

# The Impact of Cloud Computing on Enhancing the Performance of Financial Banking Programs in Jordanian Commercial Banks

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## Abstract

The aim of the study was to investigate the impact of cloud computing on enhancing the performance of financial banking programs in Jordanian commercial banks. This was done through the utilization of cloud computing services such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). The researcher adopted a descriptive-analytical approach in constructing the study. The study population consisted of employees in Jordanian commercial banks, totaling 15,400 employees distributed across branches and the general administration. The researcher employed a survey questionnaire as the data collection tool, which was distributed to a sample of 590 respondents. Eleven invalid questionnaires were excluded from statistical analysis, resulting in a valid sample of 579 questionnaires. Among the notable results were the high level of cloud computing utilization in Jordanian commercial banks. The results also demonstrated a statistically significant impact, at a significance level ( $\alpha \leq 0.05$ ), of cloud computing utilization represented by the

dimensions of IaaS, PaaS, and SaaS on enhancing the performance of financial banking programs in Jordanian commercial banks. The study's recommendations included urging Jordanian commercial banks to expand their support and development of infrastructure to facilitate the use of cloud computing technology, as it plays an effective role in improving the performance of banking programs.

**Keywords:** Cloud Computing, Financial Programs, Commercial Banks, Jordan

### **Introduction**

Business organizations are striving to keep up with the advancements in digital technologies, which have introduced new concepts, methods, and approaches to managing their activities. One of the prominent technologies is cloud computing, which offers various systems and models that companies and organizations can choose from based on their needs, tasks, and specialties (Pibi, 2022).

The use of cloud computing has become a new pattern of work, where an electronic cloud is utilized to store and handle vast amounts of important data and information. However, this has raised concerns among users about the security and privacy of their data. Nevertheless, these services have become necessary to meet the daily information technology and communication needs of organizations.

The increasing reliance of banks on information and communication technology has impacted various economic and social aspects, including the diversification of services provided. This shift towards digital technologies has led to the emergence of financial technology, with banks rapidly adopting these technologies in their services. Modern technologies such as blockchain, artificial intelligence, and smart contracts have transformed banking products and services from traditional to digital (Qawjil, 2021).

Financial programs have garnered significant attention from banks, as technological innovations have enabled the development of software applications, processes, or new services that have an impact on financial markets. These innovations have directly influenced the way financial services are delivered, improving service speed, quality, and cost-effectiveness in a simplified manner. Many of these financial programs are delivered through cloud computing and the services provided by it, which has expanded the reach of these programs to users (Zaid, 2022).

Considering the aforementioned points, it is essential to shed light on cloud computing, which is one of the latest trends in the world of information technology. It has introduced a new model that reduces the complexity of financial technology by enhancing the efficient aggregation of on-demand self-organizing virtual infrastructures. Cloud computing utilizes the internet to share computing resources such as data storage, processing, and access to applications, data, and services from anywhere and on any device. It offers various features such as remote information access, processing via the internet, resource configuration, subscription options, and self-service capabilities.

### **Study Problem**

Cloud computing is one of the key factors supporting banks in keeping up with digital technological advancements and utilizing them to organize banking financial programs and connect them between financial technology providers and banks through specialized systems that provide all the accounting procedures for economic entities. Despite the multiple advantages of cloud computing in the field of financial technology, its implementation is plagued by various problems and risks that may affect the quality and credibility of

information and reports, which in turn impact the performance of these financial programs. These programs are the final product provided to the customer and relied upon by all users. The problem statement of the study is highlighted by addressing the following main question:  
Main Question:

- To what extent does the use of cloud computing improve the performance of banking financial programs in Jordanian commercial banks?

The main question gives rise to the following sub-questions:

1. How does the infrastructure as a service impact the performance of banking financial programs in Jordanian commercial banks?
2. How does the platform as a service impact the performance of banking financial programs in Jordanian commercial banks?
3. How do applications as a service impact the performance of banking financial programs in Jordanian commercial banks?

### **Importance of the Study**

Scientific Importance (Theoretical):

The importance of the study lies in demonstrating the impact of cloud computing on improving the performance of banking financial programs in Jordanian commercial banks and its reflection on banking services and the effectiveness of the connection between service providers and commercial banks. It also investigates the models provided by cloud computing to customers and their usage methods. Additionally, this study is expected to contribute to the knowledge base related to the effects of cloud computing used in commercial banks and the applied models for operating service activities and financial technology.

Practical Importance (Applied):

This study is beneficial for decision-makers in the commercial banking sector in terms of how to deal with and utilize optimal models that align with the adopted financial technology in those banks. This will help improve performance efficiency.

### **Study Objectives**

This study aims to:

1. Identify the impact of using cloud computing on improving the performance of banking financial programs in Jordanian commercial banks.
2. Determine the extent to which infrastructure as a service improves the performance of banking financial programs in Jordanian commercial banks.
3. Assess the impact of platform as a service on the performance of banking financial programs in Jordanian commercial banks.
4. Examine the effect of applications as a service on the performance of banking financial programs in Jordanian commercial banks.

### **Study Hypotheses**

Main Hypothesis H0:

There is no statistically significant impact of cloud computing usage at a significance level ( $\alpha \leq 0.05$ ) on improving the performance of banking financial programs in Jordanian commercial banks.

**Subsidiary Hypothesis H0<sub>1</sub>:**

There is no statistically significant impact of infrastructure as a service at a significance level ( $\alpha \leq 0.05$ ) on improving the performance of banking financial programs in Jordanian commercial banks.

