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INVESTMENT IN AI TOOLS AND HUMAN CAPITAL DEVELOPMENT IN THE NIGERIAN PUBLIC SECTOR

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Abstract
The deployment of artificial intelligence (AI) tools across Nigerian public sector organisations, accelerated by the National Digital Economy Policy and Strategy (NDEPS, 2020-2030), has intensified interest in the implications for employee human capital development. Yet the relationship between AI investment and employee skill acquisition, productivity, and continuous learning within the public sector remains underexplored in peer-reviewed literature. This study adopts a systematic qualitative review methodology, drawing on published academic works and credible institutional documents, to examine this relationship. Grounded in Human Capital Theory and the Technology Acceptance Model, the study finds that AI investment generates conditional human capital development outcomes that are critically moderated by the alignment of strategic HRM practices. Based on the findings, the study recommends that Nigerian public sector administrators mandate joint AI-HRM strategic planning, reorient AI deployments from automation toward augmentation, operationalise competency-based civil service reform, and establish AI-enabled continuous learning infrastructure as foundational conditions for realising the human capital development potential of ongoing digital investments.

Keywords: artificial intelligence; human capital development; Nigerian public sector; strategic HRM; digital transformation; skill acquisition.

Introduction

Globally, the rapid diffusion of artificial intelligence has fundamentally reshaped the nature of work, the structure of organisations, and the composition of competencies demanded of the contemporary workforce. Brynjolfsson and McAfee (2014) characterise this transition as the second machine age, a period in which intelligent machines are progressively capable of performing not only routine physical tasks but complex cognitive functions previously exclusive to human labour. The implications for human capital development are far-reaching and compel organisations across sectors to reassess how they invest in and develop their workforce. This reality is reflected in the global surge of organisational AI investment, which the McKinsey Global Institute (2023) reports has more than doubled across industries over the preceding five years. Within the public sector, these dynamics carry particular governance significance. As AI tools are progressively integrated into public administration processes, the digital transformation of public service requires that civil servants acquire new competencies, including digital literacy, data interpretation, and the capacity for productive human-AI collaboration (Mergel et al., 2019; Ademeso & Nsana, 2025). In Nigeria, this imperative has been formalised at the highest policy level. The National Digital Economy Policy and Strategy (NDEPS, 2020-2030), launched by the Federal Government of Nigeria, identifies the digitalisation of public administration and the development of a digitally competent public service as strategic national priorities. Specific AI and digital tool investments, including the Integrated Personnel and Payroll Information System (IPPIS), the Government Integrated Financial Management Information System (GIFMIS), and a range of e-governance service delivery platforms, have been progressively deployed across federal ministries, departments, and agencies (MDAs). These investments represent a significant and growing commitment of national resources to AI-enabled public sector modernization.

Despite the scale of this investment, critical questions about its human capital development impact remain unanswered. Research examining AI adoption in the context of skill development and training has predominantly been conducted within private sector and tertiary education settings (Amanawa; Emefiele, 2025; Ali et al., 2025). The Nigerian public sector, with its distinctive civil service regulatory architecture, persistent infrastructural constraints, and evolving HRM practices, has received negligible direct attention in this literature, creating a substantive empirical and contextual gap. Whether organisational AI investment in this setting translates into genuine skill acquisition, improved knowledge capacity, and sustainable learning for public employees remains poorly understood. This gap is best understood through four specific dimensions of human capital development that emerge directly from the literature reviewed. The first concerns the actual scope and character of AI tool investment across Nigerian MDAs, since it is not possible to assess human capital outcomes without first establishing the nature of the investment itself. The second relates to whether AI tool deployment influences employee skill acquisition and professional development. The third asks whether AI tools translate into enhanced employee productivity and knowledge capacity, given that productivity gains and knowledge development are distinct outcomes that do not necessarily move in parallel. The fourth examines whether AI-driven systems are being leveraged as platforms for training and continuous learning.

