THE ADOPTION OF CLOUD COMPUTING IN SYRIAN BUSINESS ORGANIZATIONS: A TOE FRAMEWORK APPROACH

Miriam Bahna – Szalay Zsigmond Gábor

Abstract

Cloud-based applications are receiving increasing attention among Syrian companies today. Primarily, companies operating in the technology sector, such as software development companies and system administrators, are those that use and provide cloud-based services, but other sectors, such as banks and insurance companies in the financial sector for financial transaction management, telecommunications companies for database management, and the healthcare sector for electronic records. Cost-effectiveness, scalability and flexibility are valued in the applications. Despite the increased spread, not all companies have been able to provide the necessary environmental, infrastructural, and organizational factors for the adoption and integration of cloud services. The purpose of this paper is to examine the use and acceptance from the users' viewpoint, primarily from an organizational perspective. For this, a questionnaire-based survey was conducted, and a sample of 400 employees working at companies in Syria was asked about their experiences and opinions regarding the use of cloud services. The results of the research confirm that cloud-based services are relatively widely used, and users cite faster work, efficiency and cost reduction as recognized and accepted benefits, but security concerns still arise.

Keywords: *cloud services, adoption, behavioral intention*
JEL code: *C88, O14, P42*

Introduction

The term cloud computing refers to the on-demand access to computer system resources, most notably data storage and computational power, without the need for the user to manage these resources directly and actively. In the past decade, cloud storage has become progressively popular in data centers that are accessible to many users over the Internet (Aceto et al., 2020).

According to Bello et al. (2021), Cloud computing indicates offering a service using hardware and software over a network, typically the Internet. Traditionally, email service providers such as Microsoft Outlook, Google Gmail, and Yahoo Mail prove the growing utility of Cloud computing for storing communications (Bergelt & Englisch, 2020). In addition, the use and management of large amounts of data, storage of photos and videos have also gained ground (Chen & Yang, 2022). On a personal level, cloud storage services such as Microsoft OneDrive, Google Drive and Dropbox have been crucial in expanding the storage capacity of mobile and computer devices (Bi et al., 2022). However, Cloud computing is no longer exclusively a personal application, but has also become a driving force for success in the business world, considering its technological foundations (Chen et al., 2024).

Cloud computing has penetrated the corporate world and delivers corporations numerous business opportunities, like secure data storage, online business solutions and remote working options, which upsurge operational efficiency and reduce operating costs (Walter et al., 2022). The Covid-19 pandemic has accelerated the digital transition, and the potential and expected benefits of cloud

services, such as cost-effectiveness, increased security, fast computing, real-time access, scalability and competitive advantage, have become clear by now (Ibrahim, 2021).

As a result, the use of cloud applications has increased globally. Every business is striving to increase the efficiency of its operations, and cloud-based technology is one of the most appropriate tools for this. The chief benefits for businesses are scalability, flexibility, and the ability to focus on business operations instead of managing a complex IT infrastructure (Abdulkareem et al., 2021).

Research Gap

Syria has been the scene of armed conflict for many years, and the United Nations designated it as the world's largest humanitarian crisis in 2014. Many people in the country were even preparing to flee their homes, as the fighting left devastation everywhere. However, many civilians decided to stay in the country and survive, rebuilding the country. Today, one of the largest uses of cloud computing in Syria is in education (Wannous et al., 2017). With the development of communication and information systems technology, the growth of digital connections and networks, the Syrian state has also adopted cloud-based services. E-government is constantly evolving, because the government is trying to provide effective services and solutions to its citizens. The spread of electronic platforms and cloud-based services thus benefits not only the government but also citizens (Saleh & Alyaseen, 2023).

There have been numerous studies internationally on how employees relate to cloud computing adoption and what the acceptance and usage rates are. However, there has not been a comprehensive study of users in Syria, although Bahna (2020) found in her study that Syrian organizations are receptive to the services offered by cloud providers because they consider reliability, speed, and security to be advantages.

Based on the above, the gap is in the research that, outside of the practice of the education and government sectors, there is no survey that examines employees' attitudes, opinions and acceptance of cloud adoption at Syrian companies, even though this is one of the most imperative characteristics of an organization's life for successful execution.

Literature review

The role of cloud services in the corporate environment and their application

Today, everyone experiences the opportunities offered by digitalization in both their personal and professional lives. Without technological innovations and applications, it is almost impossible to imagine either personal life or work conditions. Technological changes are catching up with almost every country, although not at the same pace, and digitalization and electronic administration are appearing in all developed and developing countries. They are slowly permeating the life of every economy and businesses are no exception, regardless of their size.

According to a study by Gu et al. (2022), technology has a positive impact on business organizations, despite this, there are still concerns about the adoption and implementation of technology. According to Bouaynaya (2020), cost reduction and scalability can be mentioned as potential benefits, while Shamshirband et al. (2020) also mention increased productivity. Ding et al. (2021) states that data access and retrieval capabilities support workflows, while Abdulkareem et al. (2021) also

mention scalability, while cloud services prove to be equally effective in terms of flexibility and support for business processes.

