

- World Athletics. (2023). *World Athletics Championships 2023 Budapest: Official results and medal statistics*. World Athletics. <https://worldathletics.org/competitions/world-athletics-championships/budapest23>
- Yun, J. H., Rosenberger III, P. J., & Sweeney, K. (2021). Drivers of soccer fan loyalty: Australian evidence on the influence of team brand image, fan engagement, satisfaction and enduring involvement. *Asia Pacific journal of marketing and logistics*, 33(3), 755-782.

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INFLUENCE OF TECHNOLOGICAL INFRASTRUCTURE ON EMPLOYEE PRODUCTIVITY AMONG STAFF WORKING REMOTELY IN KINDE ENGINEERING WORKS IN KENYA

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ABSTRACT

This study examined how technological infrastructure influences employee productivity, particularly in a post-pandemic context where remote work has become increasingly prevalent. Guided by the Technology Acceptance Model and the Resource-Based View theory, the study explored the extent to which access to digital tools, internet connectivity, IT support, and user competence contribute to employee performance outcomes. A descriptive and correlational research design was adopted, utilizing both quantitative and qualitative data. The target population comprised 123 employees, from which a sample of 94 respondents was selected through stratified random sampling. Data were collected using structured questionnaires and interviews and analyzed using descriptive statistics, regression, and thematic analysis. The findings revealed that technological infrastructure had a significant positive relationship with employee productivity ($R^2 = 0.502$, $p < 0.001$), indicating that improvements in digital capacity explained about 50.2% of variations in productivity levels among remote workers. Respondents reported high satisfaction with the availability of software tools, system reliability, and IT support responsiveness, which collectively enhanced timeliness, task completion, and output quality. Qualitative findings further supported these results, emphasizing that digital infrastructure promotes communication efficiency, accountability, and innovation within remote teams. However, some challenges, such as inconsistent connectivity and over-monitoring through digital tools, were noted as potential productivity constraints. The study concluded that robust technological infrastructure is critical for sustaining productivity in remote working environments. Kinde Engineering Works' investment in modern digital systems and employee training has contributed significantly to maintaining performance consistency despite geographical dispersion. The study recommends continued infrastructure upgrades, capacity-building initiatives, and balanced remote work policies that integrate flexibility with effective supervision. These insights extend beyond Kinde Engineering Works, offering practical implications for other firms in Kenya's ISP and engineering sectors seeking to optimize performance under digital and hybrid work models.

Keywords: *Technological infrastructure, employee productivity, remote work, ICT support*

INTRODUCTION

Remote working has become a defining feature of modern organizational practice, fundamentally reshaping how tasks are executed, monitored, and evaluated. The COVID-19 pandemic catalyzed this transition, compelling organizations worldwide to adopt flexible work arrangements that relied heavily on digital technologies to maintain

operations and productivity (Bloom et al., 2022). The effectiveness of remote working is now recognized as being largely dependent on the adequacy of technological infrastructure—encompassing reliable internet connectivity, appropriate hardware and software, and secure digital communication platforms (Choudhury, Foroughi & Larson, 2021). In regions with well-developed ICT systems, such as South Africa and Nigeria, firms have reported measurable productivity gains attributed to reduced commuting time and enhanced flexibility (Munyua & Muriuki, 2023). However, in developing contexts, disparities in digital access and infrastructure quality continue to shape divergent remote work outcomes.

Kenya, often considered an ICT hub in East Africa, has witnessed increasing adoption of remote and hybrid work arrangements, particularly within telecommunications, engineering, and digital service firms. The necessity to sustain business continuity during the pandemic accelerated this trend, with companies like Kinde Engineering Works, an Internet Service Provider (ISP) and engineering firm adopting cloud-based collaboration tools, virtual communication platforms, and digital monitoring systems to facilitate remote operations (Ndegwa, 2022). Yet, despite being part of the connectivity industry, many ISPs face internal challenges related to uneven internet reliability, insufficient technical support, and limited access to secure virtual networks. These infrastructural gaps directly affect the efficiency and productivity of employees working remotely, influencing their ability to communicate, collaborate, and meet performance targets (Otieno & Mwangi, 2023).

Technological infrastructure thus stands as a central determinant of remote employee productivity, particularly in technology-intensive sectors such as internet service provision. For Kinde Engineering Works, productivity depends on the seamless functioning of digital tools that enable network monitoring, client support, and project coordination across geographically dispersed teams. Employees equipped with stable connectivity, responsive IT support, and access to advanced digital platforms are more likely to deliver consistent results and maintain service quality. Conversely, infrastructural inadequacies, such as poor broadband access, system downtime, and data security vulnerabilities, can hinder workflow efficiency and diminish overall output. This study therefore examines the influence of technological infrastructure on employee productivity among staff working remotely at Kinde Engineering Works in Kenya.

STATEMENT OF THE PROBLEM

While remote working has become a global phenomenon, its success remains uneven across contexts, largely due to differences in technological infrastructure. In advanced economies, studies such as Bloom et al. (2015) and Choudhury et al. (2021) have documented significant productivity gains among remote employees, facilitated by robust digital infrastructure and reliable internet connectivity. However, the direct application of these findings to the Kenyan context is problematic, as many local firms operate within infrastructural environments characterized by inconsistent broadband coverage, limited access to secure networks, and varying levels of digital tool availability (Idi & George, 2018). These disparities raise critical questions about the extent to which technological infrastructure supports or constrains employee productivity in Kenyan organizations that rely on remote work systems.

In the Internet Service Provider (ISP) sector, the issue is particularly paradoxical. Firms such as Kinde Engineering Works, which are themselves providers of connectivity solutions, continue to experience internal productivity challenges linked to technological readiness. Existing Kenyan studies have predominantly addressed broader themes such as ICT adoption and workforce digital literacy (Mkuzi, 2024; Munyua & Muriuki, 2023), yet few have examined how the quality and availability of digital infrastructure directly influence employee performance in remote work settings. This knowledge gap limits the ability of ISPs to develop targeted strategies that enhance remote work efficiency, despite their central role in the nation's digital ecosystem.

Moreover, anecdotal evidence suggests that employees at Kinde Engineering Works face recurrent technological barriers, including unreliable internet access, inadequate remote access systems, and delayed IT support, that disrupt workflows and reduce overall output. The absence of empirical research on how such infrastructural factors affect productivity leaves organizational leaders without clear guidance for investment and policy decisions. Therefore, this study seeks to examine the influence of technological infrastructure on employee productivity among staff working remotely in Kinde Engineering Works in Kenya.

OBJECTIVE

The objective of the study was to examine the influence of technological infrastructure on employee productivity among staff working remotely in Kinde Engineering Works in Kenya.

