Int Journal of Social Sciences Management and Entrepreneurship 8(3): 986-998 2024

ISSN 2411-7323

www.sagepublishers.com

CLOUD COMPUTING PRACTICES AND PERFORMANCE OF INFORMATION AND COMMUNICATION TECHNOLOGY AUTHORITY PROJECTS, KENYA.

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ABSTRACT

The study sought to examine effect of cloud computing practices on performance of projects in the Information and Communication Technology Authority in Kenya. The study targeted 7 ICT projects in Kenya focused on infrastructure as the unit of analysis. The unit of observation was the 200 respondents including ICT staff, Project managers, and Project supervisors. A Census was adopted. The study was underpinned by the Technology-Organization-Environment Theory. Both descriptive and inferential analysis were conducted using SPSS. The study also found that cloud adoption strategy and cloud infrastructure monitoring had positive significant correlation with ICT projects performance in Kenya. The study also found that cloud adoption strategy ($\beta = .180$, sig = .002) and cloud infrastructure monitoring ($\beta = .173$, sig = .000) had positive significant influence on ICT projects performance in Kenya. The study recommended the leadership in ICT authority acknowledge cloud computing capabilities and embrace all the strategic opportunities in its projects. Cloud computing is known to be versatile as well as diverse technological innovation that cuts across all sectors and activities, and processes.

Keywords: Cloud computing practices, cloud adoption strategy, cloud infrastructure monitoring, performance of ICT projects

Background of the study

In the past few decades there has been exponential growth in computer usage in business, government, non-government and educational organizations. At the same time, the World Wide Web has opened up global markets and global competition. The combination of increased computer usage, global collaboration, and competition has generated an accompanying need to maximize the use of available resources while minimizing operating costs (Ray Rafaels, 2018). In order to meet these needs, there was a need for the use of cloud computing to centralize computing power and information management task for large, mostly geographically dispersed organizations and individuals.

Cloud computing is a technology that employs the Internet (CentralRemote Servers) to support and process data and applications for the intended users, whether they are individuals or companies, as it is provided to them on demand (Mell & Grance, 2021). Currently, global Information Technology (IT) firms such as Microsoft, Google, and more than 31 million developers and investors around the world are developing cloud technologies and creating a virtual environment for individuals and institutions to harness the power of flexible, secure, interactive technological environment to a large extent. Large companies are using cloud computing technologies which has resulted in increasing their computing resources and reducing their financial and operational expenses. It also increases work productivity by more than 51% (Alsafadi, Aljawarneh, Çağlar, Bayram, & Zoubi, 2020).

For efficient and effective service delivery to people, the Cloud Computing Standard (ICT-Authority-Kenya, 2022) mandates all government agencies to ensure that they completely comply with the standard. The Information and Communication Technology Authority Kenya is also required by this Standard to conduct quarterly audits of all Ministries, Counties, and Agencies ("MCAs") to guarantee compliance with the Standard. One of the Standard's objectives is that MCAs guarantee that cloud service providers follow regulatory legislation in terms of privacy and public record keeping requirements (ICT-Authority-Kenya, 2022). The government should come out strongly to welcome and support cloud computing technology. This would increase user confidence and accelerate adoption and exploitation of the technology. (Omwansa, Tonny 2014). This indicates that there is a gap in Kenya which needed to be looked at in regards to government offices not adopting cloud technology for project management.

Statement of the problem

Despite the huge investment in ICT infrastructure in Kenya, the projects implemented by the Information and Communication Technology Authority (ICTA) have been facing various challenges leading to project delay and cost overruns. Onkoba and Mungai (2023) found that the average success rate of government driven ICT projects are lower than 10% of all the prospected projects. The laptop project's (a flagship project of the Jubilee government) chances of success appear to be in jeopardy after it failed to kick off two years later. According to Energy, Infrastructure and ICT Sector Working Group (SWG) Report (2022), Government Common Core Network (GCCN) target was not met in the FY 2019/20. GCCN required funding for upgrade and redesign. Development of eGovernment Services also failed to meet target due to reduced budgetary provision. Half of the funds for the projects (50%) were utilized to clear pending bills accrued in FY 2019/20. Other ICT projects such as the National Addressing System, National Public Key Infrastructure, and Konza Technopolis City are yet to be fully implemented (KIPPRA, 2023). There exist some studies on cloud computing in Kenya. None of the studies focused on effect of cloud computing practices on performance of ICT projects in Kenya.

Research objectives

This study sought to examine effect of cloud computing practices on performance of projects in the Information and Communication Technology Authority in Kenya.

Specific Objectives

i. To determine the effect of cloud adoption strategy on performance of Information and Communication Technology Authority projects in Kenya.
ii. To examine the effect of cloud infrastructure monitoring on performance of Information and Communication Technology Authority projects in Kenya.

