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Assessing the Impact of Digital Transformation on Human Capital Development in Public Tertiary Institutions in Delta State

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ABSTRACT: The aim of this study was to examine the impact of digital transformation on human capital development in public tertiary institutions in Delta State, Nigeria. The objectives were specifically designed to examine the impact of digital infrastructure adoption and digital skills and competency development on human capital development in public tertiary institutions in Delta State, Nigeria. The study adopted a descriptive survey design with the population size of 1,000 academic and non-academic staff members from both universities. A sample size of 286 staff were determined using Yamane's formula at 95% confidence level. Data were collected using a structured questionnaire and these were analyzed using SPSS version 26. Descriptive statistics (mean and standard deviation) summarized the data, while linear regression analysis tested the hypotheses. The findings of the study showed that digital infrastructure adoption, digital skills and competency development has a significant effect on human capital development in public tertiary institutions in Delta State have significant effect on human capital development in public tertiary institutions in Delta State. In conclusion, digital infrastructure adoption and skills development significantly influence human capital development in Delta State's public tertiary institutions, underscoring the need to pair technological investment with capacity building to enhance staff capabilities, improve institutional performance, and fully realize the benefits of digital transformation. It was recommended among other things that public tertiary institutions should prioritize sustained investment in modern, reliable, and scalable digital infrastructure to support teaching, research, and administrative processes.

Keywords: Digital transformation, Human capital development, Digital infrastructure adoption, Digital skills, Competency development, Public tertiary institutions

1. INTRODUCTION

In the evolving landscape of the 21st century, the integration of digital technologies has fundamentally reshaped organizational structures, workflows, and talent development practices. Digital transformation which is seen as the adoption and strategic integration of digital technologies to drive organizational performance and innovation, is now a key determinant of institutional effectiveness, especially in the public education sector (Vial, 2019). Across the globe, higher education institutions are increasingly

turning to digital platforms to enhance administrative efficiency, teaching delivery, and human resource development. In Nigeria, and particularly in Delta State, the impetus to digitize tertiary institutions have gained urgency due to the global shift toward knowledge economies and the disruptions triggered by the COVID-19 pandemic.

One of the critical pathways through which digital transformation manifests in educational institutions is digital infrastructure adoption, like the deployment and utilization of information and communication technologies (ICTs) such as broadband internet, virtual learning platforms, smart classrooms, and enterprise systems. These digital infrastructures are essential not only for academic delivery but also for fostering a conducive environment for employee performance, innovation, and continuous learning (Abubakar, Bala, & Yusuf, 2023). In many Nigerian public tertiary institutions, however, infrastructural deficits continue to constrain the full realization of digital transformation's potential.

Essentially, the dimension of digital skills and competency development, which reflects the capacity of institutions to equip their workforce with the technical and cognitive skills necessary for effective engagement in a digitally enabled environment. As the fourth industrial revolution demands new skill sets among academic and non-academic staff, public tertiary institutions must prioritize digital literacy, capacity building, and staff development initiatives. Institutions that invest in upskilling their human capital tend to experience greater staff engagement, adaptability, and productivity (Onah & Ugwu, 2022). In contrast, the absence of continuous digital competency development leads to workforce redundancy and underperformance, particularly in institutions that are transitioning from traditional to digital service delivery models.

Human capital development, which encompasses knowledge acquisition, skill enhancement, and employee empowerment, is central to institutional sustainability and service delivery quality. Public tertiary institutions in Delta State are expected to align their human resource strategies with digital trends to remain competitive and relevant. However, empirical investigations into how specific aspects of digital transformation such as digital infrastructure adoption and digital skills development, affect human capital development in these institutions remain limited. Bridging this gap is crucial for evidence-based policy making and institutional reform.