Effective application and adoption mean that organizations do not have to overload their own internal capacities or spend more on storage because cloud-based solutions are a secure alternative. Services can also be personalized because features can adapt to users' needs and requirements (Elkaseer et al., 2018). The traditional in-house computing has turned out to be less cost-effective in recent times since the emergence of cloud-based solutions. Continuity of operations, functional flexibility are what according to Chopra & Dhote (2019), cloud computing provides for companies, thus to move from in-house solutions to cloud-based. It brings the expected productivity, and horizontal and vertical integration can be solved, compared to traditional options.

However, along with the benefits, previous research has also found a number of concerns. Although traditional business approaches can be costly and time-consuming due to the use of human activities and the increased incidence of errors, there are still problems and doubts regarding the introduction and use of cloud services. According to Lynn et al. (2020), the biggest problem may be data protection and security issues. According to Soni and Kumar (2022), the fact that a third party, the service provider, may manage the server already poses a certain level of security risk for businesses.

Other concerns include connectivity, reliability and interoperability issues according to Avram (2014). High initial investment costs may also be a concern, but failure to meet the infrastructure requirements for technology adoption or a lack of competent professionals may also pose a problem for organizations (Al-Hujran et al., 2019).

Cloud adoption, which is considered a disruptive innovation, is therefore a research area that should be examined from several perspectives, because the advantages and disadvantages de-pend on the size of the company, the field in which it works, the processes it wants to support, the service providers available to them and with what functions (Rodríguez-Espíndola et al., 2022).

Cloud deployment models

SaaS, PaaS, and IaaS are the most common service models, but also the extended FaaS, CaaS, MaaS and HaaS, depending on the application, can be mentioned. Infrastructure-as-a-Service (IaaS) covers the use of hardware storage and data processing resources over an IP-based connection, while Platform-as-a-Service (PaaS) provides a cloud platform. Software-as-a-Service (SaaS) supports access to software applications running on the vendor's infrastructure (Chopra & Dhote, 2019). Pedone & Mezgár (2018) explain the extended applications as Container as a Service (CaaS) supports virtualization, Function as a Service (FaaS) is serverless computing, where the application and business logic are implemented at the cloud level. Hardware as a Service (HaaS) is used in larger manufacturing environments, supporting the functionality structure and related elements, while Manufacturing as a Service (MaaS) is a cloud-based service for industrial manufacturing to optimize production and capacity tasks.

Private Cloud can be installed on-site as a dedicated cloud server, which is used only by the specified organization. Access to the cloud is via the intranet, limited to the internal employees. It is a secure, customizable, flexible solution, but therefore also expensive. Public Cloud, on the other hand, provides an external service provider, and its infrastructure can be used through web applications. It is a cheaper solution compared to a private one, but many people find it problematic due to security issues. Its bandwidth is limited, although higher bandwidth is available to users depending on the service provider (Chopra & Dhote, 2019). Moreover, a hybrid solution is also

possible, in which local infrastructure is combined with public infrastructure. As a result, a corporate environment can be created that is unified and flexible, and the most suitable applications and solutions for the company are combined. The hybrid Cloud model is a mix of both private and public Cloud deployment models, with which companies mainly strive to achieve the greatest possible benefits of both models (Golightly et al., 2022).

Factors influencing the adoption and use of cloud services

In order for businesses to successfully implement and benefit from cloud services in the long term, they need to consider several factors, including economic, technological, organizational, psychological aspects but the external, market factors also affect the process. Cloud applications today provide organizations with the most modern technological opportunities, which require a large capital investment, so in order to ensure proper implementation and efficiency, an assessment must be made of what is the most important goal for them, what obstacles there may be to implementation and use (Bello et al., 2021).

Technological factors include the current infrastructure and tools that the company has. Given the size of the initial costs, most companies are only willing to accept cloud services from certain service providers if they are compatible with the technology of the given organization. This is an important aspect because, due to fit, it is necessary to consider how well the new system fits into the company's systems and processes. If the service can be easily integrated, there is a greater chance that the selected IT infrastructure and thus the application will be introduced. The issue of scalability should also be mentioned as an important technological aspect, because companies need to assess whether their existing resources need to be increased or decreased. Another issue is the usability of the service, the quality of the service provided by the service provider, and the reliability of the service provider and its services (Dar, 2018).

An economic factor is the costs and financial benefits that the company can expect. Companies do not always have to spend huge amounts on initial investments in a cloud service, this also depends on the existing IT infrastructure mentioned earlier. If they rent the service, they have to calculate with a monthly fee, which can be burdensome for smaller businesses. Businesses count on the possibility of cost reduction as a long-term return, which makes cloud services attractive. Organizations do not need to employ their own IT specialists for maintenance in case of rental, so operating costs can also be reduced. Cloud-based systems usually operate with service-based pricing (subscription-, pay-per reservation-, pay-per-use, consumption-based-, hybrid pricing), so companies using them are able to create a flexible cost structure (Lowe & Galhotra, 2018).

