CLOUD ANALYTICS PRACTICES AND PERFORMANCE OF STATE DEPARTMENT FOR HIGHER EDUCATION & RESEARCH IN KENYA

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ABSTRACT

Purpose: The aim of this study was to examine the influence cloud analytics practices on the performance of the State Department for Higher Education & Research (SDHER), Kenya. The specific objectives were to examine the influence of data management analytics; and to assess the influence of security compliance analytics on performance of State Department for Higher Education & Research in Kenya, Kenya. The study was anchored on Technology Organization Environment theory.

Methodology: In this study, the research strategy adopted was descriptive survey approach. the target population consisted of 160 personnel with ICT and technical mandates in the agencies under the state department. Due the small number, a census was adopted and the 160 individuals involved. Questionnaire was the main data collection tool, both descriptive and inferential analysis were conducted. Published reports also used as secondary source of data.

Findings: The study found a positive, significant, and strong correlation (r = 0.927; p<0.001) on data management analytics and performance of State Department for Higher Education & Research in Kenya as well as a significant weak correlation (r = 0.191; p<0.015) between Security compliance analytics and performance of State Department for Higher Education & Research in Kenya. From the regression analysis, data management analytics significantly influenced performance of State Department for Higher Education & Research in Kenya by 0.635 or 63.5% while Security compliance analytics significantly influenced performance of State Department for Higher Education & Research in Kenya by 0 .152 or 15.2%.

Recommendations: The state department should ensure the cloud solutions come with in-built data government and business intelligence capabilities; are scalable and can easily be adjusted to meet the storage and computing needs. The Government agencies should invest in advanced security technologies and ensure there is regular update and patching of the systems to ensure timely detection of anomalies, fraud and other security threats. The cloud solutions should also have security analytics capabilities with in-built threat detection and prevention tools; logging, automated vulnerability scans, and threat neutralization. Government agencies looking for a new partner to power their current and future government IT needs ensure security compliance by selecting a cloud provider with strong data protection measures to ensure compliance to Data Protection Act of 2019 and related regulations.

Keywords: Data Management Analytics, Security Compliance Analytics, Cloud computing analytics, performance of state department for higher education & research

Background of the Study

Over the last decade, there has been a technological revolution powered by the penetration of mobile computing devices and ever improving access to the internet and telecommunications infrastructure. The current decade also saw the ICT industry reaping big from otherwise a pandemic, COVID-19. Post COVID-19 pandemic, ICT has ingrained itself fully in operations both in public and private sector. With the stagnating budgets, and the demands for more finances to fund ICT projects, organizations have been pursuing solutions that are flexible, agile, scalable, and cost-efficient. Cloud computing has been coming with all attributes in addition to the much-needed analytics and the time-tested security features (Barr, 2016). Whereas cloud computing has been widely adopted in private sector, government ministries, departments, and agencies (MDA) have also taken strides towards adoption of cloud-based services although there is no coordination on the approach (Walubengo, 2023).

In this contemporary age of big data, where corporate executives have access to enormous data and information than ever before, analyzing that information to gain insights for decision making is greatly becoming important for anyone in leadership position (Vivek, 2024). The growth of data volumes both generated and consumed by organizations has demanded need for robust analytic tools such as cloud analytics. Cloud Analytics refers to the use of cloud computing resources and technologies for the storage, processing, analysis, and visualization of data (Ghosh, 2018). Cloud analytics allows organizations leverage on cloud infrastructure and services to perform data analytics tasks, enabling organizations to derive valuable insights from large and complex datasets

Cloud-based solutions give organizations of all sizes the tools and technology they need to carry out their primary mandates more effectively. Government organizations have a lot of useful information sitting in their legacy systems. However, following decades of expansion, this data is frequently dispersed between standalone cloud solutions and on-premises systems. It is therefore challenging to obtain, distribute, and evaluate data in meaningful ways because of this patchwork. Instead of adding to the burden and complexity of copying or moving data, cloud data platforms provide a single source of truth that speeds up and secures data sharing, enabling government agencies to share information effectively both internally and with other government agencies, the general public, and private partners (Snowflake, 2024).