Despite the global shift toward digital transformation in higher education, many public tertiary institutions in Delta State continue to face challenges in effectively leveraging digital technologies to enhance human capital development. Inadequate digital infrastructure, limited broadband connectivity, and insufficient investment in modern ICT tools have hindered efficient teaching, administration, and staff development. According to Abubakar, Bala, and Yusuf (2023), Nigerian universities continue to struggle with these infrastructural limitations and a lack of targeted digital training initiatives for staff.

More critically, many institutions lack structured programs to build digital competencies among academic and non-academic staff, resulting in skill gaps, low adaptability, and reduced productivity. While digital transformation holds significant promise for improving workforce capacity, empirical studies focusing on how specific dimensions—such as digital infrastructure adoption and digital skills and competency development—affect human capital outcomes in public tertiary institutions in Delta State are scarce. This gap makes it difficult for policymakers and institutional leaders to make informed decisions on digital investments and staff development strategies. Hence, there is a need to investigate the extent to which digital transformation initiatives contribute to human capital development in these institutions.

Therefore, the objective of this study is to assess the impact of digital transformation on human capital development in public tertiary institutions in Delta State, Nigeria. The specifically, the study examine the extent to which digital infrastructure adoption influences human capital development in public tertiary institutions in Delta State; The study also assessed the effect of digital skills and competency development on human capital development in public tertiary institutions in Delta State. Hypothetically,

H_{01}: Digital infrastructure adoption has no significant effect on human capital development in public tertiary institutions in Delta State

H_{02}: Digital skills and competency development has no significant effect on human capital development in public tertiary institutions in Delta State.

LITERATURE REVIEW

2.1 Digital Transformation

Digital transformation refers to the integration of digital technologies into all areas of an organization, fundamentally changing how it operates and delivers value. According to Vial (2019), digital transformation is "a process that aims to

improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies." Similarly, Reis, Amorim, Melão, & Matos (2018) define it as the organizational shift driven by the strategic adoption of digital technologies to enhance efficiency, innovation, and performance.

Digital transformation typically unfolds in three interrelated phases**:** digitization, which involves converting analog processes to digital format; digitization**,** which uses digital tools to improve existing workflows; and transformation, which signifies a fundamental rethinking of business models and value creation through digital means (Vial, 2019). These phases represent a continuum of technological maturity within organizations.

In higher education and the public sector, digital transformation is driven by factors such as increasing demand for efficiency, rising student expectations, advancements in ICT, and policy pressures for modernization.

However, several barriers hinder its progress, including limited infrastructure, resistance to change, inadequate funding, and insufficient digital skills among staff (Onah & Ugwu, 2022). These challenges are particularly evident in public tertiary institutions in developing countries, where structural limitations and underinvestment in technology infrastructure persist.

Despite these barriers, digital transformation holds significant potential for advancing institutional capacity in developing countries. It enhances transparency, promotes flexible service delivery, and supports the development of digital competencies necessary for competitive human capital (UNESCO, 2021). For institutions in contexts like Delta State, Nigeria, digital transformation is not just a technological upgrade but a strategic imperative for educational and workforce development.

2.1.1 Digital Infrastructure Adoption

Digital infrastructure encompasses the core technologies and systems that support digital processes within organizations, including broadband connectivity, hardware, software platforms, cloud computing, and institutional networks (World Bank, 2021). In the context of higher education, these elements are foundational to enabling digital teaching, administration, and research.

Modern educational institutions rely heavily on digital infrastructure to facilitate online learning, enhance institutional efficiency, and support workforce development. Through tools such as virtual learning environments, digital libraries, and administrative management systems,

institutions can scale access to knowledge and streamline operations (OECD, 2020). The COVID-19 pandemic further emphasized the necessity of robust infrastructure to maintain continuity in education.

However, public tertiary institutions in many developing regions including Delta State, Nigeria face challenges such as outdated ICT tools, unreliable internet access, poor maintenance, and inconsistent implementation of digital policies (Adebayo & Okoli, 2022). These limitations not only impede service delivery but also constrain opportunities for human capital development among staff who require regular digital engagement.

