

# THE TOE THEORY AND CLOUD COMPUTING: EXPLORING FACTORS AFFECTING THE ADOPTION OF CLOUD COMPUTING

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## **ABSTRACT**

*This study investigates the elements anticipated to affect healthcare hospitals' decision to use cloud computing. A quantitative technique is applied in this work. To find out how prepared and able the IT departments of various hospitals were to embrace cloud computing, 200 questionnaires were utilised. The decision of organisations to view cloud computing as a wise investment was influenced by Technology, Organisational, and Environmental aspects (TOE), as determined by multiple regression testing of the data. The study's results revealed that every element significantly improved hospitals' intention to use cloud computing, with the technological element having the biggest influence on the choice.*

## **KEYWORDS**

*organizations, adapt, global market, efficiency, IT industry, cloud computing, investment, environment, technological advancements.*

## **1. INTRODUCTION**

Organizations are under intense pressure to adapt quickly to the ever-changing global market by cutting costs, increasing profits, and improving efficiency. This has prompted C-suite executives in the IT industry to invest in cutting-edge tools that boost efficiency, cut costs, and maintain a competitive edge (Adigwe et al., 2023). Businesses and organizations can benefit from using IT since it increases their effectiveness. Cloud computing has emerged as a significant technical advancement to alleviate the rising processing costs associated with information technology services by improving availability, flexibility, reliability, and processing throughput. Cloud computing has emerged as a significant idea in IT recently, and it is widely acknowledged as a promising area for IT investment. Businesses can take advantage of cloud computing's vast pools of accessible virtual computer resources, and the technology has the potential to boost the economy by meeting data management and computing demands through preexisting remote infrastructure and requiring less upfront investment (Ajayi et al., 2024). However, what motivates businesses to embrace and use cloud computing still needs to be determined. The development of information systems has turned its attention to cloud computing technologies, which offer

numerous benefits to enterprises, including the ability to pool resources, quick elasticity, and extensive network connectivity.

One relatively recent development in IT is cloud computing. It evolved from the concept of centralizing resource sharing and standardization. Many businesses may improve their efficiency and output by switching to cloud computing and other new technologies, giving them a leg up in the market (AITwajiry, 2020). As a critical component of many companies' plans, cloud computing revolutionizes e-commerce, customer service, and other business processes. It is now essential for enterprises to adopt new technologies, such as cloud computing, to effectively manage their IT resources and stay competitive in the marketplace. However, there are a lot of obstacles and unknowns when it comes to the anticipated commercial value of the new technology, which makes using a cloud computing model more complex. The three main elements influencing the adoption of cloud computing, technological, organizational, and environmental, have been the subject of several studies (Banimfreg, 2023). Still, to grasp cloud computing, we must examine how other industries have embraced this technology. This research paper explores the factors affecting cloud computing adoption intentions, especially in the healthcare sector.

## **2. LITERATURE REVIEW**

### **2.1. Cloud Computing**

Most studies that have been published on the topic of cloud computing have concentrated on its shared features. Companies only pay for the resources they use. This quality is a feature of cloud computing's on-demand service. According to Banimfreg (2023), the broad access network is the second feature of cloud computing. The term describes the computing resources businesses employ; these resources are located on a network and can be accessed through many devices, including desktop computers, laptops, mobile phones, and personal digital assistants. Cloud computing also features resource pooling. The servers of cloud service providers "pooled" their computing resources. AITwajiry (2020) explains that cloud computing enables what is known as multi-tenancy, which allows for combining hardware, software, and processing resources and delivering them to numerous users. A single instance of an application program can serve numerous clients, a phenomenon known as multi-tenancy. Put another way, this aspect of cloud computing makes better use of available technology resources.

Rapid elasticity and scalability are two characteristics of cloud computing. Computer resources can be made available right away. No contracts or upfront commitments are required, and customers can raise or decrease their consumption of computer resources whenever they wish (Ajayi et al., 2024). Multiple customers can make use of computing resources. On the other hand, cloud computing is characterized by its measured services since it uses a dynamic system to track each user's computing resource utilization and responds clearly to their payment procedures. More features of cloud computing complement these five main ones. They boast about how stable and scalable cloud computing is and how it can accommodate various uses (Adigwe et al., 2023). Organizations do not own or control their systems but share computing resources. Thus, they reap numerous monetary benefits from cloud computing.