Statement of the Problem

Organisational investment in AI tools within Nigerian public institutions has accelerated substantially since the promulgation of the National Digital Economy Policy and Strategy (NDEPS) framework yet evidence of commensurate human capital development outcomes

among affected civil servants remains scarce and largely anecdotal. The World Bank (2018) identifies persistent skills gaps and inadequate employee development infrastructure as among the most significant impediments to public sector effectiveness in Nigeria, even as digital transformation expenditures have grown. This paradox points to a fundamental misalignment between the technology procurement decisions of Nigerian MDAs and the strategic HRM practices required to convert AI tool exposure into durable employee competency development. The literature on technology investment and human capital in public sector contexts consistently identifies strategic HRM alignment as a critical condition for positive workforce development outcomes (Mergel et al., 2019; Ali et al., 2025). In its absence, AI investments risk generating efficiency gains in administrative processes while simultaneously eroding the quality and breadth of civil servant competencies, particularly among junior and operational staff who are numerically significant but institutionally underserved. Without a rigorous, contextually grounded analysis of this relationship, Nigerian public sector administrators and policymakers lack the evidence base needed to design AI investments that deliver genuine and equitable human capital development returns, hence this study.

Research Objectives

Building on the four dimensions of enquiry identified in the preceding discussion, this study is guided by the following research objectives, namely to;

i. Examine the extent to which organisations in the Nigerian public sector invest in AI tools for workplace operations.
ii. Assess the influence of organisational investment in AI tools on employee skill acquisition and professional development.
iii. Determine whether AI tools enhance employee productivity and knowledge capacity in the Nigerian public sector.
iv. Evaluate the role of AI-driven systems in facilitating training and continuous learning among Nigerian public sector employees.

Research Questions

The study addresses the following research questions:

i. To what extent do organisations in the Nigerian public sector invest in AI tools for workplace operations?
ii. How does organisational investment in AI tools influence employee skill acquisition and professional development?
iii. Do AI tools enhance employee productivity and knowledge capacity in the Nigerian public sector?
iv. What role do AI-driven systems play in facilitating training and continuous learning among Nigerian public sector employees?

Conceptual Review

Organisational Investment in AI Tools: Organisational investment in AI tools refers to the deliberate allocation of financial, infrastructural, and strategic resources toward the acquisition, deployment, and institutionalisation of artificial intelligence technologies within workplace operations. These tools span a wide technological spectrum, from algorithmic automation platforms that execute rule-based administrative tasks to machine learning systems that support predictive decision-making, natural language processing applications that enhance communication processes, and AI-enabled human resource information

systems that administer personnel management functions (Davenport & Ronanki, 2018). In the Nigerian public sector, this category of investment is most visibly represented by large-scale enterprise systems such as IPPIS and GIFMIS, as well as the e-governance platforms being progressively implemented under the NDEPS framework. For analytical purposes, AI investment is operationalised in this study as the degree to which public sector organisations allocate resources toward the adoption and integration of AI-enabled technologies within their operational and HRM systems. A critical distinction in the literature, introduced by Acemoglu and Restrepo (2019), differentiates between AI deployments oriented toward automation, which involves the substitution of human labour with machine performance in existing tasks, and those oriented toward augmentation, which involves the creation of new tasks and analytical demands that require enhanced human capabilities. This distinction carries direct implications for human capital development: automation-oriented AI investment may reduce the cognitive complexity of employee work, thereby limiting skill development opportunities, whereas augmentation-oriented investment creates new competency demands that stimulate human capital growth. Understanding which orientation predominates in Nigerian public sector AI deployments is therefore central to assessing their human capital development potential.