Organizational factors represent the structure, culture, management of the organization and are also related to decision-making processes. If the company's management is inclined to introduce cloud services and they fit the goals and operating model, then they must also shape the organizational culture accordingly. Organizational culture and attitudes are related to psychological factors and mean the acceptance of cloud services in this case, and also depend on the attitude and acceptance of managers and employees. If the company supports the implementation and use, then there is a greater chance that employees will also accept the technology. At this point, managers must ensure, in addition to the necessary tools, that employees also consider cloud services that are in line with the corporate strategy to be beneficial and useful (Henry & Alexander, 2023). The attitude and intentions of users are among the main components of the acceptance of cloud services. The intentions and motivation of users, therefore determine whether employees truly accept innovation, new technology and its applications. The usability and perceived usefulness of a service

also determine how easy the applications are to use and how valuable they are to employees in their work (Amron et al., 2021).

In addition to the internal, organizational factors mentioned so far, it is necessary to mention external, market factors. These are industry trends, such as industry competition, social expectations, the legal environment, regulations, and statutory requirements, which either present opportunities or pressures for companies. Companies tend to take into account what their rivals are using and what decisions other industry players are making regarding applications (Marston et al., 2011).

Acceptance theories

The literature has discussed several different models and theories regarding the adoption of cloud services. For the purpose of this research, the following can be mentioned: Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), Diffusion of Innovations Theory (DOI), and Technology-Organization-Environment (TOE) frameworks.

TAM is one of the earliest models to explain technology adoption. Davis's 1989 model explains the factors that drive technology adoption. Its two components are perceived usefulness and perceived ease of use. It helps to assess and understand how employees judge and evaluate these two dimensions, and what the outcome of their adoption decision is (Davis et al., 1989).

Venkatesh developed UTAUT in 2003, which is an improved version of the TAM model, because researchers believed that TAM did not include all the valuable and important factors that would inspire employees to adopt. The 4 elements of UTAUT refer to people's behavioral intentions: enabling circumstances, social influence, effort expectation, and performance expectation. According to this scheme, all of these affect expectations and thus performance, because social influences and environmental factors are also taken into account, whether facilitating or inhibiting (Ayaz and Yanartas, 2020). The model was expanded with four additional attributes that act as moderating factors: experience, volunteerism, age, and gender (Afonso et al., 2012).

The DOI theory is also one of the oldest theories, created by Rogers in 1962. It refers to how a novelty becomes an idea and a product, and how it is received by society. It is one of the oldest concepts in social science. The model examines how a new technology spreads in a given society or industry. The levels of acceptance vary among different groups, so acceptance depends on the personality of the adopters and environmental influences. Based on different attitudes, people can be classified into five groups: innovators, early adopters, early majority, late majority, and laggards (Kanger et al., 2019).

TOE is used to understand how organizations adopt new technologies. It was first published by Tornatzky and Fleischer in 1990, where investigators hypothesized that TOE designates how the process of approving and implementing innovations occurs in technological, organizational, and environmental conditions. The technological context is the impact of new technological features on the decision to adopt based on perceived ease of use, perceived risks, trialability, complexity, perceived importance, compatibility, perceived barriers, and perceived benefits. Organizational context should be examined in the context of the communication process, formalization, centralization, number of employees, and company size. According to this, structure also plays a role in adoption and employee commitment (Ghaleb et al., 2021). Decentralized organizations are more open to innovative solutions and more receptive to new ideas than centralized organizations. The environmental dimension refers to the characteristics, opportunities, constraints, practices, and legal guidelines of the industry in the TOE framework (Lorente-Martínez et al., 2020).

Material and method

In this research, the pragmatist research philosophy was used, because the goal is to conduct research in order to answer the research questions. The application of the pragmatist philosophy also helps the researcher to achieve effective results that can be applied in practice. Using a deductive approach, the researcher first collected literature related to the topic through secondary research. During secondary data collection, the main theories and concepts are presented based on previous studies and research, which helps to better understand the results (Saunders et al., 2016).

The primary research is a survey research strategy, with quantitative data collection. In the process, the researcher prepares a questionnaire and defines the respondents as the target group as those employees working in IT services who work in Syria. Given that the aim of the research is to examine the adoption of cloud services in Syria, they are the most appropriate sample to conduct the research, because they can provide relevant and credible information through their own experiences and opinions.

The sample size is 400 people, and the following variables are examined: behavioral intention to use; perceived usefulness; perceived ease of use; compatibility; cloud computing awareness; cloud computing adoption; perceived risk and costs. While the first is the dependent variable, the other variables are independent.

The questionnaire consists of three main groups of questions. Firstly, demographic information about the respondents, secondly, organizational information about the company where they work, and thirdly, questions related to cloud services. The aim of the questionnaire is therefore to get an accurate and detailed picture of the extent of cloud services adoption in Syrian companies, and what aspects influence adoption. After data collection, the dataset was coded and analyzed using IBM SPSS Statistics. Descriptive statistics, ANOVA, Pearson correlation, and regression analysis were performed to evaluate the relationships between variables and test the proposed hypotheses.

