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Challenges of Cloud Computing in Jordanian Govt.: Insights from Telcos

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Abstract: Cloud computing offers many benefits to governments, including increased efficiency, flexibility, and cost savings. However, there are also significant challenges to adopting cloud computing services. In the case of the Jordanian government, some of these challenges include concerns about data security and privacy, lack of technical expertise, limited funding and resources, and cultural resistance to change. This paper examines the challenges faced by the Jordanian government in adopting cloud computing services and evaluates their impact on government institutions. The study collected data from three local telecommunications companies in Jordan to identify potential challenges and assess their significance through a questionnaire. The results indicated challenges that negatively affected cloud adoption, including performance, usability, and cost, as well as challenges that positively impacted adoption. Maintenance and information security challenges were rated as the most significant challenges. The study recommends promoting awareness, offering training programs, and conducting feasibility studies to overcome these challenges and improve cloud adoption. Future research should expand the study sample and investigate additional challenges impacting government organizations' adoption of cloud computing services.

Keywords: Cloud computing; E-government;Jordanian government; Telecommunications companies; Industry experts; Adoption

1 Introduction

In light of the imperative to reduce costs and optimize resource usage, an increasing number of organizations, institutions, and individuals are turning to online services and technology for their daily operations. Cloud computing, which provides secure online resource management, is an expanding computing model. E-governments around the world are dealing with persistent budget constraints while facing growing demand for their services. To provide cost-effective services to citizens while achieving desired outcomes, e-governments are looking for ways to utilize cloud technology, which is particularly suitable for delivering internet-based services. This plan proposes an examination of the use of cloud services in e-government operations, with a focus on the relationship between e-government and cloud hosting, as well as the potential benefits and challenges of adopting cloud computing. Given the innovative, eco-friendly, and low-cost nature of cloud technology, its use is essential for resolving e-government difficulties in developing countries. As Jordan's population expands, the government is taking measures to improve the quality of life for its citizens. The adoption of new technologies is a critical part of this process, as governments strive to provide information and services to citizens. Despite the remaining technical, cultural, and institutional obstacles to e-government adoption, cloud computing has attracted attention from various organizations and stakeholders in web applications. This is due, in part, to the scalability and on-demand availability of resources that cloud computing offers [1].
Meeting the demands for high-quality software within a fast-paced production cycle necessitates a structured plan to fulfill requirements. However, research indicates that transitioning to cloud computing often fails due to challenges such as cost, usability, information security, maintenance, and performance issues. Institutions' levels of trust in electronic services vary depending on past experiences, with some trusting them and others abstaining due to a lack of knowledge of their significance and advancement. The challenges that organizations face when moving from a fixed environment to cloud computing services can differ and significantly impact the success or failure of the system. This study seeks to examine the

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impact of cost, usability, information security, maintenance, and performance issues on Jordanian government institutions transitioning to cloud computing services.
The study aims to determine how cost, usability, information security, maintenance, and performance challenges impact Jordanian government organizations when transitioning to cloud computing services. The findings of this study will aid government institutions in making informed decisions about whether or not to adopt cloud computing services based on these challenges.
To achieve this aim, the study will use a questionnaire to gather data from a sample of cloud computing service providers in Jordan and evaluate the impact of the challenges listed above. The study's objectives are, Identify the potential challenges that service providers encounter while transitioning government services from their traditional setup to cloud computing, discover the obstacles to implementing cloud computing in e-government and its intended use, and determine and clarify the factors contributing to the limited adoption of cloud computing services by organizations in Jordan.

