adelaide, Australia, 1-14.

Aljabre, A. (2012). Cloud computing for increased business value. International Journal of Business and Social Science, 3(1), 234–239.

Alkhalil, A., Sahandi, R. & John, D. (2017). An exploration of the determinants for the decision to migrate existing resources to cloud computing using an integrated TOE-DOI model. Journal of Cloud Computing, 6(2), https://doi.org/10.1186/s13677-016-0072-x

Almabhouh, A. (2015). Opportunities of adopting cloud computing in Palestinian industries', International Journal of Computer and Information Technology, 4(1), 103-109. https://www.ijcit.com/archives/volume4/issue1/Paper040114.pdf

Almabhouh, A. & Alzaza, N. S. (2015). Barriers for adoption of cloud computing in the Palestinian industries. European Journal of Computer Science and Information Technology, 3(4), 43–57. https://www.eajournals.org/journals/european-journal-of-computer-science-and-information-technology-ejcsit/vol-3issue-4-august-2015/barriers-for-adoption-of-cloud-computing-in-the-palestinian-industries/

Almubarak, S., S. (2017). Factors Influencing the Adoption of Cloud Computing by Saudi University Hospitals. International Journal of Advanced Computer Science and Applications, 8(1), 41–48. https://doi.org/10.14569/IJACSA.2017.080107

Alshamaila, Y., Papagiannidis, S., & Li, F. (2013). Cloud computing adoption by SMEs in the northeast of England. Journal of Enterprise Information Management, 26(3), 250–275. https://doi.org/10.1108/17410391311325225

Altobishi, T., Podruzsik, S., & Gabor, S.Z. (2018). A review of the security challenges in cloud computing. Proceedings of the 7th International Conference on Research in Science and Technology, Munich. October 19-21, 2018. 30-38. https://www.doi.org/10.33422/8RST.2018.11.38

AlZain, M. A., Pardede, E., Soh, B., & Thom, J. A. (2012). Cloud computing security: From single to multi-clouds. Proceedings of the Annual Hawaii International Conference on System Sciences, 5490–5499. https://doi.org/10.1109/HICSS.2012.153

Amini, M., & Bakri, A. (2015). Cloud computing adoption by SMEs in Malaysia: A multi-perspective framework based on DOI theory and TOE framework.

Journal of Information Technology & Information Systems Research (JITISR), 9(2), 121–135.

Anindra, F., Widjaja, M., Hidayanto, A. N. & Prabowo, H. (2018). Critical components of security framework for cloud computing community : A systematic literature review. International Journal of Pure and Applied Mathematics, 118(18), 3345-3358.

Antoo, M., Gobin, B., & Cadersaib, Z. (2015). PEST Framework for Analysing Cloud Computing Adoption by Mauritian SMEs. Lecture Notes on Software Engineering, 3(2), 107–112. https://doi.org/10.7763/lnse.2015.v3.175

Arifin, W. N. (2018). Confirmatory factor analysis and Raykov's rho, https://www.researchgate.net/publication/325591344_Confirmatory_factor_analysis_and_Raykov's_rho. Accessed 10 September 2019

Armbrust, M., Fox, A., Griffith, R., Joseph, A. D., Katz, R., Konwinski, A., Lee, G., Patterson, D., Rapkin, A., Stoica, I., & Zahaira, M. (2009). Above the clouds: A Berkeley view of cloud computing. Electrical Engineering and Computer Sciences University of California at Berkeley, Technical Report No. UCB/EECS-2009-28. http://www.eecs.berkeley.edu/Pubs/TechRpts/2009/EECS-2009-28.pdf. Accessed 10 November 2019.

Armbrust, M., Fox, A., Griffith, R., Joseph, A. D., Katz, R., Konwinski, A., Lee, G., Patterson, D., Rabkin, A., Stoica, I., & Zahaira, M. (2010). A view of cloud computing. Communications of the Acm, 53(4), pp. 50–58. https://doi.org/10.1145/1721654.1721672

Arpaci, I. (2017). Antecedents and consequences of cloud computing adoption in education to achieve knowledge management. Computers in Human Behavior, 70, 382–390. https://doi.org/10.1016/j.chb.2017.01.024

Astri, L. Y. (2015). A study literature of critical success factors of cloud computing in organizations. Procedia Computer Science, 59, 188-194.

Avram, M. G. (2014). Advantages and challenges of adopting cloud computing from an enterprise perspective. Procedia Technology, 12, 529–534. https://doi.org/10.1016/j.protcy.2013.12.525

Badie, N., Che Hussin, A. R., & Dahlan, H. M. (2014). Cloud computing adoption factors for university administration, Jurnal Teknologi, 70(5), 81–87. http://doi.org/10.11113/jt.v70.3519.

Bannerman, P. L. (2010). Cloud computing adoption risks : State of play. Asia Pacific Software Engineering Conference. https://www.researchgate.net/publication/242018999_Cloud_Computing_Adoption_Risks_State_of_Play

Bayramusta, M. , & Nasir, V. A. (2016). A fad or future of IT?: A comprehensive literature review on the cloud computing research. International Journal of Information Management. 36(4), pp. 635–644. http://doi.org/10.1016/j.ijinfomgt.2016.04.006.

Bento, A., & Bento, R. (2011). Cloud computing: A new phase in information technology management. Journal of Information Technology Management, XXII (1), 39-46. https://www.researchgate.net/publication/267232982_Journal_of_Information_Technology_Management_CLOUD_COMPUTING_A_NEW_PHASE_IN_INFORMATION_TECHNOLOGY_MANAGEMENT Accessed 12 November 2019.

Bhatti, H. J., & Rad, B. B. (2017). Databases in cloud computing: A literature review. International Journal of Information Technology and Computer Science, 9(4), 9–17. http:/doi.org/10.5815/ijitcs.2017.04.02.

Bhuyan, S., & Dash, M. (2018a). Exploring cloud computing adoption in private hospitals in India: An investigation of DOI and TOE model. Journal of Advanced Research in Dynamical and Control Systems, 10(8 Special Issue), 443–451.

Bhuyan, S., & Dash, M. (2018b). Predicting cloud computing adoption in hospitals using regression analysis. Journal of Engineering and Applied Sciences, 13(6), 1436–1441. DOI: 10.3923/jeasci.2018.1436.1441.

Bildosola, I., Rio-Belver, R., Cilleruelo, E., & Garechana, G. (2015). Design and implementation of a cloud computing adoption decision tool: Generating a cloud road. PLOS ONE, 10(7), 2-20. https://doi.org//10.1371/journal.pone.0134563.