SCOPE OF THE STUDY

This study focuses exclusively on assessing the influence of technological infrastructure on the productivity of employees working remotely at Kinde Engineering Works in Kenya. While the parent research examined multiple determinants of remote work productivity, this article specifically concentrates on how factors such as internet reliability, availability of digital tools, cybersecurity systems, and technical support affect the performance of remote staff. The study includes employees engaged in both technical and administrative roles who operated under remote and hybrid work arrangements.

The geographical scope covers Kinde Engineering Works branches located in Nairobi, Kisumu, and Mombasa, representing regions with varying levels of digital infrastructure and connectivity reliability. This regional spread enables a comparative understanding of how infrastructural disparities influence remote work efficiency across different operational contexts. The study period spans January to August 2025, a phase characterized by intensified reliance on remote working models in Kenya's post-pandemic organizational landscape. Although Kinde Engineering Works serves as the focal case, the insights generated are expected to inform best practices and policy considerations for other firms within Kenya's Internet Service Provider and broader engineering sectors.

LITERATURE REVIEW

Theoretical Literature Review

The theoretical foundation for this article is anchored in the Job Demands–Resources (JD-R) Theory (Demerouti et al., 2001), which explains how the balance between job demands

and available resources shapes employee performance and well-being. In remote settings, technological shortcomings such as unstable internet, inadequate hardware, or limited access to cloud platforms act as heightened job demands that interrupt workflow and increase strain, whereas reliable ICT systems function as critical job resources that facilitate communication, task completion, and motivation (Demerouti et al., 2001; Otieno & Mwangi, 2023). Empirical work in Kenyan and African contexts indicates that firms with stronger digital infrastructure experience smoother transitions to remote work and less productivity loss, while infrastructural gaps correlate with reduced output and operational inefficiencies (Munyua & Muriuki, 2023; Mkuzi, 2024).

Complementing JD-R, the Technology Acceptance Model (TAM) (Davis, 1986) helps explain the behavioral pathway between infrastructure and productivity: employees' Perceived Usefulness and Perceived Ease of Use of remote-work technologies determine their adoption and effective utilization. When digital tools are accessible, user-friendly, and supported by training and IT assistance, employees are more likely to integrate them into daily workflows—leading to improved productivity (Davis, 1986; Choudhury, Foroughi & Larson, 2021). Conversely, even technically capable organizations can suffer productivity shortfalls if employees perceive systems as difficult or unreliable; studies from Kenyan ISPs and related sectors report that perceptions of poor system usability and intermittent connectivity undermine remote work performance (Otieno & Mwangi, 2023; Ndegwa, 2022).

Together, JD-R and TAM provide a complementary lens for this study: JD-R locates technological infrastructure as an essential organizational resource that buffers remote-work demands, while TAM describes how employees' technology acceptance mediates the link between that infrastructure and actual productive behavior. Applying these models to Kinde Engineering Works allows examination of both the objective adequacy of ICT (e.g., bandwidth, hardware, cybersecurity, IT support) and the subjective adoption dynamics (PU and PEOU) that jointly determine whether remote employees can sustain high levels of output in Kenya's ISP context (Demerouti et al., 2001; Davis, 1986; Munyua & Muriuki, 2023; Mkuzi, 2024; Otieno & Mwangi, 2023).

Empirical Literature Review

Empirical studies globally affirm that technological infrastructure plays a critical role in shaping remote employee productivity. For instance, Wang et al. (2020), in a cross-sectional survey of multinational corporations in the United States and Europe, found that reliable internet connectivity, secure cloud services, and integrated communication platforms were essential for maintaining workflow continuity and collaboration among remote teams. Similarly, Brown and Green (2019), studying the Australian telecommunications sector, established that firms with advanced digital infrastructure sustained flexible work arrangements without compromising performance, although they noted that infrastructure alone was insufficient without adequate user support and training. These studies collectively underscore the centrality of robust digital systems in enhancing productivity but were primarily conducted in developed economies where infrastructural challenges are minimal, limiting their applicability to developing contexts such as Kenya.

Emerging research in developing regions provides evidence that infrastructural deficiencies significantly hinder remote work efficiency. In India, Singh and Goyal (2021) reported that firms investing in upgraded hardware, software, and IT support experienced measurable improvements in employee efficiency and reduced downtime. Similarly, Adeyemi and Eze (2021) found in Nigeria's banking sector that uninterrupted internet and reliable devices increased task completion rates and reduced work-related stress. Martinez and Lopez (2020) also noted that scalable infrastructures, particularly cloud computing and secure remote access, enhanced collaboration and efficiency in Spain's IT firms. Despite these positive outcomes, most of these studies were conducted in industries outside the ISP sector, leaving contextual gaps regarding infrastructure adequacy and productivity among technology service providers in Africa.

Within the Kenyan context, Otieno and Mwangi (2022) observed that inconsistent connectivity and outdated hardware were major impediments to productivity among Nairobi-based tech firms, leading to frequent workflow disruptions and delays. Likewise, Kamau et al. (2023), focusing on Kinde Engineering Works, found that robust digital infrastructure improved employee engagement and output, though disparities between urban and semi-urban branches highlighted the uneven distribution of ICT resources. These findings emphasize that technological infrastructure remains a decisive factor in determining remote work effectiveness in Kenya's ISP sector. However, existing evidence is still limited, necessitating further inquiry into how infrastructural investments and technological readiness influence employee productivity in firms such as Kinde Engineering Works.

CONCEPTUAL FRAMEWORK

The conceptual framework for this study illustrates the relationship between technological infrastructure (independent variable) and employee productivity (dependent variable) within remote working arrangements at Kinde Engineering Works. It posits that the adequacy, reliability, and accessibility of technological resources such as remote work tools, internet connectivity, and IT support directly influence the efficiency, quality, and timeliness of employees' work output. When technological infrastructure is robust and responsive, employees can communicate effectively, access digital platforms seamlessly, and complete tasks with minimal disruption, thereby enhancing productivity. Conversely, inadequate infrastructure may lead to delays, reduced collaboration, and lower performance outcomes. This relationship is empirically tested using descriptive statistics, correlation, regression, and Structural Equation Modeling (SEM) to determine the strength and significance of the influence of technological infrastructure on employee productivity at Kinde Engineering Works.

