Institutiones Administrationis – Journal of Administrative Sciences Vol. 4 (2024) No. 1, 56–73
DOI: 10.54201/iajas.v4i1.93

From Tech Skills to Performance Gains: How Digital Literacy Drives Productivity Improvements in the Public Sector

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Abstract

With rapid technological advancements, developing a digitally literate workforce is imperative for public sector organizations to enhance performance. However, research linking digital literacy and employee outcomes in developing country contexts has been limited. This study investigated the relationship between digital literacy and productivity among local government employees in Nigeria. A survey was conducted with 113 employees in Ilorin West Local Government in Nigeria. PLS-SEM was used for the analysis. Digital literacy demonstrated significant positive effects on productivity. Access to ICT positively moderated the digital literacy-productivity relationship. The study makes important theoretical contributions by extending ICT adoption research to public sector contexts and revealing the performance benefits of digital literacy in the workplace. Practically, it capacitates public organizations to increase investments in structured digital skills development programs to motivate employees and unlock productivity improvements.

Keywords

digital literacy; access to ICT; employee productivity; motivation; digital skills; ICT adoption

1 Introduction

Capacity building initiatives aimed at enhancing human resources are critical for public sector organizations in developing countries to improve organizational performance and service delivery. Building the skills, competencies, and abilities of public servants enables the effective implementation of policies and programs (Hardyman et al., 2022). In Nigeria specifically, efforts at capacity building in local governments have traditionally focused on areas like

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financial management, leadership development, and project management (Igbokwe-Ibeto & Osakede, 2023). Training programs have sought to equip local government employees with essential skills for managing budgets, overseeing projects, and providing vision and direction. However, building capabilities in digital literacy has received relatively limited attention in capacity building frameworks targeting Nigerian local governments (Oyedele et al., 2017). This is despite the immense potential that digital literacy has for enhancing employee productivity, efficiency, and overall performance in the contemporary knowledge economy (Abdulkareem & Ramli, 2021a).

Developing a digitally literate workforce should be an urgent priority within the broader agenda of public sector capacity building in Nigeria, given the rapid pace of digital transformation that is underway globally. While initiatives aimed at strengthening core management and functional competencies remain important, targeted efforts aimed to improve digital literacy skills across all levels of the workforce is also of significance (Setiawan et al., 2022). This is crucial to optimize both individual employee productivity as well as overall organizational performance. With Nigeria's young demographic profile, enhancing digital competencies can catalyze innovative work practices and service delivery improvements driven by technology adoption. Equipping employees with digital problem-solving, collaboration, communication, and content creation skills can help drive productivity gains (Hasan et al., 2022). Structured training programs, on-the-job technology exposure, mentorship in digital fluency, and changes to workplace policies and culture will be needed to ingrain digital mindsets and skills. Leadership commitment and vision will be vital to drive digital literacy as a core capability development priority within a holistic public sector capacity building strategy. Focused efforts to boost digital workforce competencies will be instrumental for Nigerian local governments to leverage the potential of emerging technologies for enhanced internal efficiency, responsiveness to citizens, and local problem solving.

Digital literacy refers to the skills needed to use digital technologies and applications productively at work (van Dijk & Hacker, 2018). It goes beyond basic technical skills like using software or operating digital devices, encompassing higher-level cognitive and socio-emotional skills (van Deursen & van Dijk, 2015). These include the ability to effectively search for and process information online, critically evaluate the credibility of digital content, create original content using technology tools, apply technology in problem-solving, and use digital platforms for communication and collaboration at work. Developing such a broad set of digital competencies enables employees to fully leverage the affordances of technology to perform core job tasks more efficiently. It empowers them to take advantage of technology for enhanced communication and engagement with colleagues and clients, streamlined information search and management, development of written and multimedia content, data-driven decision making, and collaborative problem-solving through virtual platforms.

In today's knowledge economy, which is characterized by the exponential growth and proliferation of digital technologies, having a digitally literate workforce is thus imperative for boosting organizational productivity, efficiency, and competitive advantage (Abdulkareem & Ramli, 2021a). The scale and complexity of technological change underway means that workers at all levels require a broad set of digital competencies to harness the potential of new tools and data sources. Public sector organizations in particular need to rapidly build comprehensive digital skills and mindsets across all levels of the workforce in order to adapt to digital transformation trends and stay responsive to evolving citizen needs and expectations (Asah et al., 2022; Jumayev & Nazarov, 2022). Citizens increasingly expect services and information to be accessible seamlessly across digital channels (Abdulkareem & Ramli, 2021b). To meet

these demands and maintain legitimacy, public agencies must equip employees to fully leverage technologies to communicate with stakeholders, streamline processes, and deliver citizen-centric services effectively. A digitally savvy workforce is vital for public sector productivity and effectiveness at a time when technology is reshaping operations, service delivery models, and stakeholder engagement. Strategic investment in digital skills development is thus mission-critical for adaptation and sustained performance in the digital economy (Hasan et al., 2022).