Bonett, D. G., & Wright, T. A. (2015). Cronbach's alpha reliability: Interval estimation, hypothesis testing, and sample size planning. Journal of Organizational Behavior, 36(1), 3–15. https://doi.org/10.1002/job.1960

Brabra, H., Mtibaa, A., Sliman, L., Gaaloul, W., & Gargouri, F. (2016). Semantic web technologies in cloud computing: A systematic literature review. Proceedings - 2016 IEEE International Conference on Services Computing, SCC 2016, June 27- July 2, 2016, 1, 744–751. https://doi.org/10.1109/SCC.2016.102

de Bruin, B., & Floridi, L. (2017). The ethics of cloud computing. Science and Engineering Ethics, 23(1), 21–39. https://doi.org/10.1007/s11948-016-9759-0

Brynjolfsson, E., Hofmann, P., & Jordan, J. (2010) Cloud computing and electricity: beyond the utility model. Communications of the ACM, 53(5), 32. https://doi.org/10.1145/1735223.1735234

Bulla, C., Hunshal, B., & Mehta, S. (2016). Adoption of cloud computing in the education system : A survey. International Journal of Engineering Science and Computing, 6(6), 6375–6380. DOI: 10.4010/2016.1532

Buyya, R., Yeo, C. S., & Venugopal, S. (2008). Market-oriented cloud computing: Vision, hype, and reality for delivering IT services as computing utilities. Proceedings - 10th IEEE International Conference on High-Performance Computing and Communications, HPCC 2008, Dalian, China, September 25-27, 2008. 5–13. https://doi.org/10.1109/HPCC.2008.172

Carcary, M., Doherty, E., Conway, G., & McLaughlin, S. (2014). Cloud computing adoption readiness and benefits realization in Irish SMEs—An exploratory study. Information Systems Management, 31(4), 313–327. https://doi.org/10.1080/10580530.2014.958028

Charlebois, K., Palmour, N., & Knoppers, B. M. (2016). The adoption of cloud computing in the field of genomics research: The influence of ethical and legal issues. PLoS ONE, 11(10), 1–33. https://doi.org/10.1371/journal.pone.0164347

Chawla, I. (2018). Cloud Computing Environment: A Review', International Journal of Computers & Technology, 17(2), pp. 7261–7272. https://doi.org/10.24297/ijct.v17i2.7674.

Cheng, F., & Lai, W. (2012). The Impact of Cloud Computing Technology on Legal Infrastructure within Internet — Focusing on the Protection of Information Privacy. Procedia Engineering, 29, 241–251. https://doi.org/10.1016/j.proeng.2011.12.701

Chulkov, D. V. (2018). On the Role of Switching Costs and Decision Reversibility in Information Technology Adoption and Investment. Journal of Information Systems and Technology Management, 14(3), 309–321. https://doi.org/10.4301/s1807-17752017000300001

Coppolino, L., D'Antonio, S., Mazzeo, G., & Romano, L. (2017). Cloud security: Emerging threats and current solutions. Computers and Electrical Engineering, 59, 126–140. https://doi.org/10.1016/j.compeleceng.2016.03.004

Creeger, M. (2009). CTO roundtable: Cloud computing. Communications of the ACM, 52(8), 50-56, https://doi.org/10.1145/1536616.1536633

Cusumano, M. (2010). Cloud computing and SaaS as new computing platforms. Communications of the ACM, 53(4), 27–29. https://doi.org/10.1145/1721654.1721667

Dahiru, A. A., & Abubakar, H. (2018). Cloud computing adoption: A cross-continent overview of challenges. Nigerian Journal of Basic and Applied Sciences, 25(1), p. 23. https://doi.org/10.4314/njbas.v25i1.4.

Dahiru, A. A., Bass, J. M., & Allison, I. K. (2015a). Cloud computing adoption in sub-Saharan Africa: An analysis using institutions and capabilities. In C. A. Shoniregun (Ed.), International Conference on Information Society (i-Society

2014), 98-103. Red Hook, New York: IEEE. https://doi.org/10.1109/i-Society.2014.7009019

Darsi, M. P., D, V. B., & Darsi, G. (2014). Addressing trust issues in cloud computing. International Journal of P2P Network Trends and Technology, 4(1), 1-7. https://www.ijpttjournal.org/archives/ijptt-v4p402

Deil, R., & Brune, P. (2017). Cloudy with a Chance of Usage?-Towards a Model of Cloud Computing Adoption in German SME. In X. Franch, J. Ralyté, R. Matulevičius, C. Salinesi, & R. Wieringa (Eds.), 29th International Conference on Advanced Information Systems Engineering-CAiSE 2017 Forum and Doctoral Consortium Papers, June 14-16, 2017, 65-72.

Deloitte (2019). Information and Communication Technologies (ICT) 2018 Tubisad Market Data. http://www.tubisad.org.tr/en/images/pdf/tubisad_ict_2019_final_eng_20190521_1040.pdf Accessed 01 December 2019

Dhawan, G. (2017). Conceptualization of cloud computing and its security threats, challenges, technologies, and application. International Journal for Research in Applied Science and Engineering Technology, 5(IV), 629–635. https://doi.org/10.22214/ijraset.2017.4112

Dillon, T., Wu, C., & Chang, E. (2010). Cloud computing: Issues and challenges. AINA'2010: Proceedings of the 24th IEEE International Conference on Advanced Information Networking and Applications, April 20-23, 2010, 27–33. https://doi.org/10.1109/AINA.2010.187

The Software Alliance. (2018). BSA Global Cloud Computing Scorecard-Powering a bright future directive, D. P., Framework, P. and Text, E. (2020) 'Country : Turkey', pp. 1–7

Domun, V., & Bheemul, H. (2019). Factors affecting the adoption of cloud computing among SMEs in Mauritius. In: Satapathy S., Bhateja V., Somanah R., Yang XS., Senkerik R. (eds) Information Systems Design and Intelligent Applications. Advances in Intelligent Systems and Computing, 862, 333-336. Springer, Singapore. https://doi.org/10.1007/978-981-13-3329-3_31

Dove, E. S., Joly, Y., Tasse, A-M.. (2015). Genomic cloud computing: Legal and ethical points to consider. European Journal of Human Genetics, 23(10), 1271–1278. https://doi.org/10.1038/ejhg.2014.196

Durao, F., Carvalho, J. F. S., Fonseka, A., & Garcia, V. C. (2014). A systematic review on cloud computing. Journal of Supercomputing, 68(3), 1321–1346. https://doi.org/10.1007/s11227-014-1089-x

El-Gazzar, R. F. (2014). A literature review on cloud computing adoption issues in enterprises. IFIP advances in ınformation and communication technology, AICT-429, 214-242. https://doi.org/10.1007/978-3-662-43459-8

