

# Cloud Technology Management in Public and Big Data Mining

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**Abstract:** Cloud technology and the use of big data in the public sector are recently on the front burner. The purpose of the study is to explore the use of cloud technology and big data in the public sector. Literature review method was used in the study. The results demonstrate that cloud technology and big data are used to deliver different services in the public sector. As technology advances continue, the usage of cloud technology and big data are expected to increase in the public sector. Moreover, there are also expectations that the usage of cloud technology and big data in the public sector will increase due to the advantages of cost, efficiency and speed. In the study, recommendations were made for the wider use of cloud technology and big data in the public sector in Turkey.

**Keywords:** Public sector, Cloud technology, Big data.

**Özet:** Kamu sektöründe bulut teknolojisi ve büyük veri kullanımı son zamanlarda gündemde yoğun şekilde yer alan bir konudur. Bu çalışmanın amacı kamuda bulut teknolojisi ve büyük veri kullanımını araştırmaktır. Çalışmada literatür taraması yöntemi kullanılmıştır. Ulaşılan sonuçlara bulut teknolojisi ve büyük verinin kamuda farklı hizmetlerin sunumunda kullanıldığını göstermektedir. Teknolojideki gelişme sürdükçe kamu sektöründe bulut teknolojisi ve büyük veri kullanımının artması beklenmektedir. Ayrıca maliyet, verimlilik ve hız açısından sağladığı faydalar sebebiyle kamuda bulut teknolojisi ve büyük veri kullanımının artması beklentileri bulunmaktadır. Çalışmada Türkiye’de kamuda bulut teknolojisi ve büyük verinin daha geniş bir alanda kullanılması için öneriler getirilmiştir.

**Anahtar Kelimeler:** Kamu sektörü, Bulut teknolojisi, Büyük veri.

## 1. Introduction

The impact of developments in technology is observed in all areas. In parallel with the expansion of the scope of the activities carried out by companies, the need for infrastructure to be carried out through a center has become clear. In such cases, developing cloud computing technology is becoming increasingly preferred because it provides access to services independently of location.

Big data mining has emerged in parallel with the increase in the amount of information and in the need to store information. Big data has developed rapidly in a defining environment for businesses to continue their decision-making processes in an information-driven way. Today, the fact that information is central for enterprises, it seems to be a factor that accelerates the development of big data mining.

Cloud computing and big data mining are not technologies limited to the use of private sector businesses. The main objective of this study is determined as to explore the management of cloud technology and big data mining in the public sector. Explaining the conceptual framework of big data and cloud technology is also the sub-objectives of the study.

The study first presents basic information about cloud technology; then study design to explore basic information about big data mining.

It is planned to make progress by sharing examples in the analysis of cloud technology and big data usage in the public sector. The purpose of the study is to provide reference information for other researchers studying a similar subject.

## **2. Basic Information on Cloud Technology**

Cloud technology that exists in the literature with the name of the Cloud or cloud computing is defined as “the receiving of third party computing services that organizations use while conducting their business over the Internet” (Keloğlu, 2012: 14). The emphasis of the purposes for which cloud technology is used is clarified in this description.

The challenge of global competitive conditions (increased competition) is closely linked to the need for cloud technology. In parallel with increased competition, these technologies are used to improve productivity through the usage of cloud technology. Moreover, companies that want to perform superiorly in terms of speed, quality, cost and flexibility have begun to use cloud technology more and more day by day (Seyrek, 2011: 702). This has accelerated the growth of cloud technology in recent years.

Cloud computing can be used in a variety of ways. It is likely that various models will turn up according to the type of resource. Some examples of these models are shown in the following table.

