Cloud Computing Adoption Factors in Turkish Large Scale Enterprises

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Degree project 30 HE credits
Degree subject Computer and Systems Sciences
Degree project at the master level
Spring term 2014
Supervisor: Eriks Sneiders
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Abstract

Cloud computing has been a prominent IT solution in Turkey where the use of IT lags behind many developed countries. The generally agreed upon idea is that cloud computing offers affordable IT resources which create opportunities for the companies of developing countries to improve their IT related capabilities and therefore empower them in terms of being competitive in global markets. Specifically, large scale enterprises in Turkey are assumed to benefit more from cloud computing since their ability of following and implementing IT developments are higher than the small enterprises. However, the challenges that companies of developing countries can face while benefiting from cloud computing and the factors of cloud computing adoption are touched upon rarely. Therefore, the main purpose of this study is to contribute the body of knowledge on cloud computing by exploring the adoption factors of cloud computing in developing countries having Turkey as the example. Rising from this context, the research question of this thesis is “What are the adoption factors of cloud computing in large scale enterprises in Turkey?” In order to answer the research question, the factors of cloud computing adoption are initially identified based on the literature review. Next, embracing an exploratory approach, multiple case studies are conducted at five large Turkish enterprises. Grounded theory is used to analyse the qualitative data collected through the case studies. A comparison of cloud computing adoption factors derived from the literature review with the ones identified in research cases indicates that cloud computing adoption factors derived from the literature are partially recognised in research cases. The results show that the main adoption factors in favour of cloud computing are “cost”, “distributed organisational structure”, “employee mobility”, and “end-user satisfaction”, while constraints to the adoption of cloud computing involve “security”, “critical business processes”, “loss of control over data and systems” and “technical infrastructure of the region in terms of broadband”. The main difference between Turkey and developing countries with respect to cloud computing adoption factors is inadequate broadband access and lack of knowledge on cloud computing.

Keywords

Cloud computing adoption factors, cloud computing in Turkey, cloud computing adoption factors in developing countries.

Table of Contents

List of Figures

List of Tables

1 Introduction

1.1Background

Information technology (IT) has an increasing importance in today's rapidly changing business environment. IT changes the way of doing business and shape the competition in both local and global markets. In the meantime, the globalisation of the markets introduces new challenges together with the opportunities. Being competitive in this global business environment heavily depends on responding quickly and effectively to the environmental conditions. This in turn enforces enterprises to possess certain capabilities such as adaptability, flexibility and responsiveness that can be attributed to IT capabilities.

Turkish private sector is a fast growing one including different sizes of enterprises. In a general sense, enterprise sizes are classified in two main groups; "small and medium sized enterprises" (SMEs) and "large scale enterprises". The common classification criteria for identifying an enterprise size are the number of employees, total balance sheet and annual sales revenue. These criteria are also consistent with Turkish Trade Law [1] in which the enterprises are defined. According to Turkish Trade Law [1], SMEs are the enterprises which employ less than 250 people and either have an annual sales revenue of less than 40 million Turkish Lira or have a balance sheet total of less than 40 million Turkish Lira. On the other hand, large scale enterprises are the ones in which the number of employees are more than 250 people, have an annual sales revenue of more than 40 million Turkish Lira or have a balance sheet total of more than 40 million Turkish Lira.

While IT has an enormous importance for both SMEs and large scale enterprises in Turkey, its operational and strategic roles differ. The intensive use of IT in Turkish SMEs is basically for operational and routine tasks [2]. On the other hand, in large scale enterprises, IT is utilised in a more strategic way leading to gain competitive advantage which is necessary for high-level business environment requirements. One common fact for SMEs and large scale enterprises in Turkey is that IT is critical for both. However, due to economic, social, and technological reasons, the level of IT utilisation for strategic purposes is lower in developing countries compared to developed countries [3]. Specifically, the use of IT in Turkish organisations lags behind many EU countries as a consequence of limited funding, volatile political environment, and lack of national policies and standards [3].

Being aware of the fact that IT will have much more influential role in the future than it currently has, Turkish government's approach toward changing the aforementioned limitations of IT utilisation has been presented in "Turkish Industrial Strategy Document 2011-2014" [4]. Accordingly, "technological development of companies including innovation and improvement of the technological infrastructure must be supported to achieve continued growth in the Turkish economy and competitiveness of private sector" [4]. In a consistent manner, Turkish information and communications (ICT) sector is expected to continue its development as it has been receiving investments from many large international players such as IBM, Hewlett-Packard, Dell, Siemens, Cisco and NCR which have local subsidiaries in Turkey [5]. Furthermore, recently established Technology Development Zones ("TDZ") provide software developers with investment incentives and tax reductions in order to support the IT entrepreneurs [5].

Giving the current IT market structure in Turkey, it can be concluded that the utilisation of new information and communication technologies in Turkey is in rapid growth [6]. According to Kuyucu [6], the growth in the current IT market structure provides opportunities to benefit from new approaches, such as cloud computing.

Cloud computing is an on-demand IT service model in which computing resources are provided to the users by another company and accessed over the Internet, based on a pay-per-use pricing model.

The promise of cloud computing is to deliver all the functionality of existing information technology services along with enabling new functionalities that are hitherto infeasible while it dramatically reduces the upfront costs of computing that deter many organisations from deploying many cutting-edge IT services [7, 8]. Staten [8] claims that the emergence of cloud computing solves the problem of increased computing costs derived from complex information architecture and infrastructure.

Cloud computing provides dependable and secure data storage centre, many possibilities for internet application, unlimited space for storing and managing data, powerful computing capacity for users to complete all kinds of application [9]. In brief, cloud computing provides almost all of the required computing resources and capabilities that an enterprise needs to conduct its business.

Although there exists a common opinion that cloud computing is a more appropriate solution for SMEs, Hosseini et al. [10] argue that cloud computing is not just for start-ups or SMEs; since cloud providers market their services as being superior to in-house data centres in terms of financial and technical dimensions, large scale enterprises are attracted to cloud-based solutions as well. From this point of view, the availability of cloud computing services, specifically its pricing model and readiness, both SMEs and large scale enterprises are promised to gain advantages by becoming a cloud user.

Cloud computing seems to present cost effective IT solutions. Yet, there exist considerations such as; security, privacy, and performance. In order to clarify these fuzzy conceptions around cloud computing, both academics and business people have published several works outlining offerings, benefits and challenges of cloud computing [e.g. 11, 12, 13, 14]. Additionally, the review of the existing IS literature provides that there are studies that examine the adoption factors of cloud computing within the context of SMEs. However, little has been published about the implications of cloud computing from an enterprise or an organisational perspective [e.g. 10, 15]. This may be due to the research challenges for cloud computing at organisational level as discussed by a number of authors previously [e.g. 16, 17, 18, 19, 20, 21].

In spite of the fact that cloud computing has been discussed as a relatively new technological development that can provide both strategic and operational advantages to its adopters, some authors hold the idea that the cloud computing adoption rate is not growing as fast as expected [22, 23, 24, 25]. Furthermore, Borgman et al. [26] points out the results of a recent study in which surprising regional differences in cloud computing adoption rates presented. As it can be concluded, adoption of cloud computing depends on various parameters which are not limited with the aforementioned costs and benefits. There exist other factors which influence the decision of cloud computing adoption. From a wider perspective, IT adoption is a well-founded research area within IS literature; and many different theories and frameworks are applied to identify the adoption factors of new technologies.

Within the context of cloud computing, applying IT adoption theories can provide deeper understanding of cloud computing adoption factors.

Bouwman et al. [27] defines IT adoption in organisations as a decision-making process that includes three main phases; "exploration and research to find out which IT applications are available", "assessment of these applications in the light of the organisational needs in order to come to a possible solution" and, finally, "the decision whether or not to use the application, the outcome of the adoption process". There are various factors influencing the adoption decision. According to Bouwman et al. [27], these factors can be named as IT adoption factors and grouped into four main categories reflecting different perspectives of IT adoption such as organisational-factors related to the nature of the organisation and the environment in which it conducts the business, technological-factors related to the information and communication technology itself (hardware and software, networks, standards), economic-factors related to financial considerations regarding IT, and user-factors concerning the individual user's characteristics, tasks and organisational position.

In literature there are two prominent theories that explain the adoption of IT at organisational level. These are Tornatzky and Fleischer's [28] "Technology-Organization-Environment" (TOE) framework and Roger's [29] "Diffusion of Innovations" (DOI) theory. TOE framework [28] is an organisational level theory which identifies three aspects of a company's context-technological, organisational and environmental, which influence the adoption and implementation of a technological innovation. Consistent with TOE framework, the DOI theory is a theory of "how, why, and at what rate new ideas and technology spread through cultures, operating at the individual and organisation level" [30, pp. 111] and emphasises the characteristics of technological innovations (e.g. relative advantage, complexity, compatibility, observability, triability) as the influencers of technological innovation adoption.

The previous studies of application of IT adoption theories, specifically TOE framework and DOI theory have been utilised to investigate the adoption of cloud computing. Findings of these studies reveal that there are several factors other than benefits and challenges of cloud computing that have influence on enterprises when evaluating cloud computing as a "new" system to implement. These factors include organisational, environmental and technological variables which collectively compose the "adoption factors of cloud computing" in organisations.

It is important to note that cloud computing is currently at an early stage in Turkey. While it is known that the use of cloud-based social networks are becoming widespread and there are also corporate users, there is no specific data available on the use of cloud computing [31].

In this research, the aim is to identify the factors of cloud computing adoption in large scale enterprises in Turkish private sector and determine the extent they influence the adoption of cloud computing.

For this purpose, technology-organisation-environment (TOE) framework [28] will be used as an analytical tool for classifying the adoption factors of cloud computing in three groups (technological, organisational, and environmental). Additionally, DOI theory [29] will be partially applied for understanding the influence of technological characteristics (e.g. relative advantage, complexity, compatibility, triability, observability) on adoption decision.

1.2 Problem Statement

Although cloud computing presents various benefits for enterprises, it has been claimed that cloud computing adoption rate is not growing as fast as expected [22, 23, 24]. While some authors provide indirect reasons for this low rate [e.g. 8, 10,15], there is a scarcity of knowledge on how large enterprises evaluate cloud computing when they reason about possibility of replacing their existing IT systems with cloud computing services. Considering the cloud computing readiness of Turkish private sector along with differentiated use of IT in developing countries, it is expected that cloud computing adoption initially starts up with large scale enterprises and depends on various factors other than its benefits and drawbacks as it is generally the case with every other IT adoption decision. Although cloud computing adoption has been carefully examined by researchers, cloud computing adoption factors in Turkish private sector have not been researched thoroughly.

1.3Research Question

As discussed in section 1.1, and in section 1.2, the knowledge on cloud computing adoption factors in large scale enterprises in developing countries is limited. Therefore, the main purpose of this study is to contribute the body of knowledge on cloud computing by exploring the adoption factors of cloud computing in large scale enterprises in Turkey which are also applicable to the countries of similar economies. Emerging from this context, the research question which forms the basis for the investigation in this thesis is as follows:

“What are the adoption factors of cloud computing in large scale enterprises in Turkey?”

2 Extended Background

2.1Cloud Computing

In this section, it is aimed to provide a clear understanding of cloud computing by describing its architecture, service models, deployment models and essential features.

2.1.1 Cloud Computing Definition

Cloud computing and the term "cloud" have been defined by many authors as a result of various perspectives that the scholars hold toward cloud computing phenomenon. To have a clear understanding of the term "cloud computing" and concepts around it, it is necessary to make a representative definition of cloud computing which captures different aspects and related issues of it.

According to Vaquero [32], "clouds are a large pool of easily usable and accessible virtualized resources (such as hardware, development platforms and/or services)". To be more specific, "a cloud is a platform or infrastructure that enables execution of code (services, applications etc.), in a managed and elastic fashion, whereas "managed" means that reliability is automatically ensured according to pre-defined quality parameters and "elastic" implies that the resources are provided according to actual current requirements observing overarching requirements" [33]. One of the most cited definitions of cloud computing is provided by U.S. National Institute of Technology (NIST) [34]. Accordingly, "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" [34].

2.1.2 Cloud Computing Architecture

Cloud computing architecture represents the components of cloud computing systems which are structured as layers. According to Zhang et al [35] cloud computing architecture is generally divided into four layers; the hardware/datacentre layer, the infrastructure layer, the platform layer and the application layer as shown in figure 1.

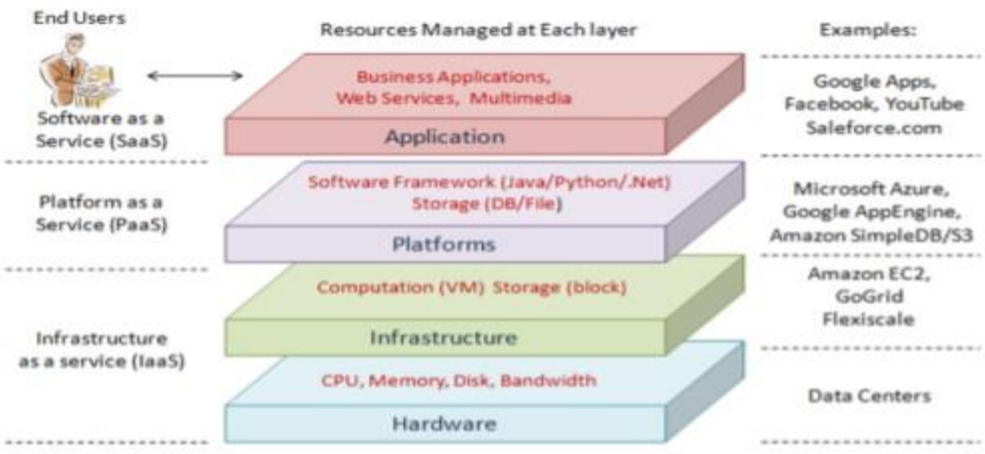

Figure 1. Cloud Computing Architecture [35]

Definition of each layer is as follows:

Hardware Layer

This layer is responsible for managing the physical resources of the cloud architecture [35]. As the lowest layer in the stack, it includes hardware resources, such as computers (CPU and memory), networks (routers, firewalls, switches, network links and interfaces), storage components (hard disks) and other physical computing infrastructure elements. According to Youseff et al. [21], the users of this layer of the cloud are normally big enterprises with huge IT requirements that needs to sublease hardware as a service. Leasing eliminates users' need to invest in building and managing data centres and therefore reduce the cost of power and insurance [36]. This model is advantageous to the enterprise users, since they do not need to invest in building and managing data centres [21].

Infrastructure Layer

Also known as the virtualization layer, infrastructure layer creates a pool of shared storage and computing resources by partitioning the physical resources using virtualization technologies [35]. Many key features of cloud computing, such as dynamic resource assignment, are only made available through virtualization technologies. Therefore, the infrastructure layer is an essential component of cloud computing [35].

Platform Layer

Built on top of the infrastructure layer, the platform layer consists of operating systems and application frameworks. Platform layer minimizes the difficulty of deploying applications directly into virtual machine (VM) containers [35]. One example of systems in this category is Google's App Engine [21].

Application Layer

At the highest level of the architectural hierarchy, the application layer consists of the actual cloud applications. Zang et al. [35] claims that cloud applications can leverage the automatic-scaling feature to achieve better performance, availability and lower operating cost as being different from traditional applications.

To summarize, cloud computing architecture is based on the principle of modularity. According to Zang et al. [35] "the architectural modularity allows cloud computing to support a wide range of application requirements while reducing management and maintenance overhead" [35].

2.1.3 Cloud Computing Service Models

Cloud computing industry often speaks about different delivery models of cloud computing, all of which refer to the different layers of the cloud computing architecture.

According to NIST [34], there are three main service models; such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). Starting from the infrastructure layer upwards, detailed description of each service model goes as follows:

Infrastructure as a Service (IaaS)

IaaS is usually the lowest level service available to a cloud computing consumer and provides access to a virtual infrastructure on which operating systems and application software can be utilised [37]. The consumer has control over operating systems, storage, and deployed applications; and potentially limited control of select networking components but does not manage or control the underlying cloud infrastructure [34]. One example of IaaS systems is Amazon's infrastructure service, EC2, where users can rent computing power on their infrastructure by the hour [38].

Platform as a Service (PaaS)

Sitting atop IaaS, PaaS allows applications to be deployed, since the necessary operating system and platform-related tools such as language compilers are already installed and managed by the cloud computing provider [37]. The consumer has control over the deployed applications and possibly configuration settings for the application hosting environment but does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage [34]. A popular example of a PaaS is Microsoft's Windows Azure platform [39]. PaaS is provided through the platform layer of the cloud architecture as mentioned earlier.

Software as a Service (SaaS)

SaaS is provided through the application layer of the cloud computing architecture. This model abstracts the consumer away from any infrastructure or platform level detail [37]. The consumers can access the applications by using devices such as thin client interfaces, web browsers (e.g. for accessing a web-based email service), or program interfaces [34]. The consumer does not have control over the underlying cloud infrastructure with the exception of limited user-specific application configuration settings [34]. Some examples of SaaS are Salesforce customer relationships management (CRM) system, and Google Apps like Google Docs and Google Spread Sheets [38].

2.1.4 Cloud Computing Deployment Models

There are different models for deploying cloud computing services. A common distinction for deployment models is based on whether the IT resources are shared among many distinct organizations or reserved to a single organization. The agreement is that cloud computing has four deployment models namely; public, private, hybrid and community. Description of each model goes as follows:

Public Cloud

As the most common form of cloud computing, public cloud, or external cloud, makes services available to the general public in a pay-as-you-go manner where customers, either individual users or enterprises access these services over the internet from a third-party provider who may share computing resources with many customers [40].

Private Cloud

A Private Cloud, also named as internal cloud, is used when the cloud infrastructure, network or data centre, is operated solely for a business or organization, and serves customers within the business fire-wall. Private clouds are generally deployed by large companies or government departments who prefer to keep their data in a more controlled and secure environment [40].

Community Cloud

In this model, the cloud infrastructure is provisioned to a specific community of consumers from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations) [34]. A community cloud may be owned, managed, and operated by one or more of the organizations in the community, a third party, or some combination of them, and it may exist on or off premises [34].

Hybrid Cloud

The cloud infrastructure in hybrid cloud is a composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology enabling data and application portability (e.g., cloud bursting for load balancing between clouds) [34]. In the hybrid cloud, the critical data and applications are kept within the enterprise firewall, while the less critical ones are hosted on a public cloud [40].

2.1.5 Non-Functional Aspects of Cloud Computing

Non-functional aspects of cloud computing represent the qualities or properties of a cloud system, rather than specific technological requirements [33]. These essential qualities and properties are relevant and required in any cloud environment, but may be limited to specific use cases [33]. The most important non-functional aspects are identified in European Commission's expert group report [33] are as follows:

- Elasticity as an essential feature of cloud systems denotes "the capability of the underlying infrastructure to adapt to changing, potentially non-functional requirements, such as amount and size of data supported by an application, number of concurrent users etc." [33].

According to Armbrust et al [16], elasticity of cloud computing can be explained by "illusion of infinite computing resources available on demand" in which users expect clouds to rapidly provide resources in any quantity at any time. Particularly, "it is expected that the additional resources can be (a) provisioned, possibly automatically, when an application load increases and (b) released when load decreases (scale up and down)" [39].

- Reliability as another essential feature of cloud technologies denotes "the capability to ensure constant operation of the system without disruption, i.e. no loss of data, no code reset during execution etc. Reliability is typically achieved through redundant resource utilization" [33].
- Quality of Service support is a relevant capability that is essential in many use cases where specific requirements have to be met by the outsourced services and / or resources [33]. According to European Commission's expert group report [33], basic quality of service (QoS) metrics like response time, throughput etc. must be guaranteed to ensure that the quality requirements of the cloud user are met. In this sense, reliability becomes a particular QoS aspect which forms a specific quality requirement [33].
- Agility and adaptability are essential features of cloud systems relate to the elastic capabilities specifically addressing on-time reaction to changes in the amount of requests and size of resources, but also adaptation to changes in the environmental conditions that require different types of resources, different quality or different routes [33].
- Availability of services and data as one of the core aspects to give rise to clouds in the first instance, denotes "the ability to introduce redundancy for services and data so failures can be masked transparently" [33]. Availability is performed through replicating the data / services and distributing them across different resources to achieve load-balancing [33].