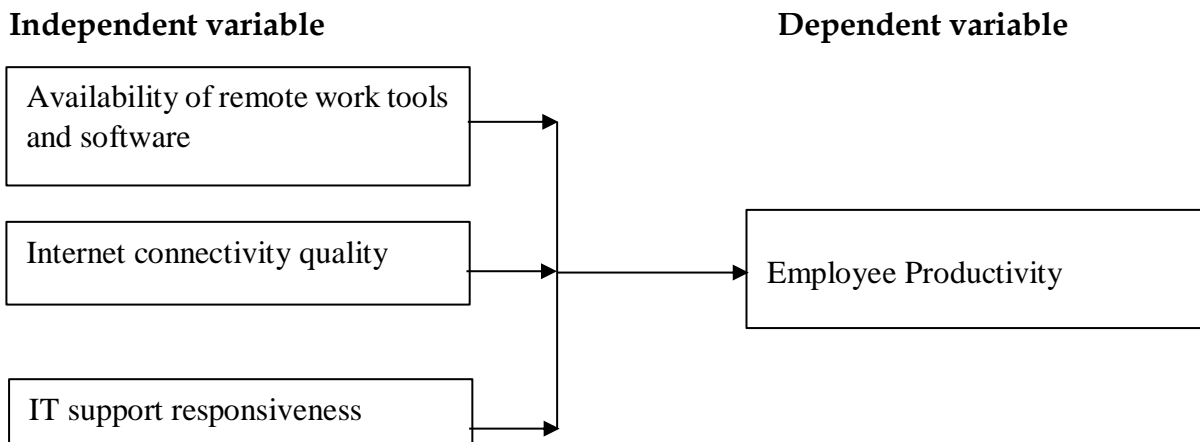


Figure 9: Conceptual Framework

METHODOLOGY

Research Design

This study adopted a descriptive cross-sectional survey design to explore the relationship between remote working and employee productivity within Kinde Engineering Works in Kenya. The design was appropriate for capturing the current perceptions, experiences, and outcomes of remote working without manipulating the environment. It enabled the collection of both quantitative and qualitative data at a single point in time through structured questionnaires and semi-structured interviews, facilitating a holistic understanding of how variables such as technological infrastructure, managerial support, work-life balance, and employee self-discipline influence productivity (Kothari, 2019; Creswell, 2014).

Target Population and Sampling Techniques

The study targeted all 123 employees of Kinde Engineering Works across managerial, technical, and administrative categories. To ensure proportional representation, stratified random sampling was employed, dividing the population into strata based on job categories.

The sample size was determined using Yamane’s (1967) formula:

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n = sample size

N = population size (123)

e = margin of error (0.05 for 95% confidence level)

Applying the values:

$$N = 123 / 1 + 123(0.05)^2 = \approx 94$$

Thus, the sample size is approximately 94 respondents.

The sample was allocated proportionally to each stratum based on their share of the total population, as shown below:

Table 1: Population and Sample Size Distribution by Employee Category

Category	Population (N)	Proportion (%)	Sample Size (n)
Managers	28	$(28/123) \times 100 \approx 22.8\%$	$0.228 \times 94 \approx 21$
Technical Staff	55	$(55/123) \times 100 \approx 44.7\%$	$0.447 \times 94 \approx 42$
Administrative Staff	40	$(40/123) \times 100 \approx 32.5\%$	$0.325 \times 94 \approx 31$
Total	123	100%	94

This approach minimized sampling bias and ensured that all key groups were adequately represented (Saunders, Lewis & Thornhill, 2019).

Data Collection and Analysis

Primary data were collected using structured questionnaires for quantitative data and semi-structured interviews for qualitative insights. Questionnaires featured Likert-scale items assessing key variables, while interviews with managers explored deeper themes regarding supervision, support, and productivity. Collected data were analyzed using SPSS Version 28. Descriptive statistics (means, frequencies, and percentages) summarized respondent characteristics, while Pearson correlation and multiple regression analysis tested relationships between independent and dependent variables. The regression model was expressed as:

$$EP = \beta_0 + \beta_1 TI + \beta_2 MS + \beta_3 WLB + \beta_4 SD + \epsilon$$

Where:

EP = Employee Productivity (dependent variable)

TI = Technological Infrastructure

MS = Managerial Support and Supervision

WLB = Work-Life Balance

SD = Employee Self-Discipline in Time Management

β_0 = Intercept

$\beta_1, \beta_2, \beta_3, \beta_4$ = Coefficients of the independent variables

ϵ = Error term

Qualitative data were analyzed thematically to complement quantitative findings.

Ethical Considerations

Ethical integrity was maintained through informed consent, privacy protection, and data confidentiality. Participants were briefed on the purpose, procedures, and voluntary nature of the study and were assured of anonymity and the right to withdraw at any stage. Data were securely stored in password-protected digital files accessible only to the research team. Ethical clearance was obtained from the National Commission for Science, Technology and Innovation (NACOSTI) and Kinde Engineering Works management before data collection. These measures ensured compliance with national research standards and upheld participants' rights, dignity, and trust throughout the research process (Resnik, 2020).

FINDINGS AND DISCUSSION

Response Rate

As shown in Table 5, technical staff recorded the highest participation at 95.2%, followed by administrative staff at 87.1%, while managers and supervisors had a response rate of

81.0%. This strong response demonstrates active engagement across all employee categories and enhances the reliability and representativeness of the data.

Table 36: Response Rate

Category	Population	Sample Size	Responses	Response Rate
Managers & Supervisors	28	21	17	81.0%
Technical Staff	55	42	40	95.2%
Administrative Staff	40	31	27	87.1%
Total	123	94	84	89.4%

According to Mugenda and Mugenda (2019), a response rate above 70% is considered adequate for analysis and reporting, thus the achieved rate exceeds the recommended threshold. The high participation level is attributed to consistent follow-up, use of convenient online survey tools suitable for remote workers, and managerial support in promoting the study. Consequently, the data collected provides a solid foundation for valid and generalizable insights into the influence of technological infrastructure on employee productivity among remote workers at Kinde Engineering Works.

Demographic Information

This section presents the demographic characteristics of respondents who participated in the study. The demographic data provide a background understanding of the participants' profiles and help in interpreting how factors such as age, gender, education, job position, department, and years of service might influence employee productivity under remote working arrangements at Kinde Engineering Works.

Distribution of Respondents by their Age Brackets

The findings in Figure 2 reveal that most respondents (66.7%) were aged between 25–34 years, followed by 19.0% aged 35–44 years, 7.1% aged 45–54 years, 6.0% below 25 years, and 1.2% aged 55 years and above.