2 Background

This study presents a review of the literature on e-government and cloud computing, providing a background on the use of technology in government services. Governments have recognized the need to incorporate technology to better serve their interests and citizens as technology rapidly advances and citizens' demands increase. E-government systems, which use modern information technologies to provide e-services to meet various citizen needs, are a result of this recognition [2].
Some believe that e-government systems must offer various and top-notch services to enhance and simplify the interaction between citizens and the government using suitable information technology tools [3].
E-government is defined as the use of modern information technologies by governments to improve citizens' access to information and e-government services, promoting citizen participation in democratic institutions and processes [4]. E-government systems are information technology-based platforms created by governments to bridge the gap between them and citizens. These systems allow citizens to easily access government services regardless of their location or work commitments. In Jordan, the Hashemite Kingdom made significant strides from the beginning of 1999 to turn the country into an e-Country, establishing several e-initiatives, and putting e-Government at the base of the government's efforts. Jordan believed that joining the global economy and developing into an e-Country was one way to improve the country and overcome its limited resources. These technologies are increasingly being employed in government and other industries [5].
The e-Government initiative was launched in September 2000 at King Abdullah II's 5th International Conference on Information Technology. In 2005, the Ministry of Information and Communications Technologies took charge of steering the government's efforts toward realizing the e-government objective of efficiently promoting social and economic growth through easier access to services and information for citizens [6]. Government institutions and other organizations have been able to benefit from cloud computing, as it provides a range of advantages, such as shared resources, cost-effective solutions, and efficient data storage. This has led to the popularity of cloud computing, due to its ease of migration of government applications and data, as well as its various characteristics. Cloud computing is built on the principles of flexibility, security, isolation, and distribution, and it utilizes a range of technologies, such as processing power, communication, virtualization technology, and storage [7]. These technologies allow for the sharing of resources across different devices via the Internet and provide for processing, storage, data compatibility, and scalability in a flexible manner [8].
The set of characteristics of cloud computing, which includes resource pooling, on-demand self-service, easy maintenance, large network access, availability, automatic system, economical pricing, security, pay-as-you-go, and measured service explained as follows:

- To deliver various services to different clients, cloud service providers utilize a multi-tenant model by allocating computing resources. Customers can request specific resources (physical or virtual), but the service provider operates on a higher level of abstraction, making the location and information of the resources unknown to the customers [9].
- On-demand Self-Service Cloud computing provides a feature that allows users to monitor server performance, uptime, and storage capacity. This feature is crucial for users to stay informed about their server's status and capabilities [10].
- Ease of Maintenance Cloud computing servers can be easily maintained with low downtime due to continuous updates and prompt error resolution [11].
- Large Network Access Data can be accessed and downloaded from the cloud using any device with internet access, from anywhere [12].
- Availability Users can adjust storage space according to their needs and requirements by purchasing and modifying it [13].
- Automatic System Cloud computing offers automatic analysis and measurement of data, with monitoring and usage control, providing transparency for both clients and host [14].

–Economical Cloud computing is a one-time investment where the host company buys storage with monthly or annual costs that cover maintenance and other expenses [15].
–Security Security is crucial in cloud computing, ensuring that stored data is protected against loss in case of server damage, and is stored in secure and inaccessible storage devices. This storage service is both reliable and efficient [16].
–Pay as You Go Cloud computing services offer a pay-per-use or free-allocation payment system, which helps customers save on unnecessary costs [7].
–Measured Service Payment for cloud computing resources is based on actual consumption, as measured and reported by the service provider [17].