2.1.6 Economic Aspects of Cloud Computing

One of the key reasons to introduce cloud systems in a business environment is economic considerations in the first instance [33]. The main economic aspects of cloud computing are as follows:

- Cost reduction is considered as one of the first concerns to develop, provide and/or deploy a cloud system that can adapt to changing business needs while reducing cost for infrastructure maintenance and acquisition [33].
- Pay per use is a relevant feature of cloud systems which allows calculate cost according to the actual consumption of resources and relates to quality of service support, where specific requirements to be met by the system and hence to be paid for can be specified [33]. Pricing should be made on a short term basis, for example by the hour, allowing users not to pay for resources as soon as they are not needed [39]. Therefore, clouds must implement features such as pricing, accounting, billing and metering accordingly for different types of service (e.g., storage, processing, and bandwidth) and usage promptly reported, thus providing greater transparency [39].
- Improved time to market is a feature which benefits business particularly. Clouds can provide dedicated services according to user needs through the essential capabilities to support easy provisioning.
- Return of investment (ROI) is crucial for the investors but cannot always be guaranteed since some cloud systems has currently failed in this aspect [33]. In order to succeed ROI, benefits obtained by employing a cloud system should outweigh the cost and effort devoted into it [33].
- Turning CAPEX into OPEX is a polemical characteristic of cloud computing since the actual benefit of cost is not always clear. Capital expenditure (CAPEX) is an expense required to build up a local infrastructure while operational expenditure (OPEX) is spent on an ongoing basis according to operational needs [33]. With regard to cloud computing, a company is able to utilise cloud services without CAPEX and therefore only pay for the scalable computing resources as OPEX.
- Going Green which is also named as “Green computing” is often cited as a potential benefit of cloud computing. Taking advantage of economies of scale, cloud computing potentially delivers computing power much more efficiently than it would be possible with local computing [41].

2.1.7 Technical Aspects of Cloud Computing

Technical aspects identify how non-functional and economic aspects of cloud computing can be realized [33]. The report of European Commission [33] defines nine technological aspects which a cloud system should have in order to fulfil the requirements of non-functional and economic aspects. Technological aspects may vary and additional technological aspects to be addressed may identified in different use cases [33]. Technological aspects of cloud computing are explained below.

- Virtualization is an essential technological characteristic of clouds which hides the technological complexity from the user and enables improved flexibility by means of aggregation, routing and translation [33]. According to the European Commission expert group report [33], virtualization supports ease of use through hiding the complexity of the infrastructure and make it easier for the user to develop new applications. It also exposes a virtual execution environment which provides flexibility and adaptability in accordance with the user requirements and location independent services which can be accessed free from physical location of the user and resources [33].

- Multi-tenancy implies that the location of code and / or data is principally unknown and the same resource may be assigned to multiple users (potentially at the same time) [33]. Multitenant architecture design apportions the resources among tenants and is able to securely differentiate data belonging to each tenant [42].
- Security, Privacy and Compliance are obviously essential in every system which deals with potentially sensitive data and code [33]. Security of cloud computing is achieved mainly through three ways. First, even a part of cloud computing system is destroyed, the loose coupling enables the system to work well. Second, cloud provider avoid exposing the details of corresponding implementations through the processes of abstraction, virtualization and privation. Third, technology cooperating with law guards cloud computing [43].
- Data Management is particularly essential for storage clouds, where data is distributed across multiple resources flexibly [33].
- APIs and / or Programming Enhancements are essential to realise the cloud features such as scalability and autonomic capabilities which are taken care by the developers in traditional programming models but managed by the provider in cloud environment [33].
- Metering of any kind of resource and service consumption is a pre-condition for the clouds in order to offer elastic pricing, charging and billing [33].
- Tools are fundamental through the cloud computing service process including development, adaptation and usage of cloud services [33].

2.1.8 Cloud Computing Entities

Cloud entities are various actors- either a person or an organization required to participate in a particular process of cloud computing service. According to NIST's Reference Architecture [44], there are five major entities of cloud computing; cloud consumer, cloud provider, cloud carrier, cloud auditor and cloud broker. Descriptions and general activities of cloud computing entities are as follows:

A cloud consumer represents a person or organization that maintains a business relationship with, and uses the service from a cloud provider in accordance with the Service Level Agreements (SLAs) which specify the technical performance requirements and remedies for performance failures [44].

Cloud consumers are provided with different types of services and therefore, they can be named as; SaaS consumer, PaaS consumer, IaaS consumer depending on the service they received [44].

A Cloud Provider is the entity responsible for making a service available to interested parties by acquiring and managing the computing infrastructure required for providing the services, running the cloud software that provides the services, and making arrangement to deliver the cloud services to the Cloud Consumers through network access [44]. In current practice IaaS and PaaS providers are often parts of the same organization and therefore PaaS and IaaS providers are can be called infrastructure providers or cloud providers [35].

On the other hand, the hosts of cloud enhanced services-SaaS are typically referred to as Service Providers [33]. SaaS/Service providers are cloud users since they use the cloud computing resources to make services available to service users [16].

Cloud Auditor is a party which performs an independent examination of cloud services to verify conformance to standards through review of objective evidence with the intent to express an opinion [44].

Cloud Broker negotiates relationships between cloud providers and cloud consumers by managing the use, performance and delivery of cloud services [44].

Cloud Carrier is an intermediary entity that provides connectivity and transport of cloud services between cloud consumers and cloud providers by using network, telecommunication and other access devices. [44].

2.1.9 Cloud Computing and Business

As mentioned earlier, economic considerations are one of the key reasons to introduce cloud systems in a business environment in the first instance [33]. In particular, as the business environment has been increasingly competitive and globalized, companies are being required to improve their strategic and technological agility and reduce the complexities of their business and IT operations to sustain their competitive advantage in a rapidly changing environment [45, 46].

Response to these challenges, cloud computing aims to provide the technical basis to meet customer demands on a business level [47]. It addresses the business requirements such as flexibility, availability, and reliability, as well as economies of scale and skill and emphasises how the technological features of cloud computing can meet these business requirements [48]. The literature provides that there are examples of cloud computing in business showing the real-life practices based on the cloud users' experiences such as reducing cost, improving business efficiency, supporting day-to-day activities and customer values in companies' business. For example, Iyer and Henderson's study [49] presents six cases explaining how cloud computing helps to create business value in user companies without distinction of company size. Accordingly, cloud computing (1) allows management to be more focused on people and business related issues, (2) enables sales force to use business applications on personal mobile devices (location and source independence), (3) increases collaboration for problem solving (virtual business environment).

Although there is strong evidence that cloud computing makes considerable sense for SMEs rather than large scale enterprises, there exist potential benefits for large scale enterprises that cloud computing offers. The opportunities for value creation in large enterprises provided by cloud computing can be grouped at three levels: the utility level, the process transformation level and the business model innovation level [50]. Followings are descriptions of the value creation levels that cloud provides to large enterprises:

Utility level- at this level, large enterprise lowers costs and increases agility through elastic computing resources and pay-per-use models. The utilization of equipment and facilities, self-service ability, scale and agility are opportunity areas for the large enterprises [50].

Process transformation level- at this level, the primary benefits are higher efficiency, closer collaboration and integration and coordination across processes. The areas to realize these benefits are process standardization and composition, streamlined handoffs and integration, new insights from data intensity and data sharing, virtual teaming around specific processes [50].

Business model- at this level, large enterprise can create new business models through linking, sharing and combining capabilities among enterprises and therefore gain competitive advantage supported by massive computing power and scale. The comprehensive areas of business opportunities include new services revealed by integration across customers, partners and suppliers, new insights through data analytics by integrating and aggregating data across channels and enterprises, new asset-light business models that can be rapidly scaled to meet market needs are the [50].

However, there exist considerations whether each type of cloud computing service is convenient or not for large scale enterprises. Regarding the service types, the public cloud is not perceived as an advantageous cloud service type for large companies and its adoption is relatively limited [50]. Therefore, in order to maintain better control over their data and applications, large organizations are focusing their cloud efforts primarily on private and community clouds [50].

2.2Information Technology Adoption

Before proceeding with the information technology adoption and discussion of adoption factors of information technology at organisational level, it is essential to define information technology and basic concepts around it. Therefore, this chapter begins with the brief definitions of terms that are considered to be proper to use in this thesis.

2.2.1 Definition of Terms

Information technology (IT) refers specifically to "technology, essentially hardware, software and telecommunications networks. It is thus both tangible (e.g. with servers, PCs, routers and network cables) and intangible (e.g. with software of all types). IT facilitates the acquisition, processing, storing, delivery and sharing of information and other digital content" [51].

Information systems (IS) is a concept which is widely used interchangeably with IT. The UK Academy of Information Systems (UKAIS) defines IS as "systems by which people and organizations, utilizing technology, gather, process, store, use and disseminate information. It is thus concerned with the purposeful utilization of IT" [51].

IT strategy can be defined as "a means for outlining the vision of how the organization's demand for information and systems will be supported by technology—essentially, it is concerned with 'IT supply'. It addresses the provision of IT capabilities and resources (including hardware, software and telecommunications) and services such as IT operations, systems development and user support" [51]. Accordingly, IT strategy as a part of IS//IT strategy which has also IS component that defines the organization's requirement or 'demand' for information and systems to support the overall strategy of the business.

Business strategy on the other hand covers a broad range of definitions and multiple meanings. According to Gartlan and Shanks [52], a business strategy is "an analytical management tool used for planning a future business path". Addressing the internal and external business environment, business strategy includes the approach to competition, vision and allocation of company resources and calls on strong commitment in its formulation and execution [52].

2.2.2 Information Technology Adoption Theories

In a generally accepted sense, adoption of IT in organizations is a process that includes exploration, research, deliberation and decision making to introduce a new system into organization [27]. This process leads to the choice of acceptance or rejection of the new system.

Ghobakhloo et al [53] reveal different definitions of IT adoption in organizations provided by the prior literature such as decision to accept and use the innovation [e.g. 54, 55, 56], implementation success [57], extent of usage [e.g. 58, 59] and effectiveness and success of adopted IT based on acceptance of or satisfaction with IT [e.g. 60, 61, 62, 63, 64].

Commonly studied determinants of IT adoption include environmental, organizational, and IS factors, as well as technology characteristics. Organisational determinants generally refer to as organisation size, scope and management which are related with internal characteristics of the organisation. Environmental factors, in turn, refer to the external environment of the organisation including variables such as environmental uncertainty, industry sector, and industry competitiveness [65].

A comprehensive study on theories for "information technology adoption models at organisation level" by Oliveira and Martins [30] suggests that the most used theories are Technology Acceptance Model (TAM), Theory Of Planned Behaviour (TPB), Unified Theory of Acceptance and Use of Technology (UTAUT), Diffusion of Innovations (DOI), and the Technology-Organization-Environment (TOE) framework which presents technological, organizational and environmental dimensions as the sets of influencers related to innovation adoption. While TAM, TPB and UTAUT are individual level theories, TOE and DOI are both organization level theories.

Specifically, TOE framework posits that a company's decision to adopt an innovation is dependent on factors from three contextual categories: technology, organisation, and environment. The technological context may include technologies, processes, techniques, and equipment in use by or of interest to the company. Organisational context is concerned with organisational attributes of the company, such as managerial styles, leadership and governance, human resources, and degrees of formalisation. Environmental context deals with the external industrial and governmental factors, as well as with competition and regulation [28]. On the other hand DOI [29] is a theory of how, why, and at what rate new ideas and technology spread through cultures, operating at either in individual or organisation level.

In the next section, for a better understanding of IT adoption factors in organizations, DOI theory and TOE framework will be presented in detail since they are both organization-level and proper to use as comparison tools in this study.

2.2.3 Technology-Organization-Environment (TOE) Framework

The Technology-Organization-Environment (TOE) framework was developed by Tornatzky and Fleischer in 1990 to investigate the adoption processes of technological innovations at organisation level. TOE framework identifies three aspects of a company's context; technological, organizational, and environmental that influence the process of adopting and implementing a technological innovation. According to Tornatzky and Fleischer [28], technological innovation is referred to as "a new development through which people extend their control over the environment". The three groups of contextual factors not only influence a company's intent to adopt an innovation, but also affect the organizational performance [66]. The three constructs of TOE framework are described in detail below.

The technological context includes all of the technologies that are relevant to the company-both technologies that are already in use at the company (internal technologies) as well as those that are available in the marketplace but not currently in use (external technologies) [67]. Technologies may include both equipment as well as processes [28]. A company's existing technologies are important when adopting new technologies since they can set a broad limit on the scope and pace of technological change that a company can undertake [67]. Innovations that exist but not yet in use at the company also influence the adoption both by marking the limits of what is possible as well as showing companies ways in which technology can enable them to evolve and adapt [67].

The organizational context is concerned with the organisational attributes of the company [68] namely characteristics and resources of the company including the company's size, degree of centralization, degree of formalization, managerial structure, human resources, amount of slack resources, and linkages among employees [28]. It addresses the structure and processes of an organization that constrain or facilitate the adoption and implementation of innovations [69]. Previous studies have reported evidence about the links between these characteristics and innovations [28, 69].

The environmental context, also named as "external environmental context" [69], is the arena in which an organization conducts its business. This includes the industry, competitors, regulations, and relationships with the government. These are factors external to an organization that present constraints and opportunities for technological innovations. Among these, market conditions, in terms of competitive market forces and market uncertainty, are a major factor in the innovation process [69].

The aforementioned elements present "both constraints and opportunities for technological innovation" [28]. Thus, every element has an interaction with the other two elements and influences the way a company sees the need for, searches for, and adopts new technology as depicted in Figure 2.

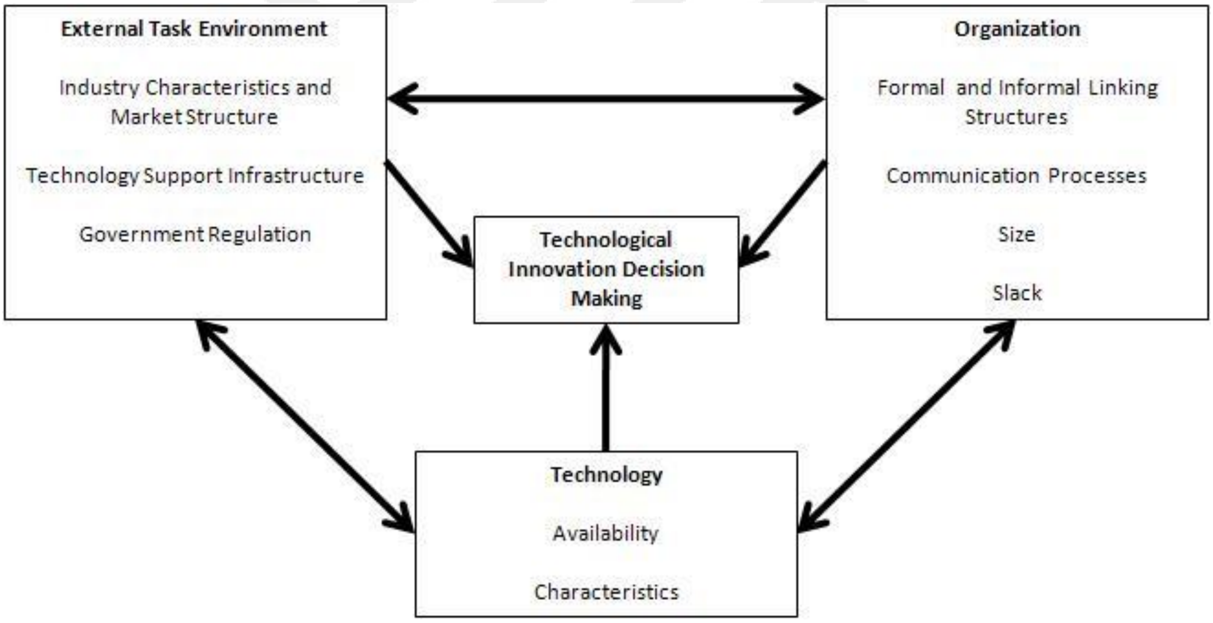

Figure 2. Technology Organisation Environment (TOE) Framework [28]

TOE framework allows to evaluate the adoption of technological innovations in multiple perspectives and thereby, presents a holistic approach toward adoption decisions. The main benefits of the according organisation-level TOE framework are its comprehensible structure, sound theoretical basis and its recognition and usage by literature [e.g.30, 69, 70]. All three contexts-technology, organisation and environment are known to influence a company's decision process, i.e., its intent to adopt an innovation, its assimilation process and eventually business value creation [66, 71].

2.2.4 Diffusion of Innovation (DOI) Theory

Diffusion of Innovation (DOI) theory also known as Innovation Diffusion Theory (IDT) was developed by Everett Rogers. Rogers introduced the theory in his book "Diffusion of Innovations" which was first published in 1962. The current version of the theory was defined as "a theory of how, why, and at what rate new ideas and technology spread through cultures, operating at the individual and organisation level" in the fifth edition of the book [29]. DOI theory is a base to understand the adoption factors of "innovation" which is an idea, practice, or object that is perceived as new by an individual or other unit of adoption [29].

According to Rogers [29], adoption is a decision of "full use of an innovation as the best course of action available" and rejection is a decision "not to adopt an innovation". Rogers [29] defines diffusion as "the process in which an innovation is communicated thorough certain channels over time among the members of a social system". As expressed in this definition, the four key components of the diffusion of innovations are innovation, communication channels, time, and social system [72].

Based on DOI theory at organisation level innovativeness is related to three categories of variables such as independent variables as individual (leader) characteristics, internal organizational structural characteristics, and external characteristics of the organization.

Individual characteristics describes the leader attitude toward change. The individual's attitude toward change influences the level of innovativeness.

Internal characteristics of organizational structure includes six elements which have an influence on innovativeness [29]. These elements in the words of Rogers [29] are as follows.

- Centralization is the degree to which power and control in a system are concentrated in the hands of a relatively few individuals. Centralization has usually been found to be negatively associated with innovativeness.
- Complexity is the degree to which an organization's members possess a relatively high level of knowledge and expertise, usually measured by the members' range of occupational specialties and their degree of professionalism (expressed by formal training). This element is positively related with innovativeness.
- Formalization is the degree to which an organization emphasizes its members' following rules and procedures.
- Interconnectedness is the degree to which the units in a social system are linked by interpersonal networks. New ideas can flow more easily among an organization's members if it has a higher degree of network interconnectedness. This variable is positively related to organizational innovativeness.
- Organizational slack is the degree to which uncommitted resources are available to an organization. This variable is positively related to organizational innovativeness.
- Size of an organization has consistently been found to be positively related to its innovativeness [29].

External characteristics of the system refers to system openness which is positively related with innovativeness.

In addition to these three categories, there are five innovation characteristics that have influence on the adoption of the innovation. These characteristics also named as "perceived attributes of technological innovation" are:

- Relative advantage is "the extent to which an innovation is considered 'better' than the idea, practice or object it is supposed to replace" [29]. According to Rogers [29], the innovations that are perceived as having greater relative advantage by receivers are likely to be adopted more rapidly than other innovations.
- Compatibility is "the extent to which an innovation is consistent with existing values, previous experiences and the needs of potential users" [29]. According to Swanson [73], a majority of the compatibility studies did not actually measure compatibility in any direct way, but simply inferred that the innovation was compatible-suitable to the potential user. The degree which an innovation is considered as compatible, is assumed to have a positive correlation with adoption decision.
- Complexity is "the extent to which the innovation is perceived as difficult to understand and complex to use" [29]. Rogers [29] states that opposite to the other attributes, complexity is negatively correlated with the rate of adoption. Thus, the adoption of an innovation is limited by its excessive complexity which is an important obstacle [14].
- Trialability is "the degree to which an innovation may be experimented on a limited basis. New ideas that can be tried on the instalment plan will generally be adopted more rapidly than innovations that are not divisible" [29]. According to Rogers [29] the trialability of an innovation, as perceived by members of a social system, is positively related to its rate of adoption.
- Observability is the last characteristic of innovations [72]. It is defined as "the extent to which the use and effects of an innovation are visible to other members of the social system" [29]. Similar to relative advantage, compatibility, and trialability, observability also is positively correlated with the rate of adoption of an innovation [72].

In summary, the characteristics of innovation has an important effect on adoption decisions. In general, innovations that are perceived by receivers as having greater relative advantage, compatibility, trialability, observability, and less complexity will be adopted more rapidly than other innovations. These are not the only qualities that affect adoption rates, but past research indicates that they are the most important characteristics of innovations in explaining rate of adoption [29].

Within the scope of this thesis "technological characteristics of innovations" will be utilised for investigating cloud computing adoption factors in order to represent the technological context. To put it more clearly, independent variables, internal and external characteristics of the system which are related to innovativeness will not be considered as deterministic factors of cloud computing adoption.