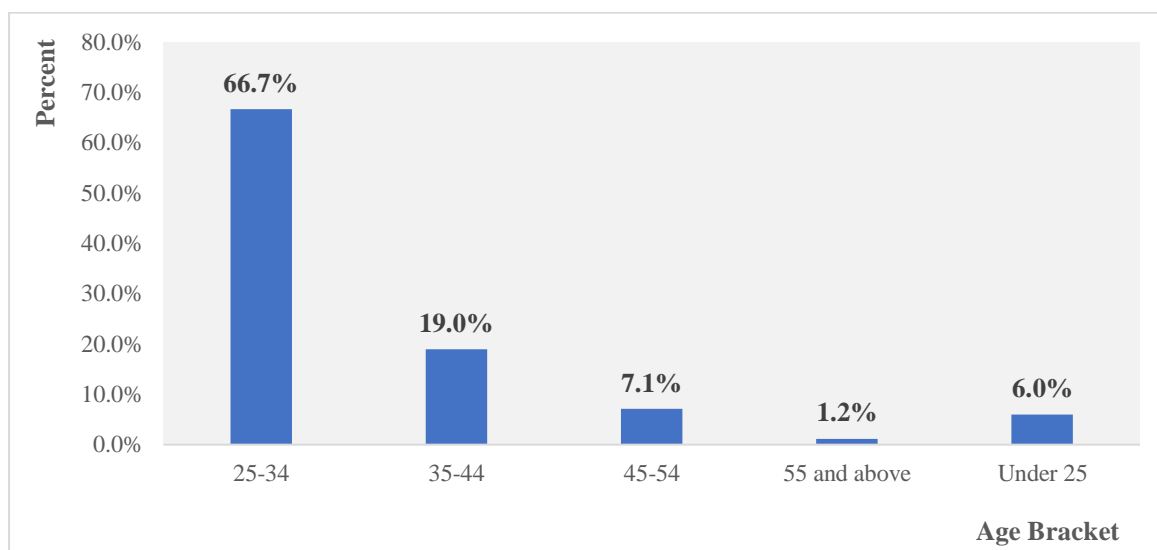


Figure 10: Age Bracket of the Respondents

This shows that Kinde Engineering Works has a predominantly youthful workforce, which is advantageous for remote working environments that depend heavily on digital skills and adaptability. Younger employees tend to be more receptive to technological tools and flexible work systems, aligning with findings by Nguyen et al. (2021) and Eurofound (2022), who reported that younger professionals display higher proficiency in digital collaboration. However, the limited number of older employees suggests a potential gap in mentorship continuity, indicating the need for intergenerational knowledge exchange to sustain productivity in remote operations.

Distribution of Respondents by their Gender

As indicated in Figure 3, males comprised the majority (85.7%) of respondents, females accounted for 8.3%, while 6.0% preferred not to disclose their gender. This gender imbalance reflects the male-dominated nature of Kenya's internet service and engineering industries, which tend to attract more men to technical roles. Such disparities may influence teamwork dynamics and inclusivity in remote work settings.

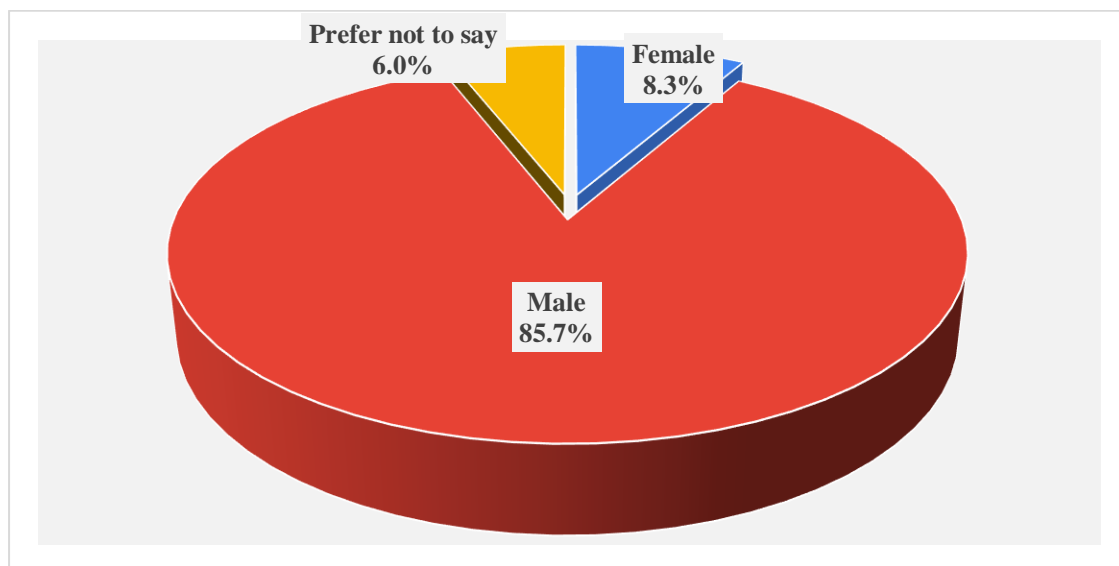


Figure 11: Gender of the Respondents

According to OECD (2023) and World Bank (2022), women remain underrepresented in digital professions globally due to structural and cultural barriers. Addressing this imbalance through gender-inclusive policies, digital upskilling, and mentorship initiatives could enhance creativity and collaboration, thereby improving remote productivity at Kinde Engineering Works.

Distribution of Respondents by their Highest Level of Education

Figure 4 shows that 44.0% of respondents held diplomas, 34.5% certificates, 20.2% bachelor's degrees, and 1.2% postgraduate qualifications. This indicates that most employees possess practical, technical training—a trend consistent with service-oriented industries that emphasize applied competencies.

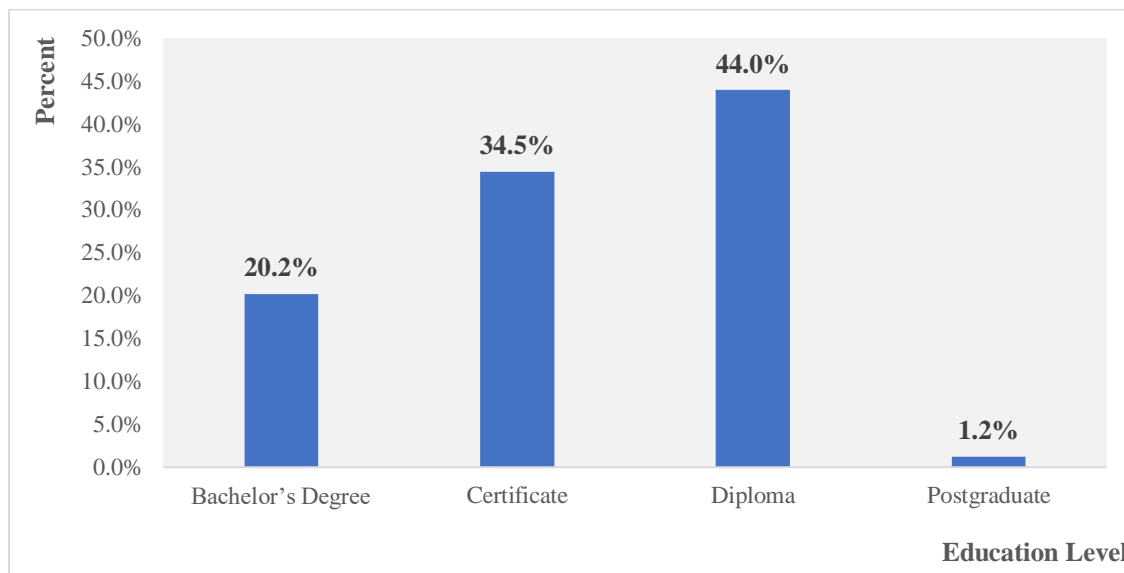


Figure 12: Highest Level of Education

The findings are in line with ILO (2021) and Kumar & Rout (2020), who noted that vocationally trained staff form the backbone of operational efficiency in engineering and ICT firms. However, the presence of degree holders provides leadership potential and innovation capacity. Continuous digital training and professional development programs are therefore essential to sustain productivity and optimize remote performance across all educational levels.