LITERATURE REVIEW

Theoretical review

This study was underpinned by the Technology-Organization-Environment theory developed by Tornatzky, L.G and Fleischer, M. The technology-organization-environment theory has a broad set of factors that predict the likelihood that information technology will be adopted and used (Tornatzky & Fleischer, 1990). As the TOE theory points out, the use and adoption of ICT are influenced by various factors that include technology development, organizational conditions, business and organizational reconfiguration and the industrial environment (Kauffman & Walden, 2001) .From a technological perspective, adoption is based on various technologies inside and outside the organization and perceived benefits, compatibility, complexity, experimentation, and visibility. Regarding the organizational context, multiple aspects of the business are embedded in its consideration. These include business scope, management support, culture, managerial structure, quality of human resources and firm size-related issues such as internal underutilization of resources and specialization (Oliveira & Martins, 2010). The environmental context is about the arena wherein the company carries out its business activities. The environmental context can be related to the availability of technical service providers and surrounding elements, like competitors, industry, etc. For instance, during the intense competition in the market, companies face pressure to accept new technology and innovation, to achieve a competitive edge over others (Baker, 2012)

Therefore, as compared to other technical innovations, cloud computing technology involves three key players, such as cloud users (client), cloud-based services and cloud service providers. Due to this, three main aspects influence cloud computing adoption in organizations, including cloud technical characteristics as a technological context, third party characteristics as an environmental context and the firm's characteristics as an organizational (Alshamaila, Papagiannidis, & Li, 2013)). Automation of services will enhance service self among users hence reducing work load for the staff and enhances effectiveness in service delivery. The authority will outsource ICT related projects depending on the demand from users. This relates to the rate at which public organizations automate the services offered hence increasing demand or use (Low, Chen, & Wu, 2011). TOE framework as a framework linked cloud adoption strategy and cloud infrastructure monitoring as cloud computing practices and how they influence the performance of ICT projects in Kenya.

Conceptual framework

In this research, the dependent variable is performance of ICT projects in Kenya while the independent variables include Cloud Adoption Strategy and cloud Infrastructure Monitoring.

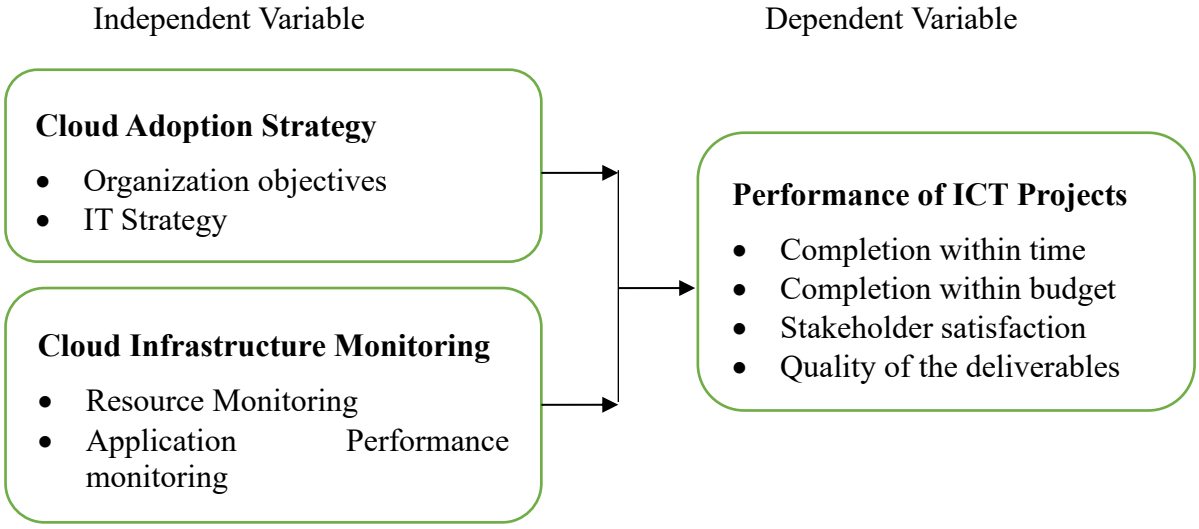

Figure 1: Conceptual Framework

Cloud Adoption Strategy

Before cloud adoption for a business, establishing clear goals for what you hope to gain by transitioning to the cloud is important. It is crucial to identify and list specific reasons for shifting to the cloud to ensure the company's success, which may include perks. To reap the most benefits from a cloud-first strategy, an organization's data must be moved to the cloud. A comprehensive assessment that takes into account opportunities, costs, and risks will ensure that business owners fully understand the ramifications and goals of cloud adoption (Buchanan Technologies, 2023). Before deploying cloud computing in your organization, you must develop your cloud strategy. Determine your cloud-related goals and objectives, the cloud service and deployment methods that are best suited for your organization, and the migration schedule. This will allow you to build a migration roadmap and ensure that everyone involved knows the plan (Valsarajan, 2023).