The Ministry of Education has embarked on key reforms in the education sector with the Department for Higher Education & Research being one of the primary implementors of the reforms. At the centre of the reforms is the implementation of the New Funding Model (NFM) which is heavily a data-driven model that seeks to use a lot of indicators to determine student's level of need (MOE, 2023). The Commission for University Education (CUE), the regulator of university education relies heavily on data to undertake its mandate, and especially to successfully implement the ongoing education reforms (Commision for University Education, 2024). Kenya Universities and Colleges Central Placement Services (KUCCPS) plays a critical role in the execution of the state department mandate by undertaking the placement of students, carrying out career guidance and providing the government with advisories related to placement of students. The mandate demands not only adoption of efficient and robust systems, but also integrations for secure data exchanges. The Higher Education Loans Board (HELB) is charged with financing the higher education and has been administering loans and bursaries However, HELB is faced challenges such as underage applicants with no national identification documents yet, increased number of applications and applicants giving incorrect or insufficient information leading to inaccurate classification especially under NFM. University Fund Board (UFB) is working in collaboration with HELB in making use of data to establish applicants' level of need to administer scholarships, previously refereed as grants. Therefore, acquisition, secure storage, and making use of data has become imperative of the agencies in the state department. Notwithstanding the

challenges, the students are required to apply for government funding via an online portal available through www.hef.co.ke whose uptime, usability, scalability, security, and agility is very critical (MOE, 2023)

The agencies in the state department, not only require enormous data to carry out their mandates, but they also generate sensitive data, which if not adequately protected, can exposed to cyberattacks and data breaches. The agencies are also expected to meet the requirements of the Data Protection Commissioner as both Data Controllers and Data Processors (ODPC, 2024). Accordingly, while seeking cloud services, the agencies are bound to adhere to data protection requirements by selecting a cloud provider with strong data protection measures. In addition, data encryption, access control, and a dedication to maintaining strong data storage and physical infrastructure security controls are all hallmarks of industry-leading data security and compliance (Barr, 2016).

Statement of the Problem

The Government of Kenya has embarked on key reforms in the education sector with the Ministry of Education and particularly the State Department for Higher Education & Research being the primary implementer of the reforms touching on the higher education. At the centre of the reforms is a myriad list recommendations of the Presidential Working Party on Education Reforms which submitted its report in June 2023 (MoE, 2023). The implementation of the reforms is resource-intensive, puts ICT at the centre as a key driver and enabler and will rely heavily on data-driven decisions. In addition, the state corporations in the Ministry of Education just like in across the other ministries are now battling survival in the wake of consideration of mergers or dissolutions by the National Treasury owing to performance issues (GoK, 2024).

The State Department for Higher Education & Research seems to have made significant strides in implementing reforms, however, the last two years has seen the state department and agencies therein attract public criticism over implications of reforms put in place. Central to the concerns raised are ability of the agencies in the state department to undertake the reforms as they are ICT-driven and the readiness and robustness of their information systems. The issues raised trace back to inadequate funding and possible lack of enough data or exploiting the available data to generate insights to facilitate decision making. For example, the NFM reforms are in the second year of implementation and are heavy on data thus demanding need for integrators and analytics through scalable, flexible, agile and secure information systems. The implementation of the NFM has also proven to be heavy on data, which is not only required to be sufficient, but accurate to ensure the applicant's level of need is accurately determined as they apply through the online portal, HEF (UFB, 2023). All these challenges may point to lack of full adoption of cloud solutions and embedment of cloud analytics in the operations of the state agencies to fully undertake their mandates with efficiency amid shortage of funding and the reliance on accurate data. Several studies have focused on data analytics and organizational performance at global, regional, and local perspective but have not looked at cloud analytics through data management analytics and security compliance analytics gaps that this study seeks to fill by examining the influence of cloud analytics and performance of state department for higher education & research in Kenya.

Objectives of the Study
The general objective of this study was examined the influence of cloud analytics practices on performance of State Department for Higher Education & Research in Kenya.
Specifically, the study sought:
  i)   To examine the influence of Data Management Analytics on performance of State Department for Higher Education & Research in Kenya.
  ii)   To assess the influence of Security Compliance Analytics on performance of State Department for Higher Education & Research in Kenya.

THEORETICAL REVIEW

Technology-Organization-Environment Theory

Tornatzky and Fleischer (1990) postulates that under Technology-organization-environment theory, there is a general set of factors that predict the likelihood that information technology will be adopted and used. As the TOE theory points out, the use and adoption of ICT is influenced various factors that include technology development, organizational conditions, business and organizational reconfiguration and the industrial environment (Kauffman, 2001). As regards from a technological perspective, adoption is based on various technologies inside and outside organization as well as perceived benefits, compatibility, complexity, experimentation and visibility.