**Subsidiary Hypothesis H0<sub>2</sub>:**

There is no statistically significant impact of applications as a service at a significance level ( $\alpha \leq 0.05$ ) on improving the performance of banking financial programs in Jordanian commercial banks.

**Subsidiary Hypothesis H0<sub>3</sub>:**

There is no statistically significant impact of platform as a service at a significance level ( $\alpha \leq 0.05$ ) on improving the performance of banking financial programs in Jordanian commercial banks.

**Study Model:**

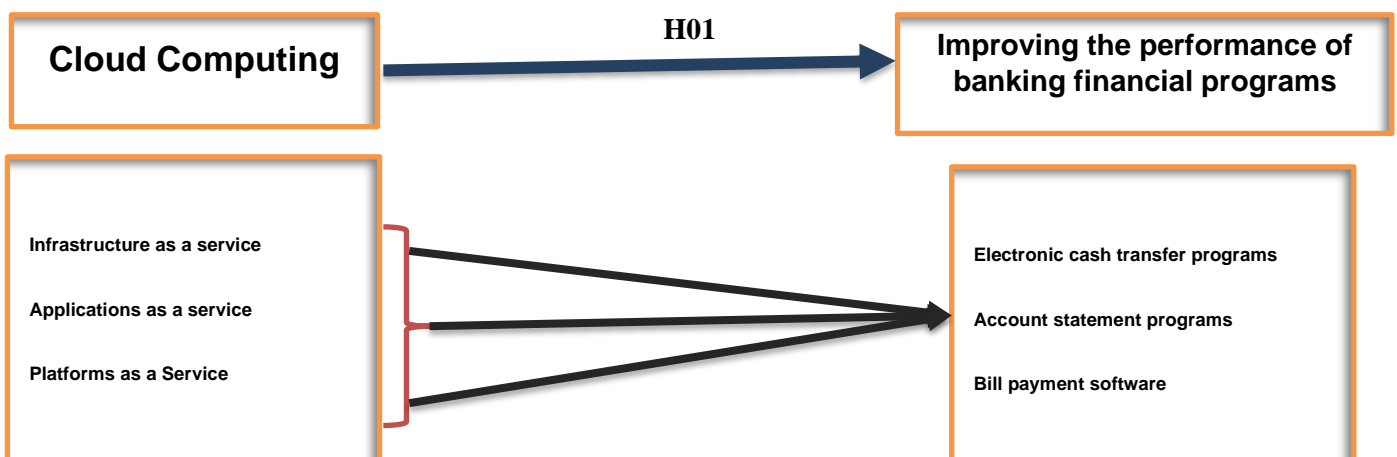
To achieve the purpose of the study and reach its specific objectives, the researcher will rely on a specific model to determine whether there is an impact on the results between the independent variables and the dependent variables. Figure (1-1) illustrates the relationships between these variables.

Independent variable

Dependent variable

Prepared by the researcher: based on the study of:

Independent variable	Palos-Sanchez (2017); Ali et al. (2018); Sadqi (2023).
Dependent variable	Ghanem (2018), Abu Shawish study (2019)



**Terminological Definitions:**

- Cloud Computing: It is a term that reflects the concept of services, applications, resources, and software that are available over the internet and managed by a third party called a service provider in their data centers (Turner et al., 2017).
- Financial Programs: It refers to those companies or their representatives that combine financial services with modern and innovative technologies, typically offering online-

based products and services with the aim of attracting customers more easily in terms of usability, effectiveness, and transparency than those products and services offered by traditional institutions (Gregor & Lars, 2016).

### Theoretical Framework:

#### Concept of Cloud Computing:

The National Institute of Standards and Technology (NIST) defines cloud computing as a model that enables on-demand access to a shared pool of configurable computing resources, such as servers, applications, and services, that can be rapidly provisioned and released with minimal effort (Cubo, D., 2015).

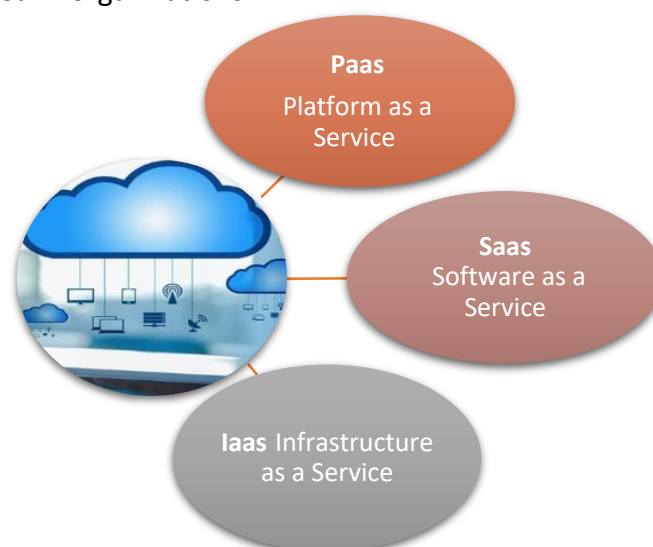
Oracle (2023) defines cloud computing as "the delivery of computing services—including servers, storage, databases, networking, software, analytics, and intelligence—over the Internet ("the cloud") to offer faster innovation, flexible resources, and economies of scale." Cloud computing enables the rental of IT resources and reduces costs spent on proprietary software, servers, and maintenance. It is characterized by the association of information technology capabilities with scalability.

Abdulrahman (2021) views cloud computing as a technology primarily based on accessing and processing data and preparing storage space through servers via communication networks. This transforms technology programs from stored products to delivered services.