IT strategy provides a detailed plan that defines how technology should be used to achieve IT and business objectives. As a written document, IT strategy outlines the various aspects that influence an organization's investment in and usage of technology. Ideally, IT strategy should align with and define an organization's broader business strategy (Lebeaux & Pratt, 2023). The strategy n should be flexible to changing organizational circumstances, market and industry conditions, corporate targets and objectives, budgetary restrictions, available skill sets and core competencies, technological advancements, and user needs. IT strategies are sometimes known as technology strategies or IT strategic plans. An IT strategy has become a fundamental component of organizational leadership. Its prominence reflects the emergence of technology as a vital component of company success. The necessity of an IT strategy has grown as organizations focus on digital transformation. Technology is vital for generating new business models, goods, and services; boosting customer service and experience; growing sales; empowering workers and improving productivity; and facilitating connections with vendors and other business partners (Luxner, 2023).

Cloud Infrastructure Monitoring

Cloud monitoring assesses IT infrastructure health, enabling organizations to proactively monitor availability, performance, and security, identifying and resolving issues before they impact user

experience (DigitalOcean, 2024). It ensures optimal operation of websites, servers, and networks, providing insights into potential risks and issues. Continuous monitoring services help detect anomalies and improve security (Sangfor, 2024). Real-time monitoring of cloud infrastructure enables proactive problem resolution, improved performance and availability, enhanced security, and cost optimization by identifying potential threats and optimizing resource usage. Cloud infrastructure management techniques, whether manual or automated, ensure the availability and performance of websites, servers, applications, and other cloud infrastructure, predicting potential issues before they arise (Cisco, 2024).

Cloud Storage Monitoring is a type of monitoring that analyses and tracks storage resources, processes, performance, users, and databases. It can also track many analytics at once and is commonly used to host Infrastructure-as-a-Service (IaaS) and Software-as-a-Service (SaaS) solutions. Database Monitoring allows businesses to guarantee that database queries, processes, and other tasks run as efficiently as possible. It assures review availability, resource utilization, and data quality. It can also monitor connections and display real-time consumption information. Access requests can also be tracked to help improve response times. Virtual Machine (VM) Monitoring allows users to monitor VM performance, traffic, users, and capacity. This service is typically scaled out as a virtual server that runs several virtual desktops while also monitoring the running state of each VM (Sangfor, 2024).

Application Performance Monitoring (APM) is a cloud monitoring service that evaluates app availability, performance, consumption, and security to provide real-time visibility into application status and performance. APM is also used to monitor distributed cloud-based programs from start to finish using a single pane of glass, and it is frequently utilized to assess the business effect of applications. APM is a crucial cloud monitoring tool that measures application availability and performance, aiding development teams in troubleshooting issues, improving user experience, meeting SLAs, minimizing downtime, and lowering operational costs (Hashemi-Pour & Bigelow, 2024).

Empirical Review

Cloud Adoption Strategy and performance

Karvela et al (2021) analyzed the challenges and opportunities of cloud adoption in the supply chain in Greece using the SWOT analysis model. The study did an extensive review of literature to provide a theoretical base for the evaluation of factors that affect the decision of a firm to adopt a cloud-based solution. The study identified that the strength of cloud adoption relates to cost savings, internal processes, and distance working. The weaknesses relate to security, performance issues, software developers, compatibility issues, and the integration process. The opportunities from the cloud include ubiquitous access, information sharing, scalability, collaboration, and resources on demand. As for the threats they include legislation and lock-in data with specific providers. The study found that Cloud technology enables fast and flexible information exchange and collaboration across multiple stages. However, firms must overcome unseen barriers like as security and legislation to take advantage of all of the cloud's features. As a result, companies must be very cautious while determining which supply chain processes to migrate to the cloud and which cloud service paradigm to adopt. They should analyze their demands and consider all of the weaknesses and threats identified (Karvela, Kopanaki, & Georgopoulos, 2021).

Carcary et al (2018) explored the adoption of cloud computing by Irish SMEs. A quantitative research approach was employed where an online questionnaire was used. A total of 20 SMEs were sampled and 95 respondents were observed. The study found that 45% of the respondents were cloud adopters. The cloud adopters had focused their attention on establishing strategies to support their transition. The key areas included, developing the strategic intent and objectives for

cloud computing adoption. Establishment of a process for identifying services that are suitable for cloud migration, and involvement of stakeholders in determining cloud service readiness. Despite the importance of cloud computing, nearly 50% of respondents did not shift any services or procedures to the cloud. Furthermore, when it comes to individuals who had moved to the cloud, the research reveals that many of these SMEs did not carefully examine their readiness for implementing cloud computing technologies or did not embrace in-depth techniques to manage cloud engagement (Carcary, Doherty, & Conway, 2018).