El-Gazzar, R. F. (2015). An overview of cloud computing adoption challenges in the Norwegian context. Proceedings - 2014 IEEE/ACM 7th International Conference on Utility and Cloud Computing, UCC 2014, 412–418. https://doi.org/10.1109/UCC.2014.52

El-Gazzar, R., Hustad, E., & Olsen, D. H. (2016). Understanding cloud computing adoption issues: A Delphi study approach. Journal of Systems and Software, 118, 64–84. https://doi.org/10.1016/j.jss.2016.04.061

El-Gazzar, R., Hustad, E., & Olsen, D. H. (2017). An institutional lens on cloud computing adoption – A study of institutional factors and adoption strategies. ECIS 2017: Proceedings of the 25th European Conference on Information Systems, Guimarães, Portugal, June 5-10, 2017. 2477-2492. https://aisel.aisnet.org/ecis2017_rp/157

El-Gazzar, R., & Wahid, F. (2015). Strategies for cloud computing adoption: Insights from the Norwegian public sector. Proceeding of European, Mediterranean & Middle Eastern Conference on Information Systems - EMOIS, June 1–15, 2015, Athens, Greece. https://www.researchgate.net/publication/279287497_Strategies_for_Cloud_Computing_Adoption_Insights_from_the_Norwegian_Public_Sector Accessed 12 November 2019

Elgelany, A., & Alghabban G. W. (2017). Cloud computing: Empirical studies in higher education a literature review. International Journal of Advanced Computer Science and Applications, 8(10), 121-127. https://doi.org/10.14569/ijacsa.2017.081017.

Erdogmus, H. (2009). Cloud computing: Does nirvana hide behind the Nebula?. IEEE Software (26:2), pp 4-6.

Etro, F. (2009). The economic impact of cloud computing on business creation, employment, and output in Europe - An application of the Endogenous market structures approach to a GPT innovation. Review of Business and Economics, (0)2, 179–208. https://pdfs.semanticscholar.org/c72f/35131bec4456272dd9854a892fd48b645ff6.pdf?_ga=2.100784513.105181449.1579289119-478865811.1560331546 Accessed 01 December 2019.

Eweoya, I., & Daramola, O. (2015). A systematic literature review of mobile cloud computing. International Journal of Multimedia and Ubiquitous Engineering, 10(12), 135–152. https://doi.org/10.14257/ijmue.2015.10.12.15

Fahmideh, M., Daneshgar, F., & Rabhi, F. (2016). Cloud computing adoption: An effective tailoring approach. Australasian Conference on Information Systems, Wollongong, Australia. 1–11. https://aisel.aisnet.org/acis2016/5/

Fichman, R. G., & Kemerer, C. F. (1993). Adoption of software engineering process innovations : The case of object orientation. Sloan Management Review, 34, 7-22.

Furrier, J. (2017). How Andy Jassy Plans To Keep Amazon Web Services On Top Of The Cloud. Forbes. https://www.forbes.com/sites/siliconangle/2017/11/27/exclusive-how-andy-jassy-plans-to-keep-amazon-web-services-on-top-of-the-cloud/#7dc2ea6d2f70 Accessed 01 December 2019.

Gallaugher, J., & Ransbotham, S. (2010). Preparing for the future: understanding the seven capabilities of cloud computing. MIS Quarterly Executive, 9(4), 197-212.

Gangwar, H., Date, H., & Ramaswamy, R. (2015). Understanding the determinants of cloud computing adoption using an integrated TAM-TOE model. Journal of Enterprise Information Management, 28(1), 107–130. https://doi.org/10.1108/JEIM-08-2013-0065

Irshad, M.B.M., Gapar, Md., Johar, Md., & Naleer, H.M.M. (2015). A review on cloud computing adoption: an exploratory analysis. International Journal of Advanced Research in Computer Science and Software Engineering, 5(1), 160-166.

Garrison, G., Wakefield, R. L., & Kim, S. (2015). The effects of IT capabilities and delivery model on cloud computing success and firm performance for cloud supported processes and operations. International Journal of Information Management, 35(4), 377–393. https://doi.org/10.1016/j.ijinfomgt.2015.03.001

Giyane, M., & Buckley, S. (2015). Cloud Computing Adoption in Zimbabwean State Universities: An Empathetic Examination. In P. Cunningham & M. Cunningham (Eds.), IST-Africa 2015 Conference Proceedings, IIMC International Information Management Corporation.

Greenberg, A., Hamilton, J., Maltz D.A., & Patel, P. (2009). The cost of a cloud : research problems in data center networks. ACM SIGCOMM Computer Communication Review, 39(1), 68–73. https://doi.org/10.1145/1496091.1496103

Griebel, L., Prokosch, H.-U., Köpcke, F., Toddenroth, D., Christoph, J., Leb, I., Engel, I., & Sedlmayr, M. (2015). A scoping review of cloud computing in healthcare. BMC Medical Informatics and Decision Making,15, 17. https://doi.org/10.1186/s12911-015-0145-7

Gutierrez, A., Boukrami, E., & Lumsden, R. (2015). Technological, organizational, and environmental factors influencing managers' decision to adopt cloud computing in the UK. Journal of Enterprise Information Management, 28(6), 788-807, https://doi.org/10.1108/JEIM-01-2015-0001

Güner, E. O., & Sneiders, E. (2014). Cloud computing adoption factors in Turkish large scale enterprises. Proceeding of the 19th Pacific Asia Conference on Information Systems PACIS 2014, June 24-28, 2014. 353.

Hair, J. F., Sarsted, M., Ringle, C. M., & Gudergan, S. P. (2017). Advanced Issues in Partial Least Squares Structural Equation Modeling. Sage Publication Inc. 272.

Haris, M., & Khan, R. Z. (2018). A systematic review on cloud computing. International Journal of Computer Sciences and Engineering, 6(11), 632-639. https://doi.org/10.26438/ijcse/v6i11.632639

Hartmann, S. B., Braae, L. Q. N., Pedersen, S., & Khalid Md. S. (2017). The potentials of using cloud computing in schools: A systematic literature review. Turkish Online Journal of Educational Technology, 16(1), 190–202.

Hassan, H., & Nasir, H.M. (2017). Determinants of cloud computing adoption at firm level: from the technological context. Journal of Engineering and Application Sciences, 12 (16): 4186-4192, DOI: 10.3923/jeasci.2017.4186.4192

Hassan, H., Nasir, M.H.M., & Khairudin, N. (2017). Cloud Computing Adoption in Organisations: Review of Empirical Literature. SHS Web of Conference, 34, 02001, https://doi.org/10.1051/shsconf/20173402001

Hassan, H., Nasir, M.H.M., Khairudin, N., & Adon, I. (2017). Factors influencing cloud computing adoption in small and medium enterprises. Journal of Information and Communication Technology, 16(1), 21-41.