Based on the above, it is evident that there are several definitions provided by researchers, which agree that cloud computing is a modern model that utilizes flexible access to hardware resources through internet-based servers, allowing access to software and applications. The key aspect highlighted in these definitions is the ability to access data anytime and anywhere through cloud computing.

#### Cloud Computing Service Models:

Cloud models represent a specific type of environment characterized primarily by their size, location, and the services provided through them. According to Sadqi (2023), three prevalent models are widely used in organizations:



*Fig. (2) represents advanced models of cloud computing services prepared by the researcher with reference to the study ( Beju, A., 2014).*

Infrastructure as a Service (IaaS): Cloud offers a model capable of processing, accessing, and storing data within the bank. This is achieved by deploying operating systems and applications within cloud servers managed by the service provider, who provides these services to the banks (Thabit et al., 2019).

Platform as a Service (PaaS): Cloud provides services by executing data computing tasks, storing and imaging them. Sometimes, the cloud platform even performs complete tasks, including comprehensive and full data storage, and other operations that were previously challenging to complete. The platform as a service reflects the level of flexibility in simulating the processing methods. As a service, the platform provides banks with data and information by providing the complete underlying system, such as operating systems and storage. The platform as a service allows users to control, monitor, request data, modify, and process it (Khalf, 2023).

Software as a Service (SaaS): Cloud provides software represented by applications that are accessed and utilized through external interfaces and media. They are available over the internet, accessible through web browsers, and compatible with various operating systems. One advantage of this model is that it eliminates the need for clients to install an IT infrastructure, such as servers and operating systems, within the bank to perform their work. These applications can be accessed directly through the internet (Al-Mansouri, 2023).

Concept of Financial Software:

Financial software programs have provided significant advantages for banks and customers, both in terms of transactional efficiency and cost, as well as the provision of services through electronic communication channels. Banks that wish to implement these programs in all their forms must obtain a license from the relevant authorities. Banks are granted licenses after ensuring certain procedures, including confirming the general policy for delivering financial software, technological options and regulatory policies, legal issues related to providing these programs, and information security measures (Kafi, 2020).

The Digital Research Institute defines financial software as "a set of software and innovations that rely on modern technology and communications, specifically related to the financial sector. This also includes digital programs used in financial procedures within banks, such as money transfers, account statements, and other software applications" (Al-Najdawi, 2023). It is also defined as "digital programs and services provided through the internet via the most clear and widespread information technology means." Furthermore, it has generated interactive functions with its customers (Abu Shaweesh, 2019).

The General Council for Banks and Islamic Financial Institutions (2021) defines financial software as a model for businesses through innovative ideas that effectively contribute to financial services. It proposes technological solutions that are suitable for different working conditions and can suggest business models or companies, and even create new job opportunities.

Furthermore, it is defined as commercial financial services that rely on technology platforms to innovate products and deliver financial services more efficiently. Financial technology is considered an emerging type of financial service in the 21st century, where some startups attempt to transform traditional transaction methods into mobile payment methods, money transfers, loans, fundraising, and even asset management (Reda, 2022).

Importance of Financial Software:

Investing in technology is a crucial factor for the success and future of companies in general, and banks in particular. Research focuses on the importance of investing in financial software

and services based on modern technology. It is expected that the share of branches in financial software will decline as ATMs, voice banking, mobile banking, internet banking, and online banking replace them. These channels will become the main means of serving customers (Al-Ghraibeh, 2020).

Financial software is highly significant and provides numerous benefits to employers and their customers. It has become an essential part of the existence and sustainability of banks. Al-Sudairy (2014) mentioned several benefits, including:

1. Opening new markets and accelerating business operations.
2. Improving supply chain management methods.
3. Increasing connectivity between customers and suppliers.
4. Reducing costs and expediting the procurement process.
5. Lowering costs and increasing efficiency.
6. The ability to address each customer individually and provide tailored services.

### **Previous Studies:**

Study by Saddiki (2023): The study aimed to determine the impact of cloud computing on supporting the role of internal auditing based on risks in Egyptian banks. It achieved several sub-objectives, such as assessing the awareness and perception of internal auditors regarding the advantages of cloud computing and identifying the main challenges they face. The researcher utilized a descriptive-analytical approach and the sample size was 338 individuals randomly selected from the study population. Key findings included the positive impact of cloud computing on accounting, leading to improved quality and faster access to accounting information.

Study by Masoudi (2023): The study aimed to understand the impact of financial technology on the quality of banking performance, based on banks' awareness of the importance of financial technology. It relied on a case study of the Local Development Bank agency in Adrar. The researcher employed a descriptive-analytical approach in constructing the study. Key findings highlighted the importance of financial technology as a mechanism to achieve quality banking performance, especially as it allows access to a larger customer base. In the rapidly evolving technological revolution in various fields, financial technology contributes to raising the level of banking performance, given its impact on the financial sector.

Study by Pibi (2022): The study aimed to explore cloud computing as one of the most prominent and influential technologies used in various fields, the advantages of cloud computing and its applications worldwide, and the analysis of the global market size of cloud computing. The researcher adopted a descriptive approach by referring to scientific references and studies related to the study variables. The study concluded that the legislation, policies, regulations, and incentives based on the "cloud-first" policy have accelerated the adoption and implementation of cloud services in important sectors of the Saudi economy, including banking, healthcare, and the industrial sector.

Study by Cheng (2022): This study examines the impact of banks' strategic shift towards cloud computing on bank performance and risk-bearing. Based on a new index of banks' exposure to cloud computing, it is found that banks' adoption of cloud computing is associated with lower cost efficiency, higher profit efficiency, and increased operational risk using data related to Chinese banks during the period 2008-2019. It is also found that cloud computing interacts with other emerging technologies, resulting in synergistic gains in cost efficiency and operational risk control but with an alternative impact on profit efficiency from blockchain.