2.1.2 Digital Skills and Competency Development

Digital skills refer to the knowledge and abilities required to effectively use digital tools and technologies for work, communication, learning, and problem-solving. These competencies can be grouped into technical skills (e.g., using digital devices and software), cognitive skills (e.g., information evaluation, digital literacy), and adaptive skills (e.g., flexibility in learning and applying new technologies) (van Laar et al., 2020).

Frameworks such as UNESCO's Digital Competency Framework for Educators (2018) provide structured guidelines for the development of digital proficiency across academic and administrative functions. The framework emphasizes not only the ability to use technology but also the pedagogical and professional competencies needed to adapt to evolving digital environments.

In public tertiary institutions, training programs**,** capacity-building workshops**,** and continuous professional development (CPD) initiatives are essential for building staff digital competencies. Upskilling enables employees to effectively engage with digital platforms, support e-learning delivery, and streamline administrative processes (Aina & Salami, 2022).

However, significant barriers to digital competence development persist in many developing contexts. These include limited access to ICT resources, lack of institutional support, resistance to change, and inadequate funding for staff development (Idogho & Eromosele, 2021). Addressing these challenges is critical for ensuring that human capital evolves in tandem with digital transformation.

2.1.3 Human Capital Development

Human capital development refers to the systematic process of enhancing the knowledge, skills, competencies, and attributes of individuals to improve organizational performance and adaptability.

It is based on the premise that people are valuable assets whose capabilities can be developed through education, training, and continuous learning. According to Becker (1993), investments in human capital particularly through formal education and vocational training lead to higher productivity and long-term institutional growth.

Core dimensions of human capital development include education**,** which equips individuals with foundational knowledge; training and skill acquisition, which foster job-specific competencies; and motivation, which drives employee engagement and retention. These components are critical in knowledge-based environments such as public tertiary institutions.

In the context of higher education, human capital development plays a pivotal role in enabling staff to adapt to digital innovations, manage institutional change, and deliver quality academic and administrative services. Effective development efforts are reflected in indicators such as increased employee productivity, professional growth, innovation in teaching practices, and overall institutional competitiveness (OECD, 2021).

2.1.4 Public Tertiary Institutions in Nigeria and Delta State

Public tertiary institutions in Nigeria, including those in Delta State, are critical to national development through their roles in education, research, and workforce training. However, many face significant challenges in embracing digital transformation due to outdated infrastructure, poor internet access, low digital literacy, and limited ICT funding (Okoye & Nwafor, 2021).

To address these issues, the Federal Ministry of Education introduced the National ICT in Education Policy in 2019, aimed at integrating digital tools into teaching, learning, and administration. The policy emphasizes infrastructure development, digital training, and resource access. Yet, implementation remains uneven, with institutions in Delta State often constrained by resource gaps and institutional inertia. Improving digital transformation in these institutions requires consistent investment, staff training, and alignment with national policy goals to enhance human capital development.

2.2 Theoretical Framework: Human Capital Theory

Human Capital Theory, developed by Becker (1993), posits that individuals and organizations benefit from investments in education, training, and skill development, which enhance productivity and long-term economic outcomes. The theory emphasizes

that human abilities such as knowledge, competencies, and innovation are valuable assets that can be cultivated to improve organizational performance. In the context of public tertiary institutions, this theory supports the notion that digital transformation initiatives such as improved digital infrastructure and staff digital skills development constitute strategic investments in human capital.

By equipping staff with relevant digital competencies, institutions enhance their capacity for innovation, teaching effectiveness, and service delivery. Thus, Human Capital Theory provides a foundational lens for understanding how digital transformation influences the growth and utilization of human resources in public tertiary institutions in Delta State.

