Adoption of Cloud Computing: A Key Performance Analytics for Financial and Technological Firms

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Abstract: Cloud computing provides a stable and highly customizable infrastructure to firms which can enable them to expand their businesses while adding more value and efficiency to their operations. The primary aim of this research is to investigate if the adoption of cloud computing has a positive impact on the performance of the firm. The adoption of cloud computing is discussed with the context of its three factors: Human (Personal innovativeness, IT/IS competence, High-Performance computing), Organizational (Top management support, Organization cultures), and Environmental (Server location and Regulatory Support) to understand its influence on the performance of the firm. For this purpose, the study has devised a survey questionnaire, for which the data has been collected from 200 individuals working in the financial and information technology industry of Pakistan. The results are analyzed using statistical tools SMART PLS. The findings of this research indicate that top management support, regulatory support, personal innovativeness and IT/IS competence has a positive impact on the adoption of cloud computing. However, no significant relationship was found between three variables (HPC competence, Organization Cultures and Server Location) on the adoption of cloud computing. However, the study concludes that the adoption of cloud computing has a positive impact on the performance of the firm.

Keywords: Digital finance, Cloud Computing, Analytics, IT Competence, High-Performance Computing, Servicer Location, Regulatory Support, and Financial Inclusion

1. INTRODUCTION

Cloud computing is regarded as one of the most recent emerging concepts that have revolutionized the world of Information Technology. The adoption of cloud computing in businesses tend to have a significant amount of impact on the performance of the firms, given the information and resources are being used efficiently [1]. It has also been noted the impact of cloud computing on businesses tend to vary in regards to the strategies being used in the firm. Furthermore, the underlying concerns and issues must be addressed before integrating the technology of cloud computing to avoid a negative experience.

The adoption and performance of cloud computing have appeared as the most important agenda in the professional and scholarly environment, especially for technological firms that are working in Pakistan with poor resources.

Most of the literature examines the determinants that impact the adoption of cloud computing in technological firms [2]. However, these researches have overlooked to examine the effect of important contextual factors i.e. (Human, Organizational, and Environmental) on the adoption of cloud computing that impact firm performance.

As an attempt to understand the implication of cloud computing on firm performance, this study aims to explore three main areas of a business or an organization that may directly experience the shift from traditional infrastructure to cloud computing.

These three factors are: human, organizational, and environmental. Where Personal innovativeness, IT/IS competence, High-Performance computing is the human aspects of integrating cloud computing that may impact the firm performance and hence, is required to be investigated. Moreover, the influence of top management support and

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organization cultures that represents organizational factors on firm performance after the adoption of cloud computing is also investigated. Lastly, this research also investigates the relationship of server location and regulatory support as the environmental factor with firm performance as a consequence of the adaption of cloud computing.

Despite numerous studies indicating the effectiveness of cloud computing on the performance of firms, it has been found that the acceptance and integration of cloud-related technology are still scarce [3]. The popularity of cloud computing services has found to be increasing in first world countries and developed nations, however, its implementation in developing nation is critically low[4]. Small and medium enterprises tend to perceive cloud computing as a feature that may require extensive capital which may hinder the overall performance of the firm [5]. This indicates a gap in the literature that the implication of effectiveness associated with cloud computing on firm performance is similar, whether the firm is small or large.

Even though it has been noted that many industries, such as government, science and technology, and health have started to accommodate cloud computing to a certain extent in their operations, the application of these services remains unused in a large part of the world. The lack of confidence in cloud computing services and their influence on firm performance is vaguely discussed in the context of undeveloped countries like Pakistan.

The primary aim of this research is to investigate if the adoption of cloud computing has a positive impact on the performance of the firm. The adoption of cloud computing is discussed with the context of its three factors: Human (Personal innovativeness, IT/IS competence, High-Performance computing), Organizational (Top management support, Organization cultures), and Environmental (Server location and Regulatory Support) to understand its influence on the performance of the firm.

The secondary objectives of this research are to:
- To investigate the impact of personal innovativeness on firm performance after the adoption of cloud computing.

- To analyze the impact of IT/IS competence on firm performance after the adoption of cloud computing

- To study the impact of High-Performance computing competence on firm performance after the adoption of cloud computing.

- To assess the impact of top management support on firm performance after the adoption of cloud computing

- To evaluate the impact of organization culture on firm performance after the adoption of cloud computing.