Cloud computing technology will be essential to information systems in the future since it can lower IT service costs while enhancing flexibility and dependability. Furthermore, it is a possible way to improve companies' IT performance and competitiveness. According to Golightly et al. (2022), the first of the three cloud computing service models is infrastructure as a system (IaaS). Known as the basic level of cloud services, it offers clients hardware and software infrastructure

services over a network. Cloud computing has advanced to the second level with the platform as a service (PaaS). Every tool required to create an application is available online. Khayer et al. (2021) also affirm that among the services are tools for hosting, testing, deploying, and designing applications that give access to libraries and programming languages. The third service model is called SaaS. It is renowned for giving users software across a network, like the internet, which allows them to install and use the program at any time and from any location as long as they have a network connection. Along with enabling organizations to expand their software applications into other global regions, it also offers agile updating for applications as the service provider hosting the application systems executes updates that appear to occur without any planned downtime. Khayer et al. (2021) illustrate that adopting cloud computing is fraught with issues. Among these is the need for more connection between TOE elements and cloud computing adoption. Companies with money, human resources support, time, good top management involvement, and other elements will favorably see cloud computing.

In a series of memos addressing an Intergalactic Computer Network, Dr. Joseph Carl Robnett Licklider, an American psychologist and computer scientist widely recognized as the father of cloud computing, introduced the initial concepts of global networking in the early 1960s (Marquis et al., 2024). Modern enterprise cloud infrastructure, however, only appeared in the early 2000s. Cloud computing and storage were first offered by Amazon Web Services in 2002. Its Elastic Compute Cloud service, which lets customers rent virtual machines to execute their apps, was released in 2006 (Olabanji et al., 2024). In the same year, Google debuted its suite of productivity apps called Google Apps. First released in 2009, Microsoft Office 2011 was Microsoft's first software as a service program.

Connectivity to the internet at fast speeds is essential for cloud computing. A wide-area network (WAN) typically links end-users to data centres and other back-end services and applications in the cloud. To ensure data travels swiftly and securely from users on the front end to resources on the back end, other cutting-edge networking technologies for cloud computing are also used, such as software-defined networking (SDN), load balancers, and content delivery networks (CDNs) (Olabanji et al., 2024). Cloud computing primarily depends on virtualizing IT infrastructure to enable pooling and division regardless of physical hardware borders. This includes servers, operating system software, networking, and other underlying components abstracted using specialized software. A single physical server, for instance, can house numerous virtual servers. With virtualization, cloud providers may optimize their data centre resources to their fullest potential (Olabanji et al., 2024). Remote data centres owned and operated by CSPs store the physical hardware that forms the basis of cloud computing, including bare metal servers, cloud storage systems, and other similar devices.

There are several types of cloud computing. When a cloud provider makes its computer resources accessible to users through the public internet, this arrangement is called a public cloud. Some examples of this type of technology are software-as-a-service apps, standalone virtual machines (VMs), bare metal computers, and development platforms and infrastructures designed for large-scale enterprises (Oladoyinbo et al., 2023). These resources may have varying cost structures, including free, subscription, or pay-per-usage options. The data centres, hardware, and infrastructure that execute the clients' workloads are owned, managed, and taken full responsibility by the public cloud provider. It usually offers high-bandwidth network connectivity to guarantee top performance and quick access to data and applications (Oladoyinbo et al., 2024). A public cloud is a type of cloud computing in which many users share the same data centre and other resources. Customer counts in the millions are shared among the top public cloud providers. Because public cloud services are elastic and easily expandable, they can adapt to meet the demands of changing workloads, so most organizations have migrated some of their computing infrastructure to the cloud (Oladoyinbo et al., 2024). Customers are drawn to the public cloud

because it promises increased efficiency and cost savings by allowing them to pay only for the resources they utilize.