Existing studies show that there has been limited integration of structured programs aimed at building digital literacy skills within broader capacity building frameworks and initiatives targeting Nigerian local governments (Chukwudi, 2015). Most training and professional development activities concentrate on improving general leadership, management, and functional/technical capabilities, without an explicit focus on developing a digitally savvy workforce (Agundu, 2008; Alao et al., 2015; Ibok, 2014). This deficiency in prioritizing digital skills development has constrained both individual employee performance, as well as overall organizational productivity, within Nigerian local governments. Employees often lack the digital competencies needed to optimally utilize technology and data in their daily work routines, which hampers efficiency and output (Abdulkareem et al., 2018).

Consequently, this study aims to empirically examine the relationship between digital literacy and productivity of local government employees in Nigeria. Specfically, this study will assess digital literacy across various dimensions including basic technical skills, information management, communication, content creation, and problem solving. More so, the study seeks to examine the relationship between digital literacy and productivity in core job responsibilities undertaken by local government workers. It aims to ascertain whether higher digital proficiency translates into improved efficiency and effectiveness in day-to-day functions. Finally, the study will explore the moderating effects of access to ICT on the relationship between digital literacy and employee productivity.

This study is designed to contribute to the scholarly understanding of how digital literacy enhances public sector capacity building outcomes, particularly in relation to employee productivity. The empirical findings will provide much-needed evidence on whether and if so how digital competency improvements translate into measurable productivity gains for public sector organizations in developing country contexts. Extant research on this topic in the public sector, especially in Africa, has been limited. The results will help addressing this knowledge gap and extending theoretical perspectives on how digital literacy drives performance improvements by individual employees and organizations as a whole.

In addition to advancing academic literature, the findings have practical utility for informing organizational development initiatives aimed at leveraging digital literacy training and skills-building to boost performance of Nigerian local governments. The conclusions can guide strategies, programs, and investments to enhance digital workforce capabilities for improved efficiency and service delivery. As digital technologies continue transforming public sector operations in the 21st century, building a digitally savvy workforce is vital for modernizing processes, enhancing responsiveness to citizen needs, facilitating data-driven decision making, and boosting productivity across an array of core governance functions. Developing actionable insights through this research will contribute towards efforts to strengthen local governments in Nigeria as capable, technology-enabled organizations for driving development at the grassroots level.

2 Literature review

2.1 Capacity building in public sector organizations

Capacity building in public sector organizations is a complex, multidimensional, and dynamic process that plays a crucial role in enhancing the overall effectiveness, efficiency, responsiveness, and service delivery capabilities of government agencies (Hardyman et al., 2022; Nurdin & Purna, 2023). This broad concept encompasses a wide range of strategies, initiatives, programs, and investments aimed at developing human resource competencies and strengthening organizational capabilities within the public sector. At its core, capacity building involves developing the knowledge, skills, and abilities of public servants to enable them to perform their duties and responsibilities at a higher level of productivity and impact. As noted by Grindle (1997); Pepinsky et al. (2017), substantial investments in training, education, and professional development of government employees are foundational to any capacity building agenda (Zia et al., 2021). Depending on the contexts and needs, this can include formal training programs to enhance specific technical, managerial, leadership, or policy implementation capabilities. On-the-job coaching, mentoring, and experiential learning approaches can also be highly effective (Mukerji & Tripathi, 2019).

However, capacity building cannot simply stop at the individual level. As emphasized by Prenestini and Lega (2013), efforts must also be directed at strengthening the broader organizational capabilities of public sector entities. This includes enhancing the institutional architecture, administrative processes and procedures, management practices, and strategic priorities that shape how these agencies function and utilize resources. Developing organizational competencies in areas like public financial management, data-driven decision making, project management, and policy implementation is key. Furthermore, as underscored by (Newman et al., 2017), capacity building requires an integrated approach spanning the individual, organizational, and institutional levels. The institutional dimension entails systemic and structural changes to the overarching governance systems, legal frameworks, policies, regulations, and bureaucratic norms that enable or constrain capacity building within public sector organizations. Ultimately, the success and sustainability of capacity building depends on addressing these interconnected dimensions holistically (Kislov et al., 2014; Sobeck & Agius, 2007).