2.3 Empirical Review

Several empirical studies have examined the nexus between digital transformation and human capital development, particularly within higher education institutions across Africa. These investigations provide valuable insights into how digital infrastructure and staff digital competencies influence organizational performance. However, they also highlight gaps in localized research, particularly within public tertiary institutions in regions such as Delta State, Nigeria.

Nwankwo and Okeke (2021), in a quantitative survey of 356 staff across four Nigerian public universities, identified a significant positive relationship between ICT infrastructure availability such as broadband internet and e-learning platforms and employee productivity. Their regression analysis demonstrated that institutions with more advanced digital infrastructure reported higher levels of staff engagement and operational efficiency, underscoring the critical role of infrastructure in enabling human capital development. In a related study, Komba (2020) employed a mixed-method design to assess digital readiness in Tanzanian public colleges. Using questionnaires and interviews from 120 staff across 12 institutions, the study revealed that poor internet connectivity, outdated ICT tools, and insufficient maintenance mechanisms significantly constrained staff training, collaboration, and overall performance. These findings highlight widespread infrastructural limitations across public educational institutions in sub-Saharan Africa.

Agyemang and Dadzie (2022) conducted a cross-sectional quantitative study involving 210 academic staff in Ghanaian public universities. Their findings showed that structured digital skills training significantly improved staff adaptability, innovation in teaching, and professional development.

Regression results confirmed a strong association between digital competency development and institutional effectiveness, reinforcing the importance of continuous upskilling.

Ahmed and Musa (2021), through a qualitative case study across six northern Nigerian universities, examined digital skill gaps among non-academic staff. Based on 24 key informant interviews, the study found that limited exposure to digital tools and inadequate training negatively impacted administrative efficiency and delayed service delivery. The authors emphasized the need for targeted digital capacity-building initiatives to enhance institutional productivity.

Similarly, Okoye and Nwafor (2021) conducted a descriptive quantitative survey among 200 academic staff in South-East Nigerian universities to evaluate digital literacy levels. Their findings indicated that many staff lacked essential technical and cognitive digital skills, thereby limiting the successful implementation of ICT-based initiatives and reforms.

3.0 METHODOLOGY

The study adopted a descriptive survey design suitable for collecting quantitative data and identifying variable relationships. It was conducted in two purposefully selected institutions: The Federal University of Petroleum Resources, Effurun (FUPRE), and the University of Delta, Agbor (UNIDEL). These universities were chosen to reflect diversity in digital maturity, institutional age, and ownership structure. The study population comprised 1,000 academic and non-academic staff members from both universities, with a sample size of 286 determined using Yamane's formula at a 5% margin of error and 95% confidence level.

Stratified sampling technique was used to ensure proportional representation from each institution and staff category, followed by simple random selection within each stratum. Data were collected using a structured questionnaire aligned with study objectives and prior literature. The instrument was divided into three sections covering demographic details, digital transformation dimensions (infrastructure and skills), and human capital development indicators, using a 4-point Likert scale. Self-administered questionnaires were distributed to participants, and data were analyzed using SPSS version 26. Descriptive statistics (mean and standard deviation) summarized the data, while linear regression analysis tested the hypotheses to determine the predictive influence of digital transformation on human capital development at a 5% significance level.

4.0 DATA ANALYSIS AND RESULTS PRESENTATION

4.1 Descriptive Statistics

Table 4.1: Descriptive Statistics and Frequency Distribution of ICT-Related Survey Responses (N = 268)

Item	Mean	SD	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
1. ICT infrastructure enhances staff development	4.12	0.78	6 (2.2%)	15 (5.6%)	28 (10.4%)	132 (49.3%)	87 (32.5%)
2. Reliable internet supports research and learning	3.89	0.91	13 (4.9%)	26 (9.7%)	43 (16.0%)	108 (40.3%)	78 (29.1%)
3. Digital platforms improve staff efficiency	4.05	0.85	8 (3.0%)	20 (7.5%)	36 (13.4%)	121 (45.1%)	83 (31.0%)
4. Investment in digital infrastructure increases access to capacity building	3.97	0.82	6 (2.2%)	22 (8.2%)	38 (14.2%)	134 (50.0%)	68 (25.4%)
5. Inadequate digital infrastructure limits staff competency development	3.55	1.02	19 (7.1%)	34 (12.7%)	60 (22.4%)	92 (34.3%)	63 (23.5%)