Cloud Infrastructure Monitoring and performance

Ghorpade and Iyer (2021) studied the impacts and challenges of cost-effective approaches using hybrid cloud infrastructure model in business analytics. This study focuses on the discussion about the cost-effective method using cloud infrastructure model for building and management of on-premise with the off-premise cloud service provider in business analytics. This chapter discusses cost-effective methodologies for building and managing on-premise and off-premise cloud services in business analytics. It uses the YGCIS methodology and YGCCS framework to implement a cost-effective approach for total cost ownership (TCO). The results increase ROI and reduce TCO, addressing business analytics needs (Ghorpade & Iyer, 2021).

Kabuye (22023) investigated the factors influencing the adoption of cloud technologies in commercial banks in Kenya. A descriptive survey design was adopted and 2,300 respondents from 44 commercial banks in Nairobi County were targeted. A sample of 340 was used for the study. The study examined the influence of organizational factors, technological factors, and behavioural factors. The study found organizational factors had a strong significant correlation ($r = .835$, $sig = .05$) and explained 72.6% variation in cloud adoption. The organizational factors also had a positive significant association ($\beta = .776$, $sig = .000$). The factors include infrastructure scalability, pay-as-you-go models, rapid deployment, reduced capital cost, high performance of IT services, and enhanced uptime. The study also found behavioral factors had a strong significant correlation ($r = .867$, $sig = .05$) and explained 74.8% variation in cloud adoption.

RESEARCH METHODOLOGY

This study used descriptive research design since it focused on observing and describing a phenomenon without manipulating variables. The unit of analysis was seven ICT projects in Kenya under the ICT Authority while the unit of observation was 200 key middle and top managerial respondents comprising of the ICT staff, Project managers, and Project supervisors involved in projects. A census was used since the population was manageable. Purposive, stratified, and simple random sampling techniques were used to select the respondents. The researcher used a questionnaire to collect primary data directly from the respondents. Descriptive and inferential analysis was used. SPSS version 28 was used for the data analysis.

RESEARCH FINDINGS

The sample size was 200 respondents who work with the ICT authority in Kenya. The researcher distributed 200 questionnaires to the respondents where 172 were filled and returned which accounted for 86% % of the response rate.

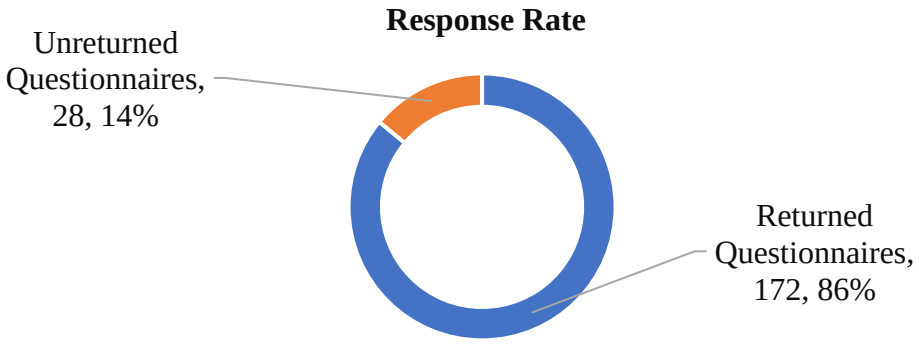

Figure I: Response Rate

Descriptive Analysis

Cloud Adoption Strategy

The descriptive data show respondents' perceptions of Cloud adoption strategy practices in ICT authority projects in Kenya. The mean measures the average response along with the standard deviation, which measures the dispersion from the mean. The first objective of the study was to determine the effect of the cloud adoption strategy on the performance of Information and Communication Technology Authority projects in Kenya. The average cloud adoption of 3.23 indicates neutrality in responses and they didn't deviate much from the mean as shown by the standard deviation of 1.021.

Table I: Cloud Adoption Strategy

Cloud Adoption Strategy	Mean	Std Dev
The ICT authority has clear objectives on the need for cloud adoption.	3.01	1.289
The ICT authority has identified specific capability gaps and organizational dependencies for improving cloud readiness	3.26	1.322
The ICT authority evaluates the IT strategy to assess the readiness of the authority to adopt cloud computing.	3.25	1.307
The ICT authority also assesses the compliance requirement in readiness to be integrated with the cloud.	3.30	1.320
The ICT authority has an elaborate adoption plan for streamlining the cloud transformation journey.	3.45	1.335
The cloud deployment model is appropriate and allows for the scalability and security requirements of the ICT authority.	3.13	1.445
Average Cloud Adoption Strategy	**3.23**	**1.021**