Moreover, in today's rapidly evolving digital age, building capabilities to fully leverage technology has become an urgent priority (Eakin et al., 2011). As governments around the world undergo digital transformation, public sector organizations need to adapt by harnessing new technologies to improve service delivery, enhance transparency, facilitate participatory decision making, and drive innovation (Abdulkareem & Mohd Ramli, 2021; Escobar et al., 2023). Developing a digitally savvy workforce and modernizing systems and processes to take advantage of digital tools are essential to futureproof government agencies. Public sector organizations are no longer just bureaucratic entities (AbdulKareem et al., 2024). They are now dynamic and interactive, constantly adapting to the evolving digital landscape (Alvarenga et al., 2020; Dunleavy et al., 2006; Simmonds et al., 2021). This transformation is largely driven by advancements in technology, which have reshaped every aspect of the society, including how citizens interact with government agencies (Abdulkareem et al., 2016). As a result, public agencies must evolve and adapt to stay relevant and efficient by embracing the digital revolution and integrate it into their operations.

2.2 Digital literacy

Digital literacy is a complex, multidimensional concept encompassing a broad set of knowledge, skills, behaviors, and attitudes required to effectively perform tasks, solve problems, and interact productively in digitally-driven environments (van Deursen & van Dijk, 2009). As conceptualized by scholars like Belshaw and Higgins (2011), digital literacy refers to the ability to appropriately and responsibly use a range of digital devices, applications, and networks to access, manage, integrate, analyze, create and communicate information. It enables individuals to achieve goals and expand capabilities through technology use.

Several theoretical frameworks have been proposed to elaborate on the multidimensional components encompassed within digital literacy. For instance, Ferrari (2012) put forth an influential model outlining three key domains of digital literacy: information literacy, communication literacy, and content creation literacy. Information literacy refers to the ability to identify, locate, retrieve, store, and analyze digital information. Communication literacy involves skills for effective social digital communication, such as appropriate email etiquette. Content creation literacy entails the ability to generate original digital content using various formats and platforms.

Similarly, Calvani et al. (2009) delineated a framework highlighting four layers of digital literacy, namely: technical-procedural, cognitive, socio-emotional, and ethical. Technical-procedural literacy includes skills like operating devices, navigating interfaces, and using software tools. Cognitive literacy encompasses searching, comprehending, and critically evaluating online information. Socio-emotional literacy refers to social skills for online communication, collaboration, and interpersonal interaction. Finally, ethical literacy involves understanding ethical issues in digital environments and behaving responsibly.

Across the various theoretical models, some common themes emerge around the multidimensional components of digital literacy. These include the importance of technical functional skills to use tools and platforms effectively, cognitive capabilities to find, understand, and evaluate information, social skills to communicate and collaborate responsibly, and ethical awareness when engaging with digital technologies. Developing competence across these interrelated dimensions is vital for unlocking the full potential of technology to enhance work performance and productivity.

Developing these well-rounded digital competencies enables optimal application of tools to enhance workplace productivity and performance. For instance, higher levels of digital literacy allow employees to effectively search for information online, critically evaluate the credibility and usefulness of digital content, analyze data, create original multimedia content, and collaborate productively with remote teams using digital platforms. It empowers more efficient and impactful utilization of technology resources for core work tasks compared to basic or limited technology skills. Integrating digital literacy development within capacity building initiatives is thus vital for empowering a workforce to thrive in today's digitally-driven world.

2.3 Impact of digital literacy on productivity

A growing body of empirical research has demonstrated positive linkages between digital literacy and productivity outcomes across diverse contexts. In educational settings, studies by Miller and Bartlett (2012) and Nikolopoulou and Gialamas (2016) found that higher digital literacy among students and teachers was associated with greater academic performance and teaching effectiveness. Martin and Grudziecki (2006) studied how digital literacy affected productivity

mindsets among university students. Qualitative findings revealed students with higher digital fluency were more inclined to view technology as useful for enhancing academic productivity and displayed greater motivation for using digital tools to increase efficiency. Hatlevik et al. (2018)'s study involving teachers found that higher digital competence significantly predicted greater motivation and self-efficacy for technology use at work. Teachers who were more digitally literate displayed higher motivation to integrate ICT in their practices to improve productivity.