- To analyze the impact of server regulation on firm performance after the adoption of cloud computing.

- To study the impact of regulatory support on firm performance after the adoption of cloud computing

- To evaluate the impact of the adoption of cloud computing on the performance of the firm.

The scope of this research is limited to the understanding of the adoption of cloud computing and its impact on firm performances in Pakistan. Moreover, this research aims to explore the three dimensions associated with cloud computing, which are a human factor, organizational factor and environmental factor to investigate the implication adoption of cloud computing in these areas influence the performance of the firms in Pakistan.

2. LITERATURE REVIEW

In the literature of cloud computing, various studies have glorified the existence of cloud computing and regarded it as an essential part of businesses, especially the firms working in the industry of Information and Technology. Cloud computing is most commonly referred to as the cloud, which indicates a platform for shared usability that comprise on a group of the interface, software, network, and servers. The collaboration of these networks and servers exist to assist the human resource in performing tasks more efficiently [6].

The term computing is the notion of cloud computing refers to the deliverance of services that enables users to interact with it in a manner that is most useful to them [7]. Modern cloud computing offers a cost-effective and time-effective solution to its users with a variety of different packages and offers entities can opt for [8]. Some of these packages offer a one-time payment to their users, while others offer a pay-per access model that further allows user to explore options based on their necessity or convenience [9]. Among many others, most of the features offered by these cloud computing third parties include networking services, application, storage and servers for ease and accessibility. Cloud computing empowers user to access their desired information across the devices, such as smartphones, laptops, desktop and tablets, using the servers on the cloud [10].

Cloud computing offers a platform to its users that ensures a system that consistently adds value to the business. Among many other benefits attached with its integration, flexibility, ease of access, and customization as the prime elements that distinctively improves the overall performance of the firm [11]. The fundamental purpose of adopting cloud computing is to ensure that the operations associated with the firm are technologically supported and being taken care of, while the human resources are occupied with other tasks [12]. The human resource of the company can be allocated for better use and

innovativeness, while the mundane tasks of operations can be appointed to the cloud services for the efficient process [13].

Cloud computing services are based extensively on the highly adaptive infrastructure within the horizon of information technology that enables multiple users to interact with the servers separately. The dynamic range of services and outputs have also contributed to its popularity among small as well as large businesses all over the world, as it offers the convenience of engaging multiple users at the same time but differ based on their needs [14].

Among many other advantages associated with the adoption of cloud computing, that cloud computing does not only reduces the cost of entry but also serves as a time-effective measure for operations in both, big and small enterprises [15]. The benefits of adopting cloud computing are not only limited to large organizations with ample amount of capital to invest but it can also be deemed as equally efficient for small businesses. This is because cloud computing offers a dynamic range of services, tailored to the need of business using it [16].
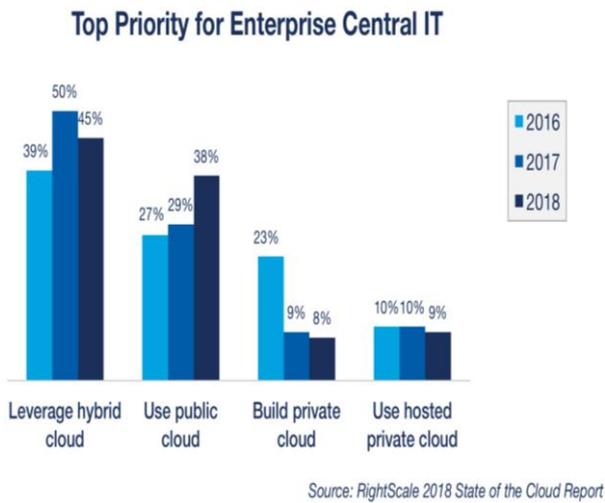

Figure 1. Cloud Deployment Model

As mentioned in figure 1, cloud deployment models which includes (leverage hybrid cloud, use public cloud, build a private cloud, and use hosted private cloud) was a top priority for the enterprise that are central IT. These stats were from the year 2018, 2017, and 2016. Among all leverage hybrid cloud were the most demanded cloud deployment model priorities by central IT enterprise.

A. Cloud Computing and Firm Performance

Similarly, the adoption of cloud computing is found to have a positive influence on the performance of the firm as it yields reports and insights that are favorable for the top management to make effective decisions [17]. Moreover, the organizational benefits attached with cloud

computing suggesting that it can have a positive impact on establishing the culture for the firm, which includes maintaining and updating the payroll, attendance, incentives based on objective performance and other related tasks [18].