Respondents were doubtful whether the ICT authority had clear objectives for adopting cloud computing in its projects. This is shown with the mean score (3.01) below the average cloud adoption strategy (3.23). This finding suggests that there is lack of a fit between the benefits of cloud adoption and the objectives of the ICT authority. According to Banerjee (2024), though cloud computing offers numerous benefits that can help your business develop, it is easy to become

overwhelmed by the enormous number of products and feature updates available, making it tough to choose which ones are best for your company. To deal with such a changing environment, there is a need to have a clear and effective cloud plan that helps keep the cloud costs low and figure out the best cloud technologies for the business. The respondents also expressed their doubt about whether the ICT authority had identified specific capability gaps and organizational dependencies for improving cloud readiness. This was indicated by the mean score of 3.26 slightly above the average cloud adoption strategy (3.23) implying that the statement positively contributes to cloud adoption strategy. A thorough investigation is required to discover the applications that may be optimized using the cloud. Identifying the important stakeholders and their requirements, such as consumer requests, industry, location factors, etc., is important for creating a cloud strategy that is preferred (Banerjee, 2024).

The respondents also doubted whether the ICT authority evaluates the IT strategy to assess the readiness of the authority to adopt cloud computing. This was supported by the mean score of 3.25 though above the average cloud adoption strategy (3.23) indicating it positively influenced the variable. Lebeaux and Pratt (2023) argued that an IT strategy has become a fundamental component of organizational leadership. Its prominence reflects the emergence of technology as a vital component of company success. The necessity of an IT strategy has grown as organizations focus on digital transformation. The respondents also expressed their disbelief that the ICT authority also assesses the compliance requirement in readiness to be integrated with the cloud. The statement was supported by the mean score of 3.30 which is above the average cloud adoption strategy indicating a positive contribution to the variable. According to Banarjee (2024), migrating to the cloud provides a security and compliance risk. Data protection and its safety is a top priority. The use of encryptions should be with vast access control and identity and access management solutions to authenticate and define roles. Compliance can be at risk of failure to meet regulatory requirements and standards which is a complex. However, complying with these standards is essential for cloud operations.

However, respondents slightly agreed that the ICT authority has an elaborate adoption plan for streamlining the cloud transformation journey. The mean score of 3.45 which is above the average (3.23) indicates agreement. A well-structured and defined cloud strategy ensures that you meet all your business requirements, goals, and objectives with the adoption of cloud computing technology. It aligns with your needs and helps you understand how cloud computing can contribute to achieving your business goals, such as reduction of costs, agility, competitiveness, etc (Banerjee, 2024). Lastly, the respondents were doubtful that the cloud deployment model is appropriate and allows for the scalability and security requirements of the ICT authority. The means score of 3.13 which is below the average cloud adoption strategy indicates the statement doesn't positively contribute to the variable. Barnjee (2024) opined that there is a need to determine which cloud service model will fit your business model and align with your objectives and resources. In addition, selecting an appropriate cloud deployment model while keeping the security and scalability requirements of your organization in mind is critical.

Cloud Infrastructure Monitoring

The descriptive data show respondents' perceptions of Cloud infrastructure monitoring practices in ICT authority projects in Kenya. The mean measures the average response along with the standard deviation, which measures the dispersion from the mean. The second objective of the study was to examine the effect of cloud infrastructure monitoring on performance of Information and Communication Technology Authority projects in Kenya. The average cloud infrastructure monitoring of 3.41 indicates agreement in responses and they didn't deviate much from the mean as shown by the standard deviation of .849.

Table II: Cloud Infrastructure Monitoring

Cloud Infrastructure Monitoring	Mean	Std Dev
The ICT authority monitors auto-scaling events to ensure that the computing resources infrastructure scales according to demand.	3.30	1.355
There is tracking of the utilization of cloud resources to ensure cost-efficiency and avoid unexpected billing spikes.	3.19	1.329
The cloud services are measured on their availability through monitoring uptime, downtime, and mean time between failures	3.46	1.468
Real-time performance metrics of cloud-hosted applications are collected, including response time, throughput, and error rates.	3.70	1.47
The SLAs are monitored to ensure that the cloud infrastructure meets the performance criteria defined	3.48	1.206
Automated alerts are configured based on specific log patterns.	3.34	1.427
Average Cloud Infrastructure Monitoring	**3.41**	**.849**

The respondents were doubtful about whether the ICT authority monitors auto-scaling events to ensure that the computing resources infrastructure scales according to demand. This is indicated by the mean of 3.30 which is below the average cloud infrastructure monitoring implying that it doesn't positively influence the variable. The respondents also were neutral on whether there is tracking of the utilization of cloud resources to ensure cost efficiency and avoid unexpected billing spikes. The mean score of 3.19 which is below average cloud infrastructure monitoring indicates the statement doesn't positively influence the variable. Cloud infrastructure offers dynamic scaling of resources in response to demand. Monitoring tools track the performance of auto-scaling systems, ensuring that resources are supplied or deleted at the appropriate periods to maintain performance while controlling costs. A good example is Microsoft Azure which encourages the use of performance monitoring tools to manage auto-scaling, to ensure that applications stay responsive even during traffic surges (Microsoft Ignite, 2022).