There are four types of cloud computing deployment models: hybrid clouds, public clouds, private clouds, and multi-clouds. A hybrid cloud comprises different networks such as VPNs, WANs, LANs, and AP. Public clouds, on the other hand, are created by the IT infrastructure and are well-known cloud services like Microsoft Azure, AWS, Google Cloud, and others. Private clouds are designed for exclusive use by a single customer or a group of customers and come with customer-specific firewalls and limited resource access. Finally, multi-cloud is a strategy that employs multiple cloud services from different vendors, both public and private.
The National Institute of Standards and Technology (NIST) has defined three standard cloud computing delivery models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) [18]. The SaaS model delivers software and applications through the cloud, while IaaS allows consumers to deploy and run arbitrary software without managing the underlying cloud infrastructure. The PaaS model manages the infrastructure, servers, and storage while controlling the deployed applications and their configuration settings.
The following is a collection of research papers that explore various aspects of cloud computing services. [19] investigate the challenges faced by clients in adopting sustainable Public Cloud Computing (PCC), while [2] examines citizens' trust in e-government systems in Jordan. [20] conduct a systematic literature review (SLR) to examine security issues, risks, and challenges associated with cloud computing.[21] review the current state of cloud technology usage in construction practices. [22] delve into the nature of Semantic-Web technology in the cloud, and [23] assesses the costs associated with transitioning to cloud computing services. [24] highlight information security issues prevalent in cloud computing services and propose solutions to address them, while [25] concentrate on the information security challenges faced by key players in cloud computing. Finally, [26] examines the issues of maintenance and various cloud computing technologies to assist IT management in evaluating cloud computing services. [19] conducted research on the challenges clients face when adopting sustainable Public Cloud Computing (PCC). The study identified 29 challenges during the PCC implementation process, with 18 of them reported as hindrances to PCC adoption. The objective of the study is to assist vendors in addressing these challenges and enhancing their business. In [2] study, the main goal is to investigate the level of trust that citizens in Jordan have in e-government systems. The study proposes a model based on technology adoption research, which is then tested using a survey of 759 Jordanian citizens. The results indicate that several factors, such as trust in government, technology, information quality, internet familiarity, and privacy/security, have a significant impact on shaping citizens' trust in e-government.
[20] conducted a systematic literature review (SLR) to investigate the security challenges, risks, and issues related to cloud computing. The SLR analyzed 80 studies published from 2010 to 2020 from various online libraries. The review identified seven significant security threats associated with cloud computing and highlighted the challenges that both providers and users face in outsourcing consumer data. The findings of the review provide recommendations for future research to improve data confidentiality, integrity, and availability in cloud computing.
[21] This research aims to provide a comprehensive review of the current usage of cloud technology in construction practices. A total of 92 papers published between 2009 and 2019 were examined in a literature review. The study reveals that cloud technology serves as a facilitator for other emerging construction methods, such as Building Information Modeling, IoT, wearable devices, and big data analytics. The authors identify and discuss different strategies to overcome the challenges hindering the wider adoption of cloud technology in construction and explore various use cases. The research underscores the potential benefits and challenges of increasing the use of cloud technology in the construction sector, which can be valuable to practitioners and researchers.
In this research paper [22] explore the intersection of Semantic Web technology and cloud computing from multiple perspectives to deepen and expand the understanding of the Semantic Web and provide guidelines for its use. The authors propose a hybrid approach that combines qualitative and quantitative methods to develop, discover, and compose cloud-based services using the Semantic Web and a Quality of Service (QoS) model that considers key metrics such as connection, speed, response time, and cost to ensure quality and user satisfaction. The study investigates the interplay between Semantic Web and cloud computing to identify new opportunities, and the authors conduct ontology research to understand the context of large-scale attacks on online applications, the attackers' tactics, and the source and purpose of security vulnerabilities in these attacks, based on a review of relevant literature.
This study [23] conducts a cost assessment of transitioning to cloud computing services using industry analysis 360. The

authors gather information on the costs associated with moving to cloud computing services through extensive interviews with consultants, vendors, and experts, and validate their findings. The study reveals that significant costs related to ”asset privacy,” including those associated with business process overhaul, service costs, administration, and identification services, are associated with the shift to cloud computing services. Therefore, effective contract management and greater flexibility in cloud computing agreements are necessary to address the uncertainties that come with cloud computing.
In this study by [24], information security issues in cloud computing services are identified, and solutions are proposed to address them. The study emphasizes the importance of finding the right balance between cost, security, and performance. To achieve this, the researchers employ various algorithms and encryption models to compare their effectiveness. The findings of the study suggest that traditional encryption algorithms are not sufficient in addressing the information security concerns in cloud computing. In this study, the focus is on the information security challenges encountered by major stakeholders in cloud computing, such as service providers, data owners, and users. The research investigates the service level agreements, effects of cyber-attacks, and data privacy concerns on cloud computing.
The study highlights the various security challenges inherent in cloud computing, which provide hackers with opportunities to compromise, breach, and steal data, revealing the limitations of cloud computing in terms of information security. In this paper, the authors investigate maintenance issues and various cloud computing technologies, as well as propose models and diagrams to improve planning management for IT managers to assess cloud computing services. The study showcases the effectiveness and high performance of cloud computing, highlighting its quality.