Human Capital Development: Human capital development encompasses the processes through which individuals expand their stock of knowledge, skills, and abilities through formal training, on-the-job learning, mentorship, and experiential practice (Oyadiran, 2008). In organisational settings, it constitutes one of the most strategically significant investments an employer can make, given the established relationship between workforce capability and both individual performance and organisational effectiveness. In AI-augmented work environments, human capital development takes on a qualitatively distinct character. The World Bank (2018) identifies digital literacy, data reasoning, and adaptive problem-solving as the competency dimensions of greatest strategic urgency, reflecting the new cognitive demands that AI tools impose on contemporary employees.

Strategic HRM Practices: Strategic HRM refers to the planned configuration of human resource practices, including training and development, performance management, competency-based appraisal, and knowledge management, designed to enable organisations to achieve their goals through the effective development and deployment of human capital (Oyadiran, 2008). Strategic HRM practices function as the organisational infrastructure through which the competency development potential of AI tools is converted into actual employee learning outcomes. An organisation may invest substantially in AI technologies and yet generate negligible human capital development if those investments are not accompanied by structured training programs, performance systems that recognise AI-related skill development, and institutional cultures that support continuous learning (Boon et al., 2019). In the Nigerian civil service, the historically compliance-oriented character of HRM practice, which emphasises procedural adherence over developmental investment, represents a critical structural constraint on the realisation of AI-driven human capital development outcomes.

Theoretical Framework

Human Capital Theory: Human Capital Theory, developed by Schultz (1961) and comprehensively elaborated by Becker (1964), provides the foundational theoretical lens for this study. The theory holds that investment in the knowledge and skills of individuals generates economic returns analogous to those produced by investment in physical capital,

accruing both to the individual in the form of enhanced earning capacity and employability, and to the investing organisation in the form of improved productivity and competitive performance. Becker (1964) further distinguished between general human capital, which retains its value across employers, and firm-specific human capital, which is of value primarily within the investing organisation. Within the Nigerian public sector, AI-related competencies exhibit characteristics of both: digital literacy constitutes transferable general human capital, while proficiency with organisation-specific AI platforms represents institution-specific human capital. Applied to this study's research questions, Human Capital Theory generates two core predictions. First, organisations that invest in AI tools in ways that create new cognitive demands, consistent with Acemoglu and Restrepo's (2019) augmentation logic, are in effect investing in the human capital of their employees, since AI-augmented work environments compel the acquisition of new competencies. Second, the return on this human capital investment is not guaranteed; it is contingent on the quality of the organisational learning environment, the design of training and development systems, and the degree to which strategic HRM practices support and reward skill development (Becker, 1964; Boon et al., 2019). These predictions align closely with the study's central proposition that strategic HRM practices moderate the relationship between AI investment and employee human capital development in the Nigerian public sector.

The Technology Acceptance Model: The Technology Acceptance Model (TAM), originally proposed by Davis (1989) and subsequently extended by Venkatesh et al. (2003) into the Unified Theory of Acceptance and Use of Technology (UTAUT), is one of the most widely applied frameworks in the information systems and organisational behaviour literature for explaining individual technology adoption behaviour. TAM posits that two perceptual constructs jointly determine behavioural intention to use a technology and, by extension, the depth of engagement from which learning outcomes emerge: perceived usefulness, defined as the degree to which a user believes a technology will improve their work performance, and perceived ease of use, defined as the degree to which they believe the technology requires minimal effort (Davis, 1989). The UTAUT extension incorporates social influence and facilitating conditions as additional determinants of adoption, which are particularly relevant in public institutional contexts where peer norms and organisational support structures are strong shapers of employee behaviour (Venkatesh et al., 2003).TAM is directly relevant to this study's research questions because it specifies the psychological mechanism through which AI tool investment generates, or fails to generate, human capital development outcomes. Employees who perceive AI tools as useful to their professional development and sufficiently accessible are more likely to invest the cognitive effort required to develop new competencies through engagement with those tools, thereby generating the human capital development that Becker (1964) predicts. Conversely, employees who perceive AI tools as irrelevant, threatening, or excessively complex are likely to exhibit resistance or minimal engagement, forgoing the development opportunities that AI-augmented environments afford. In the Nigerian public sector, where technology adoption has historically been characterised by low perceived usefulness among civil servants (Heeks, 2002), TAM provides a theoretically grounded explanation for why the human capital development returns on AI investment may be suppressed independent of the technological quality of the tools deployed.