Hernández, I., Sawicki, S., Roos-Frantz, F., & Frantz, R. Z. (2015). Cloud configuration modelling: A literature review from an application integration deployment perspective. Procedia Computer Science, 64, 977–983. https://doi.org/10.1016/j.procs.2015.08.616

Hiran, K. K., Henten, A., Shrivas, M. K., & Doshi, R. (2018). Hybrid cloud model in higher education: The case of sub-Saharan Africa, Ethiopia. IEEE International Conference on Adaptive Science and Technology, ICAST, August 22-14, 2018, Ghana-West Africa. 1–9. https://doi.org/10.1109/ICASTECH.2018.8507113

Hoberg, P., Wollersheim, J., & Krcmar, H. (2012). The business perspective on cloud computing-A literature review of research on cloud computing. AMCIS 2012 Proceedings, Research on Cloud Computing August 9-12, 2012, Seattle, 5. http://aisel.aisnet.org/amcis2012/proceedings/EnterpriseSystems/5.

Hsu, P. F., Ray, S., & Li-Hsieh, Y. Y. (2014). Examining cloud computing adoption intention, pricing mechanism, and deployment model. International Journal of Information Management, 34(4), 474–488. https://doi.org/10.1016/j.ijinfomgt.2014.04.006.

Hu, Y., & Bai, G. (2014). A systematic literature review of cloud computing in Health', Health Informatics - An International Journal, 3(4), 11–20. https://doi.org/10.5121/hiij.2014.3402.

Ibrahimi, A. (2017). Cloud computing: Pricing model. International Journal of Advanced Computer Science and Applications, 8(6), 434–441. https://doi.org/10.14569/ijacsa.2017.080658

Iyer, B., & Henderson, J. C. (2010). Preparing for the future: Understanding the seven capabilities of cloud computing. University of Minnesota MIS Quarterly Executive, 9(2), 117-131. https://www.semanticscholar.org/paper/Preparing-for-the-Future%3A-Understanding-the-Seven-Iyer-Henderson/b8755254afaeb761aa4dae12773a47ff73f61c7e Accessed 01 December 2019

Iyer, E.K. (2014). Segmentation of Risk Factors Associated with Cloud Computing Adoption. In Endicott-Popovsky, B. (Ed.), Proceedings of The International Conference on Cloud Security Management ICCSM-2014, October 23-24, 2014, Reading, 82-89, https://doi.org/10.13140/2.1.3875.8088

Jajodia, S., Kant, K., Samarati, P., Singhal, A., Swarup, V., & Wang, C. (2014). Secure Cloud Computing, Springer, New York, NY, 343. https://doi.org/10.1007/978-1-4614-9278-8

Janssen, M., & Joha, A. (2011). Challenges for adoption of cloud-based software as a service (Saas) in the public sector. ECIS 2011 ProceedEuropean Conferences, (2011), pp. 1–12. http://aisel.aisnet.org/ecis2011/80.

Johansson, B., & Muhic, M. (2017). Relativism in the cloud: Cloud sourcing in virtue of IS development outsourcing - A literature review. International Journal of Information Systems and Project Management, 5(4), 55–65. https://doi.org/10.12821/ijispm050404

Jones, S. (2015). Cloud computing procurement and implementation: Lessons learnt from a United Kingdom case study. International Journal of Information Management, 35(6), 712–716. https://doi.org/10.1016/j.ijinfomgt.2015.07.007

Kadhim, Q. K., Yusof, R., Mahdi, H. S., Al-Shami, S. S. A., Selamat, S. R. (2018). A review study on cloud computing issues. Journal of Physics: Conference Series, 1018 (2018) 012006. https://doi.org/10.1088/1742-6596/1018/1/012006

Kalghatgi, S., & Sambrekar, K. P. (2015). Review : Using cloud computing technology in agricultural development. International Journal of Innovative Science, Engineering & Technology, 2(3), 740–745. https://www.researchgate.net/publication/305014626_Review_Using_Cloud_Computing_Technology_in_Agricultural_Development

Karkonasasi, K., Baharudin, A.S., Esparham, B., & Mousavi, S.A., (2016). Adoption of cloud computing among enterprises in Malaysia. Indian Journal of Science and Technology, 9(48), 1-7, https://doi.org/10.17485/ijst/2016/v9i48/88128

Kassahun, A., & Sharma, D. P. (2016). Suitability analytics and cloud computing adoption modelling for educational institutions. International Journal of Information Technology & Computer Sciences Perspectives, 5(3), 2121–2127. https://ssrn.com/abstract=3390015

Katzan, Jr., H. (2010). On an ontological view of cloud computing. Journal of Service Science (JSS), 3(1), 1–6. https://doi.org/10.19030/jss.v3i1.795

Kaur, S., & Sharma, T. (2017). A review on cloud computing. International Journal of Computer Applications, 178(2), 48–54. https://doi.org/10.5120/ijca2017915764

Khajeh-Hosseini, A., Sommerville, I., & Sriram, I. (2010). Research challenges for enterprise cloud computing. https://arxiv.org/ftp/arxiv/papers/1001/1001.3257.pdf Accessed 10 December 2019

Khan, N., & Al-Yasiri, A. (2016). Identifying cloud security threats to strengthen cloud computing adoption framework. Procedia Computer Science, 94, 485–490. https://doi.org/10.1016/j.procs.2016.08.075

Khan, S. U., & Ullah, N. (2016). Challenges in the adoption of hybrid cloud: An exploratory study using systematic literature review. The Journal of Engineering, 5, 107–118. https://doi.org/10.1049/joe.2016.0089

Kulkarni, G., Chavan, N., Chandorkar, R., Waghmare, R., & Palwe, R. (2012). Cloud security challenges. 2012 7th International Conference on Telecommunication Systems, Services, and Applications, TSSA 2012, October, 30-3.2012, Bali, Indonesia, 88–91. https://doi.org/10.1109/TSSA.2012.6366028

Kyriakou, N., Maragoudakis, M., Loukis, E., & Themistocleous, M. (2017). Prediction of propensity for enterprise cloud computing adoption. Proceedings of the 50th Hawaii International Conference on System Sciences, January 4-7, 2017, 4907-4916. https://doi.org/10.24251/hicss.2017.596

Lai, H.-M., Lin, I.-C., & Tseng, L.-T. (2014). High-level managers' considerations for RFID adoption in hospitals : An empirical study in Taiwan. Journal of Medical Systems, 38(3), https://doi.org/10.1007/s10916-013-0003-z

Lasica, J. D. (2009). Identity in the Age of Cloud Computing, Communications. Published in the USA by Aspen Institute https://epdf.pub/identity-in-the-age-of-cloud-computing.html