- In summary of related works [19] Research problem: challenges in adopting sustainable Public Cloud Computing. Research method: a systematic literature review. Results: identified 29 challenges, with 18 hindrances to PCC adoption. Aimed to assist vendors in addressing challenges and improving their business.
- [2] Research problem: citizens' trust in e-government systems in Jordan. Research method: survey-based model proposed based on technology adoption research. Results: factors like trust in government, technology, information quality, internet familiarity, and privacy/security play a role in shaping citizens' trust in e-government.
- [20] Research problem: security issues, risks, and challenges associated with cloud computing. Research method: a systematic literature review. Results: identified seven major security threats in cloud computing, showed outsourcing consumer data remains a challenge for both users and providers, and suggested recommendations for enhancing data confidentiality, integrity, and availability.
- [21] Research problem: current state of cloud technology usage in construction practices. Research method: a literature review. Results: cloud technology enables other emerging construction methods such as Building Information Modeling, IoT, wearables, and big data analytics. Identified and discussed strategies for overcoming barriers to wider adoption of cloud technology in construction and explored different use scenarios.
- [22] Research problem: the nature of Semantic-Web technology in the cloud and its interplay with cloud technology to uncover new opportunities. Research method: a hybrid approach combining qualitative and quantitative methods. Results: presented a fresh approach to cloud-based service development, discovery, and composition utilizing the Semantic Web and Quality of Service (QoS) model, and investigated ontology research to comprehend the context of massive attacks on online applications.
- [23] Research problem: costs associated with transitioning to cloud computing services. Research method: industry analysis 360 with extensive interviews with consultants, vendors, and experts. Results: shift to cloud computing services entails significant costs related to ”asset privacy,” including those arising from business process overhaul, service costs, administration, and identification services. Calls for effective contract management and greater flexibility in cloud computing agreements.
- [24] Research problem: information security issues prevalent in cloud computing services and proposed solutions to address them. Research method: algorithm and encryption model comparison. Results: traditional encryption algorithms fall short in addressing the information security concerns in cloud computing.
- [25] Research problem: information security challenges faced by key players in cloud computing. Research method: explores agreements, service levels, and effects of cyber-attacks on cloud computing services and data privacy. Results: highlights numerous security challenges posed by cloud computing, which offer ample opportunities for hackers to compromise, breach, and steal data, revealing the information security limitations of cloud computing.
- [26] Research problem: issues of maintenance, various cloud computing technologies, and enhancing planning management. Research method: diagrams and models to assist IT management in evaluating cloud computing services. Results: demonstrated the efficiency of cloud computing and its strong performance and quality.

In terms of research method, the papers use a range of approaches, including systematic literature reviews, surveys, literature reviews, algorithm and encryption model comparisons, and diagrams and models. In terms of the research problem, the papers cover a range of issues, including challenges in adopting sustainable Public Cloud Computing, citizens' trust in e-government systems, security issues, risks, and challenges associated with

3 Method

The study model was derived from the literature review, which identified five specific challenges that could affect the adoption of cloud computing by government organizations in Jordan which are security, cost, Usability, Performance, and Maintenance. The study was conducted in the Jordanian telecommunications industry with a target population of employees working in three companies, including department heads, managers, and regular employees. A random sample of 55 questionnaires was distributed, with a response rate of 91%. The questionnaire was designed to evaluate the impact of five challenges on the adoption of cloud computing services by government organizations in Jordan. It consists of two parts, with the first part collecting personal information about the respondent, while the second part consists of 20 questions that measure the impact of the five challenges across five axes. The questionnaire was reviewed by a panel of experts consisting of five university professors with expertise in the field, who confirmed its validity and relevance for the research. The panel's evaluation results were recorded, and necessary modifications were made based on their feedback. The following are the research hypothesizes:

- H01: Moving to cloud computing services has a statistically significant impact on information security challenges, at a level of significance $(a \leq 0.05)$.
- H02: The adoption of cloud computing services is influenced by the challenge of cost at a statistical significance level of $(a \leq 0.05)$.
- H03: The impact of the challenges (Usability) on the adoption of cloud computing services by government institutions in Jordan is statistically significant at a level of significance $(a \leq 0.05)$.
- H04: There is a statistically significant impact $(at the level of significance a \leq 0.05)$ of the challenges (Performance) on the adoption of cloud computing services.
- H05: There is a significant statistical effect with a significance level of $(a \leq 0.05)$ for the challenge of (Maintenance) when transitioning to cloud computing services.