Table 1. Variables used in the questionnaire

Name of the variable	Description
Behavioral intention to use	user's intention to use cloud services
Perceived usefulness	user's perception of the usefulness of cloud services
Perceived ease of use	ease of use of cloud services as perceived by users
Compatibility	alignment of cloud services with users' existing needs, values, and experiences
Cloud computing awareness	user awareness of cloud services
Cloud computing adoption	the extent of cloud service adoption in companies and the future plans
Perceived risk	risks perceived by users (e.g. data security, privacy)
Costs	costs of adoption of cloud computing

Source: own research (2024)

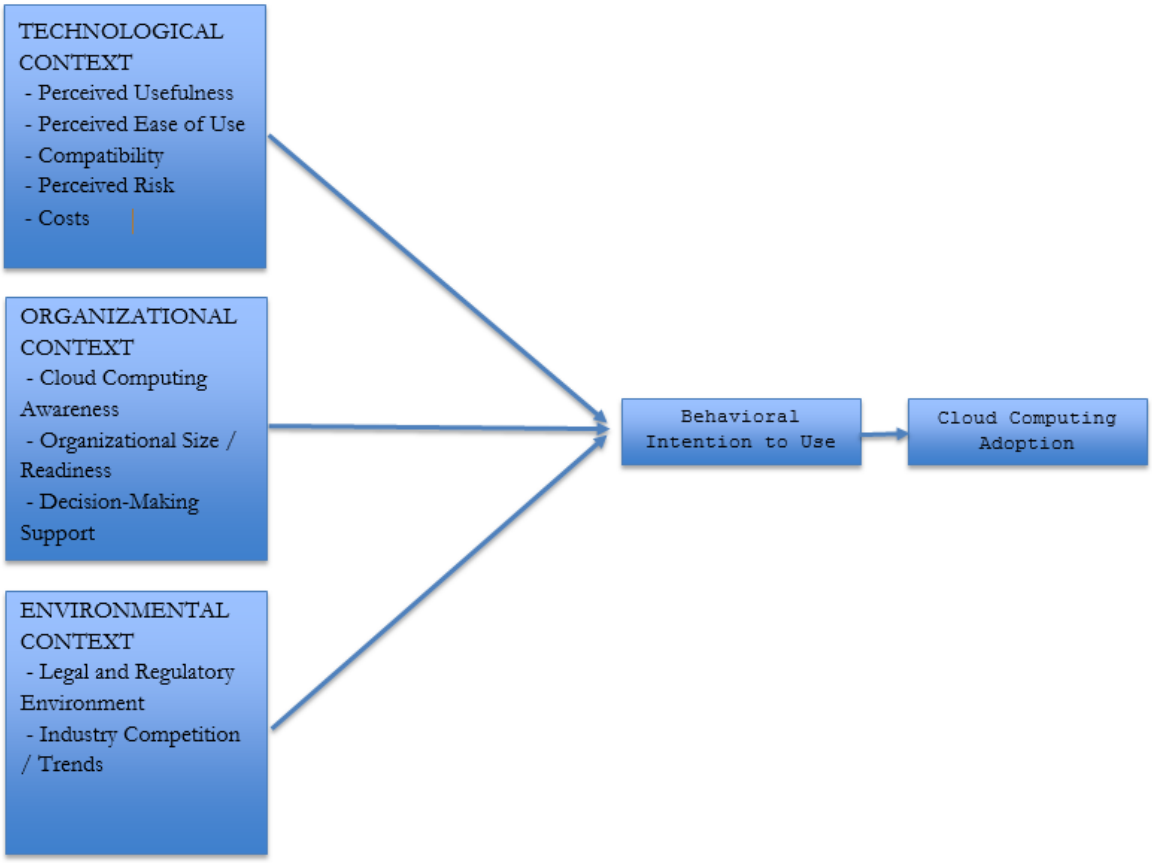

Figure 1: Conceptual Framework Based on TOE Model

Source: own research (2024)

To enhance clarity and ensure alignment between the TOE theoretical framework and the measured variables, the factors from the questionnaire were categorized into the three dimensions of the TOE model: Technological, Organizational, and Environmental. As illustrated in Figure 1, technological variables include perceived usefulness, ease of use, compatibility, perceived risks, and cost-related concerns. Organizational variables include cloud computing awareness, decision-making support, and readiness. Environmental elements though not directly measured quantitatively are considered in the form of contextual influences like industry competition and regulatory environment, as supported by the literature. These TOE factors are hypothesized to influence behavioral intention to use, which subsequently affects actual cloud computing adoption. This visual framework clarifies how multi-dimensional drivers interact in shaping user behavior in the Syrian business context.