Distribution of Respondents by Their Job Position

As shown in Figure 5, junior staff formed the largest proportion (53.6%), followed by mid-level staff (33.3%), senior staff (10.7%), and management (2.4%).

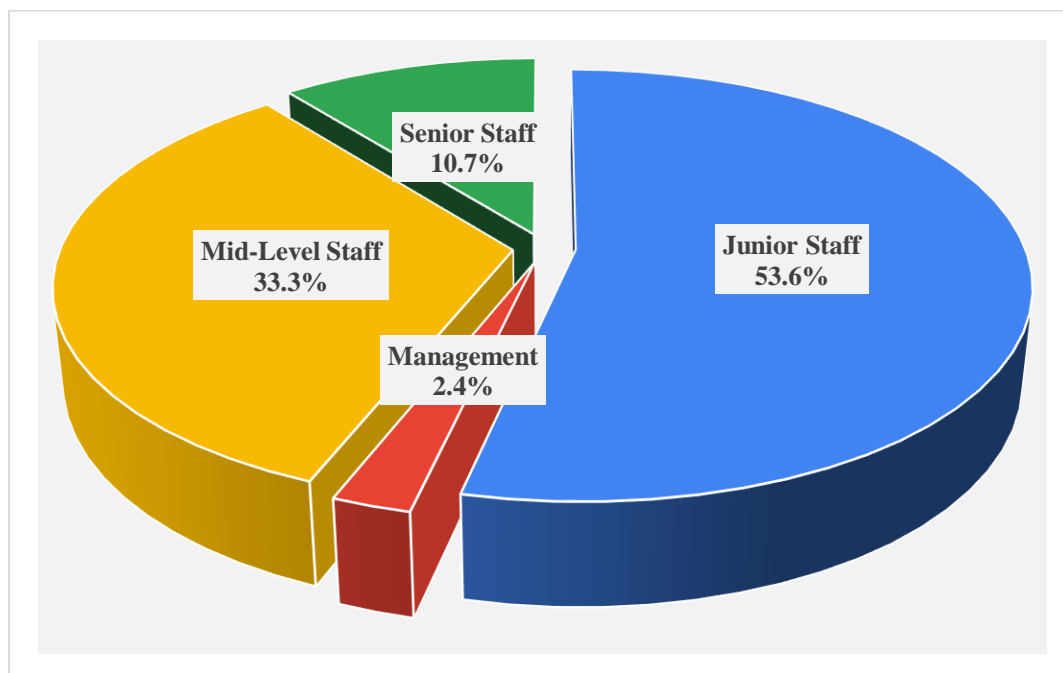


Figure 13: Job Position of the Respondents

This indicates that most respondents were directly involved in technical and customer-support operations, making them the primary actors in remote service delivery. Bloom et

al. (2022) emphasized that productivity in remote work largely depends on the effectiveness of operational employees supported by efficient supervision. The small representation of management provides valuable insights into oversight and coordination, but the dominance of operational staff strengthens the study’s focus on how technological infrastructure influences the day-to-day productivity of remote workers.

Distribution of Respondents by their Respective Department

The results in Figure 6 indicate that 84.5% of respondents were from the technical department, while customer service and other departments each accounted for 7.1%, and administration 1.2%.

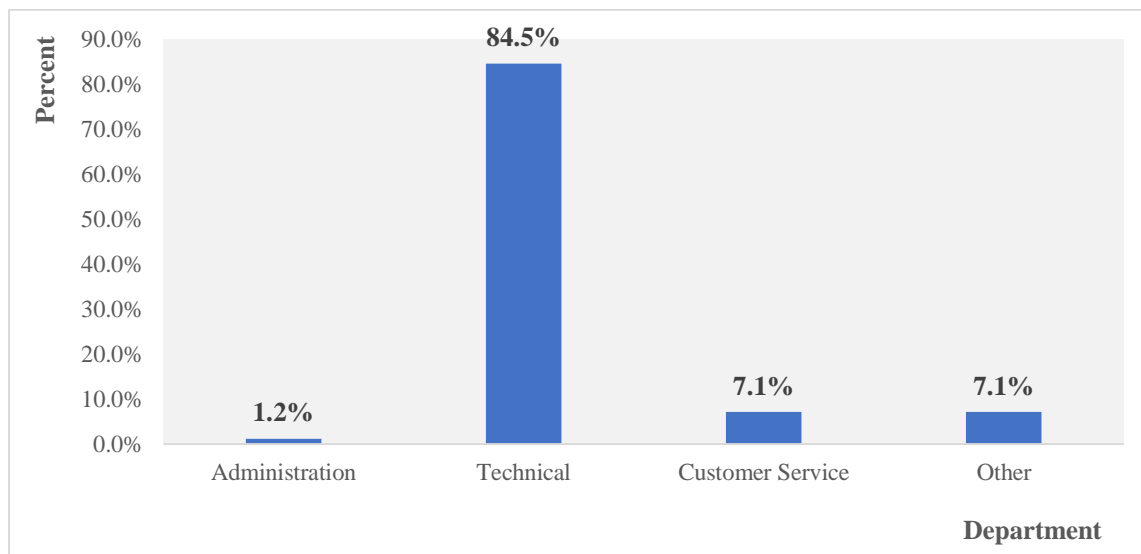


Figure 14: Department of the Respondent

This distribution reflects the technical orientation of Kinde Engineering Works as an Internet Service Provider, where operations rely heavily on network maintenance and system support. UNCTAD (2023) similarly observed that ICT firms allocate most human resources to technical departments due to the centrality of digital infrastructure in service delivery. The predominance of technical staff strengthens the study’s focus on evaluating how infrastructure quality, connectivity, and digital tools affect productivity in remote technical operations.