Source: *Field Survey, 2025*

Item 1 (Mean = 4.12, SD = 0.78): Most respondents agreed that ICT infrastructure enhances staff development. With over 81% agreeing or strongly agreeing, the mean shows high positive perception. Item 2 (Mean = 3.89, SD = 0.91): A relatively high level of agreement about internet reliability. Some variability is observed (SD ~ 0.91), indicating a mix of experiences. Item 3 (Mean = 4.05, SD = 0.85): Respondents largely agreed on the usefulness of digital platforms for efficiency. A strong positive mean supports the effectiveness of technology adoption. Item 4 (Mean = 3.97, SD = 0.82): Respondents see investment in digital infrastructure as helpful in capacity building. Slightly lower strong agreement, but still favorable overall. Item 5 (Mean = 3.55, SD = 1.02): This item is negatively worded. A mean below 4 suggests less consensus, and the highest SD (1.02) suggests greater variability in responses, indicating that while some believe inadequate infrastructure is limiting, others may not.

Table 4.2: Descriptive Statistics and Response Distribution for Digital Skills & Training Items (N = 268)

Item	Mean	SD	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
1. I have received adequate training to use digital tools relevant to my job role.	3.88	0.90	11 (4.1%)	25 (9.3%)	37 (13.8%)	127 (47.4%)	68 (25.4%)
2. Digital skill development programmes in my institution have improved staff performance.	4.03	0.81	5 (1.9%)	18 (6.7%)	34 (12.7%)	138 (51.5%)	73 (27.2%)
3. Lack of digital competency among staff hinders effective service delivery.	3.69	0.98	13 (4.9%)	29 (10.8%)	41 (15.3%)	112 (41.8%)	73 (27.2%)
4. Staff with better digital skills are more likely to access growth and leadership opportunities.	4.17	0.77	4 (1.5%)	10 (3.7%)	28 (10.4%)	139 (51.9%)	87 (32.5%)
5. My institution regularly organises training sessions to enhance staff digital literacy.	3.72	0.95	12 (4.5%)	31 (11.6%)	42 (15.7%)	117 (43.7%)	66 (24.6%)

Source: *Field Survey, 2025*

Item 1 shows general satisfaction with digital training adequacy (Mean = 3.88), but with slightly higher variation in perception. Item 2 also scored high (Mean = 4.03), with over 78% of respondents agreeing or strongly agreeing that digital skill programmes have improved staff performance. Item 3, although framed negatively, received considerable agreement (Mean = 3.69), suggesting many respondents see a lack of digital competency as a barrier to effective service delivery. Item 4 had the highest mean (4.17) and low standard deviation (0.77), indicating strong consensus that staff with better digital skills have greater access to leadership and growth. Item 5 (Mean = 3.72) reflects that while many agree their institutions provide regular training, about 31.8% remain neutral or disagree, indicating potential gaps in training frequency or reach.

4.2 Test of Hypotheses

4.2.1 Hypothesis One

Ho: Digital infrastructure adoption has no significant effect on human capital development in public tertiary institutions in Delta State

Table 4.3: Model Summary

Model	*R*	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*
1	0.652	0.425	0.422	0.683

Source: *SPSS Version 26*

R = 0.652: Strong positive correlation between digital infrastructure and human capital development. R^2 = 0.425: About 42.5% of the variation in human capital development is explained by digital infrastructure adoption.

Table 4.4: ANOVA

Model	*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Regression	82.123	1	82.123	176.01	.000
Residual	111.215	266	0.418		
Total	193.338	267			

Source: *SPSS Version 26*

The F-value = 176.01, and Sig. = .000 ($p < 0.05$), indicates the model is statistically significant.