Lee, Y.-C., & Hanh, T. N. (2012). A Study On Decision Making Factors Of Cloud Computing Adoption Using Bcor Approach. Journal Of Information Technology Services-Korea Society Of It Services, 11(1), 155–171. Https://Doi.Org/10.9716/Kıts.2012.11.1.155

Leimeister, S., Riedl, C., Böhm, M., & Krcmar, H. (2010). The business perspective of cloud computing: Actors, roles, and value networks. Proceedings of the 18th European Conference on Information Systems (ECIS), South Africa, June 7-9, 2010, 1–12. https://aisel.aisnet.org/cgi/viewcontent.cgi?article=1082&context=ecis2010 Accessed 10 December 2019

Lele, A. (2019). Cloud computing. in: Disruptive technologies for the militaries and security, smart innovation, systems and technologies, Editors. R.J. Howlett, L.C. Kain, vol 132, 167-185. https://doi.org/10.1007/978-981-13-3384-2_10

Lian, J. W., Yen, D. C., & Wang, Y. T. (2014). An exploratory study to understand the critical factors affecting the decision to adopt cloud computing in Taiwan hospital. International Journal of Information Management, 34(1), 28-36, https://doi.org/10.1016/j.ijinfomgt.2013.09.004

Lin, H. C., Wu, C. L., & Yang, J. M. (2011). A productivity review study on theory of reasoned action literature using bibliometric methodology. 2011 International Conference on Management and Service Science, 8(64), 38-42. http://www.ipedr.com/vol8/8-S00012.pdf

Lippert, S. K. & Govindrajulu, C. (2006). Technological, organizational, and environmental antecedents to Web services adoption. Communications of the IIMA, 6(1), 147-160.

Loukis, E. & Kyriakou, N. (2015). Cloud computing adoption motivation in the European north and south. Proceedings of the 9th Mediterranean Conference on Information Systems (MCIS), .26, 1-12. https://www.researchgate.net/publication/282851058_Cloud_Computing_Adoption_Motivation_in_the_European_North_and_South Accessed 11 December 2019

Lum, C. (2016). 4 Things Steve Jobs Taught Us About Cloud Computing. Wisenet. https://www.wisenet.co/blog/4-things-steve-jobs-quotes-taught-us-about-cloud-computing Accessed 5 December 2019

Lynn, T., Liang, X., Gourinovitch, A., Morrison, J. P., Fox, G., & Rosati, P.(2018). Understanding the determinants of cloud computing adoption for high performance computing. Proceedings of the 51st Hawaii International Conference on System Sciences, 3894-3903. https://doi.org/10.24251/hicss.2018.489.

M'rhaoaurh, I., Okar, C., Namir, A., & Chafig, N. (2018). Challenges of cloud computing use: A systematic literature review. MATEC Web of Conferences, International Workshop on Transportation and Supply Chain Engineering, 200, 00007, 9. https://doi.org/10.1051/matecconf/201820000007

Ma, S. (2012). A review on cloud computing development. Journal of Networks, 7(2), 305–310. https://doi.org/10.4304/jnw.7.2.305-310

Marston, S., Li, Z., Bandyopadhyay, S., Zhang, J., & Ghalsasi, A. (2011). Cloud computing — The business perspective. Decision Support Systems, 51(1), 176–189. https://doi.org/10.1016/j.dss.2010.12.006

Mas'adeh, R. (2016). Cloud computing perceived importance in the Middle Eastern firms: The cases of Jordan, Saudi Arabia and United Arab Emirates from the operational level. Communications and Network, 8(3), 103-117. https://doi.org/10.4236/cn.2016.83011

Masrom, M. & Rahimli, A. (2014). A review of cloud computing technology solution for healthcare system. Research Journal of Applied Sciences, Engineering and Technology, 8(20), 2150-2153. https://doi.org/10.19026/rjaset.8.1212

Masrom, M. & Rahimli, A. (2015). Cloud computing adoption in the healthcare sector: A SWOT analysis. Asian Social Science, 11(10), 12–18. https://doi.org/10.5539/ass.v11n10p12

Mathur, S. K., & Dhulla, T. V. (2014). Factors influencing professionals' decision for cloud computing adoption. International Journal of Research in Advent Technology, 2(4), 397–401.

Mazrekaj, A., Shabani, I., & Sejdiu, B. (2016). Pricing schemes in cloud computing: An overview. International Journal of Advanced Computer Science and Applications, 7(2), 80-86. https://doi.org/10.14569/ijacsa.2016.070211

McAfee, A. (2011). What every CEO needs to know about the cloud the benefits of the cloud. Harvard Business Review, 2–9. https://whitepapers.em360tech.com/wp-content/files_mf/1363704110HBR_CEO_article_with_Sameer.pdf.

Mell, P., & Grance, T. (2011). The NIST definition of cloud computing. National Institute of Standard And Technology. https://csrc.nist.gov/publications/detail/sp/800-145/final. Accessed 7 September 2019

Miss Majors (2019). Industry Analysis: Cloud Computing. https://www.csus.edu/indiv/h/hattonl/documents/CloudComputingIndustry.pdf. Accessed 26 September 2019

Misra, S. C., & Mondal, A. (2011). Identification of a company's suitability for the adoption of cloud computing and modelling its corresponding Return on Investment. Mathematical and Computer Modelling, 53(3–4), 504–521. https://doi.org/10.1016/j.mcm.2010.03.037

Mohammed, F., Ibrahim, O. & Ithnin, N. (2016). Factors influencing cloud computing adoption for e-government implementation in developing countries: Instrument development. Journal of Systems and Information Technology, 18(3), 297-327, https://doi.org/10.1108/JSIT-01-2016-0001

Mohd Yusoff, Y. (2013). Cloud Computing Adoption by SMEs in the Malaysia: A Multi-perspective framework based on DOI Theory and TOE Framework. Journal of Information, Technology & Information Systems Research, 9(2), 121-135.