In a private cloud, one client has exclusive access to the entire cloud's architecture and computing capabilities. Private clouds combine the scalability, ease of service delivery, and flexibility of cloud computing with the security, control, and resource customization of on-premises infrastructure (Omogoroye et al., 2023). The customer's data centre is the usual location for private cloud hosting. It can be constructed on rented infrastructure located in a remote data centre or hosted on the infrastructure of an independent cloud provider. In order to stay in conformity with regulations, many businesses opt for private clouds instead of public ones. When it comes to workloads involving sensitive information, such as medical records, financial data, personally identifiable information, intellectual property, or confidential documents, many companies, including healthcare providers, government agencies, and financial institutions, choose to use private cloud settings (Sharma et al., 2020). An organization can easily transition workloads to public clouds or run them in hybrid cloud environments when the time comes by constructing private clouds based on cloud-native principles.

A hybrid cloud combines public and private cloud elements with those on-premises. In particular, a hybrid cloud integrates all three settings into one adaptable platform to manage the business's applications and workloads. Initially, enterprises usually used hybrid cloud computing models to move specific data from on-premises to private cloud and then link that to public cloud services provided by third parties (Wulf et al., 2021). This central dashboard is the go-to for teams and administrators to monitor all systems, networks, and apps. Hybrid cloud architecture has evolved beyond cloud migration and physical connectivity to provide a safe, cost-effective, and versatile environment that allows for the automatic deployment of workloads across different environments and their portability. By utilizing this functionality, organizations can accomplish their technical and business goals more efficiently and at less expense than relying solely on public or private clouds. Banimfreg (2023) asserts that teams involved in development and operations of web applications do best in a hybrid cloud setting. Business can therefore save time and money by avoiding the need to purchase and set up the actual hardware needed for on-premises application testing. After an application is developed, a team may move it from the public to a private cloud for security or commercial reasons, according to AITwajiry (2020). One further benefit of public clouds is that workloads in private clouds are unaffected by the capacity to quickly raise or decrease resource allocation in reaction to unforeseen traffic spikes.

## **2.2. The TOE Framework**

The main reason behind developing the TOE framework was to look into how businesses use IT systems. This framework is fast becoming popular and is a crucial theoretical guideline for IT adoption. If companies wish to adopt complex IT breakthroughs, Banimfreg (2023) says they need a strong organizational structure, a good technology portfolio, and an environmental strategy. This research requires the theoretical model in order to better understand this technology. The three pillars on which the current study tries to determine if companies would adopt cloud computing are technological, organizational, and environmental. AITwajiry (2010) shows that The TOE components have increased the value of this model over earlier ones for researching technology adoption.

### **2.2.1. The Technological Context of the TOE Framework**

In this context, technology describes the internal and external resources available to businesses in terms of technology. AITwajiry (2020) explains that technologies currently used within the company are considered internal, whereas technologies available to the market but not utilized by

the business are considered external. Because they define the breadth and depth of the technological change that the firm can tolerate, the technologies it uses impact the decision to embrace cloud computing (Wulf et al., 2021). The adoption choice is impacted by technologies not already used by the firm but available in the marketplace. These technologies show how organizations can evolve by embracing new technology. Incremental, synthetic, or discontinuous changes are all caused by external technology in an organization. The least dangerous of the three options are technologies that provide gradual modifications, adding new features to current technology. Combining current technologies in new ways leads to synthetic changes. Modest modifications like these are not out of the ordinary. According to Golightly et al. (2022), when technology undergoes a discontinuous transition, it significantly differs from previous versions. More research needs to consider technological traits when examining factors impacting the decision to embrace IT, even though this competency is crucial to the effective adoption of IT. Relative Advantage, Complexity, and Compatibility are the three angles from which technological context can be examined.