Results

Descriptive statistics

In the first part of the questionnaire, examining the demographic characteristics of the respondents and their experiences with cloud services, it can be stated that the sample had a ratio of 52.8% female and 47.3% male, and most respondents (86.5%) belonged to the 31-45 age group. The majority of employees (83.8%) work in the capital, and their experiences with cloud services are quite divided. 20.8% of them have more than 10 years of experience, and the ratio of 7-10 years of experience is also 14%. 21.8% of the respondents have less than 1 year of experience. The distribution is also diverse in terms of their position. Only 7.8% are company managers or owners, and 12% are managers. In terms of IT, 13% are Software Developer/QA Analyst, the 34.3% are DevOps/System Administrator, so many of them are relevant and experts in the topic under study. Regarding their workplace, 94% of respondents work for companies located in the Damascus Governorate.

All of the respondents work for companies where cloud-based solutions are already in use and in practice. Therefore, the results are valuable due to the topic of my research. 12.5% of the companies have been using cloud services for less than a year, while 27.5% have been using cloud services for more than 10 years. The most common services include storage (57.75%) and software (57.5%) SaaS, but IaaS (55.75%) and PaaS (41%) solutions are also popular and used. According to 57% of the respondents, the most valuable cloud application is desktop applications, but emails and storage are also used. Regarding the future, 60.3% of the respondents said that they will definitely use cloud applications, while 37.3% also said that they will probably use them. The most mentioned motivations for using applications were security, cost reduction and increased efficiency. In terms of business goals, most people cited reducing operational costs and improving data quality as reasons.

Based on experience, more than two-thirds (63.75%) of respondents confirmed that they had indeed experienced a reduction in operational costs when using cloud services, and another 45% confirmed that data quality had also improved during use. According to their users, their company will expand their cloud services in the next 12 months, and nearly a fifth of them (19.8%) stated that this would increase users over 50% at the company.

Using the Likert scale, the survey also asked whether respondents would recommend the cloud service provider to others, an average response of 4.38 indicates that they would, meaning that 62.7% would definitely recommend it, while 25% were neutral. The user interface received a rating of 3.73. The majority of respondents (40.5%) had a positive opinion of it. The overall satisfaction was 3.94, meaning that respondents had a rather positive opinion, but relatively many, 47.3%, gave a neutral opinion. 33% of respondents expect that the investment in the cloud service will pay off within 6-12 months, while 25.3% believe that the payback period will take at least 2 years.

Regarding organizational and technological factors influencing cloud adoption, the survey results confirmed that respondents believe that service quality, usability, security concerns and complexity have a positive impact on cloud adoption. However, cost, complexity and organizational scale are important factors, but IT infrastructure readiness and trust are neutral factors. Respondents believe that organizations need adequate technical support and resources to successfully adopt cloud services. Corporate productivity can be increased and task management can be improved, but opinions were mixed on the issues of increased performance and faster task completion. Respondents agree that competitiveness can be improved and that employees need to be trained to use technology.

Another finding based on the responses to the questionnaires is that respondents believe that cloud services are easy to use, but there is a wide variation between individual opinions. More of them believe that service quality and security are important. The use of cloud services suits their work habits. However, neutral opinions were reported that cloud services are useful and compatible. Nevertheless, quite a lot agreed that they are beneficial for work.

Financial transactions and data protection issues were raised as security concerns; these are also important. Opinions were mixed regarding costs, with many giving a neutral opinion. The costs of cloud services (equipment cost, access cost, transaction fees) seem rather high. A general trend based on the responses is that respondents are still willing to use cloud services because they help increase efficiency and work faster.

Testing of the hypotheses

The primary aspect and main goal of the research was to examine the behavioral intention of users. Therefore, the hypotheses primarily refer to understanding behavioral intention and determining the influencing factors. The hypotheses can therefore be evaluated based on the following.

H1: Gender determines behavioral intention to use significantly. The ANOVA analysis showed that women had higher average values for the perceived usefulness of cloud services, as well as for their willingness to use them, while men reported lower average values but showed a similar degree of variability. The F-test indicated no significant relationship between gender and either the perceived usefulness, the willingness to use cloud services, or future usage intention. Consequently, H1 was not supported, as gender did not have a significant impact on the intention to use cloud services.

H2: The location of the workplace determines behavioral intention to use significantly. ANOVA results presented that respondent working in cities rated the benefits of cloud services and their willingness to use them higher, while those in the capital showed a higher future intention to use cloud services. F-test established a significant relationship between workplace location and intention to use, though the relationship was limited to specific cases and aspects, since the relationships are weak. Consequently, H2 was partially supported, demonstrating that the location of the workplace influences intention to use in some contexts, but not universally.

H3: Gender determines behavioral intention to use, perceived usefulness, compatibility, cloud computing awareness, cloud computing adoption, perceived risk and costs significantly. ANOVA analysis discovered a division in responses. Gender shows no significant influence on the adoption of cloud computing, perceived usefulness, compatibility, cloud computing awareness, perceived risk, or costs. Though, men testified higher values for usefulness, risk, and costs, while women scored higher for usability and compatibility. Consequently, H3 was not supported, as gender did not significantly affect any of the examined variables.

H4: There is a significant relationship between behavioral intention to use and perceived usefulness. The Pearson correlation between behavioral intention to use and perceived usefulness was 0.026, with a significance level 0.599, representing no significant relationship. Thus, H4 was not supported.