When it comes to the organizational context, various 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 resources and specialization. Cloud computing is being used by national and local governments around the world as a new manner of reasoning and execution for government IT departments, resulting in more competent public services with fewer public resources (Alshahrani, 2020). Most of the leading websites in Kenya like Nation Newspapers, Standard Newspapers and agencies such as Kenya Airways are also hosted in data centres outside the country and therefore are global cloud services. It can be noted that TOE theory underlines Rogers' three groups of adoption predictors—change-related leader characteristics. Including internal characteristics that include centralization, complexity, formalization, interconnectedness, organizational unevenness and size, and the external characteristics they include openness of the system. This theory was useful in explaining how cloud computing analytics influence organization performance in State Department for Higher Education & Research in Kenya.

Conceptual Framework

In this research, the dependent variable is performance of state department for higher education & research in Kenya, while the independent variables are Data management analytics and Security compliance analytics.
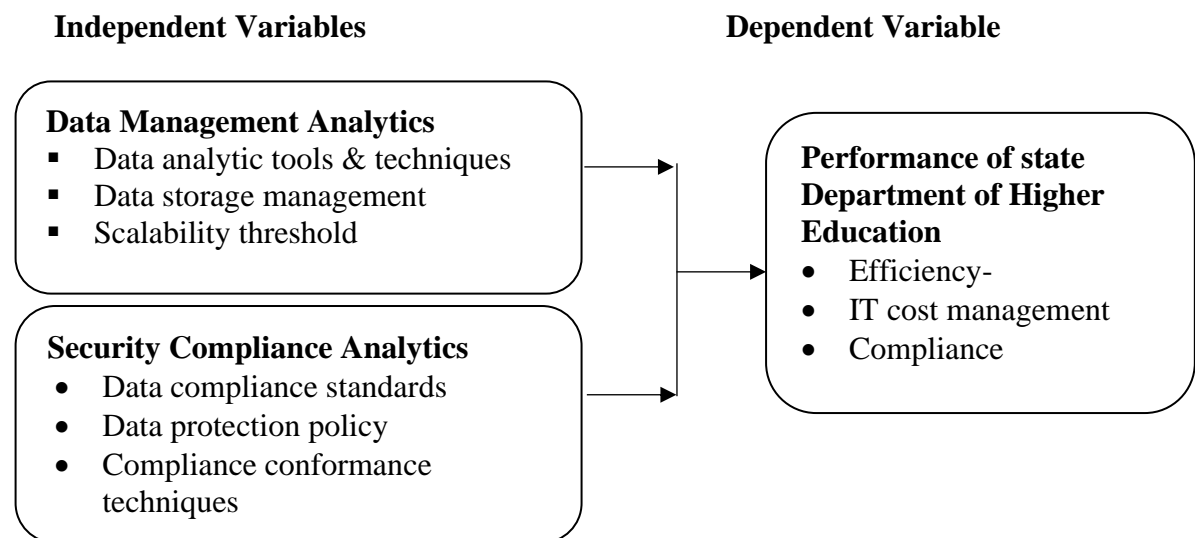

Figure 1: Conceptual Framework

Data Management Analytics

Data analytics being a subset of business analytics focusses on using data to analyze current and historical business performance to gain insights that might help executives make better decisions (Vivek, 2024). Data analytics enables businesses to develop reports and identify patterns that can help them function more efficiently. Data analysis may also help businesses make better decisions by predicting industry trends or what their customers will want next. In business, data analytics refers to the process of gathering, processing, analyzing, and interpreting large amounts of data to extract meaningful insights, patterns, and trends that can inform and guide strategic decisions, improve operational efficiency, and drive overall business growth. It entails employing a variety of strategies, tools, and procedures to convert raw data into actionable information that can be utilized to make educated decisions and optimize various elements of the organization. Data analytics enables firms to move beyond guessing and intuition and make decisions based on hard evidence. It enables firms to better understand customer preferences, optimize processes, minimize risks, find growth possibilities, and remain competitive in a continually changing business market (Stevens, 2023).