A technology component is relative advantaged when it offers businesses more benefits than drawbacks. According to Khayer et al. (2021), businesses should reasonably examine the possible benefits when deciding whether or not to use an invention. Reportedly, businesses are more inclined to implement innovations when they perceive a relative gain from them. Cloud computing adoption by organizations will have several advantages, such as more customer communication, more efficient organizational coordination, and market information mobilization. Further benefits of cloud computing include resource sharing, mobility, scalability, and paying only for what businesses require (Marquis et al., 2024). By moving to cloud computing and eschewing the expenses of owning and maintaining an unused IT infrastructure, businesses can significantly reduce the total cost of IT operations. Because cloud computing offers rental services that businesses may pay for as they go, they can change how much they use according to what they need right now. The ability of cloud computing customers to rapidly expand their infrastructure and resources to satisfy increasing needs is another advantage. According to Golightly et al. (2022), one advantage of cloud computing is its mobility; users may access and edit their papers from any location with an internet connection. Businesses can save a ton of money and time by using cloud computing's shared resource capabilities, which allow employees to access resources hosted in the cloud from anywhere.

Complexity is defined as the perceived effort required to learn and use a technology. It depends on how long things take, how well data transfers, how the system works, how the interface is designed, and how integrated it is with the cloud infrastructure (Wulf et al., 2021). If a new invention is perceived as more challenging to use, its likelihood of adoption will be lower. One difficulty that may arise for organizations when they adopt new technologies is the need to alter the procedures that interact with their business systems. According to Khayer et al. (2021), technologies should be simple, straightforward, and easy to use to boost the likelihood of successful adoption. As a result of cloud computing's immaturity, some businesses may be hesitant to embrace the technology.

Compatibility is how well an innovation fits people's preexisting beliefs, experiences, and requirements. To determine if a new technology is compatible, we look at how well it fits the organization's and its people's existing norms, practices, and beliefs (Marquis et al., 2024). When an invention is well-suited to the demands of its users, it becomes much easier to incorporate the technology into existing organizational and operational processes. Adopters might reap multiple benefits from compatibility. Adopting new technology, for example, can save time and money by preventing the need to deconstruct expensive infrastructure. A big obstacle to the innovation's adoption is that its characteristics must mesh better with potential users' needs and business procedures (Omogoroye et al., 2023). Cloud computing use is projected to increase as the

technology is seen as being consistent with current systems and organizational beliefs and values. With cloud computing, businesses may adapt to new technologies without disrupting their legacy systems, which are tailored to meet their specific managerial, operational, and organizational requirements.

### **2.2.2. The Organizational Context of the TOE Framework**

What makes up an organization's context are its resources and unique traits. Two primary parts make up the organizational context of this study. Technical preparedness is the second component, while assistance from upper management is the first. When starting, implementing, and adopting IT, top-down support is crucial (Wulf et al., 2021). Their involvement in adopting new technology within the company and sponsoring initiatives clearly shows their support. Organizational strategy and the direction of technology like cloud computing are the purviews of top management. The right amount of funding and an environment conducive to cloud computing can be obtained by upper-level management. The importance of top-level management understanding the advantages of cloud computing must be considered (Marquis et al., 2024). They must effectively manage organizational change by communicating their vision and commitment, which will inspire confidence in the new technology among all employees. The organization can better circumvent internal resistance to change by accepting such assistance. Individuals can conclude that enterprises seeking to create a competitive environment and provide the resources needed to adopt cloud service must have top-level management support. To be technologically ready, an organization must have the necessary infrastructure and information technology people resources to implement new technologies effectively (Omogoroye et al., 2023). Installed network technologies and corporate systems are examples of technological infrastructure supporting cloud computing applications. When it comes to implementing IT applications related to cloud computing, the people who work in IT are seen as the best source of knowledge and abilities. From the most tech-savvy, pioneering organizations, known as explorers, to the most conservative, less tech-savvy, and unmotivated, known as laggards, there are five distinct categories of businesses that can be classified according to their level of preparedness to embrace new technologies.