Distribution of Respondents by their Years of Service with Kinde Engineering Works

Figure 7 illustrates that 42.9% of respondents had worked for 1–3 years, 26.2% for less than 1 year, 22.6% for 4–6 years, 4.8% for 7–10 years, and 3.6% for more than 10 years.

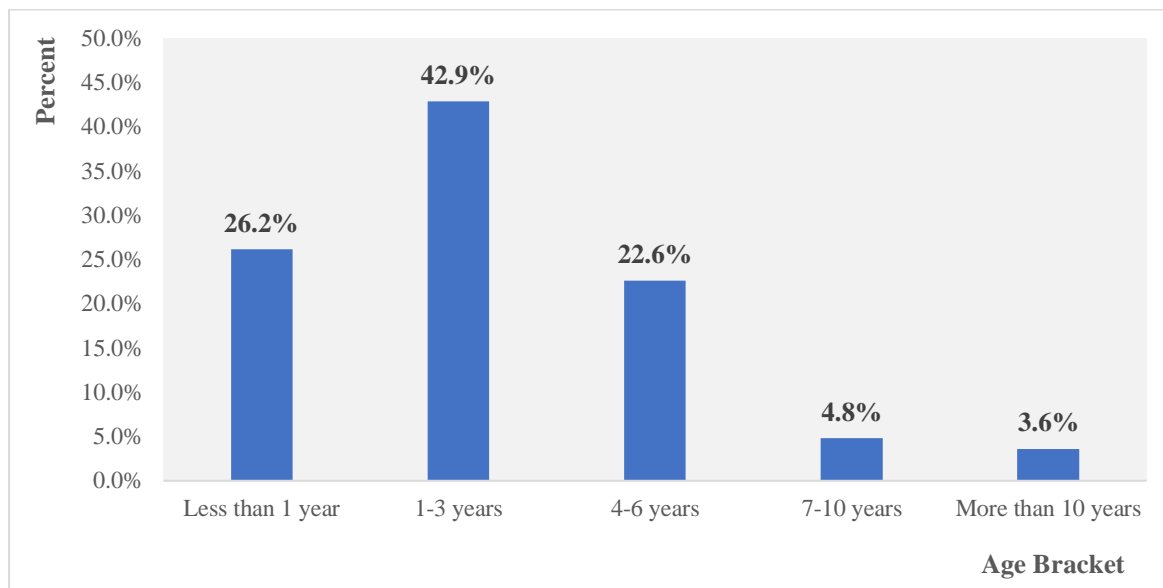


Figure 15: Years of Service with Kinde Engineering Works

This pattern indicates that Kinde Engineering Works has a relatively young workforce in terms of tenure, with most employees having limited experience but strong adaptability to new technologies. McKinsey & Company (2021) found that early-career professionals often thrive in digital environments but require structured guidance to sustain consistent performance. Therefore, combining technological investments with continuous mentorship and management support can help maintain productivity among relatively new remote workers.

Descriptive Statistics

This section presents the descriptive analysis of key study variables to illustrate how respondents at Kinde Engineering Works perceive the adequacy of technological infrastructure and its relationship to employee productivity under remote working arrangements. The analysis summarizes responses using means and standard deviations to show the level of agreement with various statements related to each construct.

Descriptive Findings on Technological Infrastructure

Descriptive results in Table 2 reveal that respondents generally agreed that Kinde Engineering Works provides adequate technological resources to support remote working, with an overall mean of 4.107 and a standard deviation of 0.978. A majority (41.5%) strongly agreed that the organization has invested in reliable systems, while 37.5% agreed. The highest-rated statement was "I am adequately trained to use the technology required for remote working" (mean = 4.369), followed by "The technological tools provided enhance my ability to perform work tasks remotely" (mean = 4.190).

Table 37: Extent to Which Respondent Agrees with Statements on Technological Infrastructure

Statement	SD	D	N	A	SA	Mean	SD
The company provides adequate hardware and software for remote working.	3.6	7.1	17.9	44.0	27.4	3.845	1.018
Internet connectivity is reliable when working remotely.	2.4	3.6	15.5	36.9	41.7	4.119	0.956
Technical support is readily available when technical issues arise during remote work.	3.6	4.8	19.0	39.3	33.3	3.940	1.016
The technological tools provided enhance my ability to perform work tasks remotely.	2.4	4.8	9.5	38.1	45.2	4.190	0.957
The remote working platforms used are user-friendly and efficient.	1.2	4.8	14.3	34.5	45.2	4.179	0.928
I am adequately trained to use the technology required for remote working.	2.4	2.4	7.1	32.1	56.0	4.369	0.897
Average	2.6	4.6	13.9	37.5	41.5	4.107	0.978

These findings indicate that employees perceive the company's digital infrastructure as efficient, accessible, and conducive to remote productivity. The consistency in responses reflects equitable access to tools that minimize workflow disruptions. This aligns with Kiarie and Ndirangu (2023) and Karanja et al. (2021), who found that strong ICT systems enhance operational efficiency and task completion. Similarly, Nguyen and Tran (2022) observed that technological readiness and connectivity positively influence performance and engagement in hybrid models.

Descriptive Findings on Employee Productivity

The findings in Table 3 show that employees largely agreed that technological infrastructure enhances their productivity, with an overall mean of 4.052 and a standard deviation of 1.083. About 85.7% of respondents agreed or strongly agreed that they completed their tasks on time and maintained quality output. The highest mean (4.310) was for the statement "I consistently complete my assigned tasks on time while working remotely," followed closely by multitasking ability (mean = 4.214). These results suggest that remote work has enabled employees to manage time more efficiently, reduce distractions, and increase output. However, a relatively lower mean (3.571) on "I am more productive when working remotely compared to working on-site" indicates that some staff still value in-person interactions for collaboration and motivation.

Table 38: Descriptive Findings on Employee Productivity among Staff Working Remotely in Internet Service Providers

Statement	SD	D	N	A	SA	Mean	SD
I consistently complete my assigned tasks on time while working remotely.	2.4	3.6	8.3	32.1	53.6	4.310	0.938
The quality of my work remains high when working from home.	4.8	11.9	15.5	29.8	38.1	3.845	1.190
Remote working has increased my overall efficiency and output.	2.4	2.4	19.0	26.2	50.0	4.190	0.982
I am able to handle multiple tasks effectively during remote work.	2.4	6.0	13.1	25.0	53.6	4.214	1.036
Working remotely has helped me to meet or exceed my performance targets.	2.4	4.8	10.7	36.9	45.2	4.179	0.966
I am more productive when working remotely compared to working on-site.	4.8	13.1	31.0	22.6	28.6	3.571	1.168
Average	3.2	6.9	16.3	28.8	44.8	4.052	1.083

This finding supports Choudhury et al. (2020) and Bloom et al. (2015), who noted that while remote work boosts individual productivity, hybrid setups often provide the optimal balance between flexibility and teamwork efficiency.