Critically, TAM also implicates strategic HRM practices as a determinant of technology acceptance. Perceived usefulness is not an objective feature of AI tools but a socially constructed perception shaped by managerial communication, organisational

support systems, and the degree to which employees observe peers successfully leveraging AI tools for professional development (Venkatesh et al., 2003). Strategic HRM practices, particularly structured training, active managerial coaching, and performance management systems that recognise AI-related competency development, directly influence these perceptions and thereby moderate the strength of the TAM pathway from AI investment to human capital development.

Methodology

This study employs a systematic qualitative review methodology, following the framework established by Tranfield et al. (2003) for evidence-informed management research. A qualitative design is appropriate given the contextual specificity of the research setting and the relative scarcity of primary quantitative data directly capturing the AI investment-human capital development relationship within the Nigerian public sector. The systematic review approach permits the synthesis of evidence across diverse source types, including peer-reviewed academic publications and credible institutional documents, into a theoretically coherent analytical framework. Secondary data were collected from peer-reviewed academic journals accessed through Google Scholar, Research gate, and Academia. Inclusion criteria prioritised peer-reviewed journal articles and academic books, with institutional policy documents included where directly relevant to the study's contextual focus. Sources were selected on the criterion of relevance to one or more of the four research objectives, with preference given to works published within the preceding decade. Sources addressing adjacent topics without direct relevance to AI investment, human capital development, or strategic HRM in public sector contexts were excluded. Thematic analysis was employed as the primary analytical method, following the six-phase framework of Braun and Clarke (2006): data familiarisation, initial code generation, theme identification, theme review, theme definition, and report production. Thematic codes were organised around the study's research objectives and theoretical framework, with emergent themes subjected to iterative review to ensure internal consistency and evidential grounding. Triangulation across academic and institutional sources was employed to strengthen the credibility of thematic interpretations.

Findings

i. **The Extent of AI Tool Investment in Nigerian Public Sector Organisations (Objective 1):** The thematic analysis reveals a pattern of growing but structurally uneven AI tool investment across Nigerian MDAs, concentrated at the federal level and driven by top-down policy directives rather than by agency-level strategic HRM imperatives. The NDEPS provides the overarching institutional mandate for AI tool adoption across the federal public service, identifying digital tool deployment in government operations as a strategic national priority. The most significant investments to date, notably IPPIS and GIFMIS, represent the institutionalisation of algorithmic automation within core administrative processes. The profile of this investment is predominantly automation-oriented, consistent with the lower end of Acemoglu and Restrepo's (2019) automation-augmentation spectrum. The majority of AI tools deployed in Nigerian MDAs function as administrative automation systems that reduce the manual effort of data entry, payroll processing, and record management, rather than as platforms that create new analytical demands requiring advanced human competencies. This automation-dominant profile, as Frey and Osborne (2017) would predict, is more likely to reduce the cognitive complexity of civil servant work than to stimulate upward skill development. Thus, AI

investment is therefore real and growing, but its structural character is not yet optimally configured for human capital development impact.

ii. **Influence of AI Tool Investment on Employee Skill Acquisition and Professional Development (Objective 2):** The thematic analysis finds that AI tool investment can generate positive skill development outcomes, but that this relationship is conditional rather than automatic. In Nigerian MDAs where AI tool deployment has been accompanied by deliberate training and development provision, civil servants report gains in digital literacy, data management competencies, and familiarity with AI-mediated workflow systems. Revenue agencies that have adopted predictive analytics tools represent the most instructive examples: employees in these agencies are required to develop genuine analytical reasoning skills to interpret AI-generated outputs, producing a form of on-the-job human capital development consistent with the skill-biased technological change mechanism documented in the technology investment literature. The moderating role of strategic HRM practices in this process is clearly in evidence. Consistent with the findings of Boon et al. (2019) and Noe et al. (2014), skill acquisition outcomes are significantly stronger in agencies where training is structured, role-specific, and aligned with the operational demands of the AI tools in use. Where training is absent or generic, which is the case in the majority of Nigerian MDAs, AI tool deployment generates minimal skill development, as civil servants adopt the minimum operational proficiency required for procedural compliance without engaging in deeper competency development.

