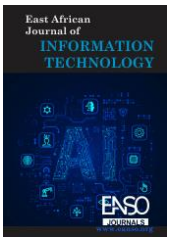

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Original Article

Network Transformation and Productivity of Public Sector Institutions in Kenya

William Too[1*], *Morrisson Mutuku*[1] *& Lydia Gachengo*[1]

[1] Kenyatta University, P. O. Box 43844 00100, Nairobi, Kenya.
* Author's ORCID ID; https://orcid.org/0009-0004-2445-3634; Email: willyrop18@gmail.com

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ABSTRACT

Public institutions in Kenya undeniably create a conducive environment for economic development. However, public sector productivity in Kenya remains a concern, hindering socio-economic transformation, global competitiveness, and job creation. There has been a long-term decline in overall productivity from 0.45 in 2009 to 0.40 in 2022 with both labour productivity and total factor productivity falling over several decades. Further, the productivity of government MDAs ranges from 45% - 65% which implies the existence of wastages in the majority of the Ministries, Departments and Agencies (MDAs) assessed. It is against this backdrop that this study assesses the effect of network transformation on the national productivity of public sector institutions. The study population included 432 state departments and agencies that have mainstreamed national productivity as provided by the National Productivity and Competitiveness Centre (NPCC). The unit of analysis of the study was 432 MDAs that had mainstreamed national productivity while the unit of observations was Heads of departments of performance monitoring units in the MDAs. The formula adopted yielded a sample of 204 respondents from the target population. The study established that network transformation also had a significant positive impact on productivity. The findings showed that network transformation was significant, highlighting its role in improving communication, connectivity, and accessibility across public institutions. Enhanced network infrastructure facilitates seamless collaboration and improves response times in service delivery. The adoption of advanced network solutions, such as new architectures, network scalability and network security, was found to be essential for enabling digital transformation hence improving the productivity of public institutions. These solutions create scalable and efficient systems that support productivity.

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INTRODUCTION

Productivity, particularly in public institutions, is a critical issue with far-reaching consequences (Pabst & Westwood, 2021). A productive public sector underpins economic growth. Efficient institutions create a stable environment for businesses to operate, facilitate trade, and invest in job creation (Krawchenko, 2021). Inefficiency conversely hinders economic activity. Public institutions play a vital role in social welfare. They deliver essential services like education, healthcare, and social security. Productivity in these sectors translates to improved citizen well-being and a more skilled workforce. Nations with efficient public institutions can attract investment, manage resources effectively, and compete favourably in the global market (Krawchenko, 2021).

Digital technologies offer immense potential to improve public sector productivity. They automate tasks, streamline workflows, and enhance service delivery (Criado & Gil-Garcia, 2019). According to Cette, Nevoux and Py (2022), digital technologies increase efficiency by 70% and reduce wastage by between 30% and 50%. Digital technologies have fundamentally reshaped economies worldwide, impacting national productivity in profound ways. The global adoption of digital technologies and AI in public sector institutions is increasingly experiencing a paradigm shift as most governments are seeking to enhance their service delivery. According to Panagiotopoulos, Klievink and Cordella (2019), digital dynamics which encompasses data analytics, e-governance, and AI applications have gained prominence as a catalyst for innovation, efficiency, and transparency in the public sector worldwide.

The US for instance has long been a leader in digital innovation. Widespread internet access, coupled with investments in software and information and communication technologies (ICT), has significantly boosted productivity across sectors (Kane, Palmer, & Phillips, 2019). A 2020 McKinsey report (McKinsey Global Institute, 2020) estimates that digital technologies contributed up to 2.2 percentage points to US GDP growth between 2000 and 2016. E-commerce and automation have played a particularly significant role. Chinese government service delivery transformation is heavily fueled by digitalization. The government's "internet plus" strategy has supported e-commerce platforms, digital manufacturing, and mobile payments, leading to significant productivity gains (Hinings, Gegenhuber & Greenwood, 2018). World Bank (2017) study found that digital technologies contributed to a 21% increase in labour productivity in China between 2008 and 2013. While Europe lags behind the US and China in digital adoption, there are pockets of innovation. Countries like Germany have embraced Industry 4.0, focusing on automation and smart manufacturing (Sainger, 2018). The European Commission has also emphasized digital skills development to bridge the digital divide. A report by OECD, (2019) highlighted the need for further investment in digital infrastructure and talent to unlock Europe's full digital potential.