B. Environmental Aspect and Cloud Computing

It has been found that the environmental aspect of the adoption of cloud computing also has a significant influence on the performance of the firm, as it involves the up-gradation of technological skillset among its employees [19]. Not only this, the implementation of technological advancement offers better networking speed, reduced cost of maintenance, and efficiency throughout the process of carrying out tasks [20]. One of the major contributors to changes in the environment is regulatory support. This is because cloud computing services require low-grade maintenance, which is mostly secured by the service provider.

Since cloud computing services are often provided with regulatory services, therefore, it reduces the pressure of the firm to consistently maintain their servers and networks. All of these factors associated with the adoption of cloud computing tend to highlight its influence on the performance of the firms [21].
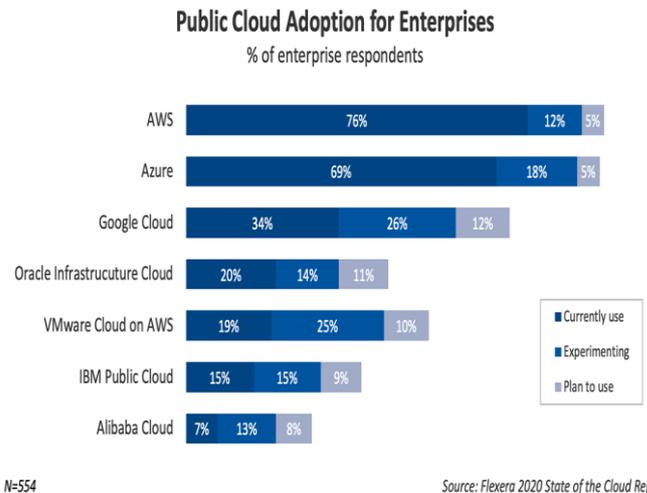

Figure 2. Public Cloud Computing Adoption

The figure 2 reflects the opinion of enterprise respondents about the public cloud adoption for the enterprise they are working with. As per respondents AWS and Azure were the most current public cloud software that is adopted by most enterprises. Whereas IBM public cloud and Alibaba cloud is the least adopted public cloud by enterprises.

C. Factors Related to Adoption of Cloud Computing

Based on the context provided above identified in this research, the following is the conceptual framework that illustrates the flow of research:
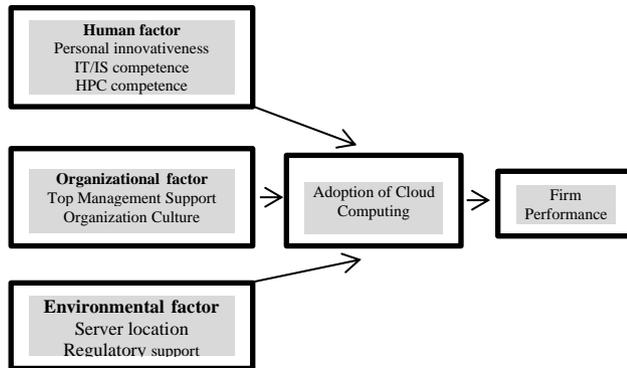

Figure 3. Conceptual Model

In accordance with the conceptual model above in figure 3, the independent variables of this research are a human factor (Personal Innovativeness, IT/IS Competence, HPC Competence), Organizational (Top Management Support, Organization culture), and Environmental (Server Location, Regulatory Support). The dependent variable used in this study is Firm Performance, while the mediator between the independent and dependent variable used in this research is the Adoption of Cloud Computing.

3. **DATA GATHERING AND APPROACH**

The data collection method is referred to as the method or the way a researcher chooses to obtain information that is relevant to the research [22]. This obtained information is then analyzed to produce results that answer the research question. Fundamentally, there are two ways to collect data, secondary and primary; where primary data is considered as the one which has been obtained solely for the research and secondary data is one that has been published before the research in some other context. In this study, primary methods of data collection have opted. The purpose of using primary methods of data collection is to ensure that the information obtained for this study is specific to the financial and Information Technology Industry in Pakistan. Therefore, a survey questionnaire has been developed to gather data that determine the impact of various aspects of cloud computing on the performance of financial and IT firms in Pakistan.