The literature shows that the DOI theory has a solid theoretical foundation and consistent empirical support [74]. On the other hand, according to past studies, the DOI theory can be enriched if the research focus is on complex technological innovations by organizations. Additional variables representing specific contexts where the new technology is actually used can be incorporated [75]. To specify, in the case of cloud computing there exist noticeable security and privacy concerns which are assumed to have influence on adoption decisions. Therefore in addition to aforementioned five technological characteristics, security and privacy issues will be investigated within technological aspect of cloud computing adoption factors.

2.2.5 Relevance of TOE Framework and DOI Theory to Identify Cloud Computing Adoption Factors

For the purpose of investigating cloud computing adoption factors, TOE (Technology-Organization-Environment) Framework of Tornatzky and Fleisher is adapted to provide an understanding of three different elements that are correlated with the adoption of cloud computing. The TOE framework implies that the process of innovation adoption depends on the combined effects of technology features, organizational properties and business environment [45; 69, 71]. In this context, the linking question is to determine whether cloud computing is an innovation or not. Previous literature provides a theoretical background for interpreting the identity of cloud computing from innovations perspective [45]. Based on the IS innovation typology of Swanson [73], cloud computing can be categorized as a type 3 innovation [45]. According to Swanson [73], type 3 innovation integrates IS products and services with core business technology and typically has an influence on general business administration as well. Therefore, the whole business is potentially affected by the innovation which may well be strategic, in terms of offering competitive advantage [73]. Correspondingly, cloud computing utilisation can integrate various service-oriented IT resources within a company's core business technology [45]. In addition to this, economic benefits such as, cost reduction, return on investment and turning CAPEX into OPEX can provide competitive advantage to the company and therefore render cloud computing a strategic innovation. In this sense, it is appropriate to investigate the organizational adoption of cloud computing from technological innovations perspective.

TOE framework has been widely used within the research area of IS/IT for investigating the adoption factors of technological innovations. Some of the previous work grounded on TOE framework are as follows:

Based on TOE framework Lippert and Govindarajulu [75] developed a conceptual model of factors impacting web services adoption at the organisation level.

In order to investigate the adoption factors of E-Commerce by SMEs, Awa and Ukoha [76] use TOE framework integrating it with Technology Acceptance Model (TAM). The authors note that some of the constructs of TOE framework are more applicable to large organizations and integrating TOE with other models such as TAM provides richer theoretical lenses to the understanding of adoption behaviour.

Alshamaila and Papagiannidis [77] adopted TOE framework as a theoretical basis to study cloud computing adoption process in SMEs in north east England.

Borgman et al. [26] built their study on TOE framework to investigate the factors influencing cloud computing adoption. By augmenting the TOE framework they also aimed to conceptualize and understand how IT governance processes and structures moderate those factors cloud computing adoption.

Within the scope thesis, DOI theory which is consistent with TOE framework is found to be useful to scrutinize the technological aspect of adoption factors since it emphasizes the influence of technological characteristics (innovation attributes).

Studies combining the TOE framework and DOI theories revealed by Oliveira and Martins [30] include the following:

Combining DOI theory and the TOE framework, Thong and Yap [78] examined the effect of three characteristics of the Chief Executive Officer (CEO) and three organizational characteristics on adoption of IT. The three CEO characteristics studied are CEO innovativeness, CEO attitude towards adoption of IT, and CEO IT knowledge. The three organizational characteristics studied are the business size, competitiveness of environment, and information intensity.

Chong et al. [79] added innovation attributes (relative advantage, compatibility, and complexity) from DOI and an additional new factor in the adoption study called “information sharing culture characteristics” to the TOE framework.

To study the determinants of post-adoption stages of innovation diffusion, Zhu et al. [74] developed an integrative model specifying four innovation characteristics (relative advantage, compatibility, costs and security concern) and four contextual factors (technology competence, organization size, competitive pressure and partner readiness) as determinants of post-adoption usage using enterprise digital transformation as an example of technology-enabled innovations.

Fichman [80] sought to identify when a company took a lead role in innovating with emerging technologies. For this purpose, the author presented a model of distinctive analysis of the determinants of technology adoption such as technology strategy, organizational learning, innovation bandwagons, and technology adaptation.

Given the examples of combined theories to examine the adoption factors of technological innovations, it can be concluded that integrating different theories of technology adoption provides a better understanding of the IT adoption phenomenon. Although specific factors identified within the three contexts may vary across different studies, both the TOE framework [66] and DOI theory have consistent empirical support. Drawing upon the empirical evidence combined with the literature review, the TOE framework and DOI theory are found to be appropriate mapping tools for studying cloud computing adoption factors in this study.

3 METHODOLOGY

The aim of this chapter is to reflect the analytical explanations that guide this thesis to be grounded on scientific methodology.

This thesis is based on qualitative research method following both deductive and inductive logic. Case study strategy is chosen as the research strategy with an exploratory purpose. The chosen method of analysis is grounded theory. The discussion and explanation of why these methods have been chosen are described below. Prior to description of the chosen methods, the alternative methods which have been rejected are presented with the motivation behind the rejection.

3.1 Choice of Method

Empirical research methods are generally categorised into two main groups; quantitative research and qualitative research.

“Quantitative research is is associated with the production of numerical data that are ‘objective’ in the sense that they exist independently of the researcher and are not the result of undue influence on the part of the researcher himself or herself” [81].

“Qualitative research in contrast, tends to place emphasis on the role of the researcher in the construction of the data” [81].

Both quantitative and qualitative approaches were evaluated to guide this thesis considering their appropriateness to answer the research question of this thesis which is “What are the adoption factors of cloud computing in large scale enterprises in Turkey?”

The first approach-quantitative research method is characterised with strong emphasis on numerical data which means the researcher needs to reach many respondents to gather data. After consideration, this alternative was found to be inappropriate since cloud computing was a relatively new IT service model for Turkish marketplace and there hasn’t been many companies to gather the specific data on cloud computing phenomenon. The second approach-qualitative method provides in-depth understanding of an investigated phenomenon. For the purpose of investigating cloud computing adoption factors in large scale enterprises in Turkey, the selected research method was expected to provide the knowledge of experts, their insights about cloud computing usage and unique organisational factors which might influence the adoption decisions. Considering the advantages of the qualitative method such as; ‘the richness and detail to data’, ‘tolerance of ambiguity and contradictions’ and ‘the prospect of alternative explanations’ allow to carry out the investigation thoroughly [81], this method was found to be appropriate to guide this study. The literature defines research strategy as a critical vision for conducting, progressing and resulting a research study. Surveys, case studies, experiments, grounded theory, action research and mixed methods are the most common research strategies that the literature defines. The use of these strategies are commonly associated with the general category of the research. For instance, most common examples of quantitative research that the literature defines are surveys and experiments while action research, grounded theory, and case study research are associated with qualitative research.

3.1.1 Survey Research

Survey research involves the utilisation of standardised questionnaires or interviews to collect data about people and their preferences, thoughts, and behaviours in a systematic manner [82]. According to Bhattacherjee [82], surveys have many advantages such as quantifying a wide variety of unobservable data, remotely accumulating data about a population that is large in size to observe directly, being economical in terms of researcher time, effort and cost. Although the survey research has its strengths and advantages, it is subject to various biases such as non-response bias, sampling bias, social desirability bias, and recall bias which may invalidate some of the inferences derived from such surveys [82]. For the purpose of investigating "cloud computing adoption factors in Turkish enterprises", survey research has been found to be inappropriate since it heavily depends on structured set of questions which limit to gain in-depth understanding of the subject of inquiry. However, there exist survey studies which investigate cloud computing from different perspectives. For example, Tan and Lin [83] explores the adoption factors of cloud computing using a web-based survey in Singapore companies. Another study based on survey is Chutipong and Hitoshi's [84] research which covers a broader spectrum than Tan and Lin's study with respect to sample size. Their study attempts to find the determining factors for cloud computing adoption in various industries in Thailand.

3.1.2 Experimental Research

Experimental research designs are considered as having great importance in organisational research [85]. Their particular strength as a research strategy is that they allow the investigator to make strong claims about causality. The execution of the experiment is simply to isolate and manipulate a single variable, and at the same time to hold all other variables constant, in order to measure the effect that the manipulated (independent) variable has upon the behaviour (dependent) variable of the subject of the experiment [86]. The two well-known sub-categories of experimental design are the lab experiment also known as "true-experiment" and the quasi-experiment, also known as the "field-experiment" [87].

"Lab experiment, or 'true-experiment', is a type of experimental design where the researcher has a great leverage and control over the study, mainly in the form of selecting the participants and randomly assigning participants and/or events into two or more study groups" [87].

"The quasi-experiment, also known as 'field-experiment' or 'in-situ experiment', is a type of experimental design in which the researcher has limited leverage and control over the selection of study participants" [87]. It has been claimed that the use of experimental research is rigorous in many fields though they have a limited use in the field of IS [87].

For the purpose of investigating the adoption factors of cloud computing at organisational level, experimental research design is not suitable to apply. The research question of this study inquires for various reasons behind the adoption decision of cloud computing which are not set or controlled by the researcher.

3.1.3 Action Research

In action research, the reasearcher and a client collaborate in the development of a diagnosis and solution for a problem, whereby the findings are expected to contribute the body of knowledge in a specific empirical domain [85]. According to Baskerville and Wood-Harper [88], action research is characterised by three conditions: (1) "The researcher is actively involved, with expected benefit for both researcher and organisation". (2) "The knowledge obtained can immediately applied. There is not the sense of detached observer but that of an active participant wishing to utilise any new knowledge based on an explicit, clear conceptual framework". (3) "The research is cyclical process linking theory and practice" [88].

Previous literature on action research in information systems field has been examined by Baskerville and Myers [89] with the aim of publishing empirical studies that can serve as models ("exemplars") of how to do action research and promote action research [89]. The examples that the authors provide that action research has been a well-suited research strategy for IS studies. However, within the scope of this thesis, action research is considered as inappropriate since the aim of this study is not to develop a solution for a particular problem but rather to investigate the cloud computing adaption factors in Turkish large scale enterprises.

3.1.4 Grounded Theory

Grounded Theory was first introduced by Glaser&Strauss in 1967 aiming to generate theory be grounded in the data collected. It is a qualitative approach that emphasises the importance of empirical fieldwork and the need to link any explanations very closely to what happens in practical situations in 'the real world' [81].

Grounded theory approach is found to be useful when the aim of the researcher is to discover new insights about a phenomenon or topic which has been relatively ignored or given little attention [81].

"It is expected from the researcher to initiate research without having any fixed ideas on the nature of the setting which is about to be investigated and not to be influenced by previous theories or other research studies related to the area" [81]. However as the use of the theory increases, it is argued that the existing theories and previous work may be used as a starting point for applying grounded theory that lead to further investigation. The application of grounded theory is as follows [90]:

"A researcher begins a grounded theory study with ideational constructs for investigation. Next, the researcher takes 'slices of data' from the area of enquiry and codes them into conceptual categories. (These slices of data can come from many different sources, and can be collected using many different data collection methods. This of course provides an opportunity for corroboration or triangulation of the data). The conceptual categories are further conceptualised into theoretical constructs by establishing 'relations' between them. Additional data are acquired using theoretical sampling until the existing categories are 'saturated' (i.e. there are no more instances of them in the data), and until no more new conceptual categories or relations emerge. The 'saturated' concepts are then reduced as much as possible to the relationships between core categories, which then form a 'grounded' theory. The grounded theory that is produced is thus anchored in the data that led to its formulation".

According to Urquhart et al [90], the grounded theory has been used mostly as a tool for coding qualitative data in many diciplines of science including IS research area. Indeed, the grounded theory has been classified as a data collection/analysis technique by some authors such as Bhattacherjee [82].

Grounded theory approach allows to use multiple data sources that provide the opportunity for comparison of the data in order to understand different aspects of the investigated phenomenon. Grounded theory can be applied together with other research strategies such as case study when available.

3.1.5 Case Study

Case study is a method which includes multiple ways of data collection such as interviews, observations, pre-recorded documents, and secondary data for investigating a phenomenon intensively within its natural setting in one or a few sites [82].

According to Bhattacherjee [82], case study can be employed for the purpose of theory testing in a positivist manner or for theory building in an interpretive manner. In order to identify “adoption factors cloud computing in large scale enterprises in Turkey”, an objective point of view is needed. Therefore case study research is found to be the most suitable research method to apply.

Case study allows to investigate different case sites which are assumed to reflect various aspects of factors that have influence on the decision of cloud computing adoption. Therefore, a single case study has found to be insufficient to address the unit of analysis. In order to establish causality and generalise the findings from single case site to other case sites, more than one case are needed to collect data. This strategy is called “multiple case design” which includes replicating and comparing the analysis in different case sites with the aim of improving the generalizability [82, 91]. Multiple-case design is selected to investigate “adoption factors cloud computing in Turkish large-scale enterprises”.

According to Denscombe [81], the appropriateness of a chosen strategy can be justified considering suitability, feasibility and ethicality. In this sense, case study as the research strategy of this thesis is;

- suitable; since the case study involves in-depth investigation of the companies through interviews, document examinations and observations to gather the data,
- feasible; in terms of accessing the data sources including large scale enterprises and interviewees from those enterprises which locates in Turkey and
- ethical; since all the participants of interviews were reluctant to contribute to this research and ensured about the confidentiality.

Case study method has been used previously by some researches for examining cloud computing. For example Loebbecke et al. [92] describes a field-tested method for assessing the cloud readiness of an organization’s IT services applying a single-case study. Another case study is Iyer and Henderson’s work [49] which is based on field interviews conducted in seven early adopter companies. The authors claim that they describe six cloud computing benefit patterns and five business-related strategic risks that can be managed using cloud computing. Additionally, Morgan and Conboy [93] applied case study strategy for investigating cloud computing adoption factors in three selected cases including service providers and their customers.

3.2Data Collection

Data collection phase can be separated in two dimensions within the scope of this thesis. The first dimension is the formal methods which can be considered as the alternative methods for collecting the data. The second dimension is the criteria of data source selection. Below, these dimensions are explained.

3.2.1 Alternative Methods for Data Collection

Methods of data collection refer to as various techniques for collecting research data. Commonly, there are two main sources of data collection; primary data and secondary data. The first source of data collection-primary data involves questionnaires, observations, interviews, and document studies. The second source of data collection-secondary data can be described as the information that already exists in scientific literature. Although there is a tendency to apply data collection methods in association with certain research strategies, data collection methods are complementary to each other, and it is preferred to use multiple methods when available. Some of the instruments when collecting primary data are explained briefly below.

Questionnaires are one of the the data collection tools refering to forms filled in by respondents. These tools can be grouped in different types such as; postal type and internet type [81]. The questionnaires are mostly used within surveys. According to Bhattacherjee [82], to collect data about people and their preferences, thoughts, and behaviours in a systematic manner in survey research, standardised questionnaires can be utilised [82]. These tools are specifically cost-effective tool when the researcher aims to collect information on simple and uncontroversial facts [81]. However, within the scope of this thesis, questionnaires are not suitable for investigating the adoption factors of cloud computing. The standardised structure of questionnaires limits the need for deep understanding of the cloud computing adoption influencers.

Observation is a systematic process of witnessing events and thereby draws on the direct evidence [81]. Observational techniques can be in the form of direct observation or participant observation. The researcher is a neutral and passive external observer and is not involved in the phenomenon of interest (as in case research) in direct observation while she is an active participant in the phenomenon and her inputs or mere presence influence the phenomenon being studied (as in action research) in participant observation [82]. Observations are also used in grounded theory research as a method for data collection. However, observation is not a suitable data collection method to answer the research question of this thesis which seeks to find out the influencers of cloud computing adoption.

Interviews are one of the most common ways of collecting data from individuals in a systematic way. According to Denscombe [81], interviews provide a suitable method to gain insights into things such as people's opinions, feelings, emotions and experiences. Although the literature defines various forms of interviews, in general there are three types of interviews namely; structured, semi-structured and unstructured.

- The structured interview is like a questionnaire which is conducted face-to-face with a respondent [81]. In structured interviews, the emphasis is on standardisation of questions in terms of wording and sequence. This type of interviews are often associated with social surveys where researchers are trying to collect sizeable amounts of data from a wide range of respondents [81]. Structured interviews are generally consist of questions which are designed for fixed-choice answers.
- Semi-structured interviews are flexible with regards to the order that the topics are considered. Interviewee generates ideas and speaks more widely on the issues raised by the researcher. The emphasis is on the interviewee evaluating the points of interest with open-ended answers [81]. The strength of semi-structured interview is that the researcher can gain deeper knowledge about the subject under investigation. However, this type of interview requires considerable amount of time.
- Unstructured interviews go beyond in the extent to which emphasis is put on the interviewee's thoughts [81]. Accordingly, the researcher's should be unintrusive as possible – to get started the topic by introducing a theme and then allowing the interviewees to develop their own ideas. Unstructured interviews are consist of open-ended questions similar to semi-structured interviews.

Interviews can be used as a data collection tool for different research strategies such as action research, grounded theory, case study and surveys but it should be noted that the interviews within the survey research are tend to be structured rather than being semi-structured or unstructured which are the expected forms of interview in action research, grounded theory and case study.

Having explained the main features of interview technique, this technique is found to be the most suitable data collection method for this study. After consideration different types of interviews, the structured interviews are found to be inappropriate to use in this study since they are not flexible in order to gather the insights of interviewees. Unstructured interviews are also found to be inappropriate since they are time-consuming in terms of data collection and analysis. Semi-structured interviews on the other hand, allow to gain in-depth information about the influencers of cloud computing adoption. Previous work on cloud computing provided that semi-structured interviews have been used for understanding cloud computing adoption as a data collection technique. [e.g. 77]. Therefore, semi-structured interviews are the main data collection method for data collection in this multiple-case study.

Document study is a technique which utilises external and internal documents such as memos, electronic mails, annual reports, financial statements, newspaper articles, and websites to accumulate further information about the phenomenon of interest or to certify other forms of evidence [82]. Document study can be applied to many kinds of research such as grounded theory, action research and case study. In order to investigate the adoption factors of cloud computing, document study can be applied as a complementary data collection method since there exist available documentary about cloud computing, its adoption and organisational utilisation. These documents can further be examined to gain insights about the adoption factors of cloud computing.

On the whole, qualitative research method is found to be suitable to investigate the adoption factors of cloud computing. Case study is considered as the best research strategy to apply compare to other strategies such as survey, experimental design and action research. Data collection method is influenced by the chosen research strategy-case study and therefore semi-structured interviews are selected as the main source of data collection in order to gain in-depth understanding from the experts at organisational level.

3.2.2 Criteria for Data Collection Sources

Company Selection Criteria

As explained above, the strategy for this research is case study which allows to choose settings, groups and/or individuals based on specific characteristic(s) which provides the researcher with insight about the phenomenon of interest [94]. Although there exist different criteria for case selection, two criteria has found to be deterministic in order to conduct case study in this research. The first criteria is that the chosen cases are asked to represent a population of cases that is often much larger than the case itself [94]. Secondly, chosen cases are expected to vary on relevant dimensions [94]. Within the scope this thesis, five large-scale enterprises from Turkish private sector are selected to represent the large-scale enterprises in Turkey. A large scale enterprise is one which employs more than 250 people and exceeds at least two of the following figures: (1) an annual sales revenue of more than 40 million Turkish Lira, (2) a balance sheet total of more than 40 million Turkish Lira [4]. Therefore the first criteria for company selection is the representativeness is expected to be fulfilled. In order to achieve variation on relevant dimensions such as sectorial diversity, companies are selected from different industries namely energy, manufacturing, construction, engineering and health-care.

Interviewee Selection Criteria

In case studies, semi-structured interviews are commonly used data collection methods. Within the scope of this thesis, interview respondents are selected considering that they are all in similar organisational positions. This also covers the need for technical and managerial expertise of the respondent to evaluate the subject of inquiry-cloud computing phenomenon.

3.3Data Analysis

There are some general principles that are commonly associated with qualitative data analysis [81]. According to Denscombe [81], the analysis of qualitative data tends to be regarded as iterative, inductive and researcher-centred. In literature, there are several approaches to analyse the qualitative data. Some of the qualitative data analysis approaches are grounded theory, content analysis, hermeneutic analysis [82], discourse analysis, conversation analysis and narrative analysis [81]. Among these, content analysis which has been considered to apply in this thesis and grounded theory which has been selected to apply in this thesis are explained below.

3.3.1 Content Analysis

Content analysis is a data analysis method which can be used with any 'text'including the forms of writing, sounds or pictures. It is used as an analytical tool for quantifying the contents of text in investigation [81]. Content analysis generally follows a logical and relatively straightforward procedure starting with selecting a suitable sample of texts. The second step of the analysis is to break the sample down into smaller component units. The unit for analysis can be any word. The researcher then codes the units in line with categories and count the frequency that these units occur. The last phase of the method is to analyse the text in terms of the frequency of the units and their relationship with other units that occur in the text [81]. The content analysis has its own strengths and limitations. Accordingly, using this method provides a means of quantifying contents of a text which is clear and repeatable by other researchers while dislocating the meaning of the units from the context in which they were made is regarded as a limitation [81]. This method has been evaluated as alternative data analysis method for this study. After consideration, this method has found to be inappropriate for this thesis since it heavily depends on words count and passes over the underlying meaning of the concepts.