For enterprises, the cloud's scalability of computing resources is a key feature (Tripathi, 2017). Cloud computing provides excellent prospects for corporate growth by allowing an enterprise to scale up or down in accordance with its computing needs (Sundee, 2018). Access to cutting-edge middleware and data services through cloud computing boosts developer productivity and code quality by reducing errors, testing expenses, and increasing accuracy, which in turn improves application delivery (Vargas et al., 2017). Data analytics is a discipline that aims to extract insights from data and includes the methods, tools, and techniques used for data analysis and management, such as data gathering, organization, and storage (Chang et al., 2019). Data analytics teams use a variety of data management approaches, such as data mining, data cleansing, transformation and modelling (Olavsrud, 2023).

Security Compliance Analytics

This is the process of collecting, analyzing, and reporting data on an organization's compliance with security policies, standards, and requirements (Naseer, Shanks, Ahmad, & Maynard, 2019). This is critical for organizations that need to guarantee that their information systems and data management procedures comply with a variety of legal and regulatory standards, including General data protection regulation (GDPR) and Data Protection Act (2019) in Kenyan context (Olavsrud, 2023). Security compliance analytics entails monitoring and analyzing data processing processes to ensure they follow GDPR principles; automating breach detection and reporting procedures; tracking and handling data subjects' requests; and ensuring data encryption and pseudonymization to safeguard personal information (ODPC, 2024).

In relation to data security standard security compliance analytics there is continuous monitoring of network security and access controls; automating vulnerability scanning and penetration testing to detect flaws; logging and analyzing transactions to detect fraud or unauthorized access; and ensure encryption and secure data storage methods are adhered to. Organizations are finding the need to deploy increasingly sophisticated analytics techniques to head off noncompliance and fraud before damages occur and regulators take notice. Some of the compliance techniques include visual analytics that summarize the actionable results of customers, use of text analytics to mine and sense the insights of documents, network analysis to identify collusive activity, detection of anomalies to identify risk compliance and new fraud, and rule base monitoring (Deloitte, 2019).

Organizational Performance

According to Walubengo (2023) one important advantage of cloud computing is this; that the technology enables businesses to adjust their processing capacity in response to fluctuations in business demand while transforming otherwise expensive upfront capital expenditures into more affordable ongoing operating costs, or "pay-per-use". Big data complements information

technology along with the utilization capability, which helps enhance organizational performance (Kung et al., 2015). This high degree of operational performance results in cost-effective operations that can make it through difficult times and support overall sustainability. Big data predictive analysis action capability can form the basis for this operational elevation and can also enable organizations to make appropriate decisions (Roman Pais Seles et al., 2018). Gupta et al. (2018) emphasize that market performance can be achieved through innovation, which has a parleying effect between market orientations and organizational learning. This is the hallmark of cloud computing, which continues to revolutionize the IT industry seeing firms move away from on-premise infrastructure to virtual, metered, flexible, scalable and secure environments.

Sheedy (2018) study on the theme found out that businesses are utilizing the public cloud by leveraging the ecosystem of partners and independent service providers (ISVs) in cloud computing to be more competitive and quickly develop new consumer value. Cloud computing lowers infrastructure costs and levels the playing field for SMEs according to Alshahrani (2021), who expanded on this finding. Another observation is that software on the cloud would be simpler to install, maintain, and update for better performance than software used with client-based computing, which necessitates software installation, configuration, and update with each new release as well as revisions of other programmes with every update. This advantage is crucial for rural consumers, who typically lack IT skills and benefit from the flexibility that cloud services offer. Cloud Computing clients do not commonly possess the physical framework filling as host to the product stage being referred to, rather, they maintain a strategic distance from capital use by leasing use from a specialist and outsider supplier (Hanlon, 2019).

EMPIRICAL REVIEW

Data Management analytics and Organizational Performance
Wan et al (2017) investigated the impact of data analytics capabilities on organizational performance of with the moderative role of exploitive and exploratory innovation department in China. The study used interviews and Delphi study to collect data where the study specified data analytics capabilities as data collection ability, analytics maturity, business knowledge of IT department, and analytical ability. Data was collected from IT managers in business and the study aimed to develop a model for measuring data analytics capabilities (Wan, Mao, Hsieh, & Chen, 2017). The study was done in China and did not come up with concrete findings. Shabir and Gardezi (2020) examined the application of big data analytics and organizational performance with a mediating role of knowledge management practices in small and medium enterprises (SMEs) in Pakistan. The study targeted SMEs and collected data from respondents working in SMEs using ana adapted instrument. Baron-Kenny approach was used for testing the mediation. The study found that application of big data analytics positively and significantly influenced organizational performance of SMEs (Shabbir & Gardezi, 2020).