The research approach refers to the selection of appropriate methods and steps to ensure that the research is relevant and authentic. There are two main forms of research approach, inductive and deductive. While the inductive approach requires the researcher to explore the subject area as an attempt to emerge a new dimension associated with the topic, the purpose of the deductive approach is to test and validate the hypotheses based on the context of the

research. This study uses a deductive approach as the data used in this study requires testing the relationships of the independent and dependent variable using the model of hypotheses.

The sample size used for this research is 200 individuals and the sampling technique applied in this research is the convenience sampling method. The purpose of using the convenience sampling method is to ensure that the data is collected through the most relevant individuals from 10 medium size financial and IT firms which were NetSol, Jics TECH, Thex Sol, fiber-cast, Abtech Pvt, TRG tech, Ovex tech, KalSoft, Bluechip financials, and Dynamic solutions. Therefore, only employees working in financial and IT firms of Pakistan were approached.

4. **DATA ANALYSIS**

This section explained the data analysis process, as SEM analysis was done with the help of SMART PLS software in order to know the relationship between the variables. Because through PLS-SEM the researcher can easily interpret the cause-effect relationship between latent variable.

D. Factor Loading

The values presented in table 1 indicate the loadings for each item for the construct developed in this study. The values of each of these items are required to be above 0.7 to ensure that the weight of the construct is significant enough to carry on with the research [23]. Since values for each of the item mentioned above is above the threshold of 0.7 therefore, it can be concluded that the constructs are valid and can be used in the further analysis of this study

TABLE 1. FACTOR LOADING

	AC	FP	HPC	IT/IS	OC	PI	RS	SL	TM
AC1	0.92								
AC2	0.85								
AC3	0.74								
FP1		0.80							
FP2		0.82							
FP3		0.80							
HPC			0.86						
HPC			0.84						
HPC			0.74						
IT/IS1				0.77					
IT/IS2				0.83					
IT/IS3				0.83					
OC1					0.86				
OC2					0.81				
OC3					0.89				
PI1						0.89			

PI2					0.86		
PI3					0.82		
RS1						0.72	
RS2						0.91	
RS3						0.83	
SL1							0.75
SL2							0.82
SL3							0.85
TM1							0.83
TM2							0.85
TM3							0.78

Where PI = Personal Innovativeness,

IT/IS = IT/IS Competence

HPC= High Performance Compentency

The values presented in a diagram showing the outer loading of each variable as the human factor i.e. (Personal Innovativeness, IT/IS Competence, HPC Competence)

TM= Top Management Support

OC= Organization Culture

Again the construct of each variable in the diagram is above 0.70

As each of the constructs is above 0.70.Which shows organizational factor i.e. (Top Management Support, Organization Culture)

SL= Server Location

RS= Regulatory Support

The construct of each factor is also 0.70 to ensure that the construct is significant. Finally Environmental factor i.e (Server Location, Regulatory Support).

APC= Adoption of cloud computing

FP= Firm Performance

Both the construct each item reported a value above 0.70 which showed that constructs are valid.

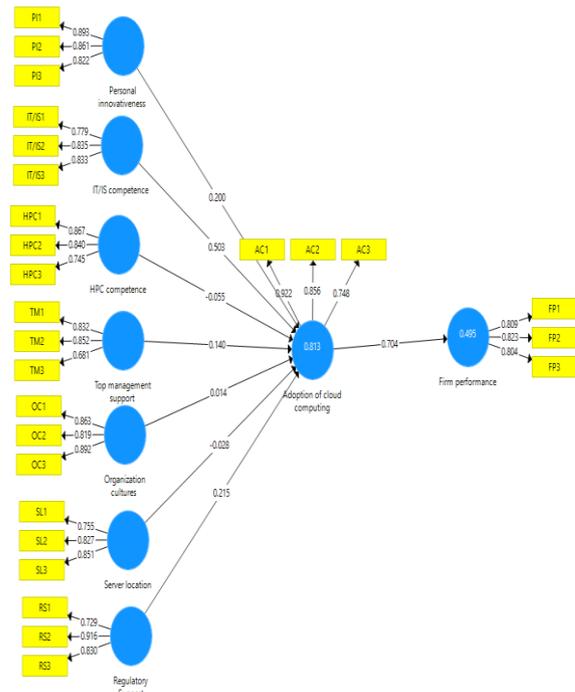Figure 4, represents the factor loading of each construct.