South Africa, which is Africa's most developed economy, is actively pursuing digitalization. The government's National Development Plan prioritizes ICT infrastructure development and digital skills training (Union, 2020). Mobile money transfer platforms demonstrate a good

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example of how digital dynamics have transformed financial inclusion and improved productivity in informal sectors. Nigeria has also witnessed a digital boom in recent years. The rise of mobile internet and a vibrant tech startup scene have driven innovation (Jansen van Rensburg et. al., 2021). The use of digital tools for agriculture and logistics is improving efficiency and productivity. However, similar to South Africa, infrastructural limitations and a skills gap hinder progress (International Finance Corporation, 2022).

Kenya is a regional leader in digital innovation, with M-Pesa being a prime example of its success. The government's Ajira Digital Literacy Initiative aims to provide residents with the skills necessary to prosper in the digital economy (Tyce, 2020). Digital platforms are transforming agriculture, education, and healthcare delivery, leading to productivity gains. However, challenges like cybersecurity threats and unequal access to technology remain (Alliance for Affordable Internet, 2021). The impact of digital dynamics on national productivity is undeniable. While developed economies like the US and China have reaped significant benefits, developing countries like Kenya and Nigeria are catching up.

Network transformation refers to the advancement in networks to fulfil the evolving demands of the digital age. According to Dyatlov, Didenko, Lobanov and Kulik (2019), network transformation entails implementing new architectures, technologies, and strategies to enhance network performance, security, scalability and agility. These transformations are fostered by a number of factors which among them includes the urge to enhance performance, support emerging technologies, and enhance user experience. In relation to the performance of public sector institutions, network transformation has been pivotal to a greater extent. Dyatlov et al. (2019) note that optimization and modernization of network infrastructure offers a solid foundation towards enhanced service delivery, responsiveness, and operational efficiency. Improved network connectivity, data access, and sharing are key to streamlining communication, facilitating informed decision-making, and mitigating information silos within departments.

Public institutions in Kenya undeniably play a crucial role in creating a fertile ground for economic development. However, national productivity in Kenya remains a concern, hindering socio-economic transformation, global competitiveness, and job creation. The KNBS (2021) reports that multifactor productivity growth (which considers labour and capital inputs) has stagnated by around 2% since independence. Further, the World Bank estimates that Kenya's labour productivity growth averaged only 1.6% annually between 1995 and 2017 (World Bank, 2020). Despite recent economic growth, Kenya's national productivity remains below its potential. This translates to a situation where the economy is producing less output for the resources invested. According to the NPCC (2023) report, the productivity of government MDAs ranges from 45% - 65% which implies the existence of wastage in the majority of the MDAs assessed. A study by KIPPRA (2023) revealed a long-term decline in overall productivity from 0.45 in 2009 to 0.40 in 2022 with both labour productivity and total factor productivity falling over several decades. By the end of the financial year 2023-2024, the National Productivity and Competitiveness Centre (NPCC) was working on productivity mainstreaming within government ministries, departments, and agencies (MDAs) to address the overall low level of productivity among government institutions.

Recognizing the challenge, the Kenyan government has undertaken several initiatives. A National Productivity and Competitiveness Centre (NPCC) was created by the Ministry of Labour to support productivity improvement strategies across public institutions. Also adopted a performance contracting system of holding public institutions accountable for achieving specific targets, aiming to improve service delivery and resource utilization and other initiatives such as e-Citizen portal, aiming to streamline government processes and enhance efficiency (Ndubai, 2016).

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Research on productivity in Kenya has primarily focused on broad economic sectors or aggregate national data. Esselaar, Stork, Ndiwalana and Deen-Swarray, (2007) examined the digital divide in Sub-Saharan Africa, including Kenya. It underscored inequalities in the accessibility and utilization of digital technology which affect economic development and productivity. However, it focuses more on access metrics rather than productivity outcomes, indicating a gap in understanding how digital dynamics impact productivity within public sector institutions in Kenya. Melo, Caldeira, Diniz and Silva (2020) examined the link between ICT adoption and firm performance in developing countries, providing insights into the productivity implications of digital technologies. However, it focused on private sector firms in Brazil, leaving a gap in understanding how similar dynamics unfold within the public sector context in Kenya.

