Artificial Intelligence and the Productivity Imperative: Repositioning Nigeria's Technical and Vocational Education System for an AI-Enabled Economy

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Abstract
Nigeria's development trajectory is increasingly defined by a paradox: an economy that grows in aggregate terms while productivity, particularly labour productivity, remains stubbornly low and unevenly distributed across sectors. This paper argues that artificial intelligence (AI), if deliberately embedded into Technical and Vocational Education and Training (TVET), offers Nigeria a realistic pathway out of this productivity trap. Drawing on Human Capital Theory, Skill-Biased Technological Change theory, and the Capability Approach, and grounding the analysis in current labour market, macroeconomic, and policy data, the paper diagnoses Nigeria's productivity challenge as fundamentally a human-capital and skills-allocation problem rather than a purely macroeconomic one. It then examines the structural weaknesses of Nigeria's polytechnic sub-sector, including chronic underfunding, curricular obsolescence, and weak industry linkages, against the backdrop of the National Artificial Intelligence Strategy (2025-2029) and emerging NBTE-led AI pilot initiatives. The paper proposes an original six-stage model, the AI-Enabled TVET Productivity Repositioning Framework (ATPRF), which links curriculum intelligence, pedagogical augmentation, competency certification, industry-institution interfacing, institutional governance, and a recursive productivity feedback loop, presented here as a visual cyclical model alongside the supporting empirical indicators in tabulated form. The paper concludes with policy recommendations for the National Board for Technical Education, the National Information Technology Development Agency, the Tertiary Education Trust Fund, polytechnic management, and private-sector partners, positioning polytechnics not as passive recipients of AI policy but as the primary institutional engine for translating Nigeria's AI ambitions into measurable productivity gains.

Keywords: *Artificial Intelligence; Productivity; Technical and Vocational Education; Polytechnics; Nigeria; Skills Development; National AI Strategy; Human Capital*

1. Introduction

Nigeria's aspiration for sustained economic transformation continues to be constrained by persistently low labour productivity despite periods of economic growth. While recent macroeconomic reforms have improved fiscal and external balances, productivity growth has remained insufficient to generate broad-based employment, reduce poverty, or accelerate structural transformation. The World Bank (2026) estimates that Nigeria would need to increase its growth rate substantially to achieve its long-term development ambitions, noting that employment expansion without corresponding productivity improvements cannot deliver inclusive economic development. Similarly, earlier analysis shows that although labour has gradually shifted from agriculture to services, much of this transition has occurred in low-productivity activities such as retail and informal trade rather than high-value productive sectors (World Bank, 2024).

The productivity challenge is closely linked to the structure of Nigeria's labour market. According to the International Labour Organization (2024), over 90 percent of employment remains informal, while self-employment dominates economic activity. Such a labour market limits innovation, technological diffusion, and skills development, thereby reinforcing low productivity across sectors. Consequently, improving productivity requires more than macroeconomic reforms; it demands strategic investment in human capital and workforce capabilities capable of supporting technological transformation. Table 1 below summarises the core macroeconomic and labour-market indicators that motivate this paper's argument.

Artificial Intelligence (AI) has emerged globally as a major driver of productivity growth. Recent estimates suggest that AI could significantly increase labour productivity through automation, intelligent decision support, and improved production efficiency, provided countries possess the necessary digital infrastructure and skilled workforce (African Development Bank, 2025; OECD.AI, 2026). Recognising this potential, Nigeria's National Artificial Intelligence Strategy (2025-2029) seeks to position the country as a regional leader in ethical and inclusive AI by promoting innovation, workforce development, and sectoral digital transformation (OECD.AI, 2026). Achieving these ambitions, however, depends fundamentally on the quality of technical skills available within the labour force. Technical and Vocational Education and Training (TVET), particularly Nigeria's polytechnic system, occupies a strategic position in producing industry-oriented human capital. Yet the sector continues to face persistent challenges including inadequate funding, obsolete curricula, weak industry partnerships, and declining public confidence, all of which undermine its capacity to respond effectively to emerging technological demands (Guardian, 2026a; Edugist, 2026). Although a growing body of literature examines artificial intelligence, productivity, and technical education independently, limited attention has been paid to how AI can systematically reposition Nigeria's TVET system as an institutional mechanism for improving national productivity. This represents an important conceptual and policy gap because the productivity benefits of AI will depend less on technology itself than on the ability of educational institutions to produce graduates equipped with AI-relevant competencies.