Opara and Sunday, (2022) examined the impact of descriptive analytics in big data and performance of commercial banks in Port Harcourt, Rivers State, Nigeria. The study adopted cross-sectional survey research design. The major findings revealed that big data: descriptive analytics is a timely intervention tool for enhancing customers' satisfaction and economic growth of Commercial Banks in Port Harcourt, Rivers State, Nigeria. The study concluded that big data: descriptive analytics influenced customers' satisfaction and economic growth of commercial banks in Port Harcourt, Rivers State, Nigeria. Nevertheless, countries differ in terms of economic development, geographical boundaries, legal frameworks and institutional frameworks hence findings from one country cannot be generalized to another country (Opara & Sunday, 2022).

Security Compliance Analytics and Organizational Performance
Naseer, *et al* (2019) did a study on enhancing information security risk management (ISRM) with security analytics: a dynamic capabilities perspective. The study proposed a model for effectively

use of security data to make informed decisions (security analytics capabilities); effective identification and protection of organization information assets (ISRM capabilities); analytics enable capabilities in ISRM; and ISRM dynamic capabilities. The study established that security analytics and ISRM capabilities have a direct influence on competitive advantage. The model has implication to various security practitioners. Security managers and business executives require a clear view of the threats to information assets that are important to their company's performance. They also require comprehensive information on known information security threats and vulnerabilities to make informed information security decisions. Security analytics capabilities use security data to provide security insights that help security managers and business leaders make such decisions (Naseer, Shanks, Ahmad, & Maynard, 2019).

Xu et al (2023) studied enterprise data compliance strategy of typical cases. The study reviewed typical cases of data security compliance in China and abroad. The study summarized the best practices of leading demonstration enterprises, and proposed key strategies for enterprise data security compliance. They include classification of typical data application scenarios, analysis of key links of data security compliance application, formulation of data security compliance application management system and standards, optimization of data security compliance application process mechanism, formulation of whole-process management measures of data security compliance, and improvement of data security compliance guarantee mechanism, in order to provide references for the research (Xu, et al., 2023).

RESEARCH METHODOLOGY

The study adopted a descriptive research design and the target population include six semi-autonomous government agencies (SAGAs) involved in the primary mandate of the state department for higher education & research. The unit of observation was representatives from the SAGAs and comprised of 160 individuals from top management, middle management and operational level with ICT and operational technical mandate and were privy and knowledgeable about the aspects under the study. Since the number was manageable, a census was used where the whole population of 160 respondents was studied. The study used purposive sampling, simple random sampling and stratified sampling. The respondents were first categorized based on their agencies in the state department. From each agency, the respondents were further stratified in terms of the level of management i.e. top management, middle management and operational level management. Purposive sample was used in selecting the top management questionnaires were used as the main data collection tool. The statistical package for social sciences (SPSS) version 26 was utilized to assist in the analysis of the data. The results were presented in tables for the descriptive statistics where the mean, frequency and standard deviation was used. Multiple regression analysis model was employed to establish the relation between the independent variables with the dependent variable.

RESEARCH FINDINGS AND DISCUSSION

Initially, a pilot study on 16 respondents (10%), where validity and reliability checks done, exposed to expert review, and subsequently the revised questionnaire was issued to the study sample of 160 individuals representing SAGAs in the state department for higher education & research in Kenya where a response rate of 81.3% (130) was registered.

Descriptive Statistics

In this section the study presents findings on Likert scale questions where respondents were asked to indicate their level of agreement with various statements that relate with the influence of cloud analytics practices and performance of state department for higher education & research in Kenya. Measures of central tendency were employed in the study to characterize and evaluate the responses. The replies were coded using a 5-point Likert scale. The following are the study variables' descriptive statistics:

Data Management Analytics

The first specific objective of the study was to examine the influence of Data Management Analytics on performance of state department for higher education & research in Kenya. The study aimed at answering the research question 'what is the influence of Data Management Analytics on performance of state department for higher education & research in Kenya.? The average for data management analytics as shown in Table I is 3.35 (Std deviation = 1.268) which translates to neutral in the Likert scale. The respondents were neutral in relation data management analytics in the State Department for Higher Education & Research.