The results are of timely policy importance and practical significance for regulators, policymakers, and bank managers.

Study by SLOVODA (2020): The study aimed to identify the trends, issues, and key risks that need to be addressed through collaboration between financial technology companies and banks in the current stage of international financial market development. The researcher identified the main challenges and risks facing the Ukrainian electronic technology market, including the legal and regulatory environment, slow adoption of innovations by traditional banks, limited open application programming interfaces in the banking sector, limited access to capital and financing for financial technology companies. One of the key findings was that the greatest advantage of technology, as a whole, is the speed at which it can evolve. While it may take years for an established and organized financial company to launch a new type of service, technology companies can emerge from scratch and start gaining market share.

Study by Masaiid (2019): The study aimed to determine the level of trust among industrial institutions in Jordan in implementing cloud computing. This crisis is divided into three different categories: a crisis of trust in software and processes, a crisis of trust in service providers, and a crisis of trust in the security and protection provided by service providers. The descriptive approach was adopted, and the questionnaire was distributed to 81 industrial companies in Irbid through a random sample representing 120 respondents from employees. One of the key findings was that there is already a crisis of trust in the implementation of cloud computing in Jordanian industrial institutions in the areas of operations and software.

Study by Devaraju & Woozeer (2015): The study aimed to investigate the impact of cloud technology on security and privacy for cloud technology users. The researcher followed a descriptive approach in building the theoretical framework of the research to identify the major challenges facing the use of cloud storage. The problem was examined from the perspective of cloud architecture, cloud storage perspective, cloud technology user privacy perspective, and cloud services. One of the key findings was that there is a list of major cloud security problems that compromise user privacy and essential elements that any proposed cloud service provider should address. There are several useful lists for cloud computing users that specialize in data storage that users should activate, and they should also fix any discovered security vulnerabilities.

### **Methodology of the Study:**

The study adopted a descriptive-analytical methodology, as it is the most suitable approach for studying social and human phenomena, and it is relevant to the study topic.

Study Population:

By reviewing the Amman Financial Market website for the year 2022, the number of employees in Jordanian commercial banks was found to be 15,400 employees, distributed among branches and the general administration. The researcher relied on the information provided on the Amman Financial Market website to define the study population.

### **Sample of the Study:**

The researcher relied on the size of the study population, which is 15,400 employees. According to Sekaran's table (2016), an appropriate and representative sample of the population should consist of no less than 375 employees. Questionnaires were distributed to employees in Jordanian commercial banks, and an electronic model was designed to facilitate the distribution process in those banks. A total of 590 questionnaires were collected,



excluding 11 invalid questionnaires for statistical analysis. Therefore, the valid sample for statistical analysis consisted of 579 questionnaires.

Reliability of the Study Instrument:

Table (3-2):

Measurement of Questionnaire Reliability

Items	Number of Items	Item Numbers	Cronbach's Alpha Coefficient
Infrastructure as a Service	6	1-6	0.849
Platform as a Service	5	7-11	0.853
Software as a Service	5	12-16	0.804
Financial Software Performance Improvement	7	17-23	0.899
Overall Total			0.947

Source: (Prepared by the researcher based on SPSS software, 2023)

It can be observed from Table (3-2) that the Cronbach's Alpha coefficients for the items of the variables range between 0.804 and 0.899. This ratio is acceptable in social sciences, as stated by Uma Sekaran in her book "Research Methods for Business: A Skill-Building Approach." This indicates that the questionnaire items are reliable.

Statistical Analysis and Hypothesis Testing

Personal Characteristics of the Study Sample:

Table (2)

Personal and Job-related Data of Study Participants

Variable	Category	Frequency	Percentage (%)
Gender	Male	343	59.2%
	Female	236	40.8%
	Total	579	100%
Experience	Less than 10 years	269	46.5%
	10 to less than 15 years	195	33.7%
	15 to less than 20 years	89	15.4%
	20 years or more	26	4.5%
Job Title	Branch Manager	37	6.4%
	Department Head	92	15.9%
	Assistant Department Head	1	2%
	Administrative Staff	449	77.5%
	Total	579	100%

Age	Less than 30 years	196	33.9%
	30 to less than 35 years	137	23.7%
	35 to less than 40 years	226	39.0%
	40 years or more	20	3.5%
	Total	579	100%
Educational Qualification	Bachelor's Degree	437	75.5%
	Master's Degree	108	18.7%
	Doctorate Degree	34	5.9%
	Total	579	100%

Source: (Prepared by the researcher based on the results of statistical analysis (2023) using SPSS)

The researcher observed the following from Table (2) in light of the analysis results for the demographic characteristics of the study sample:

Gender: The number of male participants in the questionnaire was 343, accounting for 59.2%, while the number of female participants was 236, accounting for 40.8%.

Experience: Regarding the experience dimension, it was found that the majority of the sample individuals had less than 10 years of experience, accounting for 46.5%. This was followed by the category of 10 to less than 15 years, accounting for 33.7%. The 15 to less than 20 years category accounted for 15.4%, while the category of 20 years or more accounted for 4.5%.

Job Title: The results revealed that the highest percentage was for the administrative staff category, accounting for 77.5%. The lowest percentage was for the assistant department head category, accounting for 2%.

Age: In terms of age, it was found that the majority of the sample individuals belonged to the category of 35 to less than 40 years, accounting for 39.0%. The lowest percentage was for the category of 40 years or more, accounting for 3.5%.