This paper addresses that gap by examining how artificial intelligence can reposition Nigeria's TVET system to support productivity-led economic transformation. Drawing on Human Capital Theory, Skill-Biased Technological Change, the Capability Approach, and Structural Transformation Theory, the paper analyses Nigeria's productivity challenge, evaluates the readiness of the TVET sector for AI integration, and proposes the AI-Enabled TVET Productivity

Repositioning Framework (ATPRF) as a conceptual model for aligning curriculum reform, institutional capacity, industry collaboration, and workforce development with Nigeria's AI aspirations.

2. Theoretical Framework

This paper draws on four complementary theoretical traditions to construct an integrated lens for analysing the AI-TVET-productivity nexus in Nigeria.

Human Capital Theory, developed by Schultz (1961) and later formalised by Becker (1964), holds that investment in education and training raises the productive capacity of individuals in much the same way that investment in physical capital raises the productive capacity of firms. Applied to the Nigerian context, the theory implies that low labour productivity is, in significant part, a function of underinvestment in the skills base of the workforce, and that returns to such investment should be highest where the gap between existing skills and labour-market demand is widest, which is precisely the position in which Nigeria's TVET graduates presently find themselves.

Skill-Biased Technological Change (SBTC) theory, associated with the work of Acemoglu and Autor (2011), extends this logic by showing that technological change of the kind associated with AI does not affect all workers equally; it tends to raise the relative demand for workers who possess complementary skills, while displacing or devaluing routine-task-intensive labour. For Nigeria, this suggests that the productivity dividend from AI adoption will not be automatic or evenly distributed; it will accrue disproportionately to workers and institutions that have deliberately built AI-complementary competencies, reinforcing the urgency of curricular repositioning within TVET rather than passive exposure to AI tools. The Capability Approach, articulated by Sen (1999), reframes development not merely as income growth but as the expansion of substantive freedoms and capabilities that people have reason to value. This lens is important for guarding against a narrow, purely instrumental reading of AI-TVET integration: the objective is not simply to produce workers who can operate AI tools, but to expand the real capability of Nigerian citizens, including women and rural populations who are currently underrepresented in polytechnic enrolment, to participate meaningfully in an AI-enabled economy. Finally, structural transformation theory, tracing back to Lewis (1954) and more recently elaborated by McMillan and Rodrik (2011), explains productivity growth at the national level as a function of labour reallocation from low-productivity to high-productivity sectors. As the World Bank's own analysis of Nigeria demonstrates, this reallocation has been incomplete and, in places, has moved workers into low-productivity service niches rather than higher-value activity (World Bank, 2024). AI-enabled TVET is theorised in this paper as an accelerant of genuine structural transformation, equipping graduates to enter higher-productivity segments of agriculture, industry, and services rather than simply relocating informality from one sector to another.

Taken together, these four theories generate the paper's central proposition: that AI's contribution to Nigeria's productivity challenge will be mediated by the extent to which TVET institutions are repositioned, structurally and pedagogically, to convert AI exposure into genuine, broadly distributed human capability.

3. Literature Review

A growing body of literature examines the relationship between AI, productivity, and the future of work at global, continental, and national levels, though direct treatment of the AI-TVET-productivity nexus specific to Nigerian polytechnics remains limited, a gap this paper seeks to address. At the global level, projections of AI's productivity effects vary considerably depending

on assumptions about adoption speed and task redeployment. Beyond McKinsey's 0.1 to 0.6 percentage point annual productivity growth estimate, other analyses cited in the same review suggest that automation could affect as much as half of current job tasks between 2030 and 2060 (AI and the Future of Work in Africa, 2024), while the World Economic Forum's Future of Jobs research anticipated a net global reduction of roughly fourteen million jobs between 2023 and 2027 alongside significant job churn, with both losses and gains occurring simultaneously (as cited in Demographic Dynamics and Artificial Intelligence, 2024).