LITERATURE REVIEW

Theoretical Review

The study was anchored on E-Government Theory and examines the application of ICTs to transform government operations and citizen engagement. Proponents of this theory (Halachmi, 2004) believe that digital tools can significantly enhance national productivity in public sector institutions. Halachmi (2004) explored the application of E-government theory in a real-world setting, focusing on the state of Tennessee in the USA. The proponent argues that E-government promotes streamlining of processes. Online applications, automated workflows, and data sharing significantly reduce manual tasks and bureaucratic hurdles, leading to faster service delivery and improved resource allocation (Ozkan & Kanat, 2011).

Public access to information, online reporting, and e-participation tools empower citizens to hold institutions accountable, potentially leading to more efficient use of resources and improved performance. Halachmi (2004) also argued that e-government facilitates data-driven decision-making. Using data analytics and real-time information, public institutions can make more informed decisions about resource allocation, policy formulation, and program implementation, potentially leading to higher productivity. E-government fosters citizen participation. Online platforms for public consultations, feedback mechanisms, and grievance redressal systems allow for greater citizen involvement in government processes. This leads to better-designed policies, improved service delivery, and potentially a more productive public sector (Calista & Melitski, 2007).

The critics of this theory, however, argue that some e-government projects prioritize technology implementation over addressing underlying issues in government bureaucracy or service design. Further, the field of e-government theory itself is criticized for lacking a strong, unified framework. This makes it difficult to measure success and compare initiatives across different contexts. By examining the propositions above, it becomes clear how E-government theory underpins the study of digital dynamics and national productivity in public institutions. According to the theory, digital dynamics are a recipe for increased efficiency in processes and reduced administrative costs directly translate to higher productivity; enhanced transparency and accountability lead to better resource allocation and potentially minimize waste and unproductive practices and permit citizen engagement which allows for better policy design and service delivery, ultimately contributing to more productive public services.

Empirical Literature Review

Müller and Skau (2018) study investigated how digital network transformation initiatives improve the efficiency and productivity of public sector institutions in European countries. The research used a combination of surveys and administrative data analysis. The study found that digital networks improve communication within and between government departments, leading to faster decision-making and reduced administrative delays. Network modernization helps in better resource allocation, reducing costs

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and improving service delivery and significant productivity gains were observed in institutions that adopted comprehensive digital network solutions.

Johnson and Rice (2019) studied the effect of digital connectivity on the performance and productivity of public sector institutions in the United States. It utilized a quantitative approach, analyzing data from federal and state agencies over a ten-year period. The study reported that improved digital connectivity leads to higher operational efficiency, reducing processing times for public services. The study estimated a positive economic impact, correlating digital connectivity improvements with increased national productivity. Chib and Zhao (2020) study explored how digital infrastructure, including network transformation, affects the effectiveness and productivity of public sector institutions in developing countries. The finding showed that digital network improvements increase access to government services, particularly in remote and underserved areas. Network transformation enhances efficiency and transparency, reducing opportunities for corruption and improving public trust. Measurable productivity benefits are seen in institutions that have fully integrated digital networks into their operations.

Lee and Kwak (2021) while studying the role of network modernization in augmenting the productivity of public sector institutions in Asia used a qualitative approach, conducting interviews with key stakeholders in government IT departments. The study showed that digital network transformation significantly enhances the productivity of public sector institutions, contributing to overall national productivity. These improvements are seen through increased operational efficiency, better service delivery, and positive economic impacts. Policymakers and public sector leaders can leverage these findings to prioritize and implement effective digital network transformation initiatives. Hai, Van, and Thi Tuyet's (2021) study examined the role of digital transformation in emerging economies during the COVID-19 pandemic. The authors use qualitative research methodologies to examine the benefits and problems leaders face while implementing digital technologies. Key findings highlight the acceleration of digital adoption as a response to pandemic-induced disruptions, creating opportunities for enhanced resilience, innovation, and efficiency.

RESEARCH METHODOLOGY

This study was thus informed by a positivistic research philosophy, which holds that reality is stable and can be objectively observed and characterized (Flick, 2018). The research collected qualitative and quantitative data using rigorously prepared instruments based on significant measures scored on a Likert scale. This research utilized an explanatory design. Explanatory study design is a methodological approach focused on clarifying the causal relationships between variables. It aimed to elucidate the reasons and processes behind certain events by identifying fundamental causes and mechanisms. This study design is frequently employed to develop or evaluate ideas, offering insights into the interrelations among variables.