Educational Qualification: The results indicated that the majority of the sample individuals had a bachelor's degree, accounting for 75.5%. The lowest percentage was for the category of Doctorate degree, accounting for 5.9%.

Descriptive Results of the Study Variables

Results Related to the Mean Scores of Cloud Computing Usage Dimensions.

Table (3)

Mean Scores and Standard Deviations of Cloud Computing Usage Variable Dimensions.

Number	Dimension	Rank	Mean	Relative Importance
1	Infrastructure as a Service	3	3.83	High
2	Platform as a Service	1	3.77	High
3	Software as a Service	2	3.59	Moderate
Overall Cloud Computing Usage			3.73	High

Source: (Prepared by the researcher based on the results of statistical analysis (2023) using SPSS)

Table (3) shows that the overall mean of cloud computing usage dimensions is high, with a mean of 3.73. The dimension "Infrastructure as a Service" ranked first with a mean of 3.83 and a standard deviation of 0.902, indicating high relative importance. The dimension "Software as a Service" ranked last with a mean of 3.59 and a standard deviation of 0.961, indicating moderate relative importance.

To assess the impact of cloud computing usage on improving the performance of financial banking software in Jordanian commercial banks, the means and standard deviations were extracted for the study sample estimates for each dimension of the technology domain, as follows:

Dimension 1: Perceptions of the Community Members on Infrastructure as a Service.

Table (4)

Perceptions of the Community Members on Infrastructure as a Service

Paragraph Number	Dimension 1	Mean	Standard Deviation	Rank	Relative Importance
1	Suitable data and information storage space for banking activities through cloud computing	3.94	0.931	1	High
2	Information and data protection walls through cloud computing are capable of safeguarding data	3.83	0.959	3	High
3	Continuous development of protection walls by cloud computing	3.81	0.960	4	High
4	Cloud computing provides suitable and advanced operating systems for banking services	3.75	1.010	6	High
5	Cloud computing is responsible for operating systems and storage, not the bank	3.80	0.945	5	High
6	Cloud computing responds to the bank's requirements for modification or change with new services	3.88	0.930	2	High
Overall Infrastructure as a Service		3.83			High

Source: (Prepared by the researcher based on the results of statistical analysis (2023) using SPSS)

The table above demonstrates the perceptions of community members regarding Infrastructure as a Service in the sub-paragraph level, indicating high values. The overall mean was 3.83. Paragraph number 1, which states "Suitable data and information storage space for banking activities through cloud computing," had the highest mean of 3.94 and a standard

deviation of 0.931. On the other hand, paragraph number 4, which mentions "Cloud computing provides suitable and advanced operating systems for banking services," had the lowest mean of 3.75, with a standard deviation of 1.010. Despite the lower mean, this dimension still falls within the category of high relative importance. The researcher observed from the sample responses that cloud computing offers several supportive services for banking operations, such as providing sufficient storage space, the ability to modify and adapt services, and the provision of advanced operating systems.

Dimension 2: Perceptions of Community Members on Applications as a Service.

Table (5):

Number	Dimension 2	Mean	Standard Deviation	Rank	Relative Importance
7	Cloud computing provides a range of applications for banking services in one platform	3.89	0.844	1	High
8	One of the advantages of cloud computing applications is broader integration with other banks	3.66	1.011	5	Moderate
9	Cloud computing applications contribute to securing secure cash transfer operations	3.77	0.966	3	High
10	Cloud computing applications provide detailed and updated account statements	3.80	0.973	2	High
11	Applications include electronic payment programs and tracking the path of those payments	3.76	0.913	4	High
Overall Applications as a Service		3.77			High

Source: (Prepared by the researcher based on the results of statistical analysis (2023) using SPSS)

It is noted from Table No. (5) that the dimension of applications as a service at the level of subparagraphs was between high and medium. The overall arithmetic mean reached (3.77) and it came at a high level. Paragraph No. (7) was awarded, which states, "The availability of cloud computing." A group of applications for banking services in one platform, with the highest mean of (3.89) and a standard deviation of (.844), while Paragraph No. (8), which states, "One of the advantages of cloud computing applications is broader connectivity with other banking parties" was the one that I obtained the lowest arithmetic mean of (3.66) with a standard deviation of 1.011. The researcher believes, by reviewing the sample answers, that the applications provided by cloud computing contribute effectively to providing services and meeting needs and requirements according to what the bank's management aims to achieve.

## Dimension 3: Community Members' Perceptions on Platforms as a Service.

Table (6):

Number	Dimension 3	Mean	Standard Deviation	Rank	Relative Importance
12	The cloud platform allows for more comprehensive security of banking data and information	3.63	1.000	3	Moderate
13	The platform continuously develops services	3.82	0.891	2	High
14	The cloud platform reduces the operational costs of banking services	3.92	0.832	1	High
15	The cloud platform facilitates direct access to other banking institutions	3.47	1.017	3	Moderate
16	The cloud platform accelerates the process of delivering services to customers	3.12	0.879	5	Moderate
	Overall Platforms as a Service	3.59			Moderate

Source: (Prepared by the researcher based on the results of statistical analysis (2023) using SPSS)

From Table (6), it can be observed that the perceptions of community members regarding Platforms as a Service at the sub-paragraph level fall within the average range. The overall mean was 3.59, indicating a moderate level. Paragraph number 14, which states "The cloud platform reduces the operational costs of banking services," had the highest mean of 3.92 and a standard deviation of 0.832. On the other hand, paragraph number 16, which mentions "The cloud platform accelerates the process of delivering services to customers," had the lowest mean of 3.12, with a standard deviation of 1.017. The researcher notes, based on the sample responses, that banks have adopted platforms to a lesser extent, choosing specific services through applications only.