iii. **AI Tools, Employee Productivity, and Knowledge Capacity (Objective 3):** On productivity, the introduction of AI-enabled administrative systems in Nigerian MDAs has generated documented efficiencies in specific operational domains: the implementation of GIFMIS has accelerated financial reporting cycles and reduced manual processing errors within the MDAs in which it is fully operational. These productivity gains are broadly consistent with the findings of Brynjolfsson et al. (2018), although the same authors caution that such gains typically emerge with a significant lag and are contingent upon complementary organisational adaptation. The relationship between AI-driven productivity gains and knowledge capacity development is more contested. Human Capital Theory predicts that productivity-enhancing technology investments should generate corresponding improvements in employee knowledge capacity, as workers develop the cognitive routines and mental models required to operate effectively in AI-augmented environments. The evidence from Nigerian public sector contexts, however, suggests that this learning-by-doing process is frequently short-circuited by the passive, compliance-oriented manner in which civil servants engage with AI tools in the absence of structured learning support. Consistent with Heeks's (2002) design-reality gap framework, many Nigerian public servants use AI platforms as functional instruments without developing the deeper knowledge of their analytical logic that would constitute genuine knowledge capacity development.

iv. **AI-Driven Systems and the Facilitation of Training and Continuous Learning (Objective 4):** The fourth finding reveals a significant gap between the potential and the current reality of AI as a training and learning facilitation platform within Nigerian MDAs. Noe et al. (2014) identify AI-enabled adaptive learning platforms as one of the most promising mechanisms for delivering continuous, role-specific development at scale, particularly in organisations where traditional classroom training is insufficient or inaccessible. Internationally, public sector organisations that have embedded AI-driven learning

systems within their HRM architectures report measurable improvements in employee competency development rates and engagement with continuous learning (Mergel et al., 2019). These platforms leverage machine learning algorithms to tailor learning pathways to individual competency profiles, providing real-time feedback and skill gap identification that structured training alone cannot achieve. Within the Nigerian public sector, however, AI-driven learning and development systems remain minimally deployed. The absence of AI-enabled or even digitally mediated learning platforms within most federal MDAs serve as a critical gap in the civil service development infrastructure. Training provision in Nigerian public institutions remains predominantly face-to-face, centralised, and irregular, a model that is fundamentally inconsistent with the continuous, adaptive learning demands of AI-augmented work environments. The result is a paradox in which AI tools are deployed as operational systems within Nigerian MDAs but are not leveraged as learning infrastructure, a missed opportunity for human capital development that the present study argues can only be addressed through deliberate strategic HRM reconfiguration aligned with the principles established by Boon et al. (2019).

Discussion

The four thematic findings of this study converge on a theoretically coherent and practically consequential conclusion: AI tool investment generates genuine, if structurally constrained, human capital development potential in the Nigerian public sector, but the realisation of this potential is critically moderated by the quality, coherence, and strategic orientation of HRM practices within individual MDAs. This conclusion is consistent with the predictions of both Human Capital Theory (Becker, 1964) and TAM (Davis, 1989; Venkatesh et al., 2003), and is corroborated by the empirical findings of Boon et al. (2019), Noe et al. (2014), and Mergel et al. (2019) across comparable contexts. The study's distinctive contribution lies in its contextualisation of these insights within the Nigerian public sector, where the institutional architecture, including centralised civil service regulation, compliance-oriented HRM, and significant infrastructural constraints, creates a configuration of enablers and barriers not captured in the existing international literature.