Within workplace environments spanning both private and public sector contexts, researchers have also established empirical connections between digital literacy and various productivity related outcomes. For instance, Falck et al. (2021) conducted an extensive study showing that increased computer and internet skills among adult learners participating in government-sponsored training programs led to higher wages, increased probability of securing employment, greater labor force participation, and other tangible economic benefits. The authors highlight how technology skills enable workers to access higher productivity jobs and work processes in the digital economy. A survey study of office workers by Van Deursen and Van Dijk (2016) showed that employees with moderate to high digital literacy reported being more task-focused, motivated and productive when utilizing digital technology compared to those with lower literacy. Proficient digital skills were linked to productive mindsets. Similarly, a study by Chetty et al. (2017), identified digital literacy as a strong predictor of improved labour market participation across OECD member countries. Statistical analyses revealed significant positive correlations between foundational technology skills among adults and higher employment rates. The report highlighted digital literacy development as a priority for empowering adults with essential workforce capabilities and driving productivity in the 21st century labour market. A study by Abdulkareem and Ramli (2021a) found strong correlation between digital literacy and e-government performance in the public sector in Nigeria.

These studies provide consistent evidence that digital literacy can catalyze motivation, confidence, and an empowered mindset to utilize technology in a focused way to enhance productivity across different workplace contexts. Developing a digitally savvy workforce is key for fostering technology adoption and utilization behaviors that drive gains in performance. However, more targeted research is needed to examine if similar returns can be realized within public sector organizations, especially in developing country contexts where digital literacy varies widely. This remains an empirical gap that the current study aims to address.

3 Conceptual framework and hypotheses formation

A conceptual framework (see Figure 1) is proposed based on the literature review and the study's context. Digital literacy is conceptualized as the independent variable influencing employee productivity, the key outcome of interest. Digital literacy is multidimensional, encompassing technical, cognitive, ethical, and social-emotional dimensions as it has been highlighted in frameworks by Ng (2012) and Calvani et al. (2009). It is measured through literacy assessment tools and questionnaires. Employee productivity serves as the dependent variable. It is operationalized through metrics like task efficiency and quantity of output relative to expectations. Access to ICT serves as the moderator for the relationship between digital literacy and employee productivity. Therefore, following hypotheses are tested:

H1: Digital literacy has a significant positive influence on employee motivation.
H2: Employee motivation significantly influences employee productivity.
H3: Digital literacy significantly inflences employee productivity.
H4: Access to ICT moderates the relationship between digital literacy and employee productivity

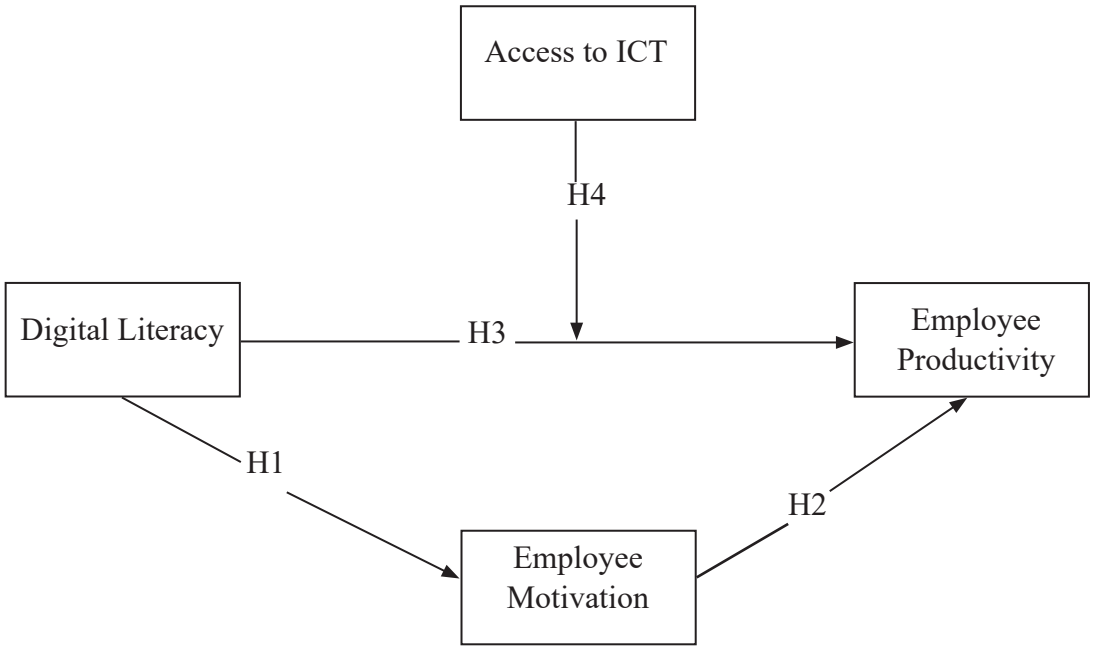
4 Model specification

The structural model was estimated using partial least squares structural equation modeling (PLS-SEM) with the following equations:

$$\text{Motivation} = \beta 0 + \beta 1 + \varepsilon 1 \quad (1)$$
$$\text{Productivity} = \beta 0 + \beta 1 + \beta 2 + \beta 3 + \varepsilon 2 \quad (2)$$

Where β0 = intercept terms, β1 = Digital literacy, β2 = Motivation, and β3= Digital_ Literacy*Access_ICT. The interaction term (Digital_Literacy*Access_ICT) captures the moderating effect of access to ICT on the digital literacy -> productivity relationship, as per H4. ε1 and ε2 represent the error terms for equations 1 and 2 respectively.