Figure 4. Factor Loading

E. Reliability

The reliability of each of the constructs developed for this research is ensured using the values of Mean, Standard Deviation, Composite Reliability and AVE (Average Variance Extracted). Convergent validity is a theory in which a group of factors joint collectively to calculate the same concept [23]. For investigating the convergent validity the examiner needs to analyze factor loadings, composite reliability and average variance extracted. Firstly, the factor loading, items should be more than 0.6 and statically significant. Secondly, the rule of thumb for average variance extracted (AVE) should be more than 0.5. Thirdly, the threshold value for composite reliability (CR) of the construct is 0.7 [24]. Since the criteria for all these measurable variances have complied, therefore, in table 2 each variable of this research is deemed reliable.

TABLE 2. RELIABILITY

	Mean	S.D	Composite Reliability	Average (AVE)
Adoption of cloud computing	3.56	0.83	0.88	0.71
Firm performance	3.78	0.75	0.85	0.65
HPC competence	3.98	0.79	0.85	0.67
IT/IS competence	4.74	0.75	0.85	0.66
Organization cultures	0.82	0.82	0.89	0.73

Personal innovativeness	0.82	0.82	0.89	0.73
Regulatory Support	0.76	0.78	0.86	0.68
Server location	0.74	0.76	0.85	0.65
Top management support	0.70	0.73	0.83	0.62

F. Discriminate Validity

Discriminant validity refers to the uniqueness of the variables and the distinction from one variable to the other [25]. A variable is said to be unique and uncorrelated if its value is closer to 1. Based on table 3 of discriminant validity below, it can be observed that each of the construct or the variable is fairly distinct from one another and therefore, can be deemed as valid for the research.

TABLE 3. DISCRIMINATE VALIDITY

	Adoption of cloud computing	Firm performance	HPC competence	IT/IS competence	Organization cultures	Personal innovativeness	Regulatory Support	Server location	Top management support
Adoption of cloud computing	0.84								
Firm performance	0.70	0.81							
HPC competence	0.58	0.58	0.81						
IT/IS competence	0.85	0.66	0.58	0.81					
Organization cultures	0.75	0.71	0.60	0.78	0.85				
Personal innovativeness	0.79	0.69	0.63	0.73	0.76	0.85			
Regulatory Support	0.76	0.79	0.64	0.69	0.72	0.76	0.82		
Server location	0.65	0.65	0.60	0.66	0.69	0.66	0.69	0.81	
Top management support	0.72	0.54	0.64	0.69	0.66	0.72	0.62	0.66	0.79

G. Path Coefficient SEM Analysis

Table 4 of the path coefficient is used to determine the strength of the relationship between two variables. It also indicates whether the relationship between two variables is positive or negative [26]. In accordance with the table above, it can be observed that the hypothesis suggesting a positive relationship between adoption of cloud computing and firm performance is accepted as the value of P is 0.000 (less than 0.05) and the value of T is 14.370 (above 0.000). In addition to this, the hypothesis stating a positive relationship between HPC competence and adoption of cloud computing is rejected as the value of P is more than the threshold value of 0.05. On the other hand, the hypothesis suggesting a positive relationship of IT/IS competence with the adoption of cloud computing is accepted with the value of P as 0.000 and the value of T is 8.688. It is also noted that the hypotheses suggesting the relationship between personal innovativeness and cloud computing, regulatory support and cloud computing and top management support and cloud computing have been accepted. This is because the P-Value of all three hypotheses is below the threshold level of 0.05 and the value of T is above 0.000 which indicates that the relationship between three independent variables and cloud computing is positive. Lastly, it is found that the relationship between server location and adoption of cloud computing has found to be insignificant as the value of P is 0.681.