The findings suggest moderate agreement among respondents that the cloud services are measured on their availability through monitoring uptime, downtime, and mean time between failures. This was shown by the mean score of 3.46 which is above the average cloud infrastructure monitoring (3.41) suggesting the importance of monitoring the cloud services. According to a Gartner report (2023) on cloud security trends, 75% of cloud security failures are due to inadequate monitoring and misconfigurations, this underscores the need for continuous monitoring. It was also agreed by the majority of the respondents that real-time performance metrics of cloud-hosted applications are collected, including response time, throughput, and error rates. The mean score of 3.70 which is above the average cloud infrastructure monitoring underscores the importance of monitoring the real-time performance metrics of the cloud-hosted applications. According to DigitalOcean (2024) Cloud metrics are critical for monitoring cloud infrastructure health and performance, optimizing resource utilization, lowering cloud expenses, and guaranteeing cloud compliance. Cloud measurements are classified into three types: performance metrics, which evaluate infrastructure speed and efficiency, operational metrics, which monitor resource utilization and system operations, and security metrics, which analyze the effectiveness of protective measures and data integrity.

The respondents also agreed that the SLAs are monitored to ensure that the cloud infrastructure meets the performance criteria defined. The mean score of 3.48 which is above the average

infrastructure monitoring (3.41) suggests that SLAs monitoring is crucial to determine the performance of the cloud infrastructure. Cloud monitoring solutions track whether the cloud provider is following these pledges, allowing organizations to hold providers accountable and make data-driven decisions about service reliability (IBM, 2023). Lastly, the respondents doubt that the automated alerts are configured based on specific log patterns to monitor the logging activities in the cloud system. The mean score of .3.34 which is below the average cloud infrastructure average of (3.41) suggests the statement doesn't positively influence the variable an indication that logging system configuration is not effectively utilized. Logs provide useful information for understanding system behaviour, tracking security occurrences, and troubleshooting performance issues. Cloud monitoring solutions frequently incorporate log management tools that collect and analyze log data from a variety of cloud services, offering actionable insights for both system administrators and developers (exabeam, 2024).

ICT Projects Performance

ICT project performance refers to how well an ICT project meets its objectives within the restrictions of time, budget, and quality. Maintaining high performance is crucial for generating value and achieving success in such ventures. There is a perception of low performance in the ICT business, with varying viewpoints on the cause. As technology grows more entrenched in society, great performance becomes increasingly important (Kashiwagi, 2021).

Table III: ICT Projects Performance

ICT Projects Performance	**Mean**	**Std Dev**
Effective cloud management practices have ensured that ICT projects are timely delivered.	3.38	1.386
The milestones for the ICT projects are met based on their schedules	3.33	1.338
The ICT projects are implemented within their desired budgets	3.34	1.290
There are a lot of budget variations for ICT projects294	3.45	1.294
The stakeholders of the ICT project are satisfied with how they are being implemented	3.35	1.282
The stakeholders of the ICT projects are also satisfied with the projects delivered	3.09	1.288
The quality of the ICT projects is desirable	3.36	1.306
The ICT projects have also produced quality deliverables	3.28	1.379
Average ICT Projects Performance	**3.35**	**.619**

The respondents were doubtful whether the cloud computing practices have ensured timely delivery of the ICT projects. The means score of 3.38 (Std dev = 1.386) though above the average project performance (3.35) suggests the time indicator of the projects is not clearly met. Kenya Education Network (KENET) is yet to fully provide cost-effective internet to enhance education and research though it boasts connecting over 200 institutions with high-speed global internet. The digital learning programme (DLP) is yet to be realized after being launched in 2013 (Ministry of information, communication and the digital economy, 2024). Konza City since its launch in 2008 has little progress with almost 16 years down the line Kenya awaiting the smart city. Keritich and Makau (2023) reiterated that though Kenya has made good strides and gained a modest global

ranking on ICT implementation, the government's ICT projects fail in different stages including the implementation stage; initiation stage, and others do not kick off at all.

The respondents also were neutral on whether the milestones for the ICT projects are met as indicated in their schedules. The mean score of 3.33 (Std dev = 1.338) which is below the average project performance (3.35) indicates the milestones are not timely met. The digital learning programme initiated in 2013 was supposed to be rolled out in phases and based on the implementation plan, the programme should be in phase 3 targeting the tertiary schools however, that hasn't been realized with only the first phase being implemented (ICT Authority, 2019). The respondents were also doubtful about whether the projects were implemented within their budgets. The mean score of 3.34 (Std dev = 1.290) which is below the average project performance (3.35) suggests that the budget indicator is not clearly met. On variations in budgets for the ICT projects, respondents agreed that the budgets for the project were changed as indicated by the mean score of 3.45 (Std dev = 1.294) which is above the average project performance (3.35).