Moh, ed, Masa, T., Al-Lozi, M., & Rateb Mahmoud Darawsheh, S. (2015). A Theoretical Study on Cloud Computing Adoption in Jordanian Universities, 4th Scientific & Research Conference on New Trends in Business, Management and Social Sciences, Proceedings, 2(5), 75–89. https://www.researchgate.net/publication/283348437_A_Theoretical_Study_on_Cloud_Computing_Adoption_in_Jordanian_Universities

Moravčík, M., Segeč, P., Uramová, J., Kontšek, M. (2017). Teaching cloud computing in cloud computing. 15th International Conference on Emerging eLearning Technologies and Applications (ICETA), Stary Smokovec, Slovakia, October 26-27, 2017, 1–6. https://doi.org/10.1109/iceta.2017.8102512

Müller, S. D., Holm, S. R., & Søndergaard, J. (2015). Benefits of cloud computing: Literature review in a Maturity model perspective. Communications of the Association for Information Systems, 37(42), 851-878. pp-pp. https://doi.org/10.17705/1CAIS.03742

Neves, F. T., Marta, F. C., Correia, A. M. R., & Neto, M. de C. (2011). The adoption of cloud computing by SMEs : Identifying and coping with external factors. 11a Conferência Da Associação Portuguesa de Sistemas de Informação, (Capsi 2011), October 19-21, 2011. https://www.semanticscholar.org/paper/The-adoption-of-cloud-computing-by-SMEs%3A-and-coping-Neves-Marta/675ada782d49c4f20e4fb3df308c914626a0ea99

Nkhoma, M. Z., & Dang, D. P. T. (2015). Contributing factors of cloud computing adoption: A Technology-Organisation-Environment framework approach. International Journal of Information Systems and Engineering, 1(1), 38-49. https://www.researchgate.net/publication/249992698_Contributing_Factors_of_Cloud_Computing_Adoption_a_Technology-Organisation-Environment_Framework_Approach

Nweke, H. F., Michael, J. S., & Nwogbaga, N. (2015). Main challenges hampering cloud computing adoption by business organizations. Researchjournali's Journal of Information Technology, 2(1), 1–11. https://www.researchgate.net/publication/329033923_Main_Challenges_Hampering_Cloud_Computing_Adoption

Odeh, M., Warwick, K., & Garcia-Perez, A. (2015). The impacts of cloud computing adoption at higher education institutions: A SWOT analysis. International Journal of Computer Applications, 127(4), 15–21. https://doi.org/10.5120/ijca2015906367

Okan, A. A., Hacaloglu, T., & Yazici, A. (2016). Study on cloud computing perception of Turkish IT sector. Tehnički Vjesnik - Technical Gazette, 23(1), 1-8. https://doi.org/10.17559/tv-20131030225745

Oliveira, L. R. De, JulioMurlick, A., Pereira, G. V., & Vicentin, R. (2013). Adoption analysis of cloud computing services. African Journal of Business Management, 7(24), 2362-2374. https://doi.org/10.5897/AJBM12.1333

Oliveira, T., & Martins, M. F. (2011). Literature review of information technology adoption models at firm level. The Electronic Journal Information Systems Evaluation, 14(1), 110–121. www.ejise.com

Oliveira, T., Thomas, M., & Espadanal, M. (2014). Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors. Information and Management, 51(5), 497–510. https://doi.org/10.1016/j.im.2014.03.006

Pallis, G. (2010). Cloud Computing: The New Frontier of Internet Computing. IEEE Computer Society, 70-73.

Paredes-Gualtor, J., Moscoso-Zea, Oç, Saa, P., Sandoval, F., & Rodas, P. (2018). Unified cloud computing adoption framework. Proceedings - 2017 International Conference on Information Systems and Computer Science, INCISCOS 2017, November 23-25, 2017, Quito, Ecuador. 247–252. https://doi.org/10.1109/INCISCOS.2017.58

Parker, C. M., & Castleman, T. (2009). Small firm e-business adoption: A critical analysis of theory. Journal of Enterprise Information Management, 22(1/2), 167-182. https://doi.org/10.1108/17410390910932812

Pathan, Z. H., Jianqiu, Z., Akram, U., Latif, Z., Khan, M. K., & Tunio, M. Z. (2017a). Essential factors in cloud-computing adoption by SMEs, Human Systems Management, 36(4), 261–275, https://doi.org/10.3233/HSM-17133

Pathan, Z. H., Jianqiu, Z., Akram, U., Khan, M. K., Latif, Z., & Tunio, M. Z. (2017b). Innovation-diffusion determinants of cloud-computing adoption by Pakistani SMEs. Human Systems Management, 36(3), 197–209. https://doi.org/10.3233/HSM-171794

Perdana, A. P., & Suharjito, S. (2017). Cloud computing implementation using model roadmap for cloud computing adoption (ROCCA) in PT Matrica consulting service. Comtech, 8(3), 145-153, https://doi.org/10.21512/comtech.v8i3.3887

Peshin, R., Dhawan, A. K. (eds.) (2009). Integrated Pest Management: Dissemination and Impact, Diffusion of Innovation Theory and Integrated Pest Management. Springer Science+Business Media B.V.1-29. https://doi.org/10.1007/978-1-4020-8990-9

Pesl Murphrey, T., & Dooley, K. E. (2010). Perceived strengths, weaknesses, opportunities, and threats impacting the diffusion of distance educaton technologies in a college of agriculture and life sciences’, Journal of Agricultural Education, 41(4), 39–50. https://doi.org/10.5032/jae.2000.04039.

Priyadarshinee, P., Jha, M. K., Raut, R. D., & Kharat, M. G. (2016). Risk analysis in adoption of cloud computing in SMEs-a literature review. International Journal of Business Information Systems, 23(1), 54-86. https://doi.org/10.1504/ijbis.2016.078023

Priyadarshinee, P., Raut, R. D., Jha, M. K., & Gardas, B. B. (2017). Understanding and predicting the determinants of cloud computing adoption: A two staged hybrid SEM - Neural networks approach. Computers in Human Behavior. 76 , 341–362. https://doi.org/10.1016/j.chb.2017.07.027

Pyae, A. (2018). Cloud computing in business intelligence cloud computing in business intelligence. Asia Pacific University of Technology and Innovation. https://www.researchgate.net/publication/333037033_Cloud_Computing_in_Business_Intelligence Accessed 12 December 2019

Qasım, H. & Abu-Shanab, E. (2014). Cloud computing risks & business adoption. 4(2), 52-63. https://www.researchgate.net/publication/264977131_Cloud_Computing_Risks_Business_Adoption Accessed 11 November 2019

Ranger, S. (2016). Quantum cloud computing could arrive in the next decade, says bill gates. zdnet https://www.zdnet.com/article/quantum-cloud-computing-could-arrive-in-the-next-decade-says-bill-gates/ Accessed 25 November 2019

Rasheed, H. (2014). Data and infrastructure security auditing in cloud computing environments. International Journal of Information Management, 34(3), 364–368. https://doi.org/10.1016/j.ijinfomgt.2013.11.002

Raut, R., Priyadarshinee, P., & Jha, M. (2017). Understanding the mediation effect of cloud computing adoption in Indian organization. International Journal of Service Science, Management, Engineering, and Technology, 8(3), 40–59. https://doi.org/10.4018/ijssmet.2017070103

Repschlaeger, J., Wind, S., Zarnekow, R., & Turowski, K. (2013). Decision model for selecting a cloud provider: A study of service model decision priorities. 19th Americas Conference on Information Systems, AMCIS 2013 – Chicago, Illinois, August 15-17, 2013. https://www.researchgate.net/publication/286007628_Decision_model_for_selecting_a_Cloud_provider_A_study_of_service_model_decision_priorities

Roche, J. (2014). Legal issues in cloud computing. Conference: CIT Security, Cork, Ireland.