## Fourth Dimension: Community Opinion on Banking Financial Programs.

Table (7):

## Community Opinion on Banking Financial Programs

Number	Dimension 4	Mean	Standard Deviation	Rank	Relative Importance
17	Cloud computing expands cash transfer operations to a wider range of users	3.71	1.084	4	High
18	Cash transfer operations rely on cloud computing services for security and confidentiality	3.58	1.119	7	Moderate
19	Cash transfer operations through cloud computing contribute to faster response time	3.60	1.111	5	Moderate
20	Services provided through cloud computing can be delivered through smart applications,	3.59	1.079	6	Moderate

	phones, and websites to beneficiaries				
21	Cloud computing ensures accuracy and continuous updating of account detection services	3.86	0.940	3	High
22	Services provided and dependent on cloud computing have good data protection	3.91	0.786	2	High
23	Cloud computing links financial programs to multiple centers, contributing to the quality of provided procedures	3.97	0.749	1	High
	Overall Banking Financial Programs	3.74			High

Source: (Prepared by the researcher based on the results of statistical analysis (2023) SPSS)

Table 7 shows that banking financial programs, at the level of sub-paragraphs, fall within the high and moderate mean range. The overall mean was 3.74, which is considered high. Sub-paragraph 23, which states that "Cloud computing links financial programs to multiple centers, contributing to the quality of provided procedures," obtained the highest mean of 3.97. On the other hand, sub-paragraph 18, which states that "Cash transfer operations rely on cloud computing services for security and confidentiality," had the lowest mean of 3.58 with a standard deviation of 1.119. The researcher observes, through reviewing the sample responses for the sub-paragraphs, that there is a positive impact of cloud computing on banking financial programs according to the sample's answers.

Normal Distribution Test for Data:

Table (8):

Data for the Normal Distribution of Study Variables

	Infrastructure as a Service	Applications as a Service	Platforms as a Service
Skewness Coefficient	-0.469	-0.724	0.5121-
Kurtosis Coefficient	1.312	0.452	0.5513

Source: (Prepared by the researcher based on the results of the statistical analysis (2023) SPSS)

Table 8 shows the results of the normal distribution test for the variables using the kurtosis and skewness coefficients. It indicates that all skewness coefficients are close to zero, and the Platforms as a Service variable has the lowest skewness value (1.512). Regarding kurtosis, all variables have values close to 3, with the Applications as a Service variable (0.452) having the lowest kurtosis coefficient. The values of skewness and kurtosis coefficients suggest that the data follows a normal distribution, supporting the null hypothesis that the data follows a normal distribution and rejecting the alternative hypothesis that the data does not follow a normal distribution.



## Test for Variance Inflation Factor (VIF) and Variance of Study Variables

Table (9):

## Results of the Multiple Correlation Test between Independent Variables

Paragraph	Tolerance	VIF	Result
Axis 1: Infrastructure as a Service	0.622	1.432	No multiple correlation
Axis 2: Applications as a Service	0.321	1.610	No multiple correlation
Axis 3: Platforms as a Service	0.559	1.815	No multiple correlation

Source: (Prepared by the researcher based on the results of the statistical analysis SPSS (2023))

Table 9 displays the results of the Variance Inflation Factor (VIF) test, where all VIF values for the study axes are less than 10, indicating no high multiple correlation among the independent variables. Therefore, the data is ready for analysis. The Tolerance test values for all dimensions are greater than 0.05, which means there is no high correlation among the dimensions of the independent variable. Thus, all of them can be used in the regression model to determine which of these dimensions has a statistically significant impact on the dependent variable.

## Multiple Regression Results

The first main hypothesis states that there is no statistically significant effect of cloud computing usage on improving the financial performance of commercial banks in Jordan at the significance level ( $\alpha \leq 0.05$ ).

Table (10):

## Coefficient of Determination and Multiple Correlation Coefficient

## Model Summary

Model	R	R <sup>2</sup>	Adjusted R Square	Std. Error of the Estimate
1	0.752	0.565	0.563	0.51777

Source: (Prepared by the researcher based on the results of the statistical analysis SPSS (2023))

Table (11):

## Calculated F-Value and Significance Level

## ANOVA

F-Value	Significance Level (Sig)	Mean Square	Degrees of Freedom	Sum of Squares
248.925	0.000	66.733	3	200.200
0.268	.578	.575	154.149	354.350

Source: (Prepared by the researcher based on the results of the statistical analysis SPSS (2023))

Table (12):

## Multiple Regression Results

	B	Standard Error	t-value	Significance (Sig)	Beta
Constant	0.306	0.130	2.344	0.019	
Infrastructure as a Service	0.483	0.049	9.856	0.000	0.445
Applications as a Service	0.165	0.054	3.038	0.002	0.158
Platforms as a Service	0.255	0.046	5.491	0.000	0.226

Source: (Prepared by the researcher based on the results of the statistical analysis SPSS (2023))

The main hypothesis was tested at a significance level ( $\alpha \leq 0.05$ ), and the results were as follows:

The significance level for the test was compared to the significance level adopted in the study to demonstrate a statistically significant effect on the dependent variable. Table 11 shows the calculated F-value, with  $F=248.925$ , and the significance level (Sig) was 0.000, which is less than the significance level (0.05). In Table 10, the summary of results indicates a strong positive relationship between the independent variables and the dependent variable, with an R value of 0.752. The  $R^2$  value (0.565) represents the explanatory power of the independent variables collectively (Infrastructure as a Service, Applications as a Service, and Platforms as a Service) on the dependent variable (improving the financial performance of banks), explaining 56.5% of the variance in the dependent variable.