### **2.2.3. The Environmental Context of the TOE Framework**

Industry markets and technology service providers are examples of the tiny environment in which the firm operates. Industry, rivals, and governmental policy or intention are all parts of a company's environmental context. Environmental factors that were considered in the study encompassed things like vendor shortages, competitive pressure, and pressure from trading partners (Marquis et al., 2024). The pressure businesses may experience from their competitors in the same industry is known as competitive pressure. Any new technology, particularly if it impacts the competition, can be positively influenced by this competition and its players. Organizations can alter the competitive environment, including adopting technology and overcoming industry structure and competitors. With cloud computing, operational efficiency, data accuracy, and cost reduction can all significantly improve (Omogoroye et al., 2023). Businesses can gain a competitive edge and ensure their survival by being the first to embrace cloud computing. The Cloud service providers are the intermediaries between trading partners in cloud computing. Businesses of all sizes depend on their trading partners' expertise and knowledge when they want to use cloud services. Considerations such as a trading partner's track record and completed projects could influence the choice to implement cutting-edge IT innovation (Oladoyinbo et al., 2023). Companies thinking about moving their data to the cloud are understandably worried about the reliability of their service providers' data availability guarantees. A mix of preventative measures and service level agreements can guarantee the desired availability.

Organizations share security concerns when it comes to trading partners. The security of cloud computing encompasses not just authentication, authorization, and accountability but also data protection, business continuity, and disaster recovery (Wulf et al., 2021). Security is related to privacy and confidentiality since service providers can access all data and could use it for unwanted reasons, whether they mean to or not. Because of the potential for application co-hosting, many businesses are wary about entrusting other machines to store their data. When there are not enough trustworthy and competent providers offering cloud services, this is known as vendor scarcity. There may be a need for more background information or expertise regarding cloud services since this industry is still relatively young. Lower service quality could result from having a small number of vendors (Omogoroye et al., 2023). When there are enough reputable providers, organizations can trust cloud services more and have a positive attitude towards transforming them. Companies will be less likely to trust cloud services if there are few vendors.

### **2.3. Research Questions**

This study examines how different TOE features affect enterprises' intentions to adopt cloud computing. The methodology will focus on responding to the following research questions:

1. How do TOE factors influence cloud computing adoption?
2. Considering organizational and environmental contexts, which technological features within TOE affect cloud adoption?
3. How do environmental factors like regulations and competition influence the relationship between organizational readiness and cloud adoption?

## **3. METHODOLOGY**

Researchers utilized 5-point Likert scales to examine how the TOE research model affected the intentions of individuals to use cloud computing. A score of 1 indicates a strong disagreement, while a 5 indicates a firm agreement. A multiple regression analysis was carried out to answer the research questions. Data was gathered through questionnaires from 120 participants in the health sector. The Survey Monkey was utilized to execute and deploy an online survey for the selected participants.

## **4. RESULTS**

This quantitative study examines the relationship between technological, organizational, and environmental factors in organization's decisions to implement cloud computing by collecting data from a questionnaire. The goal is to provide hospitals with a better understanding of these factors. Fifty(50) hospitals made up the study's population. People who work in the information technology departments of hospitals were given 200 surveys to fill out. The hospitals were randomly picked, and a representative sample was drawn from each hospital's staff. Through the use of eight variables, we will be able to quantify three aspects that influence the choice to utilize cloud computing: Technological considerations, which, according to the cited source, have three aspects: relative benefit, complexity, and compatibility, Competitive pressure, pressure from trading partners, and supplier shortage are the three components that make up environmental factors. Lastly, the organizational aspect comprises two parts: the support of upper management and technology readiness. The adoption of cloud computing was assessed using three items. By analyzing the correlations between the study's relevant variables, the acquired data will aid in testing the research's hypotheses. Analyses of variance were performed on the data. In addition to reliability and multicollinearity tests, a multiple regression analysis measure will also be

performed. The findings will lay the groundwork for determining whether the hypotheses are correct and addressing the research question.