3.3.2 Grounded Theory

As explained in section 3.1.4, the use of grounded theory as a data analysis method is very common. Grounded theory approach requires eliminating any pre-existing theoretical expectations or biases before data analysis, and allowing the data to dictate the formulation of the theory [82]. In this manner, grounded theory holds an inductive logic which inquires for making generalisations from a collection of data. The application of grounded theory for data analysis consists of a set of steps. These steps are the coding techniques used during the application of the method. Three coding techniques to analyse text data are open coding, axial coding and selective coding to derive a chain of evidence and inferences [82].

Open coding is a process aimed at identifying concepts or key ideas potentially related to the phenomenon of interest that are hidden within textual data [82]. Ideas, perceptions or attitudes of relevance are coded as "concepts". After a set of concepts which have something in are determined, these concepts are coded as belonging to a broader category. As the codes take a definite form, the researcher looks for relationships between the codes – links and associations that allow certain codes to be included under enlarged headings and certain codes to be considered as more crucial than others. This is referred to as axial coding, since it shifts the analysis towards the identification of key (axial) components [81]. The third and final phase of grounded theory is selective coding which focuses on just the core codes that have emerged from open and axial coding as being vital to any explanation of the complex social phenomenon [81]. Coding the new data with the purpose of theory refinement continues until theoretical saturation is reached [81].

Using techniques such as open coding, axial coding and selective coding seems to impose restrict procedures to the researcher. However, coding procedures moves the raw data to an abstract level and reveals the relation between investigated phenomena and concepts around it. Considering the detailed and systematic procedures of analysis, this method is the most relevant method for analysing the data collected. The research question of the thesis-"what are the adoption factors of cloud computing in Turkish large scale enterprises" can be approached to build new theories using grounded theory and help future investigation on the cloud computing adoption.

3.4Ethical Considerations

Ethical considerations in qualitative research are complex issues involving values, perceptions, and legal limitations for maintaining the integrity of the scientific research as well as protecting the research participants' individual and/or institutional rights. There are widely accepted ethical principles in scientific research that the researcher is expected to follow. According to Bhattacherjee [82], these principles are as follows:

- "Voluntary participation and harmlessness: Subjects in a research project must agree that their participation in the study is voluntary and they have the freedom to withdraw from the study at any time without any unfavourable consequences, and they are not harmed as a result of their participation or non-participation in the project".
- "Anonymity and confidentiality: To protect subjects' interests and future well-being, their identities must be protected in a scientific study. This is done using the dual principles of anonymity and confidentiality. Anonymity implies that the researcher or readers of the final research report or paper cannot identify a given response with a specific respondent. Confidentiality is a weaker form of protection than anonymity. Applying the confidentiality principle, the researcher can identify a person's responses, but promises not to divulge that person's identify in any report, paper, or public forum".
- "Disclosure: It is the responsibility of the researcher to provide some information about the study to potential subjects before data collection to help them decide whether or not they wish to participate in the study".
- "Analysis and reporting: Researchers also have ethical obligations to the scientific community on how data is analysed and reported in their study. It is important to disclose the unexpected or negative findings even if they cast some doubt on the research design or the findings. Similarly, many interesting relationships are discovered after a study is completed, by chance or data mining. It is unethical to present such findings as the product of deliberate design".

3.5 Application of the Research Method

This section presents how this research is executed starting from the literature review through the application of case study and description of the data analysis.

3.5.1 Literature Review

The information that already exists in scientific literature is a valuable source for qualitative research. Within the scope of this study, the literature review has been conducted through the research study from the beginning. Initially, previous research has been examined to find out whether the question of this thesis had already exist or not. It has been found out that "the adoption factors of cloud computing in Turkish private sector" has not been a topic of a scientific research though it was investigated for commercial reasons by some providers. Books, journals, scientific articles and white papers in which cloud computing and related concepts have been defined, explained and discussed were reviewed in order to gain deeper understanding of cloud computing paradigm. In this stage, a number of academic databases have been used such as EBSCOHost, IEEE Xplore, Elsevier, SpringerLink, JSTOR, Google Scholar and ScienceDirect. The key words- cloud computing, cloud computing adoption, SAAS, PAAS, IAAS were used to access the relevant publications. Since the research question of this study is "what are the adoption factors of cloud computing?" a wide spectrum of literature review capturing IT adoption factors was needed in order to gain information about the adoption factors of IT in organisations. Therefore, the previous literature on IT adoption factors has been reviewed using the aforementioned databases.

3.5.2 Selection of the Companies and Respondents

In order to identify factors of cloud computing adoption in large scale enterprises in Turkey, the companies were selected from the category of "Large Scale Enterprises" which operate in Turkey. It is important to note that there is no general definition of enterprise size, meaning that the definition can vary in different countries. As stated previously, the generally agreed upon classification criteria for identifying enterprise size in Turkey is defined in Turkish Trade Law [1]. According to Turkish Trade Law applicable from 2012, a large scale enterprise is one which employs more than 250 people and exceeds at least two of the following figures: (1) an annual sales revenue of more than 40 million Turkish Lira, (2) a balance sheet total of more than 40 million Turkish Lira. Sectorial diversity of the sample was considered as a requirement for reflecting different information technology needs and practices. Therefore, the companies were selected from different sectors-manufacturing, energy, healthcare, construction and engineering. The use of cloud computing was another consideration when selecting the companies. The two out of the five companies were cloud service users and labelled as "adopter(s)" while the other two companies which didn't use cloud services were labelled as "non-adopter(s)" and one company which used cloud services in the past but moved out of cloud at the time of investigation was labelled as "past adopter". Interview respondents were selected from similar organisational positions in every company. One of the criteria for respondent selection was the respondent's technical and managerial expertise to evaluate the company's existing IT system as well as the knowledge on cloud computing services. For this purpose, the respondents were all IT specialists since their knowledge on the investigated phenomenon is expected to be wider. Therefore, they provided adequate information related to their personal and organisational attitude toward cloud computing adoption. In order to maintain the confidentiality, companies are presented with identifiers namely Case A, Case B, Case C, Case D and Case E. The respondents of the interviews are identified with the letter P referring to as "participant" followed with a number. P1 and P2 are the participants in

Case A, P3 and P4 are in Case B, P5 is in Case C, P6 is in Case D and P7 is in Case E. Companies and respondents that take part in this study are briefly described in table 1.

Companies	Cloud Usage	Sector	Respondent	Respondent's Position
Case A	Adopter	Oil and Gas	Participant 1 Participant 2	Software developer IT Manager
Case B	Adopter	Health-Care	Participant 3 Participant 4	IT Manager Computer Hardware specialist
Case C	Past Adopter	Manufacturing	Participant 5	IT Manager
Case D	Non-Adopter	Construction	Participant 6	Software developer
Case E	Non-Adopter	Engineering	Participant 7	IT Manager

Table 1. Description of the companies and respondents

3.5.3 Designing the Interview Questions

Interview questions were designed to gain information about "adoption factors of cloud computing" while providing the interviewees with a certain freedom to express their own opinions on the subject. The interview questions were semi-structured which helped to increase the depth of information gained from the interviews. Previous work on cloud computing provided that semi-structured interviews have been used as a data collection technique for understanding cloud computing adoption factors [e.g. 77].

It is critical to note that the selected research methodology- case study is consistent with the analysis method-grounded theory and can be employed in an interpretive manner for theory building [82]. These selected methods also influence the design of interview questions. Therefore, it is necessary to set out the interview questions in a way that takes a neutral perspective and avoids to evoke any adoption factor of cloud computing which have been pointed out in previous literature. In the meantime, it is aimed to get as much data as possible regarding the IT adoption and use with the emphasis on cloud computing in the companies. Table 2 depicts the outline of the interview questions and their motivations.

Part 1-Questions		Motivations
Company Background	• Main industry that the company conducts its business • Number of employees • Years since establishment	Understanding the relevance of the company characteristics to the research study.
Interviewee Background	• The position of the interviewee • Years of experience • Years of experience in the company	Presenting the respondent's organizational position and area of knowledge.
Part 2		

1. Would you tell us about your current IT system? 2. Do you outsource any of your IT needs? 3. What is your strategy when outsourcing your needs? (Core, non-core related services: Will you keep competence inside?) 4. What IT functions do you have in-house? 5. What are the reasons for keeping those functions in-house? 6. What do you think of cloud computing? Compared to traditional outsourcing, or keeping in-house?	The company's current IT strategy is an important factor when evaluating its attitude toward cloud computing.
Identifier Question 7. Do you use cloud computing services?	Identifies the rest of the interview questions depending on being/not being a cloud computing user.
Part 3	
Question Set 1:	
7a. Why didn't you use/consider cloud computing services as alternative? /What reasons can you tell about not to consider cloud computing as an alternative?	The factors that have influenced not to adopt cloud computing can be partly elicited from the answer.
7b. Would you consider using cloud computing in the future? Why?	The factors that may influence the adoption of cloud computing in the future.
Question Set 2:	
7c. What cloud computing services is your company using (For example email, application, CRM, HR, Accounting, Data Storage, CPU usage, etc.)? How important they are for your competitive edge? -Do you use standard or highly adapted services? -Do you see standard services as advantageous or disadvantageous related to your own competitive edge? 7d. How long have you been using cloud computing services? 7e. Can you tell us about the reasons why you chose to use cloud computing? 7f. What are the benefits of being cloud consumer? 7g. Do you think that there are disadvantages of cloud computing? 7h. What has changed in terms of financial, technological, and organizational aspects since you have moved to cloud? 7i. Are security issues important for your cloud computing service (if your data could be stolen)? 7j. Are the back-up issues regulated in the contract? In what way do you prefer them to be addressed? 7k. What type of quality/security certifications has your CC provider? 7l. How long is your contract with the provider? 7m. Are there enough providers that could take over if you are not satisfied with the CC services?	The factors that have influenced to adopt cloud computing services in terms of service type and deployment model. The advantages and disadvantages of cloud computing from the perspective of user company. Understanding the motivation behind the preference of cloud computing provider and expected qualities of provider.
Question Set 3:	
7n. What cloud computing services did your company use in the past? 7o. How long did you use cloud computing services? 7p. Can you tell us about the reasons why you chose to use cloud computing at that time? 7r. Can you tell us about the reasons why you moved out of cloud? 7s. What are the disadvantages of being a cloud consumer? / What were the challenges? 7t. Would you consider using cloud computing in the future? Why?	The factors that have influenced the decision on moving out of cloud.

Part 4	
8. Which sectors can benefit from cloud computing most? 9. Are there any regulatory restrictions that may influence cloud computing adoption? 10.Who is the decision maker when adopting new technologies in your company? Which procedures are followed before decision making?	The respondent's opinions about cloud computing, the impact of regulatory environment and organizational decision making processes.

Table 2. Outline of the interview questions

The semi-structured interview questions of this this study consist of five parts. The first part includes questions about company background and interviewee background. The second part of the questionnaire relates with the company's current IT system and seeks to investigate outsourcing/insourcing preferences of the company. Prior to cloud computing questions, these two parts provide the basis for understanding whether the company's overall IT strategy overlaps with its attitude toward cloud computing. Before starting with the third part, there is an identifier question which is "Do you use cloud computing?" This question leads to different set of questions depending on the interviewee's respond. There are three sets of questions depending on the interviewee's respond to this question:

The first set is asked if the company doesn't use cloud computing services. These questions aim to understand the factors that have influence on the non-adoption of cloud computing and whether the company would consider using cloud computing in the future.

The second set is asked if the company uses cloud computing services. These questions are related with the cloud experience of the company such as realised benefits, advantages/disadvantages, the service type of cloud computing, deployment model of cloud computing.

The third set is asked if the company used cloud computing services in the past but not using currently. These questions are intended to understand what reasons affected the adoption decision in the past and the possibility to use cloud computing again in the future.

The fourth and last part of the interview questions relates with the respondents perceptions about cloud computing, legislatory restrictions if exist and organisational decision making procedures which may influence the adoption of cloud computing.

3.5.4 Data Analysis

In this research, qualitative data was collected through semi-structured interviews and analysed using Strauss and Corbin's [95] open and axial coding techniques. A series of codes emerged after completing the open coding phase. These codes were mainly repeated words, ideas and perceptions of the respondent related to "IT adoption", "IT resources", "IT management" and "cloud computing phenomenon". In order to identify concepts related to "cloud computing adoption factors", these codes were examined and specific properties that they had in common were brought out into open. Completing the open coding phase, it was clear that certain concepts could be grouped under a more abstract, higher order concept, based on their ability to explain to similar concepts [95]. Therefore, concepts were categorised under different labels depending on the research context such as internal factors of cloud computing adoption and external factors of cloud computing adoption.

According to Strauss and Corbin [95], "once a category is identified, it becomes easier to remember it, to think about it, and to develop it in terms of its properties and dimensions and further differentiate it by breaking it down into its subcategories". Subcategories are necessary groups for axial coding phase which is the second phase of grounded theory analysis. In axial coding, the aim is to relate categories to their subcategories in order to add depth and structure to categories. In this research, axial coding phase used to disclose the relations between subcategories and categories. Disclosed relations between subcategories and categories were tracked through the text data in order to monitor the validity of these relations. Ensuring that the validity of these relations were exist, theoretical saturation to answer the research question was achieved and presented with the conditional context in which the categories situated.

3.5.5 Ethical Considerations

Ethical considerations as mentioned previously in section 3.4 aims to maintain the integrity of the scientific research as well as protecting the research participants' individual and/or institutional rights. In this research, ethical considerations were applied as follows.

- Voluntary participation and harmlessness: The possible participants of the research were informed about the aim of the research, data collection methods, and how they were expected to contribute to the research. After their decision to participate in the research, the participants were assured that they had the freedom to withdraw from the study. It should be noted that the participants were not harmed as a result of their participation or non-participation in the project in any terms.
- Anonymity and confidentiality: To protect the study participants' interest and future well-being, it was aimed to protect their identities by following anonymity principle. The responses of the participants presented to the reader in a way that it would not be possible to match the participants' identity with the given response. Additionally, the participants were explained in written (in emails and interview documents) and verbally (at phone calls and face-to-face meetings) that their identities would not be published in any report, paper, or public forum. The participants were informed that practical security measures were taken into account meaning that data recording and storing were limited with the researcher's access.
- Disclosure: Prior to data collection, the participants acknowledged about the context of the research alongside their expected contribution to the research.
- Analysis and reporting: The ethical obligations to the scientific community was ensured by detailed explanation on how data was collected and analysed. Detailed explanation of data analysis and the presentation of the results allowed both the evaluation and verification of the findings in terms of fulfilling the ethical requirements of analysis and reporting.

3.6Research Credibility

The credibility of research findings is mostly measured according to the degree of the research's reliability, validity, and generalizability.

3.6.1 Reliability

Reliability refers to the extent to which a researcher's data collection techniques or analysis procedures will produce consistent findings [91]. Accordingly, the main threats of reliability are "the subject or participant error", "the subject or participant bias", "observer error", and lastly "observer bias".

For this study, the subject or participant error has not been an issue for the interviews during the research. The interview questions were designed to hinder such errors from the very beginning.

The subject or participant bias refers to the effect of outer pressure which a respondent is under. In this research, most of the respondents were decision makers. Therefore it was assured that participant bias were not the subject of reliability.

Third, there may have been observer error. According to Saunders et al [91], introducing a high degree of structure to the interview schedule will decrease this threat to reliability.

Finally, there may have been observer bias. To avoid this bias, interview questions were prepared without using pre-determined factors for cloud computing adoption.

3.6.2 Validity

Validity is concerned with whether the findings are truly regard to what they appear to be [91]. According to Saunders et al [91], there are six threats to validity namely; history, testing, instrumentation, mortality, maturation and ambiguity about causal direction.

During the interviews, it has been observed that cloud computing has become a well-known paradigm which IT people were willing to share their ideas. In terms of history, there hasn't been any threat to the validity of research due to the fact that cloud computing has been evolving and being discussed as a new phenomenon.

Testing was not found to be a threat within the scope of data collection since the respondents were not tested on their knowledge about cloud computing.

Instrumentation points out the hazard of participants' efforts to make profit by presenting their ideas and products [91]. This threat could occur if the participants companies were cloud providers and their institutional identities were revealed. However, no such threat found within the research cases since the participants were not provider companies.

Mortality, says Saunders et al [91], refers to participants dropping out of studies. In this research no threats of mortality has been occurred.

Maturation can be described as unexpected events to happen which could result in false inferences of existed findings. This could be a threat for the current research only if the investigated companies would change their IT systems in a short period of time which seems to be unrealistic in current circumstances.

In terms of ambiguity about a causal direction, the relationship between factors and phenomenon can be subject of debate only from the perspective of the observer. However, this threat didn't occur since the cause and effect correlation was mapped clearly by the theoretical and practical structure of data collection methods.

3.6.3 Generalizability

Generalizability is sometimes referred to as external validity. A researcher may have concerns in the design of research to the extent the results are generalizable implying that whether the findings may be equally applicable to other research settings, such as other organisations [91].

The research at hand was designed to apply a multiple case study which aims to generalise the findings as much as possible. The number of companies and diversity of the sectors were decided upon generalizability principle of the research credibility.

4 Cloud Computing Adoption Factors Derived from the Literature

As mentioned in background of this study, there is a scarcity of knowledge on how large enterprises evaluate cloud computing when they reason about possibility of replacing their existing IT systems with cloud computing services. It is not clear which factors they consider and how they evaluate these factors. Therefore, an integrated approached is necessary which covers investigation of IT adoption factors and the field of cloud computing.

The literature review on cloud computing and IT adoption factors provided that cloud computing adoption factors can be explained by the elicited theories on the subject of inquiry. These theories as introduced in sections 2.2.3 and 2.2.4, TOE framework and DOI theory. While the former one helps to understand cloud computing adoption factors from the perspectives of technology, organisation and environment, the latter contributes to the former one with providing in-depth investigation of technological aspect of the TOE framework.

The findings of literature review on IT adoption factors and cloud computing paradigm provided that there has been a strong compliance between IT adoption theories and the features of cloud computing which might have influence on adoption decision. Furthermore, evaluating the organisational and environmental aspects of technology adoption can lead to a better understanding of how different variables affect the adoption of cloud computing.

A detailed and accurate analysis is a requirement in the decision making process of new technology adoption where the the total of expected benefits and total costs of adoption are evaluated [45, 80]. On the basis of such valuation, expected benefits are positively related with technology adoption while costs are perceived to have negative impact on technology adoption. In the case of cloud computing, expected benefits and cost are generally attributed to its original characteristics.

Cloud computing adoption factors derived from literature based on TOE framework and DOI theory are the factors where a common sense of significance is reached. However, this study aims to find the adoption factors of cloud computing in an exploratory manner meaning that the factors derived from literature review are intended to be used as a mapping tool whether the adoption factors of cloud computing derived from interviews match with them or not rather than testing the TOE framework and DOI theory in terms of their suggested adoption factors.

Therefore, cloud computing adoption factors derived from the literature are expected to improve the understanding of the cloud computing adoption and prepare a platform for comparison and discussion of the findings from case studies in further sections.

Giving the affiliation of literature review with the research question of this study, the results of literature review including examples from the previous work are presented in the following sections.

4.1.1 Technological Context of Cloud Computing Adoption Factors

The technological context describes the characteristics of the innovation from the perspective of DOI theory. The original characteristics of cloud computing will be attributed to characteristics of innovation which are relative advantage, compatibility, complexity, triability and observability.

Relative Advantage

Relative advantage defines the extent to which an innovation is considered 'better' than the idea, practice or object it is supposed to replace. The impact of relative advantage on technology adoption has been widely investigated and positively associated with the adoption of innovation in previous research [e.g. 26, 29, 56, 74]. It has been shown that when businesses perceive a relative advantage in an innovation, then the probability of the adoption increases [56, 78]. Cloud computing promises a variety of advantages to companies adopting it. According to Hill et al. [37], one of the attractions of cloud computing is the rapid provisioning of new computing resources without capital expenditure since it removes capital funds, long procurement procedures and human resource investments which are common barriers for new technology adoption. Similarly, Staten [8] indicates that cloud computing can provide an almost immediate access to hardware resources, with no upfront capital investments for users, leading to a faster time to market in many businesses. As mentioned earlier in the "economic aspects of cloud computing" (see section 2.1.6), improved time to market is an essential characteristic of cloud computing.