H5: There is a significant relationship between behavioral intention to use and perceived ease of use. The Pearson correlation was 0.072, significance level was 0.152, demonstrating no significant relationship. Consequently, H5 was not supported.

H6: There is a significant relationship between behavioral intention to use and compatibility. Pearson's correlation was 0.006, significance level was 0.908, showing no significant relationship between compatibility and behavioral intention to use. Thus, H6 was not supported.

H7: There is a significant relationship between behavioral intention to use and Cloud computing awareness. The Pearson correlation was -0.026, significance level was 0.964, revealing no significant relationship between behavioral intention and cloud computing awareness. Consequently, H7 was not supported.

H8: There is a significant relationship between behavioral intention to use and Cloud computing adoption. The Pearson correlation value was 0.119, significance level was 0.018, representing a significant positive relationship between behavioral intention and cloud computing adoption. Thus, H8 was supported, confirming that the intention to use cloud services influences their adoption.

H9: There is a significant relationship between behavioral intention to use and perceived risk. The Pearson correlation was -0.037, significance level was 0.461, demonstrating no significant relationship between behavioral intention to use and perceived risk. Thus, H9 was not supported.

H10: There is a significant relationship between behavioral intention to use and costs. The Pearson correlation was 0.067, significance level was 0.182, revealing no significant relationship between behavioral intention and costs. Thus, H10 was not supported.

H11 Behavioral intention to use determines perceived usefulness significantly. The R square value from the Model Summary showed no significance (0.1% of perceived usefulness), representing that behavioral intention to use does not significantly impact perceived usefulness. Consequently, H11 was not supported.

H12: Behavioral intention to use determines perceived ease of use significantly. The R square value indicated no significance (0.5% of perceived ease of use), meaning that behavioral intention to use does not have a significant effect on perceived ease of use. Therefore, H12 was not supported.

H13: Behavioral intention to use determines compatibility significantly. The R square value showed no significance (0.0% of compatibility), indicating that behavioral intention to use does not significantly determine compatibility. Thus, H13 was not supported.

H14: Behavioral intention to use determines Cloud computing awareness significantly. The R square value showed no significance (0.0% of cloud computing awareness), demonstrating that behavioral intention to use does not significantly affect cloud computing awareness. Therefore, H14 was not supported.

H15: Behavioral intention to use determines Cloud computing adoption significantly. The R square value showed significance (1.4% of cloud computing adoption), confirming a significant relationship between behavioral intention to use and cloud computing adoption. Therefore, H15 was supported, though the relationship strength is relatively weak.

H16: Behavioral intention to use determines perceived risk significantly. The R square value showed no significance (0.01% of perceived risk), representing that behavioral intention to use does not significantly determine perceived risk. As a result, H16 was not supported.

H17: Behavioral intention to use determines costs significantly. The R square value showed no significance (0.4% of costs), meaning that behavioral intention to use does not significantly affect the costs of cloud computing. Thus, H17 was not supported.

Table 2. Evaluation of the results

Variable	Significant relationship (Yes/No)	Detailed explanation	Level of significance
Behavioral intention to use	No	The mean value of intention to use was 3.23, but it showed no significant relationship between gender, other variables, and intention to use in the future.	0.875
Perceived usefulness	No	The average value of usefulness is 3.74, and there was no significant relationship with intention to use because the level of significance was too high.	0.471
Perceived ease of use	No	The average value of ease of use was 3.52 and there was no significant relationship with intention to use.	0.152
Compatibility	No	The average value of compatibility was 3.37; there was no significant relationship with intention to use.	0.908
Cloud computing awareness	No	The awareness of cloud services averaged 3.43. It did not influence the intention to use, and the Pearson correlation and significance values showed no significant relationship.	0.964
Cloud computing adoption	Yes	Acceptance of cloud services was 3.12 on average; there was a significant positive relationship with intention to use, confirming the low-strength relationship.	0.018
Perceived risk	No	The average value of risks was 3.18 and there was no significant relationship with intention to use.	0.461
Costs	No	The average value of costs was 3.67; there was no significant relationship with intention to use.	0.182

Source: own research (2024)

Conclusions

The objective of the study was to examine the acceptance and perception of the integration and use of cloud-based applications in business organizations in Syria today, primarily from the perspective of employees. In the research, the researcher identified the factors that influence the acceptance of cloud computing experienced and used by Syrian employees at work based on the Technology-Organization-Environment (TOE) framework. The results suggest that all employees use these applications in their work and have a positive opinion of cloud services. According to the results, SaaS, IaaS and PaaS solutions are equally used and popular and show a usage value of at least 40%. The most frequently used services are storage, emails, desktop applications. Companies use them primarily for operational efficiency, improved data quality and cost reduction, and are expected to continue to use them in the near future, and they will also apply larger expansions and developments. Most people mentioned data security as their biggest concern. So, while employee adoption of cloud services is generally developing positively, the TOE framework analysis shows that the extent and effectiveness of adoption is still dependent on organizational and external factors.