There was no clear indication of whether the respondents were satisfied with the implementation of the ICT projects. The mean score of (3.35, Std dev =1.282) doesn't clearly indicate the status of the responses. The respondents also expressed their doubts that the stakeholders of the ICT projects are also satisfied with the projects delivered. The mean score of 3.09 (Std dev = 1.288) which is below the average project performance (3.35) suggests the stakeholders were not whole-heartedly satisfied with the delivered projects. The respondents also doubted whether the quality of the ICT projects is desirable. The mean of 3.36 (std dev =1.306) though slightly above the average project performance (3.35) suggests the quality of the projects was questionable. The respondents also were doubtful about whether the ICT projects have also produced quality deliverables. The mean score of 3.28 (Std dev = 1.379) which is below the average project performance (3.35) suggests the quality of the deliverables was questionable.

Onkoba and Mungai (2023) found that the average success rate of government-driven ICT projects is lower than 10% of all the prospected projects. Energy, Infrastructure and ICT Sector Working Group (SWG) Report (2022) indicated that the Government Common Core Network target was not met in the FY 2019/20. Development of eGovernment Services also failed to meet target due to reduced budgetary provision. Half of the funds for the projects (50%) were utilized to clear pending bills accrued in FY 2019/20. Other ICT projects such as the National Addressing System, National Public Key Infrastructure, and Konza Technopolis City are yet to be fully implemented (KIPPRA, 2023).

Normality Test

The Shapiro and Wilk (1965) test was performed to determine the normality of the data (Shapiro & Wilk, 1965). Table IV shows that all of the variables had p-values ranging from 0.74 to 0.123, which were larger than 0.05 inferring that, while our data is slightly skewed and kurtotic for the variables, it does not deviate considerably from normalcy.

Table IV: Shapiro-Wilk test of normality

	Shapiro-Wilk		
	Statistic	**Df**	**Sig**
Cloud Adoption Strategy	.975	172	.080
Cloud Infrastructure Monitoring	.986	172	.123
ICT Projects Performance	.946	172	.074

Multicollinearity

Multicollinearity is confirmed by significant VIF values less than 10 and small tolerance levels greater than.2 (Hair, Anderson, Tatham, & Black, 2010). In this study, the tolerance values for cloud adoption strategy (0.655) and Cloud infrastructure monitoring were all greater than 0.2 or 20% while the VIFs were all less than 10 indicating the absence of multicollinearity in the study variables. Table V below shows the findings.

Table V: Multicollinearity

	Collinearity Statistics	
	Tolerance	**VIF**
Cloud Adoption Strategy	0.655	1.527
Cloud Infrastructure Monitoring	0.634	1.578

Correlation analysis

Correlation analysis was used to determine whether there is a significant relationship between the variables and the direction of the relationship. Results from Table V below reveal that the Pearson correlation coefficient for Cloud adoption strategy was 0.655 (r > 0.5) and a significance value of 0.00, indicating that there is a strong and positive association between Cloud adoption strategy and the performance of ICT projects. A unit change in the Cloud adoption strategy would cause a magnitude of 0.655 significant positive change in ICT project performance. Previous studies have supported a strong and positive correlation between cloud adoption strategy and organizational performance. Kabuye (2023) found a strong correlation between organizational factors and the adoption of cloud computing in commercial banks (r = .835, sig = .000). Pearson correlation coefficient for Cloud infrastructure monitoring was 0.304 (r <0.5) and a significance value of 0.00, indicating that there is a weak and positive association between Cloud infrastructure monitoring and the performance of ICT projects. A unit change in Cloud infrastructure monitoring would cause a magnitude of 0.304 significant positive change in ICT project performance. Previous studies have supported a strong and positive correlation between effective.

Table VI: Correlation Analysis

		Cloud Adoption Strategy	Cloud Infrastructure Monitoring
ICT Projects Performance	Pearson	.655**	.304**
	Sig. (2-tailed)	.000	.000
		172	172

Regression Coefficients

The coefficients show the influence of each predictor variable on dependent variable. From table VII below, the coefficient of cloud adoption strategy is .180(sig = .002<0.05), suggesting that cloud adoption strategy has a significant positive relationship with the performance of ICT projects in Kenya. The result implies that implementing an effective cloud adoption strategy will likely positively influence the performance of ICT projects in Kenya. The results are also substantiated by t-calculated (3.107) > t-critical (± 1.974) which indicates the significance of the cloud adoption strategy in enhancing the performance of ICT projects in Kenya. Thus, for the first objective, cloud adoption strategy significantly influences the performance of ICT projects in Kenya.