**Table 1. Service and Distribution Models in Cloud Technology** (Bayın, Yeşilaydın and Özkan, 2016: 236)

Service Models	Deployment Models
<p><u>Software as a service–SaaS:</u> Software services provided by a third-party provider, available on-demand, and typically manageable through the internet remotely. Applications hosted by a cloud service provider, such as electronic health records, and delivered to customers over the internet or another network can be given as an example of this service.</p> <p><u>Platform as a service– PaaS:</u> Development tools such as operating systems hosted in the cloud and accessed via a browser. Developers can create web applications without installing any tools on their own computer, and deploy these applications without the need for any special administrative skills by platform services.</p> <p><u>Infrastructure as a Service– IaaS:</u> All equipment including storage, hardware, servers and network components used by the cloud to support the user's activities are provided externally. The provider owns the equipment and is responsible for its maintenance and protection. The user, on the other hand, usually pays per usage.</p>	<p><u>Public Cloud:</u> They are services that are open to the public on the Internet and can be used by a large number of users. Users access services via web applications. Microsoft, ORacle, Amazon, Google, GoGrid, Google Apps, Salesforce.com are examples of public cloud.</p> <p><u>Private Cloud:</u> In this model, the computing service is organized in a way that only one organization can be reached. The service can be operated from within the organization's own network or by a third-party company outside the corporate network. An example of a private cloud is the ability of a hospital to transform its entire programming infrastructure into IaaS.</p> <p><u>Community cloud:</u> A model where computing service infrastructure, security requirements and resources are shared between multiple organizations. Hospital systems located in the same geographical area can be given as an example.</p> <p><u>Hybrid Cloud:</u> A model formed by the use of two or more cloud types (public, private, community) together.</p>

From Table 1, it can be assessed that the use of cloud technology differs according to the type of service and deployment method. Moreover, cloud technology seems to be a broad topic.

The key features of cloud technology are listed as follows (Dokuz and Çelik, 2017: 317–318):

- There are virtual networks.
- Storage is done virtually.
- There are payment options in cloud technology depending on the amount of usage.
- There are public cloud environment interfaces.
- Resources are provided dynamically.
- Provides data recovery capabilities.
- The level of accessibility is high.
- Resources allocation is done automatically upon request
- Information sharing is essential.

- Cloud technology is in a controllable structure.
- In cloud technology, data is ensured to be permanent.
- Quick access is possible.
- It can be used with high capacity.
- Infrastructure is flexible.

These features, which mean that many advantages will arise in the use of cloud technology, also explain why cloud technology is becoming increasingly popular and developing rapidly. Cloud technology, which is also available in various areas, is a highly preferred system with ease of use and options offered.

The following table contains SWOT analysis information of cloud technology.

**Table 2. SWOT Analysis of Cloud Technology (Arslan, 2018: 20)**

<b>Strengths</b>	<b>Weaknesses</b>
1) Cost effective 2) Flexible and innovative 3) Simplified cost and consumption model 4) Compliant facilities 5) Flexible and resilient in disaster recovery 6) Reducing maintenance costs 7) Convenient level accessibility 8) Better control of resources 9) Time and place independence 10) Energy-saving 11) Environmental protection 12) User-friendly use 13) Ability to expand	1) Training required 2) High speed internet connection required 3) Very difficult to integrate with local software 4) Lack of physical control of data 5) Lack of commitment to control service quality and availability 6) Development of application 7) Increased dependency
<b>Opportunities</b>	<b>Threats</b>
1) The user can use the latest technology 2) Provides modern service for the user 3) Modern and quick solution of the problem 4) To speed up the process 5) Adaptive to future needs 6) Excellent backend for mobile phones application	1) Reliability of service providers 2) Loss of data 3) Information security (privacy) 4) Loss of connectivity 5) Integration with another platform is difficult 6) Big data storage 7) Hidden cost: backup, system recovery and problem solving 8) Lack of specific and standard regulation rules (National and international)

The information contained in Table 2 shows that the strengths of cloud technology are more than the weaknesses. Moreover, as the use of cloud technology becomes more widespread, permanent solutions will be provided for these weaknesses. Given that the opportunities and the number of threats are close to each other, it will be possible to achieve positive results with the right plans and practices.

The need for cloud technology is increasing in today's circumstances where access to information in a mobile is becoming increasingly important regardless of time and place. As a result of this, cloud technology has begun to take place in all areas of human life (Sarıtaş and Üner, 2013:193). This is also supported by the widespread use of it in various areas. Cloud technology is expected to guide the business world in the near future (Elitas and Özdemir, 2014:93).