Table I: Data Management Analytics

Data Management Analytics	SD %	D %	N %	A %	SA %	MN	SDV
Your organization utilizes data analytics tools to understand and improve the overall satisfaction of its customers.	18.5	10	10.8	40.8	20	3.34	1.395
The organization uses online feedback tools to collect response and suggestion as well as rate the services delivered.	20	9.2	20.8	30	20	3.21	1.402
The organization makes use of cloud storage service to ensure it can be easily accessed by users and customers.	9.2	19.2	20	10.8	40.8	3.55	1.420
Data management analytics are applied to data captured and stored in the organization systems and to process enormous volumes of structured data related to the organizational processes	0	18.5	30.8	40	10.8	3.43	.914
The organization handles large volume of data that cut across other ministries.	0	0	20	39.2	40.8	4.21	.754
The data management analytics at the organization are integrated to the various state agencies and directorates in the ministry.	18.5	10	10.8	30	30.8	3.45	1.479
Average Data Management Analytics						**3.35**	**1.268**

It was agreed by majority (80%) of the respondents that the organizations in the department of higher education & research handles large volume of data that cut across other agencies, department and ministries. The mean was 4.21 greater than the average of 3.35 indicating the statement has a positive effect on the variable and also as the most agreed statement. The agencies under the state department also make use of cloud storage service to ensure data can be easily accessed by users and customers. It was supported by 51.6% of the respondents and the mean of 3.55 indicate the statement has a positive influence on the variable. On whether the state department uses online feedback tools to collect responses and suggestion as well as rate the services delivered 50% agreed though the mean of 3.21 indicate the statement does not positively influence the data management analytics.

It was also agreed by 60.8% of the respondents that the department utilizes data analytics tools to understand and improve the overall satisfaction of its customers. The mean of 3.34 though indicates the statement does not sufficiently influence data management analytics positively. It

was also agreed by 50.8% of the respondents that data management analytics are applied to the data captured and stored in the state department systems and to process enormous volumes of structured data related to the ministry's organizational processes. The mean of 3.43 (std dev = .914). Finally, it was agreed by 60.8% of the respondents that the data management analytics at the state department are integrated to the various state agencies and directorate in the ministry. The statement positively influences data management analytics as supported by the mean of 3.45.

Security Compliance Analytics
The second specific objective of the study was to assess the influence of Security Compliance Analytics on performance of State Department for Higher Education & Research in Kenya. The study aimed at answering the research question 'How does of Security Compliance Analytics influence the performance of state department for higher education & research in Kenya? The average for the variable security compliance analytics as shown in Table II is 3.38 (Std deviation = 0.974) which translates to neutral in the Likert scale. Thus, the respondents were neutral in relation security compliance analytics in the State Department for Higher Education & Research.

Table II: Security Compliance Analytics

Security Compliance Analytics	SD %	D %	N %	A %	SA %	MN	SDV
The organization ensures there are standardized datasets that are spread across multiple IT systems in the organization.	0	10.8	19.2	40	30	3.89	.958
The compliance analytics at the organization comply with global standards on message traffic.	9.2	31.5	20	20	19.2	3.08	1.288
The organization also uses text analytics to mine and sense documents for insights.	9.2	20	10.8	30	30	3.52	1.348
The organization identifies and monitors fraud to ensure it is foiled.	9.2	31.5	20	30	9.2	2.98	1.168
The organization adopts information analysis to gather and store data and mine it for patterns of anomalies and discrepancies.	0	20	30	30	20	3.50	1.029
The organization uses rule-based monitoring to identify known breaches, fraud and possible compliance risks.	29.2	10.8	0	20.8	39.2	3.30	1.328
Average Security Compliance Analytics						**3.38**	**.974**