Figure 1. Conceptual model



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5 Methodology

This study aimed to investigate the relationship between digital literacy and employee productivity within the context of local governments in Nigeria. A quantitative, cross-sectional survey approach was determined as the most suitable methodology to examine this topic. The target population comprised staff of Ilorin West Local Government Area in Kwara State, Nigeria. This specific local government was selected through purposive sampling as

it represents a typical medium-sized local administration in the country, situated in an urban area and the state's capital. The sampling frame included all employees across departments at the headquarters of this local government. To collect data from respondents, a structured questionnaire was designed.

This questionnaire incorporated measurement scales adapted from existing validated sources to assess the key variables. For digital literacy, the study adapted the Digital Literacy Assessment instrument developed by Ng (2012). This comprehensive eighteen-item scale evaluates various dimensions of digital literacy including technical skills, cognitive abilities, social-emotional competencies, and ethical awareness. For motivation, a five-item Work Motivation Scale by Bjorklund (2016) was utilized to measure employee motivation levels. To assess employee productivity, the scale developed by Abane et al. (2022) was adapted. While for access to ICT, a three item scale was used based on Abdulkareem and Ramli (2021b).

The questionnaire was prepared in paper-based form for in-person administration. The minimum sample size required for the study was determined through a statistical power analysis conducted using G*Power software. Based on the inputs for power level, effect size, and significance level, a minimum sample of 113 respondents was recommended. Simple random sampling was then used to select the target 113 respondents from the staff from the local government. This ensured an unbiased cross-section of employees. To ascertain the validity of the questionnaire, subject matter experts reviewed the instrument to assess face and content validity. A pilot test was also carried out with 15 respondents matching the target demographic. Feedback from the pilot phase was used to refine the questionnaire. Reliability analysis on pilot data showed satisfactory Cronbach's alpha values higher than 0.7. For data analysis, partial least squares structural equation modeling (PLS-SEM) technique was utilized through SmartPLS software version 4. This enabled testing the conceptual framework and hypotheses involving the multiple relationships proposed. The marker variable approach was applied to check for common method bias. Regarding ethics, participation was purely voluntary without coercion or incentives. Anonymity of responses was maintained and no personally identifiable information was collected.

6 Analysis

6.1 Demographics

The sample consisted of 113 respondents from Ilorin West local government area. Males comprised 60.2% while females were 39.8% of respondents. In terms of age, most respondents fell between 25–35 years (40.7%) followed by 36–45 years (29.2%). Regarding education, a majority had Bachelor/HND degrees (67.3%) with only 7.1% having just primary education. For length of service, 49.6% had 21–30 years of experience. In terms of ICT proficiency, 36.3% had medium skills while 30.97% possessed high skills.

Table 1. Demographic Characteristics

	Parameters	Freq	%
Gender	Male	68	60.18
	Female	45	39.82
Age	below 25	12	10.62
	25–35	46	40.71
	36–45	33	29.20
	Above 45	22	19.47
Education	Primary	8	7.08
	Secondary	16	14.16
	Bachelor/ HND	76	67.26
	Postgraduate	13	11.50
Length of Service	Less than 10	11	9.73
	10–20	31	27.43
	21–30	56	49.56
	31–35	15	13.27
ICT Proficiency	High	35	30.97
	Medium	41	36.28
	Low	36	31.86
	No	1	0.88

Source: Authors' own editing

6.2 Measurement Model

The measurement model as shown in table 2 was examined by checking indicator loadings, composite reliability (CR), and average variance extracted (AVE). Majority of item loadings were above the 0.7 threshold confirming reliability. CR values exceeded 0.7 and AVE was higher than 0.5 for all constructs, satisfying the criteria for convergence validity. The heterotrait-monotrait ratio (HTMT) was used to assess discriminant validity. All HTMT values were below the 0.9 threshold, establishing discriminant validity. Thus, the measures for each construct were distinct from other constructs as shown in table 3.