### **3. Basic Information About Big Data Mining**

The concept of big data emerged as data began to be recorded in a computer environment (Çiğdem and Seyrek, 2015: 3). Hence, the history of big data mining does not go back long. "Big data is a term applied to data sets whose size is beyond the capability of commonly used software tools to capture, manage and process" (Doğan and Arslantekin, 2016: 22).

Big data mining includes the processing of data using appropriate software and algorithms. Big data is important because it varies from conventional data and the data volume is high. Big data make it possible to store and use data in many areas such as finance, social media, healthcare, shopping, private sector initiatives, public services, stock markets and sports (Köseoğlu and Demirci, 2017: 2227).

The components of big data are as shown in the figure below.

As seen in Figure 1, big data; consists of five components: veracity, variety, value, velocity, and volume (data size). Veracity includes elements related to information: trustworthiness, authenticity, reputation, availability and accountability. In the variety, the state of structured or unstructured of information, its multi-factor and probabilistic structure is determinant. The value component is related with theoretical aspects as well as statistical, correlation and events. Streams and processes are at the forefront in the velocity component. Volume includes units that express the size of the data, records and archives. Since the name of each component begins with the letter V (verification,

variety, value, velocity, volume), these components are expressed as 5Vs of big data in the literature and it is possible to encounter such a usage.

5Vs of Big Data				
Veracity	Variety	Value	Velocity	Volume
Trustworthiness	Structured	Statistical	Batch	At Terabytes Level
Authenticity	Unstructured	Events	Real/near-time	Records/Archives
Origin, Reputation	Multi-factor	Correlations	Processes	Transactions
Availability	Probabilistic	Hypothetical	Streams	Tables, files
Accountability				

**Figure 1. Big Data Components** (Dülger, 2015: 27)

Big data is used to describe data that conventional databases are insufficient to use (Aktan, 2018: 3). While big data was an issue that only IT companies gave importance before, today it has become an important issue for all businesses care about. The increase in its use in every sector including the public sector supports this argument.

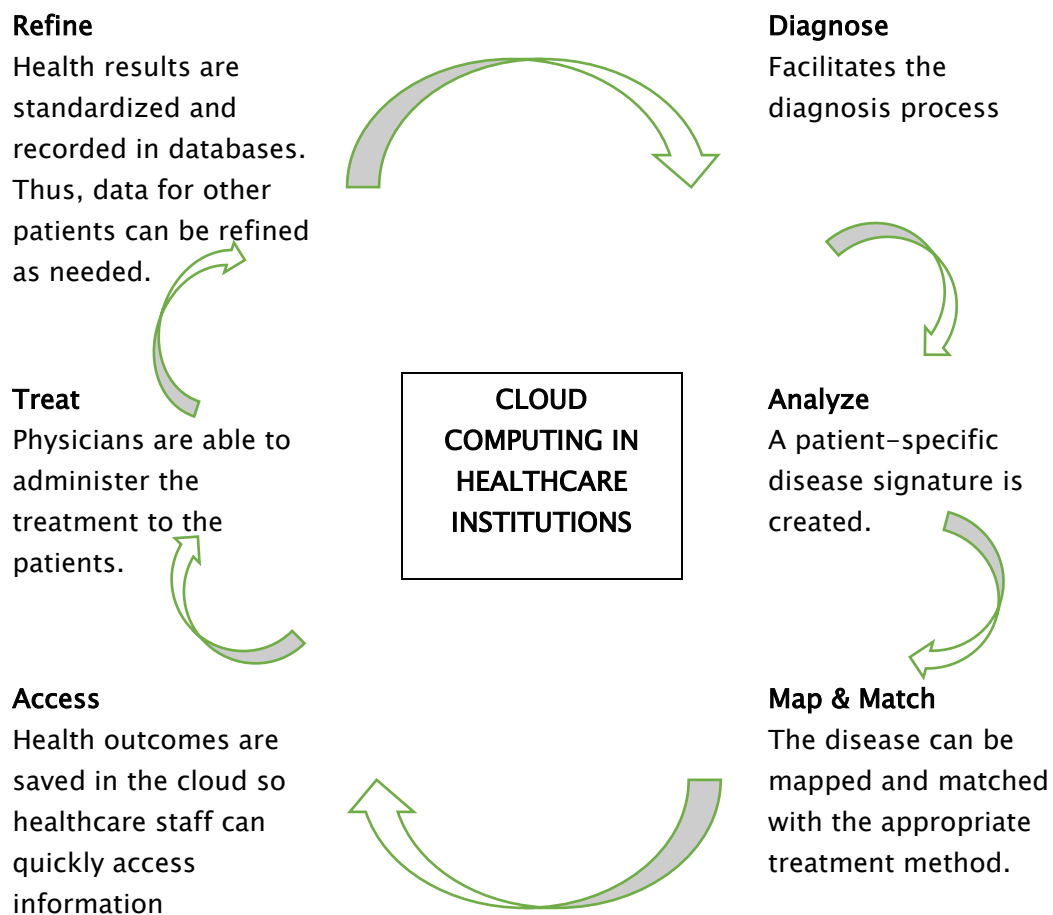
#### **4. Cloud Technology and Big Data Usage in Public Sector**