It was agreed by majority (70%) of the respondents that the state department ensures there are standardized datasets that are spread across multiple IT systems in within the institutions. The mean (M = 3.89, std dev = .958) indicate that the statement has a positive influence on the variable. It was also disagreed by a sizeable percentage, 40.7%, that the compliance analytics at the state department comply with global standards on message traffic. The mean (M =3.08, std dev = 1.288) indicate the statement does not positively influence the variable. A majority (60%) of the respondents also agreed the organization also uses text analytics to mine and sense documents for insights. The statement is supported by the mean (M = 3.52, std dev = 1.348). In addition, another sizeable portion of the respondents (40.7%) disagreed while 39.2% agreed that the state department

for higher education & research identifies monitors compliance and fraud to ensure the organization is on the right track. The mean (M = 2.98, Std dev = 1.168) indicate that the statement does not have a positive influence on the variable. It was also agreed by 50% of the respondents that the organization in the state department adopts information analysis to gather and store data and mine it for patterns of anomalies and discrepancies. The mean (M = 3.50, std dev = 1.029) supports the statement. Lastly but not the least, it was agreed by 60% of the respondents that the state department uses rule-based monitoring to identify known breaches, fraud and possible compliance risks, a key attribute required to ensure data integrity. The mean (M = 3.30, std dev = 1.328) indicate the statement does not positively influence the variable.

Performance of State department for higher education & research

The study sought to determine the influence of cloud analytics practices on performance of State Department for Higher Education & Research in Kenya. Accordingly, as per the responses from the agencies in the department, the following were found out; the mean for the variable performance of the department is 3.36 (Std deviation = 1.078), as shown in Table III translates to neutral in the Likert scale.

Table III: Performance of state department of higher education

Performance of state department	SD %	D %	N %	A %	SA %	MN	SDV
The organization has improved on its efficiency in service delivery due to adoption of cloud analytics practices.	1.3	16.3	7.5	40	35	3.02	1.545
Cloud analytics practices have helped to reduce the cost of operation of systems and processes.	0	18.8	2.5	43.8	35	3.98	1.015
The organization has witnessed reduced complaints related to quality service delivery as a result of integrating cloud analytics in operations.	1.3	16.3	6.3	45	31.3	3.12	1.431
The organization has improved on time taken to provide services to its customers.	1.3	15	6.3	48.8	28.8	3.42	1.346
The organization can collaborate and share resources with other organizations/state departments with ease and convenience.	1.3	17.5	30	30	21.3	3.41	1.192
Cloud analytics practices have ensured increased number of customers served.	2.5	17.5	31.3	30	18.8	3.20	1.229
Average Performance of state department						**3.36**	**1.078**

A huge percentage, 75%, of the respondents across the state department agreed that the state department for higher education & research has improved on its efficiency in service delivery due to adoption of cloud analytics practices. The mean (M = 3.02, std dev = 1.545) indicate the statement does not have a positive influence on the variable. Likewise, 78.8% agreed that cloud analytics practices have helped to reduce the operational cost of systems and processes. The statement was also supported by the mean (M = 3.98, std dev = 1.015). The agencies in the state department have also witnessed reduction in complaints related to quality service delivery as a result of integrating cloud analytics in operations as agreed by 76.3% of the respondents and

supported by the mean (M = 3.12, std dev = 1.431). In terms of turnaround time, the agencies in the state department have improved on time taken to provide services to its customers as supported by 77.6% of the respondents and further supported by the mean (M = 3.42, std dev = 1.346). It also further agreed by 51.3% that the state department can collaborate and share resources with other state departments with ease and convenience. The statement positively influences the variable as shown by the mean (M = 3.41, std dev = 1.192). Finally, respondents agreed that cloud analytics practices have ensured increased number of customers served at the State Department for Higher Education & Research. However, the statement does not positively impact the variable.

Correlations

Accordingly, Pearson correlation analysis (r) was used to determine the strength of association between independent variables (Data Management Analytics and Security Compliance Analytics) and the dependent variable (Performance of state department for higher education & research). Table IV provides a summary of these findings.

Table IV: Correlation analysis

		Data Management Analytics	Security Compliance Analytics
Performance of state department for higher education & research	Pearson correlation	.927**	.191*
	Sig (2-tailed)	.000	015
	N	130	130

**. Correlation is significant at the 0.01 level (2-tailed).

Data management analytics has a positive strong significant correlation with performance of State Department for Higher Education & Research in Kenya (r = .927, sig = .000). This implies that an improvement (increase) in data management analytics by the State Department for Higher Education & Research could lead to an increase in performance. The findings concur with a similar study by Apondi (2023) on the impact of data analytics and organizational performance of KCAA. The researcher found out a strong positive correlation between predictive analytics, diagnostic analytics, prescriptive analytics and descriptive analytics with organizational performance at KCAA.