Rogers, E. M. (1983). Diffusion of ınnovations. 3rd. Edition, Macmillan Publishing, 453 p.

Ryan, M. D. (2011). Cloud computing privacy concerns on our doorstep. Communications of the ACM, 54(1), 36. https://doi.org/10.1145/1866739.1866751

Sabi, H. M., Uzoka, F. M. E., Langmia, K., & Njeh, F. N. (2016). Conceptualizing a model for adoption of cloud computing in education. International Journal of Information Management, 36(2), 183–191. https://doi.org/10.1016/j.ijinfomgt.2015.11.010

Sahandi, R., Alkhalil, A. & Opara-Martins, J, (2013). Cloud computing from SMEs perspective : A survey-based investigation. Journal of Information Technology Management, XXIV(1), 1–12. https://www.researchgate.net/publication/272019050_Cloud_Computing_from_SMEs_Perspective_A_Survey-based_Investigation

Sahin, I. (2006). Detailed Review of Rogers' Diffusion of Innovations Theory and Educational Technology-Related Studies Based on Rogers' Theory. The Turkish Online Journal of Educational Technology, 5(2), 1303–6521. https://www.researchgate.net/publication/284675572_Detailed_review_of_Rogers'_diffusion_of_innovations_theory_and_educational_technology-related_studies_based_on_Rogers'_theory

Salah Hashim, H. & Bin Hassan, Z. (2015). Factors that influence the users' adoption of cloud computing services at Iraqi Universities: An empirical study. Australian Journal of Basic and Applied Sciences, 9(27), 379-390. https://www.researchgate.net/publication/311964825_Factors_That_Influence_The_Users'_Adoption_Of_Cloud_Computing_Services_At_Iraqi_Universities_An_Empirical_Study Accessed 20 October 2019

Sallehudin, H., Razak, R. C., & Ismail, M. (2015). Factors influencing cloud computing adoption in the public sector: An empirical analysis. Journal of Entrepreneurship and Business, 3(1), 30–45. https://doi.org/10.17687/JEB.0301.03

Seifu, S. D., Dahiru, A. A., Bass, J. M., & Allison, I. K. (2017). Cloud-computing: Adoption issues for Ethiopian public and private enterprises. The Electronic Journal of Information Systems in Developing Countries, 78(7), 1-14. https://doi.org/10.1002/j.1681-4835.2017.tb00575.x

Senyo, P. K., Effah, J., & Addae, E. (2016). Preliminary insight into cloud computing adoption in a developing country. Journal of Enterprise Information Management, 29(4), 505–524, https://doi.org/10.1108/JEIM-09-2014-0094

Shakir, M., Hammood, M., & Kh. Muttar, A. (2018). Literature review of security issues in saas for public cloud computing: A meta-analysis. International Journal of Engineering & Technology, 7(3), 1161-1171. https://doi.org/10.14419/ijet.v7i3.13075

Sharma, N., Singh, M., & Misra, A. (2015). Causal understanding of limited adoption of cloud computing by customers. International Journal of Computer Applications, 131(12), 13-17. https://doi.org/10.5120/ijca2015907232

Sharma, S. K., Al-Badi, A. H., Govindaluri, S. M., & Al-Kharusi, M. H. (2016). Predicting motivators of cloud computing adoption: A developing country perspective. Computers in Human Behavior, 62, 61–69. https://doi.org/10.1016/j.chb.2016.03.073

Shiau, W. L., & Chau, P. Y. K. (2016). Understanding behavioral intention to use a cloud computing classroom: A multiple model comparison approach. Information and Management, 53(3), 355–365. https://doi.org/10.1016/j.im.2015.10.004

Shimba, F. (2010). Cloud computing : Strategies for cloud computing adoption-licence. Masters Dissertation Dublin, Technological University Dublin, http://arrow.dit.ie/scschcomdis/29/ Accessed 17 December 2019.

Singh, S., & Jangwal, T. (2012). Cost breakdown of public cloud computing and private cloud computing and security issues. International Journal of Computer Science & Information Technology, 4(2), 17-31. https://doi.org/10.5121/ijcsit.2012.4202

Singh, S., & Tripathi, A. K. (2016). Analyzing for performance factors in cloud computing. International Conference on Sustainable Computing Techniques in Engineering, Science and Management (SCESM 2016), At Hierank Business School, Noida, 9(21), 87-96. https://www.researchgate.net/publication/309565208_Analysing_for_Performance_Factors_in_Cloud_Computing

Skolmen, D. E., & Gerber, M. (2015). Protection of personal information in the South African cloud computing environment: A framework for cloud computing adoption. Proceedings of the ISSA 2015 Conference: 2015 Information Security for South Africa, Johannesburg, https://doi.org/10.1109/ISSA.2015.7335049

Son, I. Lee, D., Lee, J.-N., & Chang, Y.-B. (2011). Understanding the impact of IT service innovation on firm performance: The case of cloud computing. PACIS 2011 Proceedings, paper 180.

Srilakshmi, M., Veenadhari, CH. L., & Pradeep, I. K. (2013). Deployment models of cloud computing: challenges. International Journal of Advanced Research in Computer Science, 4(9), 135-138. https://www.ijarcs.info/index.php/Ijarcs/article/viewFile/1834/1822 Accessed 22 November 2019

Srivastava, P., & Khan, R. (2018). A review paper on cloud computing. International Journal of Advanced Research in Computer Science and Software Engineering, 8(6), 17-20. https://doi.org/10.23956/ijarcsse.v8i6.711

Steele, E. H., & Guzman, I. R. (2016). Investigating the role of top management and institutional pressures in cloud computing adoption. SIGMIS-CPR '16: Proceedings of the 2016 ACM SIGMIS Conference on Computers and People Research, 25-26 https://doi.org/10.1145/2890602.2906197

Stieninger, M., & Nedbal, D. (2014). Characteristics of cloud computing in the business context: A systematic literature review. Global Journal of Flexible Systems Management, 15(1), 59–68. https://doi.org/10.1007/s40171-013-0055-4

Susanto, H., Almunawar, M. N., & Kang, C. (2012). A Review of cloud computing evolution individual and business perspective. Social Science Research Network & University of Brunei, 1-10. https://doi.org/10.2139/ssrn.2161693

Tariq, M. F., Pangil, F., & Shahzad, A. (2017). Diffusion of innovation theory: Beyond decision stage. International Journal of Advanced and Applied Science 4(5), 12–18. https://doi.org/10.21833/ijaas.2017.05.002

Technavio, (2018). Construction Market in Turkey 2019-2023, Technavio.com.