In this chapter, the examples of the use of cloud technology in the public and the examples of the use of big data in the public sector will be discussed under separate titles.

##### **4.1. Examples of the use of Cloud Technology in the Public Sector**

E-mail services, web servers, portal servers, test and development servers, database applications, business continuity servers, enterprise applications for the use of cloud technology in the public sector seem to be the priority target areas (Orge, 2017: 51).

The example of the use of cloud computing in public sector, and in this context specifically healthcare services, is as shown in the following figure.



**Figure 2. Use of Cloud Technology in Healthcare** (Bayın, Yeşilaydın and Özkan, 2016: 238)

According to the information given in Figure 2, cloud technology is used at all stages from diagnosis to treatment in the delivery of health services. With the accurate use of cloud technology in the healthcare industry, facilitating and effective examples include such as easier diagnosis, more effective management of patient's treatment, more quickly access information by healthcare professionals.

At this point, it is now recognized that cloud technology is favored by public institutions and organizations (Çetin et al., 2013: 1) and the trend in this direction is expected to

increase, The perception that the public sector is behind the private sector can be broken with the effective usage of cloud technology in the public sector (Orka, 2018: 51).

#### **4.2. Examples of Big Data Usage in the Public**

As with cloud technology, there are no barriers to use in the public sector for big data, but rather, there are many gains. The use of big data in the public sector provides advantages in terms of providing cost effectiveness, increasing efficiency, and providing special services (Altun, Şahin and Öztaş, 2017: 2022).

The necessity and importance of using big data in the public sector has been realized. Article 412 of the Tenth Development Plan emphasizes that appropriate solutions should be implemented for the use of big data in the public sector (Özbilgin, 2015: 7). This reveals the expectation of increased use of big data in the public sector.

The use of big data in the public sector can be in areas such as culture, education, politics, natural resources, legal system, traffic, transportation, tourism, geographical information, and there are examples of these (Altun, Şahin & Öztaş, 2017: 2026). In a study conducted on the use of big data in the public sector in Turkey, it was determined that improvements should be made in issues such as qualified staff, data combination from different sources, awareness, data processing speed, data query performance (Orka, 2018: 54).

### **5. Conclusion and Recommendations**

The study on cloud technology and big data usage in the public sector has found that cloud technology and big data are widely used by enterprises in parallel with the developments in technology. The public sector could not remain indifferent to these developments and cloud technologies and big data have started to be used in the public.

Assessments on cloud technology and big data set forth the cloud technology and big data are exploited in many areas from traffic and transportation information, legal information to tourism preferences in the provision of public health services.

The results of the study show that the effective usage of cloud technology and big data in the public sector will lead to break the perception that the public sector is lagging behind the private sector.

Taking these results into consideration, the following recommendations are made:



- The need for qualified personnel required for cloud technology and big data use in the public sector should be addressed
- It is recommended to raise awareness about cloud technology and big data in the public.
- On-the-job training on cloud technology and big data usage is recommended for public sector employees.

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