The scalable resources of cloud computing can be easily adjusted to changing business needs [26]. Business agility is therefore another driver for the adoption of cloud computing [37]. According to Hill et al. [37], the other key business driver is the potential reduction in ongoing capital expenditure costs afforded by cloud computing. "As the use of IT becomes more sophisticated, greater demands are placed upon IT fundamentals such as data storage, and if the requirements fluctuate significantly, the pay-per-use pricing model of cloud computing can realise operational savings beyond the costs of the potential extra hardware requirement" [37].

Additionally, as an environment friendly initiative and a promising strategy, going green enables corporates to minimise IT units' energy consumption and save on energy bills [96]. Furthermore, implications of not going green might cost a lot in the context of environmental regulations, stakeholder demands, competitiveness, brand/corporate image and social responsibility. In this context, clouds principally allow to reduce the consumption of unused resources (down-scaling) and provide an energy efficient way to use computing resources. Therefore, going green can be as another relative advantage that has been perceived when determining cloud computing adoption factors.

To sum up, the relative advantage of cloud computing is directly linked to its attributes such as "turning Capex into Opex, cost reduction, flexibility, and going green". These attributes set a positive correlation between relative advantage and cloud computing adoption. Therefore, perceived relative advantage of cloud computing in both technical and economical aspects should encourage IT professionals when considering the use of cloud computing to conduct their businesses [97].

In at least some cases, however, costs associated with cloud computing may outweigh potential financial benefits. One commonly cited cost is migration. The cost of migration occurs when users move the data and other resources from their own facilities to those of provider depending on factors such as size of the resources being moved, the way the resources are moved [41].

Compatibility

Compatibility refers to the degree which an innovation is perceived as consistent with internal organisational and information systems environments [29]. The internal organisational environment considers business structures in organisations (e.g. primary and support activities), business strategy in general, existing values, experience, work practice, and organisational needs while the internal information systems environment includes capability, infrastructure (e.g. operating environments including hardware and software infrastructures), domain technology, and implementation technique [97, 98]. Previous research frequently singles out this factor's influence on the adoption of innovative technology; it correlates positively with the diffusion of innovations [26, 73].

Regarding cloud computing, the improved compatibility of different software platforms over the last decades provide a more suitable stage for adoption. However data and process compatibility are still seen as major obstacles which limit the adoption of cloud computing [16, 26]. Specifically in large scale enterprises, cloud computing adoption is influenced by the compatibility of cloud services with the well-established IT systems.

Complexity

Complexity refers to the degree which an innovation is perceived as relatively difficult to understand and use [29]. A general consensus is that a complex innovation which requires greater technical skills and effort to implement reduces the likelihood of adoption [97].

Some authors [32, 43] claim that the complex aspects of cloud computing are hidden from the end user. In the words of Vouk, [20] "the complexity of the cloud framework should be kept away from the higher level users through judicious abstraction, layering and middleware. The complexity of the underlying infrastructure and middleware can be daunting, and, if exposed, can impact wider adoption of a solution" [99]. Hence, IT professionals are more likely to consider using cloud computing if it does not require more technical skills and greater efforts to implement and use it [97].

Trialability

Trialability is the degree to which an innovation may be experimented on a limited basis [29]. If the potential adopters have the option of experiencing the innovation before the adoption, it will increase the likelihood of adoption.

In the current marketplace, many of the cloud providers such as Microsoft, Oracle, IBM, Amazon, Salesforce, etc. offer trial versions of their services. It may be argued that cloud applications have high triability, given their availability at either no or very low cost.

Trialability can increase the likelihood of using cloud computing because IT professionals may feel more comfortable with it after having used and handled it [97].

Observability

Observability refers to the degree which the results of an innovation are visible and communicated to others [29] and positively related with the adoption of innovation. In a research conducted by Lin et al [97], results show that companies will not adopt a new technology unless the technology can demonstrate a relative advantage in comparison to existing technologies and commercial benefits. According to Lin et al [97], the IT professionals are more likely to use cloud computing if the benefits of using cloud computing are obvious and being communicated to them. Therefore, observability is positively correlated with cloud computing adoption.

Security and Privacy

Referring to the innovations' characteristics definitions of Rogers [29], security in terms of cloud computing can be described as the degree which cloud computing is perceived to be relatively secure and protect privacy.

Security has been a concern for many of the technology enabled innovations including cloud computing [e.g. 8, 74, 97, 99]. The literature provides that security is one of the major issues which reduces the growth of cloud computing since the complications with data privacy and data protection continue to be discussed [100]. According to Vouk [20], "for end-users to feel comfortable with a "cloud" solution that holds their software, data and processes, they shoud have considerable assurances that services are highly reliable and available, as well as secure and safe, and that privacy is protected".

Although some of the authors hold the idea that cloud computing provides a more secure computing environment than traditional computing environments, from an objective point of view it can be concluded that security and privacy are negatively correlated with cloud computing adoption since the debates on security continues.

4.1.2 Organisational Context of Cloud Computing Adoption Factors

The organisational context refers to the organisational characteristics' effects on the adoption of cloud computing. The organisation size and scope; the centralisation, formalisation, interconnectedness, and complexity of the managerial structure; and the quality and availability of the company's human resources are the main organisational characteristics [75].

Several studies have pointed out the importance of organisational characteristics on innovation adoption [e.g. 45, 65, 66, 74, 77, 26, 101, 102, 103]. Among these, Son et al. [45], Alshamaila et al [77], Borgman et al. [26] and Low et al [103] developed variants of TOE framework in which organisational context was a determining aspect for discovering cloud computing adoption factors.

Within the organisational context some of the characteristics have found to be greater influence than others. Specifically, the adoption literature proposed that organisation scope and size are important organisational factors for technology adoption [75]. In the current study, organisation size and top management support will be explained in detail for two reasons: First, this study puts emphasis on the size of the companies aiming to explore adoption factors of cloud computing in large scale enterprises. Second, top management support is critical for creating a supportive climate and for providing adequate resources for the adoption of new technologies [103, 104, 105]. As the complexity and sophistication of technologies increase, top management can provide a vision and commitment to create a positive environment for innovation adoption [103, 106, 107].

Organisation Size

Various studies have found significant relationship with organisation size and technology adoption. Usually, size is found to be positively related to innovation adoption. This, it is argued, is because larger organisations feel a greater need to adopt innovations in order to support and improve their performance [102]. Many past studies on organisational innovation suggest that organisational size should positively affect organisations' capability to adopt innovations, partly because large organisations have more complex and diverse facilities that contribute to the adoption [63, 65, 77].

According to Wang et al [104], small businesses, on the other hand, are disadvantaged in terms of resources with tight IT budgets, a lack of in-house IS personnel and expertise, and short-range management perspectives, resulting in more barriers to IT innovation adoption. Controversially, it is argued that smaller organisations are more flexible and innovative which results with an enhanced receptiveness towards new products [108].

These apparently contrary relations and mixed results may be attributed to the correlation of size with other factors [102]. The researchers Lee and Xia [65] attempted to explain these mixed results through a meta-analysis of 54 correlations derived from 21 empirical studies. Accordingly, although a positive relationship generally existed between organisational size and IT innovation adoption, the relationship was moderated by five variables; type of innovation, type of organisation, stage of adoption, scope of size and type of size measure.

Within the scope of cloud computing adoption, the type of innovation is therefore a considerable fact for understanding the size factor of adoption. According to Lee and Xia [65] there are three types of innovations;

- "IT product innovations- new IT products or services that are internally developed or externally purchased to meet user needs. This type of innovation does not require changes in IT or business processes",
- "IT process innovations- new practices of IT or IT-enabled business processes that organisations use to generate products and/or deliver services. This type of innovation does not necessarily require development or purchase of new IT products or services".
- "Mixed types lastly- there are some IT innovations that cannot be classified into one type because they include both components. For example, information centres were considered as both. IT innovations with both product and process innovation elements defined as mixed types".

Results from Lee and Xia's analysis [65] suggest a positive relationship between organisational size and IT innovation adoption for all three groups and that correlations for the IT process innovation and the mixed IT innovation sub-group are significantly higher than that for the IT product sub-group.

Cloud computing as an innovation falls into the IT mixed innovation since it involves components from both product and process innovations. In such a way that it does not require changes in IT or business processes (component from the product innovation) and there are cloud enabled business process to deliver services-the (component from process innovation).

Given the influence of innovation type on innovation adoption, it can be expected that there is a positive correlation between organisational size and cloud computing adoption.

Top Management Support

Top management support is an important factor in the adoption of new technologies and has found to be positively related with innovation adoption by providing a vision, support, and a commitment to create positive environment for innovation [26, 109].

Top management support can take different forms such as "true participation- activities or personal interventions in the management of IT" and "executive involvement- a psychological state reflecting the degree of importance placed on technology" [26, 110].

Previous literature [e.g. 26, 77, 103] considers top management support as an organisational factor of cloud computing adoption. According to Low et al [103] the role of top management is important because cloud computing implementation may involve integration of resources and reengineering processes. Additionally, findings of Alshamaila and Papagiannidis [77] represent that without top management support, companies are less likely to adopt cloud computing.

4.1.3 Environmental Context of Cloud Computing Adoption Factors

The TOE framework's environmental context relates to the area "in which a company conducts its business - its industry, competitors, access to resources supplied by others, and dealing with the government" [28]. For this study, the constructs competitive pressure and regulatory environment are selected for investigation considering the fact that the former has been recognised as a weighty factor in innovation adoption literature and the latter has a specific importance for cloud computing environments regarding the security and privacy issues.

Competitive Pressure

Competitive pressure refers to the level of pressure felt by the company from competitors within the industry [30] and is considered as an important factor for innovation adoption [71, 101, 111]. In the study of Porter and Millar [111], strategic rationale underlying competitive pressure as an IT adoption driver was analysed. Accordingly, by adopting information systems, companies might be able to alter rules of competition, affect the structure of the industry, and leverage new ways to outperform their competitors, thereby changing the competitive environment [75]. Actually, as high-tech industry presents rapid changes, companies face pressure which motivate them to follow their competitors' adoption of new technologies [103, 112]. This analysis of the relationship between competitive pressure and IT adoption can be extended to cloud computing domain.

Cloud computing can provide benefits such as; better understanding of market visibility, greater operation efficiency, and more accurate data collection [103, 113]. Based on this, it can be argued that competitive pressure is positively correlated with cloud computing adoption. According to Chebrolu [114], companies with higher competitive pressure are more likely to adopt cloud computing for the purpose of enhancing their business competence in the market. As mentioned earlier, the relative advantages of cloud computing such as flexibility, agility and availability can support companies in terms of gaining competitive advantage. This supports the arguments which emphasise the positive correlation between competitive pressure and cloud computing adoption.

Regulatory Environment

Regulatory environment is concerned with exogenous aspects such as governmental regulation and legislation [28] which have been reoccurring issues in IS research [70, 101] and considered in many different TOE-based studies [e.g. 70, 101, 115].

The regulatory environment can either have a beneficial or an unfavourable effect on innovation [26, 67]. For example, governments can support technology innovation by providing tax advantages and introducing regulations that force companies to adopt certain technology standards [15, 26]. Adversely, governments can also pass constraining regulations - e.g. data security constraints can limit the cloud computing adoption in specific sectors such as health care and financial services. Hence, a restrictive regulatory environment is negatively associated with cloud computing adoption while a supportive regulatory environment can have a positive correlation with cloud computing adoption.

4.1.4 Summary of the Literature Review

In this chapter, focusing the literature on cloud computing characteristics and IS adoption theories, cloud computing adoption factors are classified in technological, organisational and environmental contexts. The technological context includes the constructs from DOI theory which are attributed to the characteristics of cloud computing such as relative adavantage in terms of cost reduction, flexibility, turning CAPEX into OPEX and going green, compatibility, complexity, triability and observability. Security and privacy are also considered as technological factors on which a great weight is placed on by previous work though they are not original constructs of DOI theory. The second context of cloud computing adoption factors includes organisaiton size and top management support. Regarding organisation size, TOE framework posits that it is one of the main influencers of technology adoption. In the current study, larger companies are determined to adopt cloud computing due to their technological readiness and awareness of benefits obtained from cloud computing adoption. Top management support, on the other hand, isn't included in the original TOE framework. However, previous work considers this factor as an important part of technology adoption decisions which has a positive correlation with the adoption of cloud computing. The last context of cloud computing adoption factors consists of competitive pressure and regulatory environment which are the environmental factors. Previous work suggests that companies are engaged to their external environment which influences the innovations decisions. Market conditions such as competitive pressure can encourage companies to adopt cloud computing in terms of raising competitive advantage over their rivals. On the other hand, regulatory environment can either have a positive or a negative effect on cloud computing adoption according to the previous work. These reviewed factors of cloud computing adoption along with the relevant literature sources are shown in table 3.

Adoption Factor	IS Literature Source	Related Work on Cloud Computing Adoption
Relative Advantage	DOI Theory	Borgman et al. [26], Alshamaila et al. [77], Tan and Lin [83], Morgan and Conboy [93], Lin and Chen [97], Low et al [103]
Compatibility	DOI Theory	Borgman et al. [26], Alshamaila et al. [77], Tan and Lin [83], Morgan and Conboy [93], Lin and Chen [97], Low et al [103]
Complexity	DOI Theory	Borgman et al. [26], Alshamaila et al. [77], Tan and Lin [83], Morgan and Conboy [93], Lin and Chen [97], Low et al [103]
Triability	DOI Theory	Alshamaila et al. [77], Morgan and Conboy [93], Lin and Chen [97]
Observability	DOI Theory	Tan and Lin [83], Lin and Chen [97]
Security and Privacy		Lin and Chen [97]
Organisation Size	TOE Framework	Borgman et al. [26], Alshamaila et al. [77], Low et al. [103]
Top Management Support		Borgman et al. [26], Alshamaila et al. [77], Low et al. [103]
Competitive Pressure	TOE Framework	Borgman et al. [26], Alshamaila et al. [77], Tan and Lin [83], Low et al. [103]
Regulatory Environment	TOE framework	Borgman et al. [26]

Table 3: Cloud computing adoption factors derived from the literature

5 Results

This section includes the responses of the participants to the interview questions presented in Table 2. As explained previously, the interview questions were lined according to the cloud computing usage of the companies. In order to provide a clear understanding, the interview results are presented in the same way. The first seven questions are the same for all participant companies uniformly. After the seventh question, the questions are changed for adopters, non-adopters and the past-adopter. Five interviews were conducted where four of them were in person and one by email. The interviews were conducted in Turkish. Therefore the presented results are translations from Turkish to English.

Question 1: Would you tell us about your current IT system?

P1: The number of people in IT team is nine including London, Ankara and Iraq offices. The company is using outsourcing.

P2: We use both in-house and outsource technologies. We use outsourcing for onsite support-human resources, counselling services (oil&gas) for developing, organizing and launching general systems in North Iraq, Ankara and London. These general systems are both related to infrastructure and oil and gas expertise. However, we generally use outsourcing for end-user support. As information systems, we have finance systems here (in-house). There are systems which are used in specific departments such as Finance and Accounting. We have them here. We use “Primavera” for project management. Apart from those, we use SaaS and PaaS. SaaS is being used for HR. PaaS is for organizational communication services such as email and portal. Architecture is mostly set on a Paas system which is provided by Microsoft. This includes database too. As network systems, our firewalls are deployed from different vendors. The main systems are in Turkey in Ankara and in IBM’s data center in İzmir. Additionally, we have some of these systems in our offices in London and North Iraq.

P3: We are utilizing the maintenance services for the hardware such as printers and the ones which are difficult to mend with in-house resources. This is important because, these equipment have to work regularly, 7/24. There are also pos machines, and consumables that we outsource. As software, we used to outsource in the past. We have been using the software developed by our developers since January 2012. To compare outsourcing and in-house software, it is more efficient to use the ones developed in-house. We don’t pay for development. We address the requirements and our colleagues develop. We are satisfied with this way of working.

P5: We have both in-house and outsourced IT. We have two system rooms here. We have WAN and two lines which connect with WAN. One is 20 megabyte, and the other is 30 megabyte. We have a network backbone which works full-redundant. The system rooms are working online with storage transparent. Our systems are application aware.

P6: The information systems of the company has been set through LL, ADSL and independent domain structure. We make the use of accounting program through VPNs. Virtualization is being used in the central system. All the employees are utilizing the mailbox system which is set in the centre system.

P7: We use the softwares of Microsoft. We have servers on which Microsoft applications are running. We use SQL database. Almost one hundred and fifty end-users are using the network here in the central office. We have mail servers and web servers but not all them are kept here. We host them in our different buildings in Ankara. Here in this building, we have our network server. Our company has many power centrals in different regions of Turkey. We monitor the production here. All the production is being monitored for 24 hours with our scada computers which are placed here. This is our main system and the infrastructure is based on this system. Another application of IT is related to energy sales. Anyone who likes to prepare proposals for energy sales can use our IT system. We also use Logo-tiger plus in our company. This system is an integrated software which connects all the departments of the company such as accounting, finance and purchase. We can consider Logo-tiger plus as an ERP system.

Question 2: Do you outsource any of your IT needs?

P1: Yes.

P2: Yes, as explained in the first question.

P3: It is just hardware and consumables.

P5: Yes, for end-user support and for SAP management systems such as maintenance of database systems, operating systems which are built on SAP systems and for loading patches. We can say IT support, in SAP language you can call it "SAP basis management".

P6: We don't use outsourcing in terms of IT resource, but we use it as IT support. We are getting support for some hardware and software issues.

P7: Yes we use outsourcing.

Question 3: What is your strategy when outsourcing your needs? (Core, non-core related services: Will you keep competence inside?)

P1: There are certain outsourcing companies that we work with. These are the ones that we worked before and/or the ones that are known in the market. Specifically infrastructure, operation and programs that the oil department used are outsourced. The sector- oil&gas is fast changing which needs to be reacted rapidly. There are different areas of expertise that the sector imposes. This requires experience. In Turkey, there hasn't been expertise in this area. So, we use overseas outsourcing. Outsourcing help us to improve ourselves, we try to learn from them.

P2: We use outsourcing for routine tasks; end user support (a service for end-user's lap top), tasks at different locations-Iraq and other operation regions. These tasks can be cabling, networking, infrastructure works, network related issues such as setting the access point etc.

We don't want to dedicate our team to these kind of routine tasks. Therefore we prefer to use outsourcing. We prefer doing the work with "our team when it's related to applications and systems development which are critical decisions and when there is a decision to make strategically.

P3: There is an employee in charge of the maintenance of these equipment, however in the need of extra help, they work with experts.

P5: Our strategy for outsourcing is to use it for new technology works, non-value added activities, and routine tasks and in need of additional resources. Some of the examples are end-user support and system management activities. We have both national and international partners for outsourcing.

P6: Not outsourcing but we take support for emergency in order to increase our competence.

P7: The most important criteria that is considered when using outsourcing is to work with well-known companies. We usually prefer to use MS softwares. As we are an engineering company, our engineers use AutoCAD. There are softwares which are similar to AutoCAD and they are known to be cheaper than AutoCAD. But we always prefer to use AutoCAD. We also use Primavera and MS project.

Question 4: What IT functions do you have in-house?

P1: We keep the default infrastructure here.

P2: I have mentioned them in the first question.

P3: Hardware maintenance and software development.

P5: We prefer to use in-house IT for the functions which have direct effects on business processes and have high added value. Because the sustainability is important to us.

P6: We prefer keeping all the functions and their controls in-house.

P7: We don't develop any applications here. But we have the infrastructure to use the applications which are developed externally. We used to develop softwares many years ago when package softwares were not developed this much.

Question 5: What are the reasons for keeping those functions in-house?

P1: We know the company needs more such as the importance of data and continuity. Another reason is to improve our expertise.

P2: As a company which is in the stock market data is critical to us. We keep the systems in-house which we need to analyze fast, get results fast, and make the log analysis fast. We keep these systems in-house to take the action fast and to make the decision fast.

In short, the information that we build is critical to us. To execute the information which is produced in this company, we want to realize the systems ourselves.

P3: The main reason is cost. Prices are high for Hospital Information Systems (HIS). But, if you have a good team of developers inside the company, you can make good work. The important thing is the project duration, timing and the number of developers.

P5: It's not easy to response the needs of the business and to adjust them in an agile way with outsourcing management. When the business resources and market conditions change and if you can't catch this change in the right time, you can face with money loss and market share loss. Therefore we use in-house resources to support our main business processes. We have the system managers, developers, and business analysts here in the company.

P6: Security and Speed.