Table 4.5: Coefficients

Model	*Unstandardized Coefficients*	*Std. Error*	*Standardized Coefficients (Beta)*	*t*	*Sig.*
	B = 0.968	0.073	0.652	13.27	.000
(Constant)	0.029	0.289		0.10	0.919

Source: *SPSS Version 26*

B = 0.968: For every one-point increase in digital infrastructure adoption, human capital development increases by approximately 0.97 points**.** p-value (.000) confirms the coefficient is statistically significant. Since $p < 0.05$, we reject H_0 and accept the alternative and conclude that digital infrastructure adoption has a significant positive effect on human capital development in public tertiary institutions in Delta State. This suggests that investment in ICT infrastructure plays a pivotal role in

enhancing staff training, digital competency, and access to growth opportunities.

4.2.2 Hypothesis Two

Ho: Digital skills and competency development has no significant effect on human capital development in public tertiary institutions in Delta State.

Table 4.6: Model Summary

Model	*R*	*R Square*	*Adjusted R Square*	*Std. Error of the Estimate*
1	0.694	0.481	0.479	0.648

Source: *SPSS Version 26*

R = 0.694: A strong positive relationship between digital skills development and human capital development. R^2 = 0.481: About 48.1% of the variance in human capital development is explained by digital skills and competency development.

Table 4.7: ANOVA

Model	*Sum of Squares*	*df*	*Mean Square*	*F*	*Sig.*
Regression	92.97	1	92.97	221.35	.000
Residual	100.36	266	0.377		
Total	193.33	267			

Source: *SPSS Version 26*

F = 221.35**,** Sig. = .000 → the model is statistically significant ($p < 0.05$), meaning the independent variable reliably predicts the dependent variable.

Table 4.8: Coefficients

Model	*Unstandardized Coefficients*	*Std. Error*	*Standardized Coefficients (Beta)*	*t*	*Sig.*
(Constant)	0.211	0.264	—	0.799	0.425
Digital Skills & Competency (X)	0.949	0.064	0.694	14.874	.000

Source: *SPSS Version 26*

B = 0.949: For every one-point increase in digital skills and competency development, human capital development increases by approx. 0.95 units. p-value = .000 → this relationship is highly statistically significant. Since $p < 0.05$, we reject the null hypothesis and conclude that there is strong statistical evidence that digital skills and competency development has a significant positive effect on human capital development in public tertiary institutions in Delta State.

Digital infrastructure adoption has a significant effect on human capital

development in public tertiary institutions in Delta State. Digital skills and competency development has a significant effect on human capital development in public tertiary institutions in Delta State.

5.0 CONCLUSION

The study found that digital infrastructure adoption and digital skills and competency development significantly influence human capital development in public tertiary institutions in Delta State. This highlights the crucial role of technological investment and capacity building in enhancing staff capabilities, academic delivery, and institutional competitiveness. The findings suggest that without adequate infrastructure and relevant skill acquisition, the potential benefits of digital transformation may remain untapped. Therefore, fostering human capital growth in higher education requires a balanced approach that combines access to modern digital tools with structured programmes for developing the competencies needed to leverage such technologies effectively. By aligning infrastructure investment with targeted training initiatives, public tertiary institutions can strengthen their academic workforce, improve research and administrative efficiency, and better prepare students for the demands of a technology-driven economy. The study therefore recommends as follows:

i. Public tertiary institutions should prioritise sustained investment in modern, reliable, and scalable digital infrastructure to support teaching, research, and administrative processes.
ii. Institutions should implement continuous professional development programmes focused on digital skills and competency enhancement for both academic and non-academic staff to maximise technology's impact.