Inferential Statistics

Inferential analysis was conducted to determine the statistical relationship between technological infrastructure and employee productivity. The objective was to establish whether variations in technological capacity significantly predict performance outcomes among remote workers at Kinde Engineering Works.

Table 39: Model Summary for Technological Infrastructure and the Employee Productivity among Staff Working Remotely in Internet Service Providers

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
.708 ^a	0.502	0.496	0.520	1.864

a. Predictors: (Constant), Technological Infrastructure

The model summary in Table 4 shows that technological infrastructure explains 50.2% ($R^2 = 0.502$) of the variance in employee productivity among remote staff. The adjusted R^2 value of 0.496 confirms the model's reliability after accounting for sample size effects. Additionally, the Durbin-Watson statistic of 1.864 indicates acceptable levels of residual independence. This finding signifies that technological factors, such as reliable connectivity, software functionality, and technical support, strongly predict employees' output levels and performance consistency. Comparable studies have shown similar patterns; for example, Musau and Muathe (2020) reported that technology adoption significantly improved task coordination and output among remote workers in Kenyan ICT firms, while Omar et al. (2022) found that technology-driven work processes explained over 48% of variance in performance across Malaysian service organizations.

Table 40: ANOVA for Technological Infrastructure and Employee Productivity

	Sum of Squares	Df	Mean Square	F	Sig.
Regression	22.328	1	22.328	82.545	.000 ^b
Residual	22.181	82	0.271		
Total	44.510	83			

a. Dependent Variable: Employee Productivity

b. Predictors: (Constant), Technological Infrastructure

The ANOVA results in Table 5 reveal that the relationship between technological infrastructure and employee productivity is statistically significant ($F = 82.545$, $p < 0.001$). This indicates that the regression model used effectively explains variations in productivity as influenced by technological capabilities. The large F-ratio demonstrates a strong predictive power, suggesting that improvements in digital infrastructure lead to substantial gains in work performance. These findings align with the conclusions of Kamau and Njoroge (2022), who established that ICT infrastructure accounted for a significant portion of productivity variance in Kenyan internet companies. Similarly, Mensah and Boateng (2021) observed that reliable technological support enhances flexibility and responsiveness, especially in remote working arrangements. Thus, the statistical evidence supports the assertion that technology remains a critical driver of productivity within Internet Service Providers.

Table 41: Model Summary for Technological Infrastructure and the Employee Productivity

	Unstandardized Coefficients	Std. Error	Standardized Coefficients	t	Sig.
(Constant)	1.343	0.304		4.426	0.000
Technological Infrastructure	0.659	0.072	0.708	9.085	0.000

a. Dependent Variable: Employee Productivity

As shown in Table 6, the regression coefficients indicate that technological infrastructure has a positive and statistically significant influence on employee productivity ($\beta = 0.659$, $t = 9.085$, $p < 0.001$). This implies that a one-unit improvement in technological infrastructure results in a 0.659-unit increase in productivity, holding other factors constant. The constant value ($\beta_0 = 1.343$) shows that even without major technological enhancements, productivity remains moderate but significantly improves with better infrastructure. The results emphasize that technological systems not only facilitate task execution but also strengthen remote monitoring and knowledge sharing. Studies by Onyango and Were (2024) and Malik et al. (2023) support this, noting that digital automation and system interoperability increase operational precision and minimize downtime, leading to overall performance gains in both private and public institutions.

The results affirm that technological infrastructure is a significant determinant of employee productivity in remote work environments. These findings agree with previous research by Kamau and Njoroge (2022), who demonstrated that ICT investment enhances employee motivation, coordination, and output in technology-oriented industries. Similarly, Kiarie and Ndirangu (2023) found that technological accessibility bridges communication gaps and supports effective supervision, particularly in hybrid setups. The strong explanatory power of this model suggests that technology acts as both an enabler and a performance stabilizer, ensuring continuity of operations even under remote working conditions.

Furthermore, this study's results reinforce global evidence showing that firms with robust technological systems achieve higher adaptability and employee satisfaction. Malik et al. (2023) found that organizations with reliable internet and digital tools reported up to 40% higher output compared to firms with weaker digital systems. Within the Kenyan context, Kinde Engineering Works serves as an example of how structured investment in ICT infrastructure, coupled with continuous user training, can sustain productivity in remote and hybrid work setups. Consequently, organizations seeking to optimize performance in the digital era must integrate technological infrastructure development into their strategic workforce management frameworks.

Qualitative Findings

The qualitative findings derived from interviews with managers and key staff at Kinde Engineering Works revealed that technological infrastructure plays a pivotal role in sustaining productivity among remote employees. Respondents consistently emphasized that stable internet connectivity, reliable digital tools, and responsive IT support are essential for maintaining workflow efficiency and effective communication. Managers noted that initial challenges, such as inconsistent network access and limited digital resources, disrupted coordination during the early stages of remote work implementation. However, subsequent investments in cloud-based systems, virtual collaboration software, and enhanced cybersecurity significantly improved operational continuity and task completion.

These findings correspond with Musau and Kiiru (2022), who reported that robust technological systems enhance efficiency in Kenya's manufacturing sector, and Ollo-López et al. (2020), who found similar outcomes in European firms adopting remote work. Additionally, respondents observed that technology not only facilitates coordination but

also strengthens accountability through performance tracking dashboards and automated reporting tools. Nonetheless, some expressed concerns that excessive monitoring could cause anxiety among employees, echoing Waweru and Muchiri's (2021) argument that productivity tools should balance oversight with autonomy. Overall, the qualitative insights affirm that technological infrastructure serves as both a productivity enabler and a structural support system, fostering collaboration, time management, and organizational resilience in remote work environments.

CONCLUSION

The study concluded that technological infrastructure significantly influences employee productivity in remote working environments at Kinde Engineering Works. The findings demonstrated that reliable internet connectivity, adequate digital tools, effective IT support, and user training collectively enhance employees' efficiency, task completion rates, and overall job satisfaction. Both quantitative and qualitative analyses confirmed that employees with access to robust technology systems perform better and adapt more easily to remote working demands. The study also established that technological infrastructure not only facilitates operational continuity but also strengthens accountability, collaboration, and innovation. Therefore, investment in digital systems and technical support remains essential for sustaining productivity and competitiveness within Kenya's ISP sector, particularly as remote and hybrid work arrangements continue to evolve.

RECOMMENDATIONS

Based on the study findings, Kinde Engineering Works should prioritize continuous improvement of its technological infrastructure by investing in high-speed internet, reliable collaboration platforms, and regular employee training on emerging digital tools. Establishing a responsive IT support framework and upgrading remote work systems will minimize downtime, enhance efficiency, and foster a more productive virtual work environment. Additionally, management should implement structured feedback mechanisms to assess technological gaps and align system upgrades with employee needs.