When evaluating the value and accuracy of data, two key metrics are validity and reliability. When evaluating an instrument's validity, it is essential to consider its accuracy and whether it measures the target variable. Checking the consistency and stability of the questionnaire is what reliability is all about; it is all about precision. Scales and items included in this study were created and used by other researchers interested in the same field. Also, four professors with extensive expertise in the field reviewed an early version of the survey to remove any room for interpretation and ensure that all items measured the intended constructs. Using Cronbach's alpha, the research could determine how trustworthy the instrument was. Every metric or indication should have a value greater than 0.60, the suggested minimum. Table 1 and Figure 1 show the variables' validity and reliability.

Table 1: Cronbach's Reliability of Variables

Variable	Cronbach's Alpha	No. of Items
Technology Factor	0.68	7
Organizational Factor	0.745	8
Environmental Factor	0.7	7
Intention to adopt cloud computing	0.651	3

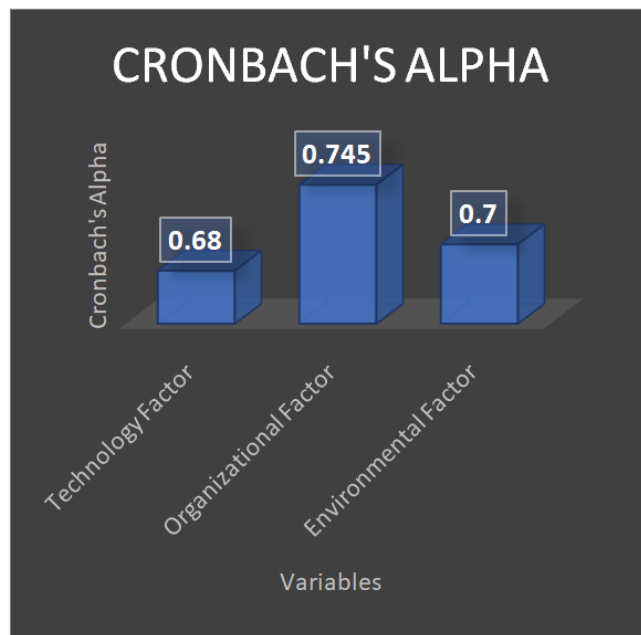


Figure 1: Reliability of Variables

The variables were tested for tolerance and VIF, as shown in Table 2 and Figure 2.



Table 2: The Tolerance and VIF for the Independent Variables

Variables	Tolerance	VIF
Technology Factor	0.711	1.407
Organizational Factor	0.639	1.565
Environmental Factor	0.698	1.433

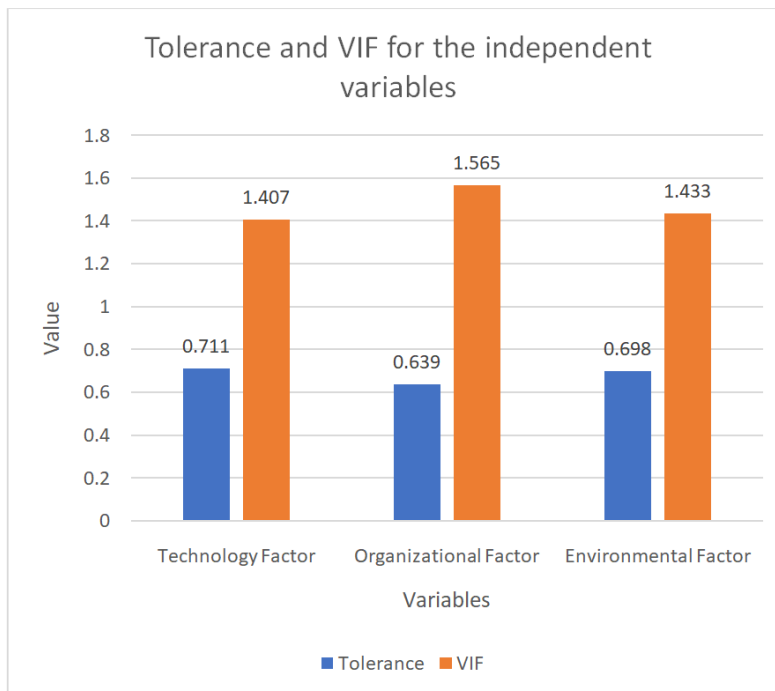


Figure 2: Tolerance and VIF for the Independent Variables

The regression analysis was conducted, as shown in Table 3.