REFERENCES

Abubakar, A. M., Bala, K., & Yusuf, I. (2023). *Digital infrastructure and academic performance in Nigerian universities: A moderated mediation analysis*. International Journal of Educational Management, 37(2), 350–368. https://doi.org/10.1108/IJEM-09-2022-0421

Adebayo, R. A., & Okoli, C. F. (2022). Enhancing digital readiness in Nigerian public universities: Infrastructure, policy, and strategy. *African Journal of Educational Management, 20*(1), 45–56.

Agyemang, F. G., & Dadzie, S. A. (2022). Digital competency and innovation capacity among university staff: Evidence from public institutions in Ghana. *International Journal of Educational Management, 36*(2), 317–330. https://doi.org/10.1108/IJEM-07-2021-0305

Ahmed, A. Y., & Musa, B. I. (2021). Evaluating digital skill acquisition among administrative staff in northern Nigerian universities.

African Journal of Information Systems, 13(4), 87–101.

Aina, S. A., & Salami, O. A. (2022). Building digital skills capacity in Nigerian public universities: Prospects and limitations. *Nigerian Journal of Educational Technology, 15*(2), 88–97.

Becker, G. S. (1993). *Human capital: A theoretical and empirical analysis, with special reference to education* (3rd ed.). University of Chicago Press.

Becker, G. S. (1993). *Human capital: A theoretical and empirical analysis, with special reference to education* (3rd ed.). University of Chicago Press.

Idogho, P. O., & Eromosele, E. O. (2021). Barriers to ICT adoption among academic staff in Nigerian tertiary institutions. *African Journal of Information Systems, 13*(3), 1–13.

Komba, W. L. (2020). ICT infrastructure and e-learning adoption in Tanzanian public colleges. *Education and Information Technologies, 25*(3), 2125–2140. https://doi.org/10.1007/s10639-019-10049-w

Nwankwo, C. A., & Okeke, E. I. (2021). ICT infrastructure and staff performance in Nigerian public universities. *Nigerian Journal of Educational Technology, 14*(1), 23–34.

OECD. (2020). *The impact of digital technologies on education and development*. Organisation for Economic Co-operation and Development. https://www.oecd.org/education/the-impact-of-digital-technologies.pdf

Onah, F. O., & Ugwu, L. I. (2022). *Workforce digital competencies and the changing demands in Nigerian higher education institutions*. African Journal of Business Management, 16(4), 101–110. https://doi.org/10.5897/AJBM2022.9373

Organisation for Economic Co-operation and Development (OECD). (2021). *Skills for a digital world: Human capital development in the 21st century*. https://www.oecd.org/skills/

Reis, J., Amorim, M., Melão, N., & Matos, P. (2018). Digital transformation: A literature review and guidelines for future research. In *Proceedings of the International Conference on Business Excellence*, *12*(1), 1189–1201. https://doi.org/10.2478/picbe-2018-0106

UNESCO. (2018). *Digital competency framework for educators (DigCompEdu)*. United Nations Educational, Scientific and Cultural Organization. https://unesdoc.unesco.org/ark:/48223/pf0000265403

UNESCO. (2021). *ICT in education: A critical enabler for sustainable development*. United Nations Educational, Scientific and Cultural Organization. https://unesdoc.unesco.org/ark:/48223/pf0000377096

van Laar, E., van Deursen, A. J., van Dijk, J. A., & de Haan, J. (2020). Determinants of 21st-century digital skills: A large-scale survey among working professionals. *Computers in Human Behavior, 100*, 93–104. https://doi.org/10.1016/j.chb.2019.06.017

Vial, G. (2019). *Understanding digital transformation: A review and a research agenda*. The Journal of Strategic Information Systems, 28(2), 118–144.

https://doi.org/10.1016/j.jsis.2019.01.003

Vial, G. (2019). Understanding digital transformation: A review and a research agenda

World Bank. (2021). *Digital infrastructure for development: Toward a digitally inclusive Nigeria*. https://documents.worldbank.org/en/publication/documents-reports/documentdetail