Furthermore, to balance productivity with employee well-being, the organization should adopt a human-centered remote work policy that integrates flexibility with effective performance monitoring. This includes promoting digital literacy, offering mental health support, and ensuring fair workload distribution across teams. By embedding these practices into strategic operations, Kinde Engineering Works—and similar firms within Kenya's ISP sector—can strengthen workforce resilience, optimize performance, and maintain competitiveness in the evolving digital workspace.

REFERENCES

- Adeyemi, T., & Eze, S. (2021). Impact of internet quality and IT resources on remote employee productivity: Evidence from the Nigerian banking sector. *Journal of African Business*, 22(3), 345–361. <https://doi.org/10.1080/15228916.2021.1879654>
- Bloom, N., Han, R., & Liang, J. (2022). *How hybrid working from home works out* (NBER Working Paper No. 30292). National Bureau of Economic Research. <https://doi.org/10.3386/w30292>

- Bloom, N., Liang, J., Roberts, J., & Ying, Z. J. (2015). Does working from home work? Evidence from a Chinese experiment. *Quarterly Journal of Economics*, 130(1), 165–218. <https://doi.org/10.1093/qje/qju032>
- Brown, K., & Green, M. (2019). Technological readiness and employee performance in remote work: A study of the Australian telecommunications sector. *Telecommunications Policy*, 43(5), 101820. <https://doi.org/10.1016/j.telpol.2019.101820>
- Choudhury, P., Foroughi, C., & Larson, B. Z. (2020). Work-from-anywhere: The productivity effects of geographic flexibility. *Strategic Management Journal*, 42(4), 655–683. <https://doi.org/10.1002/smj.3251>
- Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (4th ed.). Sage Publications.
- Davis, F. D. (1986). A technology acceptance model for empirically testing new end-user information systems: Theory and results. *Doctoral dissertation*, MIT Sloan School of Management.
- Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology*, 86(3), 499–512. <https://doi.org/10.1037/0021-9010.86.3.499>
- Eurofound. (2022). *Living, working and COVID-19: Impact on telework and work-life balance*. Publications Office of the European Union. <https://www.eurofound.europa.eu/publications>
- Idi, J. M., & George, K. K. (2018). Mobile telephony, social networks and credit access: Evidence from MSMEs in Kenya. *Cogent Economics & Finance*, 6(1).
- International Labour Organization (ILO). (2021). *Skills development in the digital economy: Trends and policy responses*. <https://www.ilo.org>
- Kamau, D., & Njoroge, P. (2022). Technological infrastructure and employee performance among Kinde Engineering Works in Nairobi, Kenya. *African Journal of Management Research*, 8(2), 87–102.
- Kamau, P., Njoroge, S., & Wambui, J. (2023). Managerial support and remote work productivity among employees in Kenya's Kinde Engineering Works. *Kenya Journal of Business and Management*, 15(2), 89–104.
- Karanja, J., Ndirangu, S., & Wanyoike, R. (2021). ICT readiness and employee productivity in the telecommunications industry in Kenya. *International Journal of Information Systems and Technology*, 3(1), 45–59.
- Kinde Engineering Works. (2025). *About us*. Retrieved May 2025, from <https://kindeengineering.co.ke/about-us>
- Kothari, C. R. (2019). *Research Methodology: Methods and Techniques* (4th ed.). New Age International Publishers.
- Kumar, R., & Rout, P. (2020). Workforce skill alignment and employability in the ICT sector: A global perspective. *Journal of Human Resource and Sustainability Studies*, 8(2), 75–88. <https://doi.org/10.4236/jhrss.2020.82006>
- Malik, R., Sharma, V., & Singh, D. (2023). Digital infrastructure and remote employee performance: Evidence from Asia. *Journal of Global Business and Digital Economy*, 14(1), 34–49.
- Martinez, J., & Lopez, S. (2020). Technological infrastructure and productivity in the Spanish IT industry during remote work. *Journal of Information Technology*, 35(2), 151–165.

- McKinsey & Company. (2021). *The future of remote work: Balancing productivity and well-being*. <https://www.mckinsey.com>
- Mkuzi, P. (2024). Impact of teleworking on employee productivity in Kenya. *Kenya Journal of Management Studies*, 18(1), 45-59.
- Mugenda, O. M., & Mugenda, A. G. (2019). *Research methods: Quantitative and qualitative approaches* (Rev. ed.). ACTS Press.
- Munyua, J., & Muriuki, L. (2023). Challenges of remote work in Kenyan industries. *African Journal of Business and Management*, 10(2), 120-135.
- Muriuki, L. (2022). Technological advancement in Kenya's manufacturing sector. *East African Industrial Review*, 8(2), 15-29.
- Ndegwa, P. (2022). *Digital Transformation and Workplace Productivity in Kenya's Telecommunications Sector*. *African Journal of Business and Technology*, 14(2), 55-68.
- Nguyen, T. T., Pham, H. M., & Tran, D. K. (2021). Digital readiness and employee adaptability in post-pandemic remote work environments. *Asian Journal of Business and Management Research*, 11(3), 45-56.
- Organisation for Economic Co-operation and Development (OECD). (2023). *Bridging the digital gender divide: Include, upskill, innovate*. OECD Publishing. <https://doi.org/10.1787/9a1e7b7b-en>
- Otieno, L., & Mwangi, J. (2023). *Adoption of Remote Work Strategies in Kenyan ICT Firms Post-COVID-19*. Nairobi: Kenya Institute of Management.
- Otieno, M., & Mwangi, J. (2022). Technological infrastructure challenges and remote work productivity in Nairobi's tech sector. *Kenya Technology Review*, 6(2), 42-57.
- Resnik, D. B. (2020). *What is Ethics in Research & Why is it Important?* National Institute of Environmental Health Sciences.
- Saunders, M., Lewis, P., & Thornhill, A. (2019). *Research Methods for Business Students* (8th ed.). Pearson Education Limited.
- Singh, R., & Goyal, P. (2021). Impact of digital infrastructure on remote work productivity: Evidence from India's IT sector. *Information Technology for Development*, 27(1), 38-52.
- United Nations Conference on Trade and Development (UNCTAD). (2023). *Digital economy report 2023: Cross-border data flows and development*. United Nations Publications. <https://unctad.org/publication/digital-economy-report-2023>
- Wang, B., Liu, Y., Qian, J., & Parker, S. (2020). Achieving effective remote working during the COVID-19 pandemic: A work design perspective. *Applied Psychology*, 70(1), 16-59.
- World Bank. (2022). *Women, business and the law 2022*. World Bank Group. <https://openknowledge.worldbank.org>