TABLE 4. PATH COEFFICIENT SEM ANALYSIS

	Beta	Std.Dev	T-Stats	P Values	Results
Adoption of cloud computing -> Firm performance	0.704	0.049	14.37	0.00	Accepted
HPC competence -> Adoption of cloud computing	0.055	0.053	1.025	0.30	Rejected
IT/IS competence -> Adoption of cloud computing	0.503	0.058	8.688	0.00	Accepted
Organization cultures -> Adoption of cloud computing	0.014	0.064	0.218	0.82	Rejected
Personal innovativeness -> Adoption of cloud computing	0.200	0.080	2.486	0.01	Accepted

Regulatory Support -> Adoption of cloud computing	0.215	0.084	2.568	0.01	Accepted
Server location -> Adoption of cloud computing	0.028	0.067	0.412	0.68	Rejected
Top management support -> Adoption of cloud computing	0.140	0.070	1.996	0.04	Accepted

The figure 5, reflects the SEM analysis which portrayed the relationship between each of the variable.
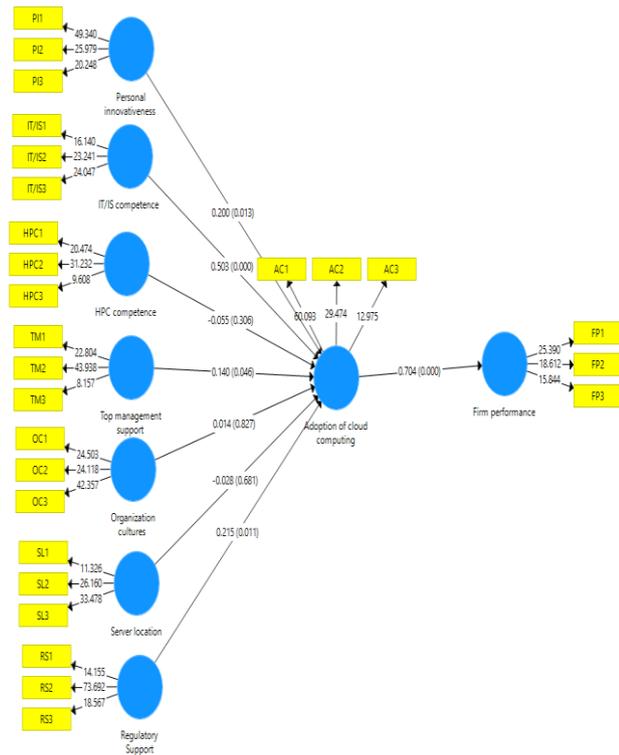

Figure 5. SEM Analysis

5. CONCLUSION AND RECOMMENDATION

In recent times, more and more companies in the developed nations are migrating towards cloud computing, which implies the transformation of their existing services through emerging virtual cloud computing services [27]. The adoption of cloud computing entails that certain tasks are assigned virtually to the applications and networking services to ensure efficiency and cost-effectiveness. The literature on this subject has significantly emphasized its efficiency, controllability, and flexibility as part of its service provision. However, it is found that regardless of its undeniable effectiveness in the daily operations of a business, most companies hesitate to integrate these services into their firms. Moreover, its application in the developed nations is comparatively better than in developing nations like Pakistan. This is because many businesses perceive the adoption of cloud computing as an expensive venture and do not fully comprehend its impact on the firm's performance.

Therefore, to signify the importance of different aspects of cloud computing on a firm's performance, this study aims to explore three aspects of cloud computing that may impact the performance of the firm. These three factors associated with cloud computing are Human, Organizational, Environmental. Personal innovativeness, IT/IS competence, High Performance, Top management support, Organization cultures, Server location and Regulatory Support are the identified independent variables of this research that relates to the mediating variable of this study: Adoption of Cloud Computing. The influence of these variables is further investigated in regards to the influence these have after the adoption of cloud computing on the performance of firms in Pakistan.

To conclude this research, the study has developed a closed-ended survey questionnaire, which includes the data that has been collected from 200 individuals working in the Financial, Information and Technology industry of Pakistan. The data obtained from the survey was then analyzed to ensure that the constructs are valid and reliable. The statistical tools have been used to analyze the results of this research.

The findings of this research indicate that top management support, regulatory support, personal innovativeness and IT/IS competence has a positive impact on the adoption of cloud computing. However, no significant relationship was found between three variables (HPC competence, Organization Cultures and Server Location) on the adoption of cloud computing. Moreover, the study concludes that the adoption of cloud computing has a positive impact on the performance of the firm.

The adoption of cloud computing impact on business as cloud computing is convenience, since it provide remote access to employees to work from anywhere. In technical term as cloud computing has technological advancement so firm should invest in different software and IS integration. Additionally the firm should train their employees technically so, in this way consistent firm performance can be achieved.

This research recommends business owners, policymakers, and decision-makers integrate the features of cloud computing in their businesses as the positive impact of adopting cloud computing is evident through this research, which can translate into improvising business performance.

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