The Cronbach Alpha equation was used to assess the reliability of the study tool, which tests the internal consistency of the study tool and its variables. The minimum reliable score is considered to be between 0.6 - 0.7. The value for this study was 0.898, indicating a high level of reliability. A normal distribution test was performed to determine if the study sample of 50 participants was representative of the population. The normal distribution of the study variables was tested using the Smirnova-Kolmogorov and Shapiro-Wilk tests. The results of these tests are shown in Table 1. The fact that the probability value is greater than 0.05 indicates that the data in the study are normally distributed.

Table 1: Normal Distribution test results

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
SECURITY	.169	50	.102	.903	50	.090
COSTING	.144	50	.154	.943	50	.130
USABILITY	.184	50	.225	.903	50	.151
PERFORMANCE	.172	50	.143	.917	50	.073
MAINTENANCE	.154	50	.118	.937	50	.099

4 Results

We analyze the data collected from two questionnaires, test the study's hypotheses, highlight key findings from the questionnaire, and identify the study variables which includes statistical processing of the questionnaire data, including descriptive statistics and verification of the validity of the research model. We present and analyze the results of the study, which were obtained through the use of SPSS software. We review the distribution of the participants who participated in the survey according to gender, work experience, age, job title, and educational level. The gender distribution of the 50 service providers who responded to the survey is depicted in Table 2, which reveals that 80% were male and only 20% were female.

Table 2: The Percentage of the Gender in the Survey

	Gender	Frequency	Percent
1	Male	40	80%
2	Female	10	20%
	Total	50	100%

The respondents in the study sample include service providers with varying levels of experience, ranging from less than 5 years (20%), 5-10 years (24%), 11-15 years (28%), and 16 years and over (28%), as demonstrated in Table 3. This indicates that the institute is comprised of a large and highly experienced workforce, providing valuable insights and accurate answers to the questionnaire.

Table 3: The Percentage of Work Experience in the Survey

	Years of Experience	Frequency	Percent
1	less than 5 years	10	20%
2	From 5 -10 years	12	24%
3	From 11-15 years	14	28%
4	From 16 years and over	14	28%
	Total	50	100%

Table 4 shows that the respondents to the questionnaire are employees aged between 20 and 59 years old, with 20% aged between 20 and 29 years, 40% aged 30-39, 32% aged 40-49, and 8% aged 50 and over, indicating that the society under investigation is relatively young and can be nurtured by promoting a culture of learning and leveraging their experiences in the future.

Table 4: The Percentage of the Age Group in the Survey

	The age	Frequency	Percent
1	From 20 - 29 years old	10	20%
2	From 30 - 39 years old	20	40%
3	From 40 – to 49 years old	16	32%
4	50 years and over	4	8%
	Total	50	100%

The job title of the respondents to the questionnaire was Manager (10%), Head of the Department (14%), and Employee (76%), as illustrated in Table 5, which indicates that the respondents are employees who work in a known institute in the Middle East, with great experience in the field of cloud services.

Table 5: The Percentage of the Job Title in the Survey

Current job		Frequency	Percent
1	Manager	5	10%
2	Head of the Department	7	14%
3	Employee	38	76%
Total		50	100%

Table 6 shows that the sample of service providers consisted of 50 experts, all of whom had a background in the field of information technology, with 70% having a bachelor's degree, 24% having a master's degree, and 2% having a Ph.D.

Table 6: . The Percentage of the Educational Level in the Survey

Educational level		Frequency	Percent
1	Diploma	2	4%
2	Bachelor's Degree	35	70%
3	Master's Degree	12	24%
4	PhD	1	2%
Total		50	100%

To verify the main hypothesis, a one-sample t-test was utilized to assess the significance of the disparity between the average response on the variable and the default scale mean (3, representing a moderate level). The existence of an effect can be suggested if the average response is higher than the default average and there are statistically significant differences. The following were the results: The first hypothesis was tested by conducting a one-sample t-test to assess whether there is a statistically significant effect at a significance level of $(a \leq 0.05)$ for the security challenges when transitioning to cloud computing services. The results are shown in Table 7. The one-sample t-test results for the first axis (information security challenges) indicate a statistically significant effect at a level of significance of $(a \leq 0.05)$. The average responses for the information security challenges were 3.51, with a standard deviation of 0.45, which indicates low dispersion among the study participants' answers. The calculated value of T was 7.991, and its statistical significance was 0.000. These results demonstrate that the average score is higher than the default average (3), indicating that there is a statistically significant effect at the level of significance $(a \leq 0.05)$ for the information security challenges when transitioning to cloud computing services.