References

Abdulkareem, M. N. – Zeebaree, S. – Sadeeq, M. A. – Ahmed, D. – Sami, A. S. – Zebari, R. R. (2021): IoT and cloud computing issues, challenges and opportunities: A review. Qubahan Academic Journal, 1(2), 1-7. https://doi.org/10.48161/qaj.v1n2a36

Aceto, G. – Persico, V. – Pescapé, A. (2020): Industry 4.0 and health: Internet of things, big data, and cloud computing for Healthcare 4.0. Journal of Industrial Information Integration, 18, 100129. https://doi.org/10.1016/j.jii.2020.100129

Afonso, C. M. – Roldán, J. L. – Sánchez-Franco, M. – Gonzalez, M. (2012): The moderator role of Gender in the Unified Theory of Acceptance and Use of Technology (UTAUT): A study on users of Electronic Document Management Systems,7th International Conference on Partial Least Squares and Related Methods? Houston, Texas.

Al-Hujran, O. – Al-Lozi, E. – Al-Debei, M. – Maqableh, M. (2019): Challenges of cloud computing adoption from the TOE framework perspective. In book: Cloud Security, pp.1312-1332. http://dx.doi.org/10.4018/978-1-5225-8176-5.ch066

Amron, M. T. – Ibrahim, R. – Bakar, N. A. A. (2021). Cloud computing acceptance among public sector employees. Telecommunication, Computing, Electronics and Control, 19(1), 124-133. http://doi.org/10.12928/telkomnika.v19i1.17883

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

Ayaz, A. – Yanartas, M. (2020): An analysis on the unified theory of acceptance and use of technology theory (UTAUT): Acceptance of electronic document management system (EDMS), Computers in Human Behavior Reports, 2, August–December, 100032. https://doi.org/10.1016/j.chbr.2020.100032

Bahna, M. (2020): The adoption of cloud computing in business organizations for an immediate tactical advantage or making it part of their long-term strategic I.T. plan. Hungarian Agricultural Engineering, 38, 23-29. http://doi.org/10.17676/HAE.2020.38.23

Bello, S. A. – Oyedele, L. O. – Akinade, O. O. – Bilal, M. – Delgado, J. M. – Akanbi, L. A. – Ajayi, A. O. – Owolabi, H. A. (2021): Cloud computing in construction industry: Use cases, benefits and challenges. Automation in Construction, 122, 103441. https://doi.org/10.1016/j.autcon.2020.103441

Bergelt, R. – Englisch, N. (2020): Towards cloud-supported automotive software development and test. Embedded Selforganising Systems, 7(2), 8-12. https://doi.org/10.14464/ess.v7i2.440

Bi, T. – Xia, X. – Lo, D. – Grundy, J. – Zimmermann, T. – Ford, D. (2022): Accessibility in Software Practice: A Practitioner's Perspective. ACM Transactions on Software Engineering and Methodology, 31(4), 1-26. https://doi.org/10.1145/3503508

Bouaynaya, W. (2020): Cloud computing in SMEs: Towards delegation of the CIO role. Information & Computer Security, 28(2), 199-213. https://doi.org/10.1108/ICS-01-2017-0001

Chen, A. – Li, L. – Shahid, W. (2024): Digital transformation as the driving force for sustainable business performance: A moderated mediation model of market-driven business model innovation and digital leadership capabilities. Heliyon, 10(8), e29509. https://doi.org/10.1016/j.heliyon.2024.e29509

Chen, R. – Yang, B. (2022): Construction of an intelligent analysis model for website information based on big data and cloud computing technology. Discrete Dynamics in Nature and Society, 22(3), 1-10. https://doi.org/10.1155/2022/7876119