Security compliance analytics also has s a positive weak correlation with performance of State Department for Higher Education & Research in Kenya (r = .191, sig = .015). Thus, an increase in Security compliance analytics would lead to minimal increase in performance of State Department for Higher Education & Research in Kenya. Daud et al (2018) indicated that security practices in terms of structured security processes, security investment, and cyber security compliance in organizations help promote organizational performance in Malaysia. Alzahrani and Seth (2021) opined that security training, knowledge sharing, security education, and security visibility significantly impact information security performance. The impact of security training and knowledge sharing is significant on building trust in the organization. The weak correlation can be attributed to the fact that whereas information security is an important element in the operation of an organization, the security measures may introduce red-tapes in the overall operations of an organization.

Regression Coefficients

Multiple linear regression was done to the relationship between the independent variables and the dependent variable. In the regression analysis predicting the performance of state department higher education & research in Kenya, several variables demonstrate significant effects.

Table V: Regression Results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.352	.150		-2.352	.020
Data Management Analytics	.540	.030	.635	17.895	.000
Security Compliance Analytics	.168	.027	.152	6.309	.000

a. Dependent Variable: Performance of State Department for Higher Education & Research

Data management analytics exhibited a statistically significant positive coefficient (β = .540, sig = .000), indicating that improvements in data management analytics practices result to higher performance outcomes for State Department for Higher Education & Research. Data management analytics has the highest impact on performance of higher education & research at 63.5% (std Beta = .635). The finding underscores the importance of data management measures in enhancing organizational performance including effective data analytic tools, enhanced data storage facilities, and data management applicable in the various state agencies. The findings are aligning with the research of Apondi (2023) who acknowledged the significant impact of data analytics on organizational performance at Kenya Civil Aviation Authority. The study also recommended for regular implementation of diagnostic data analytics to enhance performance of KCAA and organizational success and employee engagement. This finding is also in agreement with Ghosh (2018), who opined that adoption of cloud-based big data analytics is a determinant of organizational performance improvement.

Security Compliance Analytics also emerges as a significant predictor (β = .168, sig = .000) of micro-lending institution performance. Security compliance analytics has the second least impact on performance of higher education & research at 15.2% (std Beta = .152). The findings underscore the importance of effective data security measures in enhancing organizational performance, the red-tapes notwithstanding. The findings are supported by Naseer et al. (2019), who demonstrated a positive impact of security analytics on competitive advantage and organizational performance.

The following multiple regression equation was obtained;

$$Y = -0.352 + 0.540X_1 + 0.168 X_2 \text{...(i)}$$

Where: Y = Performance of State Department for Higher Education & Research.

χ_1 = Data Management Analytics (DMA)
χ_2 = Security Compliance Analytics (SCA)

CONCLUSION

The first specific objective was to examine the influence of Data Management Analytics on performance of state department for higher education & research in Kenya. The study found a strong positive correlation between data management analytics and performance of state department. It was also found that data management analytics practices have a significant association with performance of the department in Kenya. The study therefore concludes that data management analytics significantly influence performance of State Department for Higher Education & Research in Kenya. The second specific objective was to assess the influence of Security Compliance Analytics on performance of state department for higher education & research in Kenya. The study found a weak positive correlation between security compliance analytics and performance of State Department for Higher Education & Research in Kenya. It was

found that security compliance analytics practices have positive significant association with performance of State Department for Higher Education & Research in Kenya. The study therefore concludes that security compliance analytics significantly influence performance of State Department for Higher Education & Research in Kenya.

RECOMMENDATIONS

The state department should ensure the cloud solutions come with in-built data government and business intelligence capabilities; are scalable and can easily be adjusted to meet the storage and computing needs. The Government agencies should invest in advanced security technologies and ensure there is regular update and patching of the systems to ensure timely detection of anomalies, fraud and other security threats. The cloud solutions should also have security analytics capabilities with in-built threat detection and prevention tools; logging, automated vulnerability scans, and threat neutralization. Government agencies looking for a new partner to power their current and future government IT needs ensure security compliance by selecting a cloud provider with strong data protection measures to ensure compliance to Data Protection Act of 2019 and related regulations.

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