Table 7: The Results of the (One-Sample Test) Test For the First Hypothesis

One-Sample Statistics						
	N	Mean	Std. Deviation	Std. Error Mean		
SECURITY	50	3.5150	.45572	.06445		
One-Sample Test						
	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
SECURITY	7.991	49	.000	.51500	.3855	.6445

The second hypothesis was tested by conducting a one-sample t-test to assess whether there is a statistically significant effect at a significance level of $(a \leq 0.05)$ for the costing challenges when transitioning to cloud computing services. The results are shown in Table 8. The one-sample t-test results for the second axis (cost challenges) reveal that there are no statistically significant differences $(a \geq 0.05)$ between the average responses of 2.89 and the default average of 3. The standard deviation was 0.80, indicating low dispersion of answers from the study participants. The calculated T-value was -0.924, with a statistical significance of 0.360. As the average of the responses is lower than the average of the scale, the second hypothesis is rejected, meaning that there is no statistically significant effect $(a \leq 0.05)$ for the cost challenges when moving to cloud computing services, and the alternative (null) hypothesis is accepted.

Table 8: The Results of the (One-Sample Test) For the Second Hypothesis

One-Sample Statistics						
	N	Mean	Std. Deviation	Std. Error Mean		
COSTING	50	2.8950	.80352	.11363		
One-Sample Test						
	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
COSTING	-.924-	49	.360	-.10500-	-.3334-	.1234

The third hypothesis was tested using a one-sample t-test to evaluate whether there is a statistically significant effect at a significance level of $(a \leq 0.05)$ for the usability challenges when transitioning to cloud computing services. The results are shown in Table 9. The third hypothesis's one-sample t-test results indicate no statistically significant differences $(a \geq 0.05)$ between the average responses on the usability axis (2.88) and the default average (3). The standard deviation (0.73) suggests low dispersion of answers among study participants, and the calculated T-value was -1.110, with a statistical significance of 0.272. The hypothesis stating "There is a statistically significant effect at the level of significance $(a \leq 0.05)$ for the challenges (Usability) when moving to cloud computing services" was rejected, as the average of responses was lower than the average of the scale. The alternative (null) hypothesis "There isn't a statistically significant effect at the level of significance $(a \leq 0.05)$ for the challenges (Usability) when moving to cloud computing services" was accepted.

Table 9: The Results of the (One-Sample Test) For the Third Hypothesis

One-Sample Statistics						
	N	Mean	Std. Deviation	Std. Error Mean		
USABILITY	50	2.8850	.73229	.10356		
One-Sample Test						
	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
USABILITY	-1.110-	49	.272	-.11500-	-.3231-	.0931

The fourth Hypothesis was tested using a One Sample T-test, to determine if there was a statistically significant effect at a significance level of $(a \leq 0.05)$ for the challenges of performance when transitioning to cloud computing services. The results of the test are presented in Table 10. The average response on the fourth axis (performance challenges) was 2.94, which was not significantly different from the default average of 2.94, with a standard deviation of 0.71. The calculated T-value of -0.592 and a significance of SIG = 0.557 supported the acceptance of the null hypothesis, meaning that there was no statistically significant effect at the level of significance $(a \leq 0.05)$ for the challenges (performance) when moving to cloud computing services.