P7: We can control the system and interfere rapidly when we have infrastructure as an in-house resource. And, we are in such era that people can't tolerate connection outages even for a moment. Hence, we need to interfere rapidly

Question 6: What do you think of cloud computing? Compared to traditional outsourcing, or keeping in-house?

P1: Here we use cloud computing heavily. There are systems which the continuity is very important such as email system. Therefore we keep it (email system) in a provider's database (in the cloud) which we trust.

P2: It's a right investment decision, a right strategy. I think that the market will grow in the future. In the future, cloud computing will be the one to one solution for many companies-either big or small-specifically the small ones. Instead of investing for the systems, companies will use the shared resources for standard and routine tasks. And this is quite right. Additionally, cloud computing and the solutions built on cloud are absolutely right to make the good use of human resources, to provide dedicate human resources, and to manage these resources.

P3: Our email system is in the cloud. Other than email system, every hospital has its servers inside. The reason is security (for in-house IT). In health-care sector, the patient information is important and the decision makers (hospital managers) are concern about "keeping our patients' information in someone else's server. This is a question mark for them. Okay, the cost is lower but they fear if someone accesses the patient data which is kept in somewhere else than our hospitals. But in terms of email system, we moved to cloud since the email system is centralized.

P5: Cloud Computing is logical if the way you work and the sector you are in are decentralised. If your company is structured in a way that its employees need to access data from everywhere at any time, the cloud architecture is quite logical

P6: We didn't make a research on cloud computing but evaluated in terms of security, speed and cost.

P7: My overall opinion about cloud computing is positive. It may be useful for the companies which have non critical business processes. Based on our current needs, we are not working on cloud computing.

Question 7: Do you use cloud computing services?

P1: Yes.

P2: Yes.

P3: Yes, email system

P5: Not currently. We used in the past. We had a public cloud service, email service.

P6: No, we don't.

P7: No, we don't.

Questions for Non-Adopter Companies

Question 7a: Why didn't you use/consider cloud computing services as alternative? /What reasons can you tell about not to consider cloud computing as an alternative?

P6: Security, speed and cost are the reasons.

P7: My overall opinion about cloud computing is positive. It may be useful for the companies which have non critical business processes. Based on our current needs, we are not working on cloud computing.

Question 7b: Would you consider using cloud computing in the future? Why?

P6: Yes, cloud computing can be considered in the future.

P7: Technology is developing rapidly and needs change. Our business can change, we can think about using cloud computing in the future.

Questions for Adopter Companies

Question 7c: What cloud computing services is your company using (For example email, application, CRM, HR, Accounting, Data Storage, CPU usage, etc.)? How important they are for your competitive edge?

P1: Cloud service types that we use are IaaS, PaaS and SaaS. IaaS from IBM data centre and PaaS from Microsoft Azure. HR is all in the cloud, we use a cloud based e-procurement system.

-Do you use standard or highly adapted services?

We have both.

-Do you see standard services as advantageous or disadvantageous related to your own competitive edge?

It doesn't make any difference.

P2: We use SaaS for HR. Other than SaaS, the global systems that needs to be accessed by everyone globally are there (in the cloud). These systems are dedicated to us. They are not the systems that we have here, but dedicated to us by our provider as a private cloud. What we have there...email system, link system. But, the local systems such as finance and other departmental systems are here in our data centre.

P3: email system

-Do you use standard or highly adapted services?

Standard systems.

-Do you see standard services as advantageous or disadvantageous related to your own competitive edge?

There is no competitive advantage of using a standard email system. However, if we could mobilize it and move our current HIS to cloud than the doctors could access patient information from everywhere

Question 7d: How long have you been using cloud computing services?

P1: More than one and half year.

P2: One and a half year or so.

P3: Almost two years.

Question 7e: Can you tell us about the reasons why you chose to use cloud computing?

P1: The main reason is the inadequate technical infrastructure of the geographical location- Ankara. I mean the air-conditioning and electricity...Therefore we wanted to move to professional cloud system. The reasons are; continuity, not to have data loss and security.

P2: The first reason is the cost. These are visible costs and invisible costs. The investment costs are visible in some degree. However, the operational costs and the sustainability of operational costs are huge problems. The critical point is the operational part and sustainability resides there. The loss (financial cost) can cause serious problems.

P3: The main reason is performance. Our company has reached to 4000 employees in Turkey and in abroad. Previously email system was on relatively small server. Therefore, the email box storage was and attachment limits were low. Buying a new server including all the system needs and licenses was expensive. Cloud is cost efficient. We reduce the cost and meet our needs.

Question 7f: What are the benefits of being cloud consumer?

P1: We are not involved with the infrastructure works. This is a huge advantage. This provides us (the employees) to improve ourselves and chance of outside looking in. When you are busy with technical works too much, you can miss out the big picture. You are dealing with works like air-conditioning, UPS, electricity and the security of systems room which take time. When you move to cloud you can use your time in a different way. Also, we influence the efficiency of the company with the services we provide

P2: We are more comfortable in terms of accessibility. Cloud computing provides a more advantageous architecture for organizations which are not set in one office but operates in multiple areas and regions to sustain a continuous accessibility.

Cloud Computing helps to focus and concentrate more on your investments. When we use in-house IT, it can cause the waste of resources. You have the resources, but you don't use the resources. However, in cloud computing, there is effective use of resources because of the shared pool. The resources are distributed and in the time of need, you are provided with what you need in a very fast manner. Compared to traditional outsourcing, cloud computing eliminates the time wasted with supplying your need. The provision process can be longer in traditional outsourcing. Distribution and adjustment of resources are more comfortable in cloud computing and you can adjust things faster.

P3: Cost effectiveness and performance are the benefits for us.

Question 7g: Do you think that there are disadvantages of cloud computing?

P1: Yes, there is cost. However, the company developed more than expectations so he data amount increased. This resulted with the increase in the cost. Secondly, you can't have the whole control of things. We are utilizing a dedicated cloud service (Private cloud).

P2: Sometimes you want to have the whole control over the systems. This is all about SLA (Service Level Agreement). But sometimes SLAs can be problematic when you consider that your provider gives service not only to you but also others. Although you have SLAs and strict contracts, there is always a risk of disruptions. On the other hand when you use in-house IT, you can directly interfere.

P3: The main concern is security. JCI rules enforce us to be excessively protective about patients' information. We can't take the risk of revealing patient's private information. The lack of knowledge about cloud computing is another disadvantage. Managers are concerned about how it (cloud) works, where the data is located. You need a continuous internet connection. The regional and locational connection outages are drawbacks. Back-ups are available but they increase the cost. There is an issue of connection. You need a continuous internet connection for cloud computing. However, there are still regional and locational connection outages in our country. It makes no sense to have the data in the cloud if you are faced with such connection outages.

Question 7h: What has changed in terms of financial, technological, and organizational aspects since you have moved to cloud?

P1: There has been an increase on employee satisfaction. I mean there is a decrease on problems. We had so many problems with email system before we migrated this system to cloud. After migrating to cloud that problem was solved.

P2: It’s hard to address organisational and financial changes in the company since we are a newly established enterprise. However, i can firmly state that there are positive changes in terms of sustainability and continuity.

P3: Pay-per-use model of cloud computing is very advantageous. Instead of buying a new server, we pay for what we use. Another change is the employee satisfaction which is a result of increased performance of systems (email system).

Question 7i: Are security issues important for your cloud computing service (if your data could be stolen)?

P1: It’s very important to us. When we say security it may refer to as both virus and physical security.

P2: Some people are concerned about the fact that their data is kept under somebody else’s systems. But I’m not one of them. I’m comfortable with that. I have no concern about security and privacy.

P3: Absolutely important. Privacy and security of Patient’s information is guaranteed by JCL certificate which we have.

Question 7j: Are the back-up issues regulated in the contract? In what way do you prefer them to be addressed?

P1: We need to have back-ups daily. We asked for it from the provider. For example, we tell them to get 2 back-ups and keep one, send the other one to us. This is a standard process.

P2: Contracts with the providers include back-up issues.

P3: It should be regulated, but i don’t know much about that. The responsible employee is in İstanbul centre.

Question 7k: What type of quality/security certifications has your CC provider?

P1: Standard certificates.

P2: The provider has all the necessary quality and security certifications.

P3: I don’t know.

Question 7l: How long is the contract with the provider?

P1: 5 years, and it is renewed every year.

P2: 5 years.

P3: We have a yearly contract based on pay-per-use model. We receive the bill every year and pay what’s been used.

Question 7m: Are there enough providers that could take over if yours are not satisfied with the CC services?

P1: There are other providers apart from ours. Cloud computing is developing in Turkey. Therefore, many big companies are entering this business (cloud business).

P2: Yes, there exist other ones.

P3: Of course, there are. The factors of choosing a provider is determined by service type. For critical services such as HIS, the quality of cloud service is important and you can pay more. What we want is high continuity, high quality and high performance for critical services. For non-critical services such as email, the cost is the important criteria.

Questions for Past-Adopters

Question 7n: What cloud computing services did your company use in the past?

P5: Email service.

Question 7o: How long did you use cloud computing services?

Question 7p: Can you tell us about the reasons why you chose to use cloud computing at that time?

P5: Actually, there are arguments in favour of cloud computing such as “cloud is very cheap”, “you don’t pay for license and backups”, “you don’t need to hire a systems manager”. However, when you consider the total costs, you see that the reality is different.

Question 7r: Can you tell us about the reasons why you moved out of cloud?

P5: The raise on demand created a need for increasing the provision of email services which in turn leaded to additional costs. According to the feasibility reports, the cost of increasing the email provision dedicated by the cloud provider exceeded the one which could satisfied by in-house IT resources. Therefore we chose to move out from cloud and alternatively we made use of the existing IT resources with a little modification on email servers.

Question 7s: What are the disadvantages of being a cloud consumer? / What were the challenges?

P5: Cloud computing in general is not very promising for large enterprises. I mean, here we have an infrastructure and business processes are atop. We have a risk point of view that looks for enterprise solutions. As a cloud architecture type, private cloud matches with this perspective in terms of security and infrastructure sustainability.

Question 7t: Would you consider using cloud computing in the future? Why?

P5: Yes, after office 365 is released.

Question 8: Which sectors can benefit from the cloud most?

P1: Banking (In sectors where the non-outage is very important) and Government (public) sector; in government, they always mention about security and tell that they wouldn’t give the data out but as far as i know their systems are not that secure. So, i think the cost would be lower if they move to cloud.

P2: Every sector can benefit from cloud computing without exception but specifically SMEs. Because it is not easy for them to make huge investments. From the perspective of enterprises, cloud computing can be utilized for routine services such as filing, back-ups, disaster recovery and so on. And also cloud computing can be a fitting solution for enterprises with many agencies.

P3: For the sectors which have their employees in field such as medical sales representatives.

P4: Medical sales representatives can benefit from cloud computing as well as the ones in food sales and retail selling businesses.

P5: Banking and sales sectors can benefit from cloud computing. Cloud computing is very logical for a company which has its employees in the field. Because, there is a possibility that you might not be able to provide the accessibility for all he employees in the field. Using cloud instead of in-house IT means that the employees in extreme points are using an accessible service.

P6: Cloud computing can be beneficial for more distributed company structures and companies which have mobile users.

P7: Cloud computing can be more useful for the companies which are in IT sector. They can make use of virtualisation technologies.

Question 9: Are there any regulatory restrictions that may influence cloud computing adoption?

P1: I don’t think that there are any regulatory restrictions. We have never met one. Maybe there exist (regulatory restrictions) for governmental institutions.

P2: There are some regulations for some sectors which restrict to keep the data in other countries. This may be a blockage for the use of cloud computing. However, we have not met with such difficulties.

P3: JCL doesn’t dictate not to use cloud but, as stated previously, the privacy and security of patient information is a limitation. On the other hand, there are different legal requirements in terms of patients’ information. For instance, the hospital has to keep patient records indefinitely and the visual records for ten years. Hence, you need a big storage to keep this big data. Also, you need to back-up this data for sustaining continuity and preventing data loss. When you moved to cloud you are free from these concerns. It is nice!

P7: I can’t talk much about that. Because we observe instability in Turkey. We don’t know what is restricted when.

Question 10: Who is the decision maker when adopting new technologies in your company? Which procedures are followed before decision making?

P1: IT team shares the ideas with their manager. The manager has limitations when purchase. If our need doesn’t exceed those limitations, then he directly make the purchase. Otherwise, the president makes the decision.

P2: I’m responsible for making the decisions related with IT and sharing information with the vice-president.

P3: If the decision is related to all hospitals of the company, then it is the central hospital manager’s responsibility to make the decision. If this hospital needs to make a purchase, we sent a request to purchase department. Purchase department approves our request and sends it to executive management, after their budget approval, we buy the service/product. The decision making process is a traditional purchase process.

P5: We make the decisions with our top management in accordance with the company strategies. We have meetings with every department of the company. We collect their needs and demands. According to those needs and demands, we control the current systems, identify the priorities and present them to our top management. There, we consolidate the choices and top management makes the final decision.

P6: Information Technology Headship makes the decision after completing cost/ performance analysis

P7: The decision making authority is IT management department. But there is also financial aspect of the decisions. We send our demands to purchase department, and last approval is delivered by them.

6 Analysis and Discussion

This chapter presents the analysis of the collected data through interviews at five cases. The aim of the analysis is to find the answer to the research question “What are the adoption factors of cloud computing in large scale companies in Turkey?” Based on the grounded theory, interview transcriptions are analysed and the findings are assessed in a transparent and systematic way. Additionally, cloud computing adoption factors derived from the literature are discussed to present which of these factors are recognised in research cases.

6.1Grounded Theory Analysis

The grounded theory method is applied to interview transcriptions to conduct the analysis. The analysis process begins with the open coding phase where the participants’ answers are dissected line by line to discover the reasons for adopting and non-adopting cloud computing. In this phase, the words of the participants related to adoption factors of cloud computing such as benefits, challenges and features of cloud computing, technological requirements of the companies and current IT resources of the companies are determined as ”codes” and then abstracted as the “concepts”. After a set of concepts which have similarities and features in common are revealed, the second phase of the analysis-axial coding is processed. In axial coding, concepts are classified into higher groups as “categories” based on the specific features that they have in common. For instance, security, reliability and availability are determined as concepts that have common characteristics-technological features. Therefore, these concepts are abstracted into a higher group and revealed the category of “technological factors”. Conversely saying, the category of technological factors include security, reliability and availability as the concepts. The same analytical process is applied to every case. Therefore, three categories of cloud computing adoption factors namely; technological factors, internal factors and external factors of cloud computing adoption are created. The codes, concepts and categories that emerged from the analysis are shown below in table 4.

Categories	**Concepts**	**Sample Codes**
Technological Factors	security	in-house IT, privacy, SLAs contracts, trust, architecture type, private cloud, public cloud, enterprise solutions
	reliability	data-loss, SLAs, connection failures
	availability	accessibility, global services, connection failures
	cost	cost reduction, increased cost in-house IT, operational costs visible costs, financial loss cost effective, hidden costs total cost
	performance	elasticity, capacity, speed
	Pay-per-use	pricing, elasticity

Internal Factors	organisation size	enterprises, SMEs, large scale companies,
	organisation structure	distributed structure, global companies, accessibility,
	employee mobility	employees in the field, sales sector, banking, accessibility
	end-user satisfaction	increase on employee satisfaction, availability, increased performance of the systems
	focus on core competencies	human resources, organisational improvement
	loss of control over data and systems	SLAs, controlling the systems, in-house IT
	lack of knowledge on cloud computing	How cloud works, where the data is located.
	critical business processes	connection failures, risk, ERP, in-house IT, infrastructure, business processes
External Factors	provider's reputation	provider, trust, reputation, SLAs
	technical infrastructure of the region in terms of power supply	technical infrastructure, the region, power outages
	technical infrastructure of the region in terms of broadband	technical infrastructure, the region, internet outages, bandwidth
	sector specific regulations	Health care sector, limitations, legal issues.

Table 4. Codes, concepts and categories that emerged from Grounded Theory Analysis

6.2 Cloud Computing Adoption Factors in Turkish Large Scale Enterprises

The analysis reveals that cloud computing adoption factors can be classified in three main groups namely, technological factors, internal factors and external factors. Technological factors refer to the IT specific requirements, benefits and risks which are associated with cloud adoption. Internal factors refer to the characteristics of the company influencing the cloud adoption. Last group- external factors are the influencers of cloud adoption which exist independent of the company. Each factor is determined to have either a positive or a negative effect on the adoption. Positive effect means that the respondent considers that factor as an advantage of cloud computing. Negative effect means that the respondent has concerns about the factor and is hesitant to use cloud computing because of that factor.

6.2.1 Technological Factors of Cloud Computing Adoption

Technological factors of cloud computing adoption identified in five research cases and their effects on the adoption are presented in table 5.

Technological Factors	Positive in Case	Negative in Case
Security	A	B, C, D
Reliability	A	C
Availability	A	C
Performance	B	D
Cost	A, B	C, D
Pay-per-use	B	

Table 5. Technological factors of cloud computing adoption and their effects

Security

Security denotes the extent that cloud computing is perceived to be secure and protect data privacy. The analysis of the five cases shows that security has an impact on cloud computing adoption in four cases. In Case A, security of cloud computing was found to be positively related with cloud computing adoption depending on two main reasons; (1) SLAs and (2) provider's reliability. As Participant 1 in Case A pointed out, "the main reasons to move to the cloud are continuity, not to have data loss and security". The IT Manager in Case A (participant 2) was of the similar opinion with Participant 1 stating that, "there is always a risk of security in all systems. However, you are protected with strong SLA's and contracts in the cloud. When evaluating the security issues you should consider that you trust people in your company as well. This is not just about being in the cloud."

The analysis reveals that the security concerns on cloud computing are related with the SLAs between the provider and the customer. In Case A, the users are comfortable with their SLAs and their provider's reliability. For example participant 1 stated that, "...we keep our email system in a provider's database in the cloud which we trust".
Therefore the security in cloud computing is a determinant of cloud computing adoption which is characterised by SLAs, and provider's reliability.
However, security does not have the same positive impact on the adoption in other cases. For example, In Case B, security has found to be a concern which influences the adoption of cloud computing in a negative way. In the words of Participant 3,

> *The reason for in-house IT is security. In health-care sector, the patients' information is important and the decision makers (hospital managers) are concerned about keeping our patients' information in someone else's server...The main concern is security. JCI rules enforce us to be excessively protective about patients' information. We can't take the risk of revealing patient's private information.*

Although the company is using SaaS for the email system, security concerns limit the use of cloud computing. According to the IT Manager, the email system was not including critical information and therefore, could be moved into the cloud. However, for other IT services such as HIS, the in-house IT was preferred in order to eliminate any risk that would potentially harm the privacy of patients' information. In order to evaluate the influence of security on cloud computing adoption, it is necessary to consider the service type and deployment model of cloud computing since the adoption factors tend to differentiate. The analysis of the results found in Case C support this claim revealing that security issues were evaluated in relation with the deployment model of cloud computing. Based on their experience with cloud computing, the IT manager (Participant 5) made a distinction between public clouds and private clouds explaining what he thought about cloud computing. The IT Manager explained that, "We have a risk point of view that looks for enterprise solutions. As a cloud architecture type, private cloud matches with this perspective in terms of security and infrastructure sustainability".
Private clouds compare to public clouds, provide a more controllable IT environment to the enterprises. In Case C, the existing IT infrastructure was designed and developed to meet all IT requirements of the enterprise relatively in a secure manner. Inevitably, the IT manager was of the opinion of taking the full advantage of their IT investments. When making the decision of adopting or non-adopting cloud computing, his preference would be adopting a private cloud service which could provide the use of both internal and external IT resources in a secure and sustainable way. Therefore, security was found to be positively related with private cloud computing adoption in Case C. Similar

to the results found in Case B and Case C, security was determined as an adoption factor of cloud computing in Case D since the participant 6's overall evaluation of cloud computing adoption was resulted with negative decision and security as an element of this evaluation was found to be negatively related with cloud computing adoption.

Reliability

Reliability denotes the capability to ensure constant operation of the system without disruption [33]. Reliability is cited as a relative advantage of cloud computing by some researchers [e.g. 77]. Although the analysis reveals that reliability is an influencer of cloud computing adoption, it does not have the same impact on each case. For example, this factor has a positive effect on adoption in Case A which is an adopter company while it has a negative impact on the adoption in Case C which is a past-adopter company.