The unit of analysis of the study was the 433 MDAs while the unit of observations was Heads of departments, directors and supervisors of performance monitoring units in the MDAs that had mainstreamed national productivity. The study comprised a sample size of 204 respondents. The study employed stratified random sampling to determine the sample population. Stratified random sampling was employed to ensure the representation of the MDAs while random sampling was used to ensure that all the members of the study population had an equal chance of being selected hence eliminating the selection bias.

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Table 1: Sample Size Determination

Category	Population	Sample
Ministries	4	1
State Departments	312	147
State Agencies	118	56
Total	433	204

Source: National Productivity and Competitiveness Centre (NPCC) (2024)

Primary data was collected via semi-structured questionnaires, while secondary data was gained by reviewing relevant literature and existing records. A multiple linear regression model was used to determine the impact that the four constructs have on the productivity of public sector institutions in Kenya. Multivariate regression is ideal for examining how several predictors (independent variables) simultaneously influence a single outcome (dependent variable). This is particularly critical in complex models where predictors are often interrelated (Kutner et al., 2005).

The linear regression model will be as follows:

$Y= \beta_0+ \beta_1 NT +\varepsilon$

Where:

Y= Productivity of Selected Public Sector Institutions in Kenya.

NT= Network Transformation

ε= error term.

β0= Refers to the constant.

STUDY FINDINGS AND DISCUSSIONS

The findings indicate a very strong response rate for the survey. With 169 returned surveys out of a total of 204, the response rate was significant at 83%. This implied a high level of engagement from the target population and increased confidence in the generalizability of the research findings to the larger population under study. The findings can be extended to the full population of 433 MDAs with reasonable confidence, provided that the sample was representative and respondents were scattered throughout different MDAs.

Table 2: Response Rate

Response Rate	Frequency	Percent (%)
Completed and Returned Questionnaires	169	83%
Unreturned Questionnaires	35	17%
Total	204	100%

Source: Survey Data, (2025)

Descriptive Statistical Analysis Results

The descriptive statistics in Table 3 provide insights into the implementation of network transformation within the selected public sector institutions. Network transformation is evaluated based on aspects like network architecture, scalability, security, leadership support, and resource allocation.

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Table 3: Descriptive Statistics for Network Transformation

Descriptive Statistics	N	Min	Max	Mean	Std. Dev
Our institution has implemented new network architectures to improve efficiency and performance	168	1	5	3.67	1.29
We regularly review and upgrade our network architecture to align with emerging technologies	168	1	5	3.68	1.31
Our network infrastructure is designed to scale easily in response to increasing demands	168	1	5	3.67	1.43
We have established protocols to ensure our network can handle future growth and expansion	168	1	5	3.71	1.26
Our institution has implemented robust network security measures to protect against cyber threats	168	1	5	3.76	1.30
We conduct regular network security audits and updates to safeguard our data	168	1	5	3.77	1.32
There is strong leadership support for network transformation initiatives in our institution	168	1	5	3.64	1.40
We have allocated sufficient resources (budget, personnel, training) to support our network transformation efforts	168	1	5	3.71	1.38
Aggregate mean score				**3.70**	**1.34**

Source: Survey Data (2025)

The aggregate mean score of 3.70 indicates that, overall, respondents moderately agree that network transformation initiatives have been implemented in their institutions. The score suggests that while progress is evident, there remain some areas that need further enhancement. The aggregate standard deviation of 1.34 indicates moderate variability in responses reflecting differences in how network transformation practices are perceived or implemented across institutions. The findings generally suggested moderate progress in network transformation across the public sector institutions, with strengths in network security and scalability. However, leadership support and ensuring consistent resource allocation were low. The study finding agreed with Müller and Skau (2018) whose study found that digital networks improve communication within and between government departments, leading to faster decision-making and reduced administrative delays. Network modernization helps in better resource allocation, reducing costs and improving service delivery and significant productivity gains were observed in institutions that adopted comprehensive digital network solutions.

Regression Analysis Results

The coefficient (β) for Network Transformation was 0.824, indicating a positive correlation with production. p-value equals 0.000. This is below the significance level of α=0.05, indicating a statistically significant connection (H_{02}). The positive coefficient (β=0.824) suggests that improvements in Network Transformation were associated with higher productivity in public institutions. Specifically, a unit increase in the effective implementation of Network Transformation contributes to an increase in productivity by 0.824 units, assuming all other factors remain constant. Network Transformation is a critical driver of productivity in public institutions. Its positive and statistically significant impact underscores its importance in modernizing public services and optimizing institutional performance.