Table 10: The Results of the (One-Sample Test) For the Fourth Hypothesis

One-Sample Statistics						
	N	Mean	Std. Deviation	Std. Error Mean		
PERFORMANCE	50	2.9400	.71707	.10141		
One-Sample Test						
	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
PERFORMANCE	-.592-	49	.557	-.06000-	-.2638-	.1438

The fifth Hypothesis, which states that there is a statistically significant effect at a significance level of $(a \leq 0.05)$ for the challenges of maintenance when transitioning to cloud computing services, was also tested using a One Sample T-test. The results of the test are presented in Table 11. The average response on the fifth axis (maintenance challenges) was 3.57, which was significantly different from the hypothetical average of 3, with a standard deviation of 0.42. The calculated value of (T) was 9.537 with a statistical significance of SIG = 0.000, indicating that there was a statistically significant effect at the level of significance $(a \leq 0.05)$ for the challenges (maintenance) when moving to the cloud computing services. Therefore, the fifth hypothesis was accepted.

Table 11: The Results of the (One-Sample Test) For the Fifth Hypothesis

One-Sample Statistics						
	N	Mean	Std. Deviation	Std. Error Mean		
MAINTENANCE	50	3.5750	.42633	.06029		
One-Sample Test						
	Test Value = 3					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
MAINTENANCE	9.537	49	.000	.57500	.4538	.6962

According to the study results, the respondents rated the challenges faced by the Jordanian government in using cloud computing with a mean value ranging from 2.88 to 3.57. The maintenance challenge received the highest mean rating of 3.57, followed by the information security challenge with a mean of 3.51, which was rated as moderately important. The performance challenge had a mean rating of 2.94, also considered to be of medium importance, followed by the costs challenge with a mean of 2.89 and the usability challenge with a mean of 2.88, both of which were also rated as having medium importance. This suggests that the Jordanian government has a moderate level of understanding regarding the importance of the challenges associated with using cloud computing. The study findings can be attributed to the government's fundamental knowledge of cloud computing and its ability to handle the issues that hinder its successful implementation, including challenges related to performance, usability, and cost. The fact that the maintenance challenge was rated as the most significant challenge faced by the Jordanian government in using cloud computing, followed by the information security challenge, underscores the importance of safeguarding the assets and intellectual property of the users of these services. This issue is a real problem that poses a threat to the successful adoption of cloud computing. The maintenance challenge is particularly problematic because only the service provider has control over it, and they may not be able to address malfunctions instantly. After analyzing the data collected from the survey, the researcher recommends the following actions based on the study's findings:

–Encourage the relevant authorities in the Jordanian government to adopt cloud computing for its benefits.
–Conduct a feasibility study on switching to cloud computing while ensuring adherence to data security and privacy standards.
–Promote awareness of cloud computing among government employees.

–Provide training programs for government workers in cloud computing and its applications, as well as the necessary hardware for the implementation of cloud computing services.
–Further, investigate the challenges faced by the Jordanian government in utilizing cloud computing and examine additional variables beyond those addressed in this study.

In this study, the survey results on the challenges faced by the Jordanian government in adopting cloud computing services were discussed. The data collected from the respondents were analyzed using the SPSS program to gain insight into the challenges. The analysis revealed that several challenges harm the adoption of cloud computing services, such as information security and maintenance, while others have a positive impact, including ease of use, performance, and cost. These results provide a clear understanding of the challenges that need to be addressed to effectively adopt cloud computing services in the Jordanian government.

5 Conclusion

This study examines the challenges faced by the Jordanian government in adopting cloud computing services and assesses their impact on the implementation of these services in government institutions. The study begins by defining e-government and cloud computing, including their features, benefits, and classifications. It then identifies potential challenges faced by the Jordanian government in transitioning to cloud computing services from the service provider's perspective based on a review of previous research. The five identified challenges are cost, ease of use, performance, maintenance, and information security. The research methodology involved distributing a questionnaire to three local telecommunications companies that provide cloud computing services in Jordan. The aim was to collect responses from industry experts on the questionnaire. After collecting data from 50 responses, the data were analyzed using SPSS software. The results showed that there were challenges with positive statistical significance that negatively impacted the adoption of cloud computing services, and others with negative statistical significance that positively impacted the adoption of these services. However, the study has some limitations. To improve accuracy, future work should involve expanding the study sample to include a greater number of companies both within and beyond Jordan. Additionally, further investigation into challenges impacting government organizations' adoption of cloud computing services beyond those addressed in this study is recommended.

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