The constant value B (0.306) is necessary for building the regression equation for the variables as follows:

Financial Program Improvement = (0.306) + 0.483 Infrastructure as a Service + 0.165 Applications as a Service + 0.255 Platforms as a Service.

Based on the above, the null hypothesis is rejected, and the alternative hypothesis is accepted, which states that there is a statistically significant effect of using cloud computing at the significance level ( $\alpha \leq 0.05$ ) on improving the financial performance of commercial banks in Jordan.

#### Testing the First Sub-Hypothesis

Sub-Hypothesis 1: There is no statistically significant effect of Infrastructure as a Service at the significance level ( $\alpha \leq 0.05$ ) on improving the financial performance of commercial banks in Jordan.

Table (13):

Results of Simple Linear Regression Analysis for the First Sub-Hypothesis

Variables	Dependent Variable	Correlation Coefficient (R)	Determination Coefficient ( $R^2$ )	B-Value	Constant B-Value	Beta	t-Value	Significance
Dependent Variable	Financial Program Improvement	0.713	0.508	0.772	0.785	0.713	6.344	0.000
Independent Variable	Infrastructure as a Service							

Source: (Prepared by the researcher based on the results of the statistical analysis SPSS (2023))

The analysis confirmed the significance of the regression with the calculated t-value and significance level (Sig) to ensure the statistical significance of the regression. It is evident that the calculated t-value (6.344) is less than ( $0.05 \geq \alpha$ ). By comparing the significance level of the test to the study's adopted level, the table number (13) shows that the significance level for t was (0.000), which is less than the study's adopted significance level (0.05). Therefore, Sub-Hypothesis 1 is rejected, and the alternative hypothesis is accepted, indicating that "there is

a statistically significant effect of Infrastructure as a Service at the significance level ( $\alpha \leq 0.05$ ) on improving the financial performance of commercial banks in Jordan." Value R indicates the correlation between the independent variable and the dependent variable. In table number (13), it suggests a strong positive relationship between the independent variable, Infrastructure as a Service, and the dependent variable (Financial Program Improvement), with a correlation coefficient of 0.713. The determination coefficient,  $R^2$  (0.508), represents the explanatory power of the independent variable, Infrastructure as a Service, on the dependent variable, explaining 50.8% of the variance in Financial Program Improvement.

To assess the predictive capacity of the equation, we relied on the B-Value, which represents the expected change in the dependent variable when there is a change in the independent variable. The table shows that the B-Value was (0.772), indicating that a one-unit change in the Infrastructure as a Service variable would result in a positive impact of (0.772) on Financial Program Improvement.

#### Testing the Second Sub-Hypothesis

Sub-Hypothesis 2: There is no statistically significant effect of Applications as a Service at the significance level ( $\alpha \leq 0.05$ ) on improving the financial performance of commercial banks in Jordan.

Table (14):

Results of Simple Linear Regression Analysis for the Second Sub-Hypothesis

Source: (Prepared by the researcher based on the results of the statistical analysis SPSS

Variables	Dependent Variable	Correlation Coefficient (R)	Determination Coefficient ( $R^2$ )	B-Value	Constant B-Value	Beta	t-Value	Significance (Sig)
Dependent Variable	Financial Program Improvement	0.677	0.458	0.708	1.074	0.677	8.687	0.000
Independent Variable	Applications as a Service							

(2023))

The analysis confirmed the significance of the regression with the calculated t-value and significance level (Sig) to ensure the statistical significance of the regression. It is evident that the calculated t-value (8.687) is less than ( $0.05 \geq \alpha$ ). By comparing the significance level of the test to the study's adopted level, the table number (14) shows that the significance level for t was (0.000), which is less than the study's adopted significance level (0.05). Therefore, Sub-Hypothesis 2 is rejected, and the alternative hypothesis is accepted, indicating that "there is a statistically significant effect of Applications as a Service at the significance level ( $\alpha \leq 0.05$ ) on improving the financial performance of commercial banks in Jordan." Value R indicates the correlation between the independent variable and the dependent variable. In table number (14), it suggests a strong positive relationship between the independent variable, Applications as a Service, and the dependent variable (Financial Program Improvement), with a correlation

coefficient of 0.677. The determination coefficient,  $R^2$  (0.458), represents the explanatory power of the independent variable, Applications as a Service, on the dependent variable, explaining 45.8% of the variance in Financial Program Improvement. To assess the predictive capacity of the equation, we relied on the B-Value, which represents the expected change in the dependent variable when there is a change in the independent variable. The table shows that the B-Value was (0.708), indicating that a one-unit change in the Applications as a Service variable would result in a positive impact of (0.567) on Financial Program Improvement.

Testing the Third Sub-Hypothesis The Third Sub-Hypothesis: There is no statistically significant effect of cloud platforms as a service at a significance level ( $\alpha \leq 0.05$ ) in improving the performance of financial programs in Jordanian commercial banks.