Table 3: Pearson Regression Analysis

Variables	R	R2	F	Sig (F)	$\beta$	t	Sig (t)
<b>Technology Factor</b>	0.431	0.19	16.63	0.000	0.21	2.92	0.004
<b>Organizational Factor</b>					0.11	1.48	0.14
<b>Environmental Factor</b>					0.21	2.84	0.005

## 5. DISCUSSION

This study set out to answer the question, "Did the TOE framework's proposed factors impact hospitals' intentions to adopt innovations like cloud computing?" Its target audience was healthcare providers, who are rightfully enthusiastic about technological advances that have the potential to enhance patient care. The research found that the three framework-proposed factors,

Technology, Organization, and Environment, did influence healthcare organizations' decisions to use cloud computing.

Results showed that the technology positively and significantly affected the intention to use cloud computing. It was also determined that this component was the most important in implementing this new technology. This could be because of the technological component, which states that companies are more inclined to implement new practices when they see a clear benefit to themselves. Reduced costs, portability, flexibility, and sharing of resources are just a few of the many advantages of cloud computing technology. Businesses can improve their efficiency by using cloud computing services (Oladoyinbo et al., 2023). Before adopting cloud computing, organizations must be assured that substantial benefits are achievable. This could be crucial, mainly when funds are restricted and such technologies are not readily available. Another major factor in cloud computing adoption is complexity. Many firms have certain reservations and fears when investing in new IT advancements. Technology is crucial when embracing cloud computing for many reasons, including compatibility. Organizations must determine whether the technology aligns with the present infrastructures of their business and if it meets the current values and needs of the people using it (Wulf et al., 2021). Businesses should ensure that cloud computing aligns with their policies, IT development environment, and business requirements. Thus, the organization's infrastructure must be modified to accommodate cloud solutions, which necessitates the modification of current operations. An essential factor in the decision to use cloud computing, compatibility was overlooked.

The study's findings demonstrated that the three interrelated components of this model, Technology, Organization, and Environment- substantially impact the choice of enterprises, especially healthcare facilities, to embrace cloud computing. Technological, environmental, and organizational factors were the most influential factors shaping the desire to use cloud computing (Wulf et al., 2021). ICT providers and management must pay close attention to the results of this study. The results can help prepare for the use of cloud computing. The research model can shed light on the decision-making process for hospitals in Jordan to utilize cloud computing services, which is valuable information for ICT service providers. Additionally, businesses can evaluate the service's complexity, ease of implementation, and compatibility with their systems.

## **6. CONCLUSION**

Companies are most influenced by technological preparedness, security, privacy, moral issues, and ease of use when deciding whether or not to employ cloud computing. Consistent with other studies, this demonstrates that enterprises prioritize concerns about IT infrastructure, availability of skilled IT workers, data security, company reputation, and ease of access to data from various devices in different places when deciding to use cloud computing. Firms consider many criteria before adopting cloud computing because of its many options. The literature reviewed and conversations with industry experts indicate that these aspects are carefully considered. The study's suggested model incorporates other elements such as security, necessity, legislation and regulations, on-demand service, pricing, supplier availability, reliability, maintenance, virtualization, integration, and performance. Companies would rather spend less on their information technology demands; thus, they are willing to pay for cloud computing services. The study also suggests that firms are more likely to utilize cloud computing when they need to do so and are concerned about security. The advent of a competitive global economy necessitates technical advancements for companies. Companies' requirements are ever-evolving in this regard. One of the five main draws of cloud computing services for companies is the ability to meet various business requirements. Businesses have no qualms about moving their systems to the cloud if they feel their data is safe there. This research adds to the growing evidence that laws and

regulations are critical to bolstering the security and privacy of data stored in cloud-based systems.

## COMPETING INTERESTS

The author declared that the study did not involve in any conflicts of interest.

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