The IT specialist in Case A (participant 1) pointed out that one of the factors to move to the cloud was "continuity" and the other was "not to have data loss". As previously explained in section 2.1.5, reliability of cloud computing is observed through the continuous operations of the systems and applications. Participant 1 clearly describes the reliability of cloud computing services as "continuity" and "not to have data loss". Therefore, these factors are grouped under the "reliability" which is an influencer of cloud computing adoption.
According to the comments of the participants, reliability was found to be positively related with cloud computing adoption in Case A. On the contrary, The IT manager in Case C, explained that the company's critical business processes were highly dependent on in-house Enterprise Resource Planning (ERP) system. When asked about the reasons for using in-house IT, the IT Manager in Case C explained that, "the architecture that supports our business processes is ERP. There is no sense to have ERP in the cloud because the production is conducted here. We can't put the production in the cloud and take the risk of having a loss due to connection failures".

In comparison with existing IT resources, cloud computing services were lagging behind to meet the IT demands of the company. As it can be understood, reliability was one of the technology centred and business focused influencers which negatively related with the adoption of the cloud computing in Case C.

Availability

Availability is defined as an essential capability which introduces redundancy for services and data so failures can be masked transparently. Fault tolerance also requires the ability to introduce new redundancy in an online manner non-intrusively [33]. The analysis of the cases reveals that "availability" is defined by the users as "accessibility" to data and services and found to be a significant adoption factor of cloud computing in Case A and in Case B. Similar to reliability, "availability" has a positive impact on cloud computing adoption in Case A, while it has a negative correlation with the adoption in Case C. The IT Manager in Case A (participant 2) stated that, their global systems that needed to be accessed by everyone were in the cloud. Participant 2 further explained that, "we are more comfortable in terms of accessibility. Cloud computing provides a more advantageous structure to sustain a continuous accessibility for organisations which are not set in one office but operates in multiple areas and multiple regions."

However, the analysis shows that this factor is negatively related with cloud computing adoption in Case C. Participant 5 explained that, "We can't put the production in the cloud and take the risk of having a loss due to connection failures... It (cloud) can only be an alternative if the availability is 99,99% and the cost is lower than the existing solutions".

Accordingly, using external IT resources such as cloud computing services was determined by the risk point of view of the company. The mission-critical IT applications and processes of the company were needed to be available in a continuous manner. Therefore, availability was found to be negatively related with cloud computing adoption in Case C.

Cost

The analysis reveals that cost is recognized as a positive adoption factor in adopter companies (Case A and Case B), while it is considered as a negative factor that have influence on the adoption in the past-adopter company Case C and non-adopter company Case D. Based on the analysis, it was clear that cloud computing was eliminating the investment costs of IT infrastructure in Case A. As stated by the IT Manager in Case A (participant 2), "The first reason to move to the cloud is the cost." In terms of economic reasons that influenced cloud computing adoption decision, the IT manager further elaborated,

> *There are visible costs and invisible costs. The investment costs of in-house IT are visible in some degree. However, the operational costs of in-house IT and the sustainability of operational costs are huge problems. The critical point is the operational part (operational costs) and the sustainability resides in it. The loss (financial loss) can cause serious problems.*

According to IT Manager in Case A, by adopting cloud computing, the company not only reduced the investment costs but also decreased the risk of financial loss related with the operational costs of in-house IT investments. Cloud computing has an agreed characteristic defined as "Turning CAPEX into OPEX" (see section 2.1.6) which explains the cost reduction of IT resources by eliminating the capital expenditures and leaving only the operational costs as IT expenses. The IT Manager in Case A argued that cloud computing was also beneficial in terms of monitoring the operational expenses as they could pay-as-they-go. Similarly, economic considerations were influenced the adoption of cloud computing in a positive manner in Case B. According to the disclosure of the IT Manager (participant 3), the IT capacity was lagging behind the IT needs of the company. One option was to buy a new email server while the other was to move the email system into the cloud. After evaluation the costs and benefits, the company started to deploy a standard email service. Participant 3 explain that, "Buying a new server including all the system needs and licenses was expensive. Cloud is cost efficient. We reduced the cost and met our needs." However, participant 1 in Case A was holding a different approach in terms of cost-cloud computing relation. Participant 1 pointed out that "cost is a disadvantage of cloud computing". Participant 1 further explained that, "...the company grew more than expectations so the data amount increased. This resulted with the increase in the cost".

It can be understood that the growth of the company created an increase on IT demands which resulted with increase of the costs. Similar to participant one in Case A, participant 5 in Case C is of the opinion that the cost is a drawback for cloud computing adoption. In Case C, cloud computing was utilized in the past by deploying a public cloud- email service. Then, the company moved out from cloud and used its own in-house resources for email services. When asked about the reasons why they preferred to use in-house resources back, the IT Manager explain that, "Actually, there are arguments in favour of cloud computing such as "cloud is very cheap", "you don't pay for license and backups", "you don't need to hire a systems manager". However, when you consider the total costs, you see that the reality is different." Even though cloud computing is very much known with its ability of cost reduction, the hidden costs associated with cloud computing can occur when the IT needs of the cloud customer changes. The IT Manager further explained that,

The raise on demand created a need for increasing the provision of email services which in turn leaded to additional costs. According to the feasibility reports, the cost of increasing the email provision dedicated by the cloud provider exceeded the one which could satisfied by in-house IT resources. Therefore we chose to move out from cloud and alternatively we made use of the existing IT resources with a little modification on email servers.

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The literature provides that SaaS adopters do not consider financial risk to be crucial, meaning that they are satisfied with the basic economics of SaaS [119]. On the contrary, analysis of Case C showed that the increased IT demands caused an increase in the costs as a negative consequence of adopting cloud computing. Therefore, cost was found to be a negative influencer of cloud computing adoption in Case C. According to IT Manager's opinion the company would only consider cloud computing as an alternative if the availability of services was 99,99% and the cost was lower than the existing solutions.

Another case in which cost was found to be a negative factor of adoption is Case D. Participant 6 expressed that they evaluated cloud computing in terms of speed, security and cost. These three elements of cloud computing evaluation addressed the influencers of cloud computing adoption in Case D. Although cloud computing may reduce the IT investment expenditures and provide cost efficiency, it is possible for a company to be comfortable with its current IT resources which support its business demands and objectives. Moreover, cloud computing may not be the most cost effective IT solution in every case. As seen in Case C, the in-house IT solutions' costs can be lower than cloud computing solutions. Similarly, in Case D, the comparison of existing IT costs with the estimated cost of cloud computing revealed that cost was negatively related with cloud computing adoption.

Pay-per-use

Pay-per-use pricing model of cloud computing is a significant facilitator of cloud computing adoption in Case B. Participant 3 clearly explained that, "Pay-per-use model of cloud computing is very advantageous. Instead of buying a new server, we pay for what we use". Related to cost and resource efficiency, the pay-per-use model of cloud computing was determined as a factor of cloud computing adoption which has a positive impact.

Performance

Performance of cloud computing services can be related to a few indicators such as acceptable response times, elapsed times, requirements for throughput, and capacity requirements; for example, for network bandwidth or storage [118]. The analysis of case studies reveals that this factor has an impact on cloud computing adoption in two cases within this study. The first case that performance has an influence on adoption is Case B which is an adopter company. The participants in Case B expressed that the performance was the main reason of moving their email systems into the cloud when asked about the reasons for the use of cloud computing services. IT Manager in Case B (Participant 3) explained how they needed to increase their IT capacity as, "the main reason (to move to the cloud) is performance. Our company has reached to 4000 employees in Turkey and in abroad. Previously email system was on a relatively small server. Therefore, the email box storage and attachment limits were low". In Case B, the company's need to increase their server capacity was a result of the increased number of email accounts, the inadequate email box storages and low attachment limits. These were both related to "elasticity" and "capacity" requirements of the IT services. As previously explained in section 2.1.5, elasticity refers to the capability of the underlying infrastructure to adapt to changing, potentially non-functional requirements, for example amount and size of data supported by an application, number of concurrent users etc. [33]. Capacity, on the other hand usually addresses bandwidth, processor speed and storage capacity [118]. Based on the grounded theory analysis, elasticity and capacity were identified as the sub-factors of performance which was a higher level adoption factor of cloud computing. Therefore, being dependent on the elasticity and capacity sub-factors, performance was found to be positively related with cloud computing adoption in Case B.

The second case in which performance was found to be an influencer of cloud computing adoption is Case D. Participant 6 explained that "We didn't make a detailed research on cloud computing but we evaluated cloud computing in terms of speed, security and cost".

Although the participant declared speed as a determinant in cloud computing evaluation, based on grounded theory analysis, speed was found to be an indicator of performance-a higher level of adoption factor (includes sub-factors and indicators). In particular, the speed of a cloud service depends on a number factors such as speed of delivery, speed of connection and bandwidth as well as its integration with existing applications of the company [121].

In occasions that speed falls behind the customer expectations, the performance of cloud computing service can be perceived as poor. Additionally, speed can be regarded as a data management feature that up-takers can expect from current commercial cloud computing tools [33]. The report of EU [33] addresses that speed in the context of data management is not well supported by current commercial efforts. Therefore, based on the analysis of company's evaluation results, performance of cloud computing was found to be negatively related with cloud computing adoption in Case D due to the higher demands of speed when compared to Case B.

6.2.2 Internal Factors of Cloud Computing Adoption

Internal factors of cloud computing adoption identified in five research cases along with their effects on the adoption are presented in table 6.

Internal Factors of Adoption	Positive in Case	Negative in Case
Organisation Size		A, C
Organisational Structure (Distributed)	A, B, D	
Critical Business Processes		B, C, E
Employee Mobility	B, C, D	
End-user satisfaction	A, B	
Focus on Core Competencies	A	
Loss of Control over data and systems		A
Lack of Knowledge on Cloud Computing		B

Table 6. Internal factors of cloud computing adoption and their effects

Organisation Size

The analysis reveals that there is a negative correlation between cloud computing adoption and organisation size. This means that cloud computing is not considered as an advantageous IT solution in large scale enterprises. In Case A, the company's IT Manager (Participant 2) argued that, "Cloud computing will be the one-to-one solution for small companies. Instead of investing for the systems, companies will use the shared resources for standard and routines services". Accordingly, organisation size may reflect the IT resources and capabilities of organizations. The companies with less IT resources and capabilities can benefit more from cloud computing as a result of economies of scale. Similar to participant 2 in Case A, participant 5 in Case C explained that, “Cloud computing in general is not very promising for large enterprises.” However, the IT manager also explained that private cloud could be an option since it provided a more secure IT environment than public clouds. The deployment model of cloud computing was considered as an influencer when investigating the adoption factors. Therefore, the size of the organisation was found to be negatively related with public cloud computing adoption in large scale companies while private cloud was positively related with the adoption of cloud computing in Case C. Although Case A is an adopter company and Case C is a past-adopter company, both of the IT professionals are of the same opinion that cloud computing is more beneficial for SMEs. According to these participants, cloud computing can reduce the small companies’ IT expenses and make sophisticated IT resources affordable. This finding is also consistent with the previous literature which put emphasis on cloud computing adoption in SMEs [e.g. 77, 113]. The size of the companies as an adoption factor of cloud computing can also be evaluated based on the number of cloud user companies participated in this research. The two of the companies in the total of five cases are adopters, while the others include a past-adopter and two non-adopter companies.

Distributed Organisation Structure

Distributed Organisation Structure denotes the geographically distributed business and operation model of a company and is positively related with cloud computing adoption. According to the comments of the respondents, the more distributed a company’s structure, the more likely it is that the company can take advantage of cloud computing.

Case A is a large enterprise which operates in three different geographical locations around the world. Company’s IT services are needed to be accessed from these different locations at any time. IT Manager at Case A stated that, “...the global systems that needs to be accessed by everyone globally are there (in the cloud)”. Accordingly, the availability of services in cloud computing fits with the IT requirements of distributed organisational structures. IT manager (participant 2) further explained that,

“We are more comfortable in terms of accessibility. Cloud computing provides a more advantageous structure to sustain continuous accessibility for organisations which are not set in one office but operates in multiple areas and multiple regions.” Similar to participant 2 in Case A, the IT Manager in Case C was of the same opinion that cloud computing was beneficial for distributed organisational structures, specifically the ones that had their employees in the field such as sales and retail. Participant 5 explained that, “Cloud Computing is logical if the way you work and the sector you are in is decentralised. If your company is structured in a way that its employees need to access data from everywhere at any time, the cloud architecture is quite logical”.

The other participant that hold the same idea with participant 2 and 5 is participant 6 in Case D. Participant 6 explained that, ”More distributed company structures and companies which have mobile users can benefit from the cloud”.

Employee mobility

Employee mobility denotes the condition of employees working out of office due to the requirements of the job. According to the analysis, this factor has a positive influence on cloud computing adoption. For example, the participants in Case B explained that cloud solutions can better serve to companies which have mobile users. Since the mobile users need to reach the IT services of their company from anywhere at any time, cloud computing’s availability provides employees to work remotely. Although the company hasn't used cloud computing for mobile applications and/or with mobile users, the participants (Participant 3 and Participant 4) commented that cloud computing can be best utilised by companies which have their employees at the field. Similarly, participant 5 claimed that employees that need to access data from anywhere at any time (possibly by mobile technologies) can benefit from cloud computing architecture. Also, in Case D, the participant 6 explained that, "More distributed company structures and companies which have mobile users can benefit from the cloud Therefore, employee mobility is found to be a positive adoption factor of cloud computing".

End-user satisfaction

End-user satisfaction becomes apparent after becoming cloud user and has a positive relation with cloud computing adoption in adopter companies (Case A, and Case B). End-users in Case A are highly depend on the IT services to conduct the business. The company's organisational communication tools such as email, link and portal reside in the cloud. Although, end-users' satisfaction has not been measured by any tool, end-user satisfaction has increased in Case A after moving to cloud. As participant 1 pointed out, "There has been an increase on employee satisfaction. I mean there is a decrease on problems related to availability." End-user satisfaction was found to be positively related with cloud computing adoption in Case A. The analysis revealed that the employee satisfaction was increased with the adoption of cloud computing in Case B as well. When asked about the changes in the organisation after the adoption of cloud computing, IT Manager in Case B explained that, "...Another change is the employee satisfaction which is a result of increased performance of systems" End-user satisfaction has a positive relation with cloud computing adoption in adopter companies (Case A, and Case B). Both of the adopter companies' participants were of the same opinion that cloud computing directly or indirectly provided satisfaction with its users.

Focus on Core Competencies

Focus on core competencies denotes the use of both human and non-human resources aligned with the strategic purposes of the company by proving employees with necessary resources to improve their proficiency. The analysis reveals that it has a positive relation with cloud computing adoption. In Case A, Participant 1 explained that, "We are not involved with the infrastructure works anymore. This is a huge advantage…When you move to cloud you can use your time in an efficient way… Also, we influence the efficiency of the company with the services we provide."

Cloud computing adoption in Case A enabled IT employees to focus on the areas which could help to improve their professional skills in addition to personal development. The IT manager of the company supported this argument by explaining how cloud computing helped their IT human resources to be used more effectively. "Cloud computing and the solutions built on cloud are absolutely right to make the good use of human resources, to provide dedicated human resources, to manage these resources".

Critical Business Processes

Critical business processes denotes the core business processes that are critical to company are found to be influencers of cloud computing adoption as they have strong interaction with other adoption factors such as "reliability" and "availability". The analysis reveals that critical business processes have negative influence on the adoption in Case B, Case C and Case E. The participants 3, 5 and 7 remarked that their IT systems were comprised of enterprise level integrated systems. These optimised and manageable systems are designed in accordance with the business processes of the companies. For example in Case B, Hospital Information Systems (HIS) are used for the core business process. Although the company is using SaaS for email system, the critical business process are running on

HIS due to security considerations. Similarly, in Case C, IT manager explained that their production related processes were relied on ERP system and they didn't consider to move this processes into an external cloud environment. In the words of the IT manager, "We have more than 600 agencies and service points which are all dependent to our IT systems to run the business. For example they are using our IT systems for tracking the components in warranty process, ordering, tracking the orders, payment conditions and finance information." According to the IT Manager of the company, a private cloud solution was inevitable for sustaining the aforementioned processes in a continuous way. However, instead of moving their information processes to into an external environment, the company chose to build its own cloud-an internal cloud which serves to internal customers. On the other hand, for the production related processes, the company relied on their ERP system and didn't consider to move this processes into an external cloud environment. In the words of the IT manager,

> *We can't put the production in the cloud and take the risk of having a loss due to connection failures. You know why? Because the production is here, there is no sense to move the production processes into the cloud and increase the loss which is caused by connection outages...There is no sense to make the IT systems out of use when the factory is working.*

Similarly, the analysis shows that business processes in Case E are also negatively correlated with cloud computing adoption. Case E, as described previously, is a construction and engineering company. The company's IT/IS infrastructure was designed to support, develop and monitor the engineering based projects. The IT manager of the company (participant 7) stated that, they were not looking for a cloud based solution. When asked about the reasons why the company didn't consider cloud computing as an alternative IT resource, the IT manager of the company explained that it was related to their critical business processes. Their highly complex operational business processes were supported with the main IT systems of the company such as EMS, project management applications and ERP. Therefore, the critical business processes are found to be negatively related with cloud computing adoption with regard to reliability, availability and security of the services.

Loss of Control over Data and Systems

Loss of control over data and systems denotes the shift of systems and data management from users to providers which leads to related considerations. The analysis reveals that it has a negative relation with cloud computing adoption. Specifically in Case A, participants pointed out their concerns about not to have control over their data**.** For example, participant 1 explained that, "You can't have total control over things in the cloud". Similar to participant 1, participant 2 stated that, "Sometimes you want to have complete control over the system".

Loss of governance over IT infrastructure has previously pointed out as a major risk in cloud computing by researchers- Brender and Markov [116]. According to Brender and Markov [116], loss of governance may raise problems regarding to regulatory compliance and auditability or in extreme cases, reputation damage, prosecution and fines. The IT Manager of the company further explained his concerns about loss of control over data and systems as, "Although you have SLAs and strict contracts, there is always the risk of disruptions. On the other hand, in a situation that you use in-house IT, you can directly interfere."

This factor has also found to be an organisational influencer of cloud computing adoption by Morgan and Conboy [93] though they named this factor as "IT managers' fear of losing control of their IT environment". Case E is the other case in which the management and control of in-house systems are found to be critical factors which influence the company's IT outsourcing decisions as well as adoption of cloud computing. When asked about the reason for preferring in-house IT resources, the

IT manager explained that, "We can control the system and interfere rapidly when we have infrastructure as an in-house resource. And, we are in such era that people can't tolerate connection outages even for a moment. Hence, we need to interfere rapidly". Based on the analysis, the loss of control over data and systems has found to be negatively related with cloud computing adoption.

Lack of Knowledge on Cloud Computing

Lack of knowledge on cloud computing denotes the inadequate knowledge and bias about cloud computing. The analysis reveals that there is a link between cloud computing adoption and the knowledge about cloud computing. While the concerns of security, data management and control are defined under technological and organisational adoption factors of cloud computing, these factors partially arose from "lack of knowledge about cloud computing". For example when explaining the drawbacks of cloud computing, Participant 3 stated that, "...concerns about cloud computing also related with the lack of knowledge about cloud computing e.g. 'how it works?', 'where the data is located?'..." According to participant 3, decision makers can have a negative perception of cloud computing derived from their lack of knowledge about cloud computing. Therefore, "lack of knowledge on cloud computing" has found to be negatively related with cloud computing adoption in Case B and might influence the widespread adoption as well.

6.2.3 External Factors of Cloud Computing Adoption

External factors of cloud computing adoption identified in five research cases along with their effects on the adoption are presented in table 7.

External Factors of Adoption	Positive in Case	Negative in Case
Provider's Reputation	A	
Technical Infrastructure of the region in terms of power supply	A	
Technical infrastructure of the region in terms of broadband		B
Sector Specific Regulations		B

Table 7. External factors of cloud computing adoption and their effects

Provider's Reputation

Provider's Reputation denotes the reliability of the provider. The analysis discloses that adoption of cloud computing services are influenced by the reliability of the cloud computing provider in a positive manner. According to the adopters, features such as good reputation and recognition of the provider are considered when adopting cloud computing. For example participant 1 in Case A stated that, "We keep it (email system) in a provider's database (in the cloud) which we trust".

The reliability of the provider is usually guaranteed by the quality and security certifications that the provider has. When asked about the certifications of their provider, IT Manager explained that their providers had all the necessary quality and security certifications. Furthermore the SLAs are taken into account as secure business agreements between the provider and the customer. SLAs are fundamental to an effective and secure cloud utilisation and customers need them to ensure service qualities are provided in the way they asked for [117]. As the IT manager in Case A further explained, "You are protected with strong SLA's and contracts in the cloud. When evaluating the security issues you should consider that you trust people in your company as well. This is not just about being in the cloud". Since cloud applications may be crucial to the core business operations of the enterprises, it is essential that the customers have guarantees from providers on service delivery [23]. Therefore, adoption of cloud computing services are influenced by the reliability of the cloud computing provider in a positive manner when supported with the strength of SLAs. This finding reveals that reliability of the provider influences cloud computing adoption in a positive way.