The results are consistent with past research findings, such as Rawashdeh and Rawashdeh (2023) who established that cloud accounting adoption significantly influenced the performance of SMEs in Jordan in industrial, services, and commercial sectors. It was found that digital vision moderated the cloud adoption process since the digital vision in SMEs represented broad intentions, forward-thinking, and all-inclusive. Though most organizations adopted technology organization environmental (TOE) framework, the digital vision was applied in this study. The management should play a clear role in establishing a clear digital vision for the organization to expand and integrate technology. Alshahrani (2021) found that based on the resource-based view and TOE framework adoption of cloud computing positively impacts on the organizational performance of SMEs in Saudi Arabia. Kabuye (2023) found organizational factors had a positive significant relationship with the adoption of cloud computing in commercial banks in Kenya (β = .776, sig = .001). Nassoura and Hassan (2021) found that leadership support significantly influences the adoption of cloud computing for human resource management, leading to significant innovation behavior. This suggests that leadership support partially mediates the relationship between cloud-based human resource management and innovation behavior.

The coefficient of cloud infrastructure monitoring is .173 (sig = .000 <0.05), suggesting that cloud infrastructure monitoring has a significant positive relationship with the performance of ICT projects in Kenya. The result implies that implementing an effective cloud infrastructure monitoring will likely positively influence the performance of ICT projects in Kenya. The results are also substantiated by t-calculated (4.021) > t-critical (± 1.974) which indicates the significance of the cloud infrastructure monitoring in enhancing the performance of ICT projects in Kenya. Thus, the second objective of the study was to examine the effect of the cloud infrastructure monitoring on performance of Information and Communication Technology Authority projects in Kenya. The study found a positive significant association between cloud infrastructure monitoring and the performance of ICT projects in Kenya.

According to a Gartner report, organizations that use cloud-based performance monitoring systems improve their operational efficiency by 33% on average. For example, a large e-commerce site switched to cloud infrastructure and saw a 50% decrease in downtime, greatly increasing sales during busy seasons. This change not only improved resource allocation, but also enabled real-time response to traffic spikes, illustrating how cloud solutions can promote agility and resilience. Furthermore, the scalability provided by cloud technology not only improves performance monitoring but also turns it into a competitive advantage. According to a McKinsey analysis, organizations that use cloud-based analytics are five times more likely to make faster decisions than their cloud-less counterparts. Consider a financial services organization that used a cloud monitoring solution: they could analyze performance parameters in real-time, reducing reporting time by 70%. This increased speed of insight allowed them to adapt their strategy and dramatically improve customer happiness, demonstrating how integrating cloud infrastructure can lead to major improvements in performance monitoring and overall business success.

Table VII: Coefficients of Study Variables

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.191	.199		5.996	.000
	Cloud Adoption Strategy	.180	.058	.297	3.107	.002
	Cloud infrastructure Monitoring	.173	.043	.238	4.021	.000

a. Dependent Variable: Performance of ICT Projects

The following regression model was fitted;

$$Y = 1.191 + 0.180X_1 + 0.173X_2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (i)$$

Where; Y= Performance of ICT projects;

β_o = Constant (Coefficient of intercept) e_0 = Error term

X_1 = Cloud Adoption Strategy

X_2 = Cloud Infrastructure Monitoring

CONCLUSION

The first objective of the study was to determine the effect of cloud adoption strategy on performance of Information and Communication Technology Authority projects in Kenya. The study found that cloud adoption strategy significantly influenced performance of projects in the ICT authority. The study therefore concludes that cloud adoption strategy as a practice significantly influences performance of ICT authority projects in Kenya. The second objective of the study was to examine the effect of Cloud infrastructure monitoring on performance of Information and Communication Technology Authority projects in Kenya. The study found that cloud adoption strategy significantly influenced the performance of projects in the ICT authority. The study therefore concludes that cloud adoption strategy as a practice significantly influences performance of ICT authority projects in Kenya.

Recommendations

Organizations should adopt a hybrid cloud strategy, combining on-premises and cloud resources, to protect sensitive data while utilizing public cloud services. Working with localized providers reduces latency and ensures local regulations. Choose cloud providers that align with project goals, consider factors like data security, reliability, customer support, and cost transparency, and opt for platforms with easy integration and open standards. The study also recommends stable internet connections, use of dedicated bandwidth, and being mindful of latency and bandwidth costs when using public cloud services, and choosing local providers when appropriate. The study also recommends the choice of scalable cloud platforms for Kenya's rapidly developing ICT sector to meet future demands and ensure your organization can keep pace with future demands. It is also important to upskill local IT teams with relevant certifications and cloud training programs to improve adoption and address talent gaps, and work with global cloud vendors for knowledge transfer.

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