Table 2. Table of Reliability

Constructs	Items	Loadings	Mean	SD	CA	CR	AVE
Digital Literacy	DGT1	0.685	5.941	1.064	0.814	0.812	0.556
	DGT2	0.774	5.588	1.263			
	DGT3	0.714	5.647	1.047			
	DGT4	0.722	5.706	1.169			
	DGT5	0.772	5.118	1.064			
	DGT6	0.716	5.588	0.996			
	DGT7	0.744	5.706	1.176			
	DGT8	0.732	5.412	1.169			
	DGT9	0.719	5.765	1.121			
	DGT10	0.792	5.807	1.278			
	DGT11	0.772	5.412	1.131			
	DGT12	0.718	6.059	1.054			
	DGT13	0.812	5.588	1.176			
	DGT14	0.775	5.715	1.169			
	DGT15	0.701	4.706	0.970			
	DGT16	0.770	5.824	1.064			
	DGT17	0.715	4.844	1.105			
	DGT18	0.763	5.882	1.121			
Employee Productivity	EMP1	0.775	6.176	1.074	0.785	0.779	0.592
	EMP2	0.719	5.529	0.943			
	EMP3	0.728	6.412	1.278			
	EMP4	0.825	5.824	1.074			
	EMP5	0.805	5.412	0.939			
	EMP6	0.775	6.000	1.225			
	EMP7	0.743	5.471	1.125			
Employee Motivation	EMT1	0.788	5.468	1.107	0.766	0.753	0.562
	EMT2	0.748	5.882	1.111			
	EMT3	0.746	5.588	1.176			
	EMT4	0.772	5.294	1.359			
	EMT5	0.719	5.529	1.068			
Access to ICT	ACT1	0.725	5.706	1.105	0.772	0.768	0.550
	ACT2	0.738	5.412	1.278			
	ACT3	0.733	5.824	1.015			

Source: Authors' own editing

Table 3. Discriminant Validity

	Digital Literacy	Employee Productivity	Employee Motivation	Access to ICT
Digital Literacy	0.441			
Employee Productivity	0.542	0.471		
Employee Motivation	0.539	0.426	0.339	
Access to ICT	0.468	0.598	0.532	0.496

Source: Authors' own editing

6.3 Structural model: hypothesis testing

The structural model results as shown in table 4 and figure 2 provided support for the hypothesized relationships. Digital literacy had a significant positive effect on motivation (β=0.622, $p<0.001$), supporting H1. The path from digital literacy to productivity was also significant (β=0.542, $p<0.001$), confirming H2. Motivation positively impacted productivity (β=0.31, $p<0.001$) providing support for H3. The interaction term between ICT access and digital literacy in predicting productivity was significant (β=0.12, $p=0.004$). Thus, access to ICT positively moderated the relationship between digital literacy and productivity, supporting H4. Specifically, as shown in figure 2 the positive slope as coefficient indicates that the positive relationship between digital literacy and productivity gets stronger as access to ICT increases. The impact of digital literacy on employee productivity is enhanced when employees have greater access to information and communication technologies. When ICT access is low, improving digital skills may not translate into significant productivity gains. However, as ICT infrastructure, resources and awareness improve in the workplace, the benefits of higher digital literacy become more salient.

Table 4. Hypothesis testing

Hyp		B	Std Dev	T-value	P values
H1	Digital Literacy -> Motivation	0.622	0.046	13.482	0.000
H3	Digital Literacy -> Productivity	0.542	0.089	6.075	0.000
H2	Motivation -> Productivity	0.31	0.061	5.073	0.000
H4	Access to ICT x Digital Literacy -> Productivity	0.12	0.039	3.065	0.004
	Rsquare = 0.542				