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Table 4: Linear Regression Analysis Results

	B	Std. Error	Beta	t	Sig.
(Constant)	0.622	0.164		3.804	0.000
Network Transformation	0.824	0.043	0.83	19.156	0.000

ANOVA	Sum of Squares	df	Mean Square	F	Sig.
Regression	84.607	1	84.607	366.962	.000b
Residual	38.273	166	0.231		
Total	122.879	167			

Model Summary	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.830a	0.689	0.687	0.48017

a Dependent Variable: Productivity
b Predictors: (Constant), Network Transformation

The study established that network transformation also had a significant positive impact on productivity. Enhanced network infrastructure facilitates seamless collaboration and improves response times in service delivery. The adoption of advanced network solutions, such as new architectures, network scalability and network security, was found to be essential for enabling digital transformation. These solutions create scalable and efficient systems that support productivity. The study finding agreed with Müller and Skau (2018) whose study found that digital networks improve communication within and between government departments, leading to faster decision-making and reduced administrative delays. Network modernization helps in better resource allocation, reducing costs and improving service delivery and significant productivity gains were observed in institutions that adopted comprehensive digital network solutions. The study further supports Chib and Zhao (2020) who showed that digital network improvements increase access to government services, particularly in remote and underserved areas. Network transformation enhances efficiency and transparency, reducing opportunities for corruption and improving public trust. Measurable productivity benefits are seen in institutions that have fully integrated digital networks into their operations. Similarly, the findings were in agreement with Lee and Kwak's (2021) study that showed that digital network transformation significantly enhances the productivity of public sector institutions, contributing to overall national productivity. These improvements are seen through increased operational efficiency, better service delivery, and positive economic impacts.

This study finding further supports the E-Government Theory proposition that the adoption of network transformation in government contributes to streamlining processes, online applications, automated workflows, and data sharing which significantly reduce manual tasks and bureaucratic hurdles, leading to faster service delivery and improved resource allocation (Ozkan & Kanat, 2011). The proponents such as Halachmi (2004) also argued that e-government facilitates data-driven decision-making. Using data analytics and real-time information, public institutions can make more informed decisions about resource allocation, policy formulation, and program implementation, potentially leading to higher productivity. Kenya's e-Citizen portal, for instance, demonstrates how network transformation has allowed citizens to access government services like birth certificate applications online, minimizing turnaround times and increasing transparency (Ndubai, 2016).

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CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The study established that network transformation also had a significant positive impact on productivity. The coefficient for network transformation was $\beta = 0.313$, $p < 0.05$, highlighting its role in improving communication, connectivity, and accessibility across public institutions. Enhanced network infrastructure facilitates seamless collaboration and improves response times in service delivery. The adoption of advanced network solutions, such as new architectures, network scalability and network security, was found to be essential for enabling digital transformation. These solutions create scalable and efficient systems that support productivity. Network transformation plays a pivotal role in fostering productivity by enhancing connectivity, communication, and access to information. Reliable and advanced network infrastructure enables seamless collaboration across departments and institutions, reducing operational delays and facilitating better service delivery. Investments in scalable and high-speed networks are essential for sustaining digital transformation efforts.

Recommendations

This study recommends that all public institutions should create a robust ICT department and allocate adequate resources to enhance the implementation of new network architectures to improve efficiency and performance. The department should further lead in regularly reviewing and upgrading the network architecture to align with emerging technologies. Further, the study recommends that all network infrastructure should be designed to scale easily in response to increasing demands for effective service delivery and productivity. Finally, this study recommends that public institution leaders should ensure there is strong leadership support for network transformation initiatives to enhance productivity and service delivery.

Limitations of the Study

The key limitation that the study encountered was limited data availability. Obtaining complete and accurate data on digital dynamics and national productivity was challenging. Limited access to internal documents or inconsistencies in record-keeping was projected to hinder a comprehensive analysis. However, the study put in place mitigation measures that ensured the reliability and validity of the data was guaranteed. The study further focused on selected public sector institutions in Kenya, potentially limiting the generalizability of the findings to the entire sector. Additionally, measuring productivity within individual institutions was challenging, however extensive literature review was used to mitigate this limitation.

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