The automation-oriented character of most AI deployments in Nigerian MDAs is a direct consequence of the policy and procurement logic driving investment decisions. Where AI tool adoption is driven primarily by efficiency imperatives without strategic HRM co-design, it will tend toward automation of existing tasks rather than toward the creation of new analytical demands that stimulate skill development, consistent with the dynamics documented by Acemoglu and Restrepo (2019) and Frey and Osborne (2017). Reorienting Nigerian public sector AI investment toward augmentation-oriented deployments, and embedding those deployments within strategic HRM architectures that support employee learning, is therefore the most important single change that Nigerian public administrators could make to improve the human capital development returns on their AI investments. The TAM analysis further reveals that the problem is not simply one of insufficient training supply. It is fundamentally one of employee perception. Civil servants who do not perceive AI tools as useful to their professional development will not invest the cognitive effort required for skill development, irrespective of training availability. Changing these perceptions requires deliberate managerial action, including communicating the developmental benefits of AI tools, modelling productive AI engagement, and building performance management systems that make the connection between AI tool proficiency and career advancement explicit and credible. This is, in essence, a strategic HRM challenge

as much as a technology design challenge, and one that the compliance-oriented civil service HRM architecture of most Nigerian MDAs is currently ill-equipped to meet.

Conclusion

This study examined the relationship between organisational investment in AI tools and employee human capital development in the Nigerian public sector across four dimensions: the extent and character of AI investment, its influence on skill acquisition and professional development, its impact on productivity and knowledge capacity, and its role in facilitating training and continuous learning. The evidence, synthesised through a systematic thematic review grounded in Human Capital Theory and the Technology Acceptance Model, demonstrates that Nigeria's growing AI investment portfolio carries real but as yet largely unrealised human capital development potential. The primary constraint is not technological but institutional: the compliance-oriented, strategically misaligned HRM architecture of most Nigerian MDAs prevents the translation of AI tool exposure into structured competency development, productivity-linked knowledge growth, and AI-enabled continuous learning. Meaningful progress requires a fundamental reorientation of how AI investment decisions are made and managed within the Nigerian civil service, from technology-first procurement toward strategically integrated HRM-AI co-design.

Recommendations

i. The Office of the Head of Civil Service of the Federation should mandate joint AI-HRM strategic planning across all MDAs, requiring that every AI tool procurement proposal be co-designed with human resource departments and accompanied by an explicit human capital development plan that specifies training provisions, competency targets, and performance management implications for affected employees.

ii. Heads of MDAs should deliberately reorient their AI investment decisions from automation-dominant toward augmentation-oriented deployments by prioritising tools that create new analytical and decision-making demands, thereby generating the competency development opportunities that the existing literature identifies as necessary for genuine human capital growth.

iii. The Bureau of Public Service Reforms should accelerate the operationalisation of its proposed competency framework by incorporating explicit digital and AI-related competency standards into civil service promotion criteria, annual performance appraisals, and mandatory training requirements, so that career advancement in the federal civil service is demonstrably linked to AI-related skill development.

iv. Each MDA with significant AI tool investments should procure or develop AI-enabled adaptive learning platforms for employee development, moving beyond centralised face-to-face training toward continuous, role-specific, and grade-inclusive digital learning provision accessible to all civil servants who interact with AI-enabled systems.

v. Federal and state governments should resolve electricity, broadband, and hardware deficits within MDAs as a foundational precondition for AI-driven human capital development, recognising that the human capital development potential of AI tools cannot be realised in environments where reliable technology access remains unavailable.

vi. The BPSR, in collaboration with Nigerian research universities, should commission longitudinal impact evaluations tracking the human capital development outcomes of AI investments across a representative sample of MDAs, generating the evidence base

required to refine investment decisions, improve HRM practice design, and build institutional accountability for the developmental returns on public AI expenditure.

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