Source: Authors' own editing

Figure 2. Structural model result

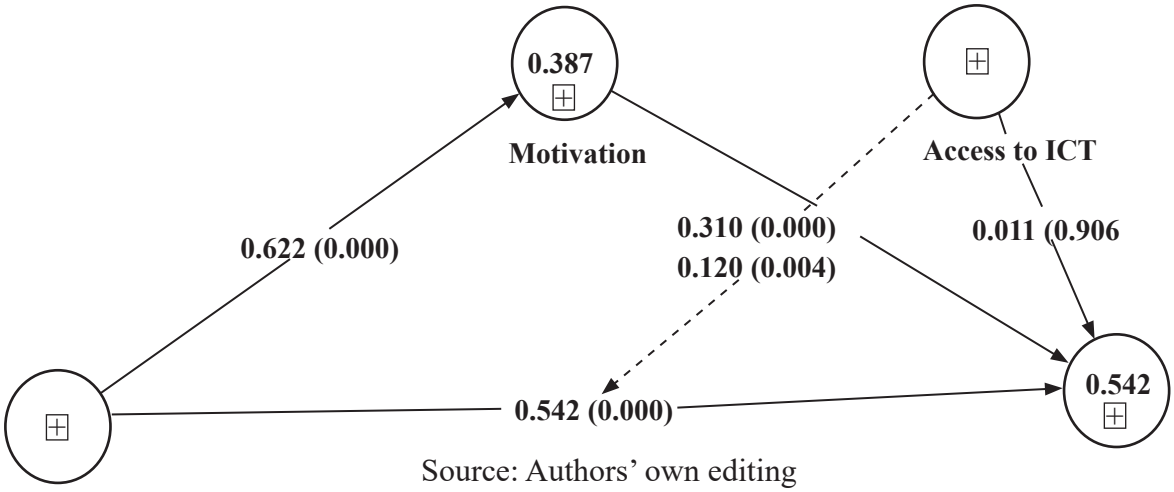

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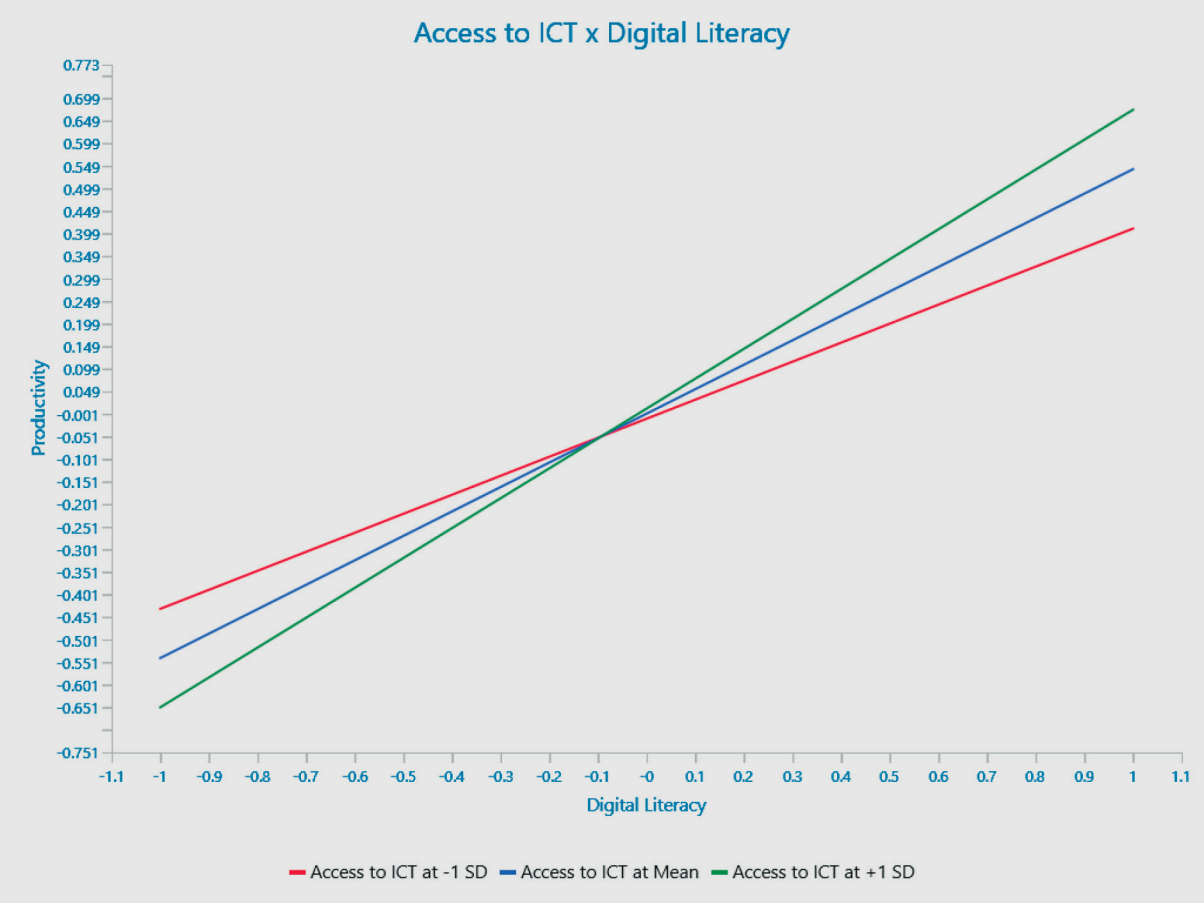
Figure 3. Interaction effect slope analysis