Chopra, M. – Dhote, V. (2019): A Comparative study of Cloud computing through IOT. International Journal of Engineering Development and Research, 7(2), 259-266.
Dar, A. A. (2018): Cloud Computing-Positive Impacts and Challenges in Business Perspective. Journal of Computer Science & Systems Biology, 12(1), 15-18. http://dx.doi.org/10.4172/jcsb.1000294
Davis, F. D. – Bagozzi, R. P. – Warshaw, P. R. (1989): User acceptance of computer technology: A comparison of two theoretical models. Management Science, 35 (8), 982–1003, https://doi.org/10.1287/mnsc.35.8.982
Ding, B. – Ferràs Hernández, X. – AgellJané, N. (2021): Combining lean and agile manufacturing competitive advantages through Industry 4.0 technologies: an integrative approach. Production Planning & Control, 7(3), 1-17. https://doi.org/10.1080/09537287.2021.1934587
Elkaseer, A. – Ali, H. – Salama, M. – Scholz, S. (2018): Approaches to a practical implementation of industry 4.0. The Eleventh International Conference on Advances in Computer-Human Interactions, pp. 141-146.
Ghaleb, E. A. A. – Dominic, P. D. D. – Fati, S. M. – Muneer, A. – Ali, R. F. (2021): The assessment of big data adoption readiness with a Technology–Organization–Environment framework: A perspective towards healthcare employees. Sustainability, 13(15), 8379. https://doi.org/10.3390/su13158379
Golightly, L. – Chang, V. – Xu, Q. – Liu, B. – Gao, X. (2022): Adoption of cloud computing as innovation in the organization. International Journal of Engineering Business Management, 14. https://doi.org/10.1177/18479790221093992
Gu, C. – Dai, C. – Shi, X. – Wu, Z. – Chen, C. (2022): A cloud-based deep learning model in heterogeneous data integration system for lung cancer detection in medical industry 4.0. Journal of Industrial Information Integration, 30(6),100386. https://doi.org/10.1016/j.jii.2022.100386
Henry, E. – Alexander, J. (2023). Cloud Computing Adoption: Implications for Organizational Structure and Culture. International Journal of Advanced Engineering Technologies and Innovations, 1(3), 83-102.
Ibrahim, M. (2021): Task scheduling algorithms in cloud computing: A review. Turkish Journal of Computer and Mathematics Education (TURCOMAT), 12(4),.1041-1053. http://dx.doi.org/10.17762/turcomat.v12i4.612
Kanger, L. – Geels, F. W. – Sovacool, B. – Schot, J. (2019): Technological diffusion as a process of societal embedding: Lessons from historical automobile transitions for future electric mobility. Transportation Research Part D: Transport and Environment, 71, 47-66. https://doi.org/10.1016/j.trd.2018.11.012
Lorente-Martínez, J. – Navío-Marco, J. – Rodrigo-Moya, B. (2020): Analysis of the adoption of customer facing InStore technologies in retail SMEs. Journal of Retailing and Consumer Services, 57, 102225. https://doi.org/10.1016/j.jretconser.2020.102225
Lowe, D. – Galhotra, B. (2018). An Overview of Pricing Models for Using Cloud Services with analysis on Pay-Per-Use Model. International Journal of Engineering & Technology, 7(3.12):248. http://dx.doi.org/10.14419/ijet.v7i3.12.16035
Lynn, T. – Fox, G. – Gourinovitch, A. – Rosati, P. (2020) Understanding the determinants and future challenges of cloud computing adoption for high performance computing. Future Internet, 12(8), 135. https://doi.org/10.3390/fi12080135
Marston, S. R. – Li, Z. – Bandyopadhyay, S. – Zhang, J. (2011). Cloud computing — The business perspective. Decision Support Systems, 51(1), 176-189. https://dx.doi.org/10.2139/ssrn.1413545

Pedone, G. – Mezgár, I. (2018). Model similarity evidence and interoperability affinity in cloud-ready Industry 4.0 technologies. Computers in Industry, 100(6), 278-286. https://doi.org/10.1016/j.compind.2018.05.003
Rodríguez-Espíndola, O. – Chowdhury, S. – Dey, P. K. – Albores, P. – Emrouznejad, A. (2022): Analysis of the adoption of emergent technologies for risk management in the era of digital manufacturing. Technological Forecasting and Social Change, 178, 121562. https://doi.org/10.1016/j.techfore.2022.121562
Saleh, A.A. – Alyaseen, I. F. T. (2023): Proposed Smart E-Government Application Design toward Achieving Operational Excellent in Government. International Journal on Perceptive and Cognitive Computing (IJPCC), 9(1), 50-55. https://doi.org/10.31436/ijpcc.v9i1.350
Saunders, M. – Lewis, P. – Thornhill, A. (2016): Research methods for business students. 7th ed. Harlow, England; New York: Pearson.
Shamshirband, S. – Fati, M. – Chronopoulos, A. T., Montieri, A. – Palumbo, F. – Pescape, A. (2020): Computational intelligence intrusion detection techniques in Mobile Cloud Computing Environments: Review, taxonomy, and open research issues. Journal of Information Security and Applications, 55, 102582. https://doi.org/10.1016/j.jisa.2020.102582
Soni, D. – Kumar, N. (2022): Machine learning techniques in emerging cloud computing integrated paradigms: A survey and taxonomy. Journal of Network and Computer Applications, 205(76), 103419. https://doi.org/10.1016/j.jnca.2022.103419
Walter, L. – Denter, N. – Kebel, J. (2022): A review on digitalization trends in patent information databases and interrogation tools. World Patent Information, 69(5), 347-351. https://doi.org/10.1016/j.wpi.2022.102107
Wannous, M. – Nakano, H. – Nagai, T. – Almustafa, M. M. (2017): Use and Extent of Cloud and Mobile Technologies in Distributing Educational Materials During Crisis, Syria as an Example. IPSJ Transactions on Computers and Education, 3(1), 46-52.

Authors

Miriam Bahna
0009-0001-8878-0018
Phd Student
Hungarian University of Agriculture and Life Sciences
Doctoral School of Economics and Regional Sciences
Miriam.bahna@phd.uni-mate.hu

Zsigmond Gábor Szalay
0000-0001-6301-3237
associate professor
Hungarian University of Agriculture and Life Sciences
Rural Development and Sustainable Economy
szalay.zsigmond.gabor@uni-mate.hu