Technical Infrastructure in terms of Power Supply

Technical Infrastructure of the region in terms of power supply denotes the stability of power supply in the region. The analysis reveals that it has an effect on cloud computing adoption in Case A. The power outages can cause the entire in-house IT system including data and services to become incapable of working until the generators power on. According to participant 1 in Case A, such an outage brings out the back-up issues and maintenance cost. However, cloud computing adoption eliminates the back-up issues and maintenance of the hardware specifically in times of such outages. In Case A, participant 1 clearly explained that the technical infrastructure of geographical location's importance when adopting cloud computing. In the words of participant 1, "The main reason to move to the cloud is the inadequate technical infrastructure of the geographical location-Ankara. I mean the air-conditioning and electricity". Although the companies can take precautions such as having power plants, a few seconds of outage has the potential to lower the IT operations, and in extreme, can destruct the system. Compared with in-house IT, applications, systems and data are protected when the service is deployed in the cloud. Although the risks are not completely vanished, it may be claimed that the risks related with loss of applications, services and data are shifted from the user to the provider. Therefore, adoption of cloud computing can be influenced by the unstable power supply in the geographical location in order to eliminate aforementioned risks. In Case A, this factor has found to be positively related with cloud computing adoption.

Technical Infrastructure in terms of Broadband

Technical infrastructure of the region in terms of broadband denotes the adequacy of broadband access in the region. According to the analysis, the internet connection of Turkey in terms of broadband access hasn't been developed enough to satisfy the user needs. At times of internet connection outages the services provided by cloud will be inaccessible. In Case B, this factor is identified as a barrier for cloud computing usage and therefore negatively related with the adoption of cloud computing. The IT manager in Case B explained that, "There is an issue of connection. You need a continuous internet connection for cloud computing. However, there are still regional and locational connection outages in our country. It makes no sense to have the data in the cloud if you are faced with such connection outages". Although wireless connections can be an alternative, the participants in Case B remark that such alternative brings additional costs. Therefore, the inadequate technical infrastructure in terms of broadband has a negative impact on cloud computing adoption.

Sector Specific Regulations

Sector Specific Regulations denotes the regulatory rules and frameworks specific to an industry. This regulations have an impact on cloud computing adoption in Case B which is a health-care company and runs the business in accordance with Joint International Commission (JCI)'s regulations. These regulations enforce the member hospitals to fulfil specific standards for improving the quality and patient safety in all clinical and managerial functions. In this context, protecting patient's data and electronic medical records becomes a critical issue for IT department. As the IT Manager in Case B puts it, "JCI doesn't dictate not to use cloud but, as stated previously, the privacy and security of patient information is a limitation". The participants in Case B further elaborated that, "JCI rules enforce us to be excessively protective about patients' information. We can't take the risk of revealing patient's private information". Although the company uses a cloud based standardised email service, they don’t have a plan to move their critical information and processes into the cloud. Therefore, sector specific regulations have a negative impact on cloud computing adoption in Case B.

However, previous literature provides that there are examples of cloud computing adoption in health-care sector. According to Etro’s research [122] on the economic impact of diffusion of cloud computing, cloud computing can help to improve health-care services by providing cost reduction. For example, the Children’s Hospital of Bambino Gesù in Rome switched to an online solution for the email services of its 2500 employees and created cost savings. Swedish Red Cross adopted a cloud based solution for real time communication between the employees. A Russian cardiovascular centre, Penza, adopted a country wide cloud computing solution to coordinate activities, diagnosis and decisions on treatment and surgery between doctors [122]. Yet, these examples are only presented as adopter institutions and it is not clear what factors affected the adoption decision.

It should also be noted that, there are other regulations which might influence the adoption of cloud computing in a positive manner. For example, IT Manager in Case B revealed that the hospitals were required to store large amounts of data to fulfil their legal obligations. IT Manager further explained that,

> *There are different legal requirements in terms of patients’ information. For instance, the hospital has to keep patient records indefinitely and the visual records for ten years. Hence, you need a big storage to keep this big data. Also, you need to back-up this data for sustaining continuity and preventing data loss. When you moved to cloud you are free from these concerns.*

Although the participants explained the appropriateness of cloud computing services to store their data, privacy regulations limit the extent of cloud computing adoption in Case B.

7 Comparison of Cloud Computing Adoption Factors Derived from Literature Review with the Analysis Findings

Cloud computing adoption factors derived from the literature were previously defined in chapter 4 to provide an understanding of about cloud computing adoption factors. These factors were defined in three contexts-technological, organisational, and environmental on the basis of the two prominent theories of IT adoption literature-TOE Framework [28] and DOI theory [29]. Technological context includes relative advantage, compatibility, complexity, triability and observability; organisational context includes organisation size and top management support and lastly; environmental context includes competitive pressure and regulatory environment as adoption factors of cloud computing.

The analysis of the case studies revealed that some of the adoption factors derived from the literature were similar to the ones found in the research cases while others were dissimilar. In order to explain similarities and dissimilarities, adoption factors of cloud computing are divided into two groups. The first group is the set of similar factors-those derived from the literature and later found in research cases. The second group is the set of dissimilar factors which is composed of two sub-groups: (1) factors which are covered in previous work but not found in research cases and (2) factors which are not covered in previous work but found in research cases. In the following sections the similarities and differences between the cloud computing adoption factors derived from the literature and research cases will be discussed by means of defined groups.

7.1 Similar Factors of Cloud Computing Adoption

Similar factors of cloud computing adoption are those covered in previous work and recognised in research cases after the analysis. Relative advantage in terms of cost, pay-per-use and Turning Capex into Opex; security and privacy; organisation size and regulatory environment are the most apperant factors which are directly observed in research cases. Additionally, compatibility, triability and observability are found to be applicable factors to cloud computing services which are general conditions influencing the adoption of innovations provided by literature [29]. Although the participants of current study did not explicity point them as cloud computing adoption factors, these factors are observed within the research cases. Cloud computing adoption factors those covered in previous work and later found in research cases are as follows.

7.1.1 Relative Advantage

Relative Advantage in terms of cloud computing adoption was defined as cloud computing's perceived benefits in terms of cost reduction, pay-per-use, flexibility, turning Capex into Opex and going green. The analysis revealed that cost reduction is a positive influencer when adopting cloud computing in adopter companies (Case A and Case B). However, the same factor is considered as a drawback in past-adopter company-Case C and non-adopter company-Case D. Therefore, cost as an adoption factor of cloud computing is recognised in research cases with maximum proximity.

Another component of relative advantage was the pricing model of cloud computing-pay-per-use. This component was found to be positively related with cloud computing adoption in Case B which is an adopter company since it was clearly explained by the users that they were enjoying scalable pricing model. Therefore, pay-per-use is directly identified as an adoption factor of cloud computing presenting sameness in both previous literature and research cases.

Turning Capex to Opex was considered as another component of relative advantage. The participant 2 and participant 3 acknowledged that cloud computing was eliminating the initial investment expenditures and provide cost-efficient solutions. Specifically, participant 2 in Case A explained that it was one of main benefits of cloud computing to provide customers with a service in which measuring, scaling and sustaining operational costs were possible. Therefore, turning Capex into Opex has similar influences with cost as an adoption factor of cloud computing.

On the whole, relative advantage in terms of cost, pay-per-use and Turning Capex into Opex were similar to cloud computing adoption factor- cost which is derived from the analysis of research cases.

7.1.2 Security and Privacy

The analysis of the case studies revealed that one of the adopter companies (Case A) found cloud computing relatively secure. However, same factor has found to be one of the main reasons for non-adoption of cloud computing in three other cases including one adopter, a past-adopter and a non-adopter company. Therefore, similar to the explanation in cloud computing adoption factors derived from the literature, security and privacy issues has found to be significant influencers of cloud computing adoption after the analysis of the case studies. Regarding security and privacy issues, the findings of the analysis are consistent with cloud computing adoption factors derived from the literature. Therefore security and privacy are recognised as being same for both the factors derived from the literature and the ones found in research cases.

7.1.3 Organisation Size

In cloud computing adoption factors derived from the literature, organisation size has found to be positively related with cloud computing adoption implying that the larger companies are more likely to adopt cloud computing compared to smaller ones. However, the analysis shows that the likelihood of cloud computing adoption diminishes when the organisation size grows. Although the effect of organisation size on cloud computing adoption in research cases is different from what previous work suggests, organisation size is still an influencer of cloud computing adoption in both previous work and in research cases.

7.1.4 Regulatory Environment

Regulatory environment was previously presented in this study as an adoption factor of cloud computing derived from the literature. It can either positively or negatively affect the cloud computing adoption (see section 4.1.3). Consistently, the analysis has shown that regulatory environment in health-care sector has an indirect negative influence on cloud computing adoption while it has shown no significant effect in other sectors. Therefore, regulatory environment has shown similarity to the sector specific regulations which is an adoption factor of cloud computing adoption found in research cases.

7.1.5 Compatibility

Compatibility of cloud computing services defines the integration of existing systems and processes with cloud solutions. Compatibility was determined as an adoption factor of cloud computing based on the literature review. The analysis of the case studies revealed that this factor was considered as an influencer but not positively affect the adoption decision. For example, in the past-adopter company (Case C) and in one non-adopter company (Case E) the participants explained that cloud computing was not matching with their critical business processes and their needs. However, according to Kim et al [120] cloud integration may be partly solved by using technologies such as enterprise application integration and enterprise service bus.

7.1.6 Triability

Triability of the cloud computing is highly available and its impact on the adoption is expected to be positive. The analysis revealed that the two adopter companies in this study were looking for expanding their cloud experience after being a cloud customer (Case A and Case B). They were satisfied with existing cloud applications and willing to try new cloud solutions. Similarly, the past-adopter of cloud computing (Case C) was willing to move some of their applications to the cloud in the future. However, the two non-adopter (Case D, Case E) companies which had no experience related with cloud computing didn't have an intention to try cloud computing. Therefore it can be claimed that triability of cloud computing has a positive impact on the adoption.

7.1.7 Observability

As described in section 4.1.1 observability is the degree to which the results of an innovation are visible and communicated to others [29] and positively related with the adoption of innovation. To the extent of cloud computing, observability not only applies to adoption but also the non-adoption decisions. For example, in Case C, cloud computing adoption process was progressed as adoption, implementation, observation and non-adoption. This company preferred to move out from the cloud after the recognition of challenges regarding cost (hidden costs of cloud computing-see section 6.2.1). Therefore, it can be concluded that the observability of cloud computing is an influencer of cloud computing adoption which can have either a positive or a negative impact.

7.2 Dissimilar Factors of Cloud Computing Adoption

Dissimilar factors are composed of two groups of factors. The first group includes the factors which are covered in previous work but not found in research cases. These factors are "going green", "complexity", "top management support" and "competitive pressure". The second group, on the other hand includes the factors which are not covered in previous work but found in research cases. These factors are revealed after the analysis of case studies and defined previously in chapter 6.

7.2.1 Going Green

Going green is a component of relative advantage which derived from literature as a cloud computing adoption factor. However, none of the participants in research cases mentioned about the environmental friendly features of cloud computing which was assumed to benefit the cloud users. Therefore, it is predicted that going green has no significant effect on providing relative advantage to the study participants and is dissimilar to adoption factors of cloud computing found in research cases.

7.2.2 Complexity

Complexity of cloud computing is the degree to which it is difficult to implement and use. Rogers [29] suggests that complexity has a negative relation with the innovation's adoption. With regard to cloud computing, it is often mentioned that the complexity of cloud systems is hidden from the end-user [32, 43]. As Lin and Chen [97] state, "companies consider to implement and use cloud computing, if it doesn't require advanced technical skills and greater efforts". In this study, the adopter companies were able to implement and use cloud systems without specific requirements in terms of expertise. Additionally, none of the participants mentioned about the complexity issues having an effect on cloud computing adoption. Being dissimilar to the adoption factors found in research cases, the complexity of cloud systems has no significant effect on the adoption in research cases and is dissimilar to the factors of cloud computing adoption found in the research cases.

7.2.3 Top Management Support

Although top management support was previously presented as an influencer of cloud computing adoption in section 4.1.2 and in some other researches [26, 77, 103], this factor has found to have no significant effect on the adoption in five large companies participated in this study.

7.2.4 Competitive Pressure

Although some of the benefits of cloud computing such as flexibility, agility and availability can support companies in terms of gaining competitive advantage, the analysis has revealed that competitive pressure didn't impact on the decision of cloud computing adoption in participated companies of this study.

7.2.5 Cloud Computing Adoption Factors Found in Research Cases that are not covered in Previous Work

Cloud computing adoption factors found in research cases but not covered in previous work are revealed after the analysis of research cases. These include reliability, availability and performance, employee mobility, end-user satisfaction, focus on core competencies, loss of control over data and systems, lack of knowledge on cloud computing and critical business processes provider's reputation, technical infrastructure in terms of power supply and broadband. These factors emerged from user preferences and considerations specific to cloud computing. The main reason behind the dissimilarity between these factors and the ones derived from the literature is that the previous work is highly dependent on pre-determined factors of TOE framework and DOI theory which limit the investigation and lead to the reoccurrence of adoption factors in different studies. On the other hand, the current study aimed at exploring cloud computing adoption factors without any pre-determined factors in order to provide the adoption factors which are considered to be important to the Turkish large scale enterprises. Thus, it is observed that there are country-specific factors such as "technical infrastructure of the region in terms of power supply and broadband" which influence the adoption of cloud computing services in Turkey and apply to countries of similar economies.

8 CONCLUSION and FURTHER RESEARCH

8.1Conclusion

This study presents adoption factors of cloud computing in five large scale Turkish enterprises operating in Turkey. Providing insights from two adopters-companies which are cloud service users, two non-adopters-companies which didn't use cloud services and one past adopter-a company which used cloud services in the past but moved out of cloud at the time of investigation, it has been found that cloud computing adoption in large scale Turkish enterprises is influenced by the advantageous technological features that are inherent in cloud computing. However, these features are only able to function when the business requirements are fulfilled and environmental conditions are convenient.

This study reveals that cloud computing adoption in Turkish large scale enterprises is determined by technological, internal and external factors. Technological factors include security, reliability, availability, performance, cost and pay-per-use. Among these, security and cost are the most significant factors which are observed at four out of five research cases. These factors are also matching with the cloud computing adoption factors derived from the literature. However, security of cloud computing services generally depends on the deployment model. In particular, private cloud is perceived as a more secure deployment model compared with public cloud. Considering security issues the companies in this research either prefer to use private cloud computing services or prefer to use public clouds for non-critical business processes. Similar to security, cost has also its own exceptions as an adoption factor. In spite of the fact that cloud computing is often reported as a cost efficient solution, current study shows that cost alone doesn't have a significant effect on cloud computing adoption. One reason for this might be the financial resources advantages of the large scale enterprises. Since these enterprises have large resources to allocate IT, their priority when adopting a new technology is not only determined by the cost but also by the quality of service.

Regarding internal factors of cloud computing adoption, organisation size is most significant influencer of cloud computing adoption in which most of the research participants are of the same opinion. Most of the participants claim that cloud computing is more beneficial for small sized companies. The relevance of the negative influence of organisation size on cloud computing adoption is also supported by the fact that cloud computing services were being used at two out of the five cases. Other internal factors which are negatively related with cloud computing adoption include critical business processes, lack of knowledge on cloud computing and loss of control over data and systems. It is important to note that critical business processes and lack of knowledge on cloud computing are observable factors prior to adoption decision. On the other hand, loss of control over data and systems is observed by the users after the adoption of cloud computing.

The internal factors which are positively related with cloud computing adoption are distributed organisational structure, employee mobility, end-user satisfaction and focus on core competencies. Among these, distributed organisational structure and employee mobility are apparent factors prior to the adoption decision. Meanwhile, end-user satisfaction and focus on core competencies are realised after the adoption of cloud computing although they are predictable before the adoption.

The last group is comprised of external factors of cloud computing adoption. These factors are provider's reputation, sector specific regulations and technical infrastructure of the region. The influence of provider's reputation is defined with the positive effect that it has on the adoption. According to the adopters, features such as the good reputation and recognition of the provider are considered when adopting cloud computing. Another external factor of cloud computing adoption is "sector specific regulations". Sector specific regulations are apparent in health-care sector. Although there has not been any legislative restrictions at country level, the international standards related to patient data and privacy are considered as critical issues in cloud computing adoption.

The last two external factors are *"technical infrastructure of the region in terms of power supply"* and *"technical infrastructure of the region in terms of broadband"* which have not been addressed in previous studies of cloud computing adoption. Surprisingly, the instability of power supply has been a driver for cloud computing adoption for the reason that it eliminates the costs derived from power outages. Regarding broadband, the considerations of accessibility of cloud services are influenced by the inadequate bandwidth and broadband in Turkey which are considered as major obstacles for cloud computing adoption that would also cover countries with similar IT infrastructures.

8.2 Ethical and Societal Consequences

The principles of ethical considerations such as voluntary participation and harmless, anonymity and disclosure were followed in this study as previously explained in section 3.4.5. The participants of this study were willing to contribute to the thesis at hand since the wider implications of a scientific study have potential benefits to community and they were ensured that no personal or organisational risk would occur.

In terms of societal consequences, this study is expected to be beneficial for both academia and business circles. From an academic perspective, the researchers who would like to know more about cloud computing adoption in Turkey can benefit from the findings of this study and gain information about how cloud computing adoption factors differ in different geographical regions. For the business, the results are valuable since they provide insights from the adopters and non-adopters. Based on the experiences of adopter enterprises, potential cloud computer customers can have scientifically valid information which is expected to be evaluated when deciding whether or not to adopt cloud computing. Similarly, these insights can lead to cloud computing providers to consider the customer perspective and revise their marketing strategies in Turkish private sector.

8.3 Originality and Significance

8.3.1 Research Quality

In order to maintain the credibility of this study, a guiding process was followed considering reliability, validity and generalizability principles of scientific research. The collected data and the findings in this study are free from the reliability threats such as "the subject or participant error", "the subject or participant bias", "observer error", and lastly "observer bias". The findings of the research were presented clearly to avoid manipulation and encourage the reader to test the reliability.

In terms of constructing validity, embracing a multiple case study approached provided wide range of data derived from the answers to the same set of interview questions within the context of cloud computing adoption. Additionally, after revealing the major adoption factors of cloud computing, the external validity of the results were ensured with examining the casual relationship between the factors. This examination provided that some of the technological factors of cloud computing were dependent on organisational factors.

Another measurement of credibility of research is generalizability. Within the context of this research five case studies were conducted. These cases were selected considering their representativeness of large scale enterprises in Turkey. Although it was aimed to generalise the findings, the results showed that cloud computing adoption factors were diverse in different sectors. The main similarity that ensures generalizability principle was the effect of resource advantage of large scale enterprises which lead to non-adoption of cloud computing.

8.3.2 Research Contribution

Being different from the previous work on cloud computing adoption, the findings of the current study are of the interest to researchers and practitioners for at least two reasons. First, this study shows that there are regional barriers for cloud computing adoption. Specifically the inadequate bandwidth has been found as a country specific factor that limits the cloud computing adoption and also applicable to the countries of similar economies. In order to promote cloud computing adoption and pave the way for potential benefits offered by cloud, it is necessary to develop the technical infrastructure of Turkey which takes political will and constant effort from both government and private sector. Second, this study presents insights from large scale enterprises which provide decision makers with a better understanding of the cloud computing adoption in practise.

8.4Limitations

There are some limitations which affect the credibility of this research as it does in many other researches. The main limitation was to access the participants. The targeted population was comprised of the IT managers of the large scale enterprises in Turkey. Among the ones which were asked to participate in this study, only five of them accepted to answer the interview questions. Therefore, it wouldn’t be possible to widen the sample population and have more accurate results on cloud computing adoption factors. Assuming that more case studies would provide more data to analyse, the results of this study validates for the five large scale enterprises that were participated in this research.

8.5 Further Research

This research brings with a number of questions which are of the interest to extend the cloud computing adoption paradigm. First, the factors of cloud computing adoption tends to vary in terms of service provided. Therefore, factors of SaaS, PaaS and IaaS adoption can be evaluated as different topics. Additionally, SMEs can be selected as the research sample since cloud computing adoption in Turkish SMEs has not been a topic of interest in any scientific research yet. Considering the benefits of cloud computing, investigation of this topic can provide deeper understanding on the assistance of cloud computing to improve the IT capabilities of SMEs.

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