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7 Discussion

This study examined the relationship between digital literacy and employee productivity in the context of local governments in Nigeria. The results provide empirical support for the

significant impact of digital literacy on employee motivation and productivity. In line with expectations rooted in theory and prior research, digital literacy demonstrated a significant positive association with employee motivation levels in this study. Employees who exhibited higher competence and skill in using digital technologies productively displayed greater motivation and positivity at work. This aligns with social cognitive and self-efficacy perspectives on technology adoption, which suggest that digital fluency enhances computer self-efficacy and motivational beliefs about one's capabilities to utilize technology in effective ways (Bandura, 1989; Hatlevik et al., 2018). When employees feel confident in their abilities to deploy digital tools to accomplish tasks and goals, they develop enhanced perceptions of self-efficacy (Zou et al., 2021). In turn, this self-efficacy fuels greater enthusiasm, initiative, and intrinsic motivation to apply technology in their job roles (Dong et al., 2022). On the other hand, employees with lower digital literacy may experience anxiety and diminished motivation stemming from a lack of self-assurance. Organizations that succeed in developing a digitally literate workforce are therefore likely to benefit from the ensuing gains in employee drive, morale, and self-directed behavior. A workforce equipped with the skills to fully harness the potential of digital technologies is more motivated to actively leverage these tools to enhance work performance and productivity (Vimalkumar et al., 2021). The empirical evidence from this study lends support to these theoretical perspectives by demonstrating the positive motivational effects stemming from digital literacy development initiatives within public sector organizations.

Critically, digital literacy exhibited a strong positive relationship with employee productivity in the context of Nigerian local governments, consistent with findings from studies in other organizational settings (van Deursen & van Dijk, 2010; Martin & Grudziecki, 2006). Employees who were skilled at leveraging technology to search, evaluate, create, and communicate information in a productive manner demonstrated higher levels of efficiency and overall task performance. Specifically, digitally literate employees were able to accomplish more work within a given time period, multi-task seamlessly across different digital systems, make faster and higher quality data-driven decisions, and collaborate better with colleagues through digital channels (Chohan & Hu, 2022). Equipped with the competence to optimize modern technologies, they could work faster, accomplish more in a shorter period of time, reduce errors, and boost quality and accuracy of outputs. For instance, data analysis skills enabled performance of analytical tasks in minutes rather than hours. Content creation proficiencies allowed quick drafting of written reports, social media posts, and presentations. Employees with advanced digital literacy were able to demonstrate substantially higher productivity across a range of core job responsibilities compared to those with basic or limited technology skills. The empirical evidence from the study reaffirms conclusions from prior research while extending it to the public sector context in a developing country. Boosting digital workforce capabilities can significantly enhance organizational productivity and efficiency.

Interestingly, contrary to expectations, access to ICT resources did not exhibit a direct statistical relationship with employee productivity in this study. However, it was found to positively moderate the effects of digital literacy on productivity. Specifically, the enhancing effects of digital literacy on productivity became stronger when employees had greater access to ICT tools and infrastructure. This highlights the notion that organizations must provide the underlying technology systems and resources to complement digital skills initiatives and allow digitally adept employees to fully optimize productivity gains. While building a digitally literate workforce is crucial, the positive returns to productivity will only be realized if employees are granted adequate access to utilize their skills. Providing technology access and digital skills training must go hand-in-hand.

8 Implications

The findings from this study make contributions to theory and practice. Theoretically, the empirical evidence demonstrating a robust positive relationship between digital literacy and employee motivation provides support for key tenets of technology adoption theories such as social cognitive theory and computer self-efficacy perspectives. It highlights that developing digital fluency can enhance motivation by fostering greater technology-related self-efficacy beliefs. This expands theoretical perspectives on the motivational mechanisms underlying technology usage behaviors to public sector contexts (Lopes et al., 2023).

Also, the linkages identified between digital literacy and productivity reaffirm and expand theoretical understanding of how digital skills drive performance gains through direct competency effects as well as motivational enhancements. The results add to existing models explaining productivity improvements from technology adoption at the individual and organizational levels (AbdulKareem & Oladimeji, 2024). The insights on the role of ICT access in moderating returns also represents a theoretical contribution regarding boundary conditions for digital literacy's effects.

For practice, the findings have several important implications. Most critically, they highlight the need for public sector institutions to ramp up efforts to prioritize comprehensive digital literacy development for their workforces through training programs, on-the-job technology exposure, recruitment policies, and supportive workplace practices. The performance gains observed in terms of higher motivation, efficiency and productivity underscore that investments in enhancing digital capabilities can pay significant dividends. In rolling out such initiatives, organizations must be attentive to providing the technology infrastructure and systems to complement skills development. The moderating effects of ICT access emphasize the synergistic, reinforcing relationship between skills and technology availability. Progress on both fronts is essential for optimizing human capital and productivity returns in the digital economy.

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