Table (15):

Results of Simple Linear Regression Analysis for the Third Sub-Hypothesis

Source: (Prepared by the researcher in light of the results of the statistical analysis using SPSS)

Variables	Dependent Variable	Correlation Coefficient (R)	Determination Coefficient ( $R^2$ )	B-Value	Constant B-Value	Beta	t-Value	Significance (Sig)
Dependent Variable	Improvement in program performance	0.624	0.389	0.704	1.080	0.624	7.618	0.000
Independent Variable	Platforms as a service							

The results of the analysis confirmed that the computed t-test variance and SIG significance level were examined to ensure the significance of the regression. It became evident that the computed t-value (7.618) and the significance level were less than ( $0.05 \geq \alpha$ ). The significance level of the test was compared with the significance level adopted in the study to determine the statistical effect of the independent variable on the dependent variable. Table number (15) shows that the significance level for t is (0.000), which is less than the significance level adopted in the study (0.05), therefore, we reject the third sub-hypothesis and accept the alternative, which states, "There is a statistically significant effect of platforms as a service at the significance level ( $\alpha \leq 0.05$ ) in improving the performance of financial programs in commercial banks in Jordan."

The value of R, which indicates the correlation between the independent and dependent variables, is highlighted in Table number (15), indicating a positive correlation between the independent variable, platforms as a service, and the dependent variable, improving program performance. The correlation coefficient value is 0.624.

The determination coefficient ( $R^2$ ) amounted to 0.389, representing the explanatory power of the independent variable, platforms as a service, on the dependent variable, improving program performance, indicating that the variable of platforms as a service can explain 38.9% of the improvement in program performance.

To assess the predictive capability of the equation, the value of B was relied upon, which represents the expected change in the dependent variable if there is a change in the independent variable. The table shows that the value of B amounted to 0.704, indicating that a one-unit change in the platforms as a service variable will have a positive impact on improving program performance (0.408).

### **Discussion of the Results:**

There is no statistically significant effect of cloud computing use at a significance level ( $\alpha \leq 0.05$ ) in improving the performance of financial programs in commercial banks in Jordan: The results showed an effect of cloud computing use in improving the performance of financial programs in commercial banks in Jordan, and this effect is statistically significant. This demonstrates the ability and impact of cloud computing in improving the performance of financial programs and the relationship between the variables, which is described as strong. Thus, the impact of cloud computing is effective and will have a positive impact on the performance of financial programs in Jordanian commercial banks.

It is evident that the value of R, which indicates the correlation between the independent and dependent variables, points to a strong positive correlation between the independent variables collectively: infrastructure as a service, applications as a service, and platforms as a service. The cloud computing variable has an explanatory power of 56.5%, indicating that it contributes to 56.5% of the improvement in program performance, with the remaining percentages being explained by other factors.

The current study agrees with the results of other studies, such as the study by Sadek (2023), which showed the advantages of using cloud computing in the field of accounting, positively affecting the quality and accessibility of accounting information. Additionally, the results of a study by Abdur-Rasool (2021) indicated that cloud accounting has a significant impact by providing high security and lower costs compared to ready-made accounting software, along with ease of access by accountants and managers to all operations. The study also aligns with the findings of Hassan (2022), where it was shown that cloud computing provides information about all aspects of the economic unit's performance, its strategic objectives, and future outlook, saving a significant amount of time and effort. The current study is consistent with the results of Al-Falah (2021), where there is an impact of cloud computing on accounting system elements in commercial banks in Libya. The study also agrees with the results of Ali et al. (2018), which showed that relying on cloud computing, which in turn accelerates performance positively.

- Sub-Hypothesis 1: There is a statistically significant effect of infrastructure as a service at a significance level ( $\alpha \leq 0.05$ ) in improving the performance of financial programs in commercial banks in Jordan. The p-value = Sig .000, which is less than the significance level ( $\alpha \leq 0.05$ ). The t-value reached 6.344, which is greater than 1.96, so the alternative hypothesis is accepted.
- Sub-Hypothesis 2: There is a statistically significant effect of applications as a service at a significance level ( $\alpha \leq 0.05$ ) in improving the performance of financial programs in commercial banks in Jordan. The p-value = Sig .000, which is less than the significance level ( $\alpha \leq 0.05$ ). The t-value reached 8.687, which is greater than 1.96, so the alternative hypothesis is accepted.
- Sub-Hypothesis 3: There is a statistically significant effect of platforms as a service at a significance level ( $\alpha \leq 0.05$ ) in improving the performance of financial programs in commercial banks in Jordan. The p-value = Sig .000, which is less than the significance

level ( $\alpha \leq 0.05$ ). The t-value reached 7.618, which is greater than 1.96, so the alternative hypothesis is accepted.

### Recommendations:

1. Encourage Jordanian commercial banks to expand their support and development of infrastructure to facilitate the use of cloud computing technology, as it plays an effective role in improving the performance of financial programs used by banks.
2. It is essential to enact regulations that govern the contracting procedures between cloud computing service providers and the banks using them, and to conduct ongoing assessment and monitoring by relevant parties.
3. Invest in training specialized and professional staff to handle financial programs related to cloud computing efficiently and with high responsiveness to address any emergent issues.
4. Banks should develop alternative plans and mechanisms for service continuity in case of internet service interruptions, which might cause problems in establishing and hosting the cloud and its applications or platforms. The ability to respond in case of disasters that hinder the retrieval of essential information is crucial.

### Conclusion

In Jordanian banks, business has increased on developing the infrastructure for many data, especially cloud computing, in general both on the part of financial and banking computers in particular and on the part of human employees, which leads to efficiency in the use of programs in general and financial and banking in particular, Also, the senior managements of the banks that contribute to and use the leading companies in the cloud computing service, security processes and eliminating the speed and accuracy of the company that are used through the financial programs were discussed along with the importance of bank employees in these programs in a proficient manner and speed in dealing with any problems, This takes banks to plan for the future in the long term and modernize dealing with cloud computing and various financial data, which makes relying on the use of cloud computing with ease and a high degree of mastery, security and quality for competition and excellence, It builds banks in reliable service, speed and quality of security. Introduction.

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