Tehrani, S. R., & Shirazi, F. (2014). Factors influencing the adoption of cloud computing by small and medium-sized enterprises (SMEs). International Conference on Human Interface and the Management of Information. HIMI 2014: Human Interface and the Management of Information. Information and Knowledge in Applications and Services, 631-642.

Thakur, N., Bisen, D., Rohit, V., & Gupta, N. (2014). Review on cloud computing: Issues, services and models. International Journal of Computer Applications, 91(9), 34-38. https://doi.org/10.5120/15912-5120

Timmermans, J., Stahl, B. C., Ikonen, V., & Bozdag, E. (2010). The ethics of cloud computing: A conceptual review. 2010 IEEE Second International Conference on Cloud Computing Technology and Science, 614–620. https://doi.org/10.1109/CloudCom.2010.59

Tornatzky, L., & Fleischer, M. (1990) The process of technology innovation, Lexington, MA, . Lexington: Lexington Book

Trigueros-Preciado, S., Pérez-González, D., & Solana-González, P. (2013). Cloud computing in industrial SMEs: Identification of the barriers to its adoption and effects of its application. Electronic Markets, 23(2), 105-114. https://doi.org/10.1007/s12525-012-0120-4

Tripathi, A. M., & Singh, S. (2017). A literature review on algorithms for the load balancing in cloud computing environments and their future trends. Computer Modelling & New Technologies, 21(1), 64–73. http://www.cmnt.lv/upload-files/ns_78art10_CMNT2101_Tripathi.pdf

Tripathi, S. & Nasina, J. (2017). Adoption of cloud computing in business: A multi-case approach to evaluate the fit-viability model (FVM). Journal of Enterprise

Information Management, 12(1), 64-73. https://doi.org/10.6702/ijbi2017.12.1.2

Udemans, C. (2018). Alibaba’s future is cloud computing, CEO Daniel Zhang says. Technode. https://technode.com/2018/11/09/alibaba-cloud-computing/ Accessed 01 November 2019

Umaeswsari, P., & Shanthini, B. (2014). Security and privacy issues in cloud computing. International Journal of Applied Engineering Research, 9(24), 27879–27893. https://www.researchgate.net/publication/290011910_Security_and_privacy_issues_in_cloud_computing

Vaquero, L., Rodero-Merino, L., Caceres, J., & Lindner, M. (2009). A Break İn The Clouds: Towards A Cloud Definition. Acm Sıgcomm Computer Communication Review, 39(1), 50-55. Https://Doi.Org/10.1145/1496091.1496100

Velte, A.T., Velte, T.J., & Elsenpeter, R. (2009). Cloud computing, a practical approach, McGraw-Hill Education, 352 pages.

Venters, W. & Whitley, E. A. (2012). A critical review of cloud computing: Researching desires and realities. Journal of Information Technology, 27(3), 179-197. https://doi.org/10.1057/jit.2012.17

Vidhyalakshmi, R. & Kumar, V. (2016). Determinants of cloud computing adoption by SMEs. International Journal of Business Information Systems, 22(3), 375–395. https://doi.org/10.1504/IJBIS.2016.076878

Wambugu, A. W., & Ndiege, J. R. (2018). Adoption of cloud computing by small and medium enterprises in Nairobi county, Kenya. International Journal of Latest Research in Humanities and Social Science, 1(9), 44-50. https://doi.org/10.13140/RG.2.2.12989.97768

Wang, C., Ren, K., Lou, W., & Li, J. (2010b). Toward publicly auditable secure cloud data storage services. IEEE Network, 24(4), 19.24. https://doi.org/10.1109/MNET.2010.5510914

Wang, L., von Laszewski, G., Younge, A., He, X., Kunze, M., Tao, J. & Fu, C. (2010a). Cloud computing: A perspective study. New Generation Computing, 28(2), 137–146. https://doi.org/10.1007/s00354-008-0081-5

Widjaja, A. E., & Chen, J. V. (2012). Using cloud computing service: A perspective from users’ information security, privacy concern, and trust. In Proceedings, 43rd Decision Sciences Institute Annual Meeting (DSI), San Francisco, California, 41, 9221–9231. https://www.researchgate.net/publication/300164386_USING_CLOUD_COMPUTING_SERVICE_A_PERSPECTIVE_FROM_USERS'_INFORMATION_SECURITY_PRIVACY_CONCERN_AND_TRUST

Weinhardt, C., Anandasivam, A., Blau, B., Borissov, N., Meinl, T., Michalk, W., &

Stößer, J. (2009). Cloud Computing – A Classification, Business Models, And Research Directions. Business & Information Systems Engineering, 1, 391-399. Https://Doi.Org/10.1007/S12599-009-0071-2

Xi, L., & Mitrovic, Z. (2014). Readiness assessment of cloud-computing adoption within a provincial government of South Africa. 4th International Conference on Design, Development & Research, Cape Town, South Africa September 8-10, 2014).

Yang, H. & Tate, M. (2009). Where are we at with cloud computing? A descriptive literature review. 20th Australasian Conference on Information Systems, 807-819, December 2-4, 2009. https://aisel.aisnet.org/acis2009/26

Yang, H., & Tate, M. (2012). A descriptive literature review and classification of cloud computing research. Communications of the Association for Information Systems, 31(1), pp. 35–60. https://doi.org/10.17705/1CAIS.03102

Yassin, A. T., & Alnidawy, B. K. (2015). A taxonomy of : The reviews on cloud computing direction (CCD). Journal of Advanced Computer Science & Technology, 4(1), p. 204. https://doi.org/10.14419/jacst.v4i1.4564

Youseff, L., Butrico, M.A., & Da Silva, D. (2008). Toward a unified ontology of cloud computing: Grid computing environments workshop, GCE'08, 12-16 Nov. 2008, 1–10. https://doi.org/10.1109/GCE.2008.4738443

Yuvaraj, M. (2016). Determining factors for the adoption of cloud computing in developing countries: A case study of Indian academic libraries. Bottom Line, 29(4), 259–272. https://doi.org/10.1108/BL-02-2016-0009

Zhang, S., Zhang, S., Chen, X., & Huo, X. (2010). Cloud Computing Research and Development Trend. 2nd International Conference on Future Networks, ICFN 2010, 93-97. https://doi.org/10.1109/ICFN.2010.58

BIOGRAPHY

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