At the continental level, the picture for Africa is more optimistic but conditional. The African Development Bank, working through the G20 Digital Transformation Working Group, identifies five interlinked enablers of AI-driven growth: data, compute, skills, trust, and capital, arguing that the projected one-trillion-dollar GDP dividend by 2035 is contingent on strengthening all five simultaneously rather than treating AI adoption as a purely technological undertaking (African Development Bank, 2025). Complementing this, survey evidence from PwC's 2025 Africa Workforce Hopes and Fears Survey found that sixty-four per cent of African workers already use AI tools at work, a rate higher than the global average, suggesting considerable workforce readiness that formal education systems have yet to catch up with (Global Society, 2026). McKinsey's own continental estimates place the addressable AI-driven economic value for Africa between sixty-one and one hundred and three billion United States dollars annually if deployed at scale (AfriCatalyst, 2025).At the national level, Nigeria's policy response has been substantial on paper. The National Artificial Intelligence Strategy, published in September 2025 under the Federal Ministry of Communications, Innovation and Digital Economy with NITDA as implementing agency, sets measurable targets including equipping at least seventy per cent of the youth workforce aged sixteen to thirty-five, with fifty per cent of that cohort being women, with AI-related skills, alongside a target of reducing unemployment by five percentage points (OECD.AI, 2026). The strategy explicitly acknowledges that Nigeria's public research and development investment stands at approximately 0.2 per cent of GDP, far below the global average of 2.2 per cent, and that the country faces a shortage of skilled AI professionals compounded by brain drain (OECD.AI, 2026). Complementary institutional efforts include the National Centre for Artificial Intelligence and Robotics, an Artificial Intelligence Research Scheme providing grants to research teams and start-ups, and a partnership with Google supporting ten Nigerian AI start-ups (NITDA, 2026). Table 5 (Section 6) tabulates these strategy targets alongside the constraints the strategy itself acknowledges. Within the TVET sub-sector specifically, the literature is emergent rather than mature. The National Board for Technical Education has begun integrating AI into curriculum development, notably through a Trainer-in-the-Loop AI workshop conducted with the Commonwealth of Learning to validate AI-generated Open Educational Resources for the Science Laboratory Technology programme (National Board for Technical Education, 2025), and through a partnership with Huawei Nigeria explicitly framed by the Board's Executive Secretary as central to TVET reform, on the argument that properly integrated AI can personalise learning and improve assessment (The News Chronicle, 2026). Commentary in the national press has similarly argued that an AI-inflected technical education agenda is necessary to resolve the long-standing status conflict between polytechnics and universities and to correct deficits in Nigeria's human capital development framework (ThisDayLive, 2025).

A parallel strand of literature documents the employability and structural crisis within Nigerian tertiary education more broadly. Earlier empirical work identified persistent skills mismatches among Nigerian university graduates entering the labour market (Pitan & Adedeji, 2012), a finding echoed in more recent analysis showing that outdated, theory-heavy curricula continue to leave

graduates without the practical competencies employers demand, with polytechnic Higher National Diploma holders facing particular disadvantage relative to university degree holders in the labour market (Verivafrica, 2025). Recent scholarship specifically on polytechnic education argues that the persistent mismatch between theoretical training and industry demand continues to undermine the sub-sector's capacity to address youth unemployment despite decades of institutional expansion (International Journal of Finance, Accounting and Management Studies, 2026). The literature reviewed here converges on three points relevant to this paper. First, AI is broadly expected to raise productivity, but the magnitude and distribution of the gain depend on complementary investment in skills and infrastructure. Second, Nigeria has articulated an ambitious national AI strategy with explicit workforce-skilling targets, and the TVET sub-sector has begun, in a fragmented and pilot-scale fashion, to experiment with AI integration. Third, the underlying structural weaknesses of Nigerian technical education, chronic underfunding, curricular obsolescence, and weak industry linkage, predate the AI moment and will constrain any AI-enabled reform unless addressed concurrently. It is this third point, largely under-theorised in the existing literature, that motivates the framework proposed in section seven of this paper.

4. Nigeria's Productivity Challenge: Empirical Context

A clear empirical picture of Nigeria's productivity challenge is necessary before any AI-TVET intervention can be meaningfully designed. Nigeria's National Bureau of Statistics reports that real GDP grew by 4.07 per cent year-on-year in the fourth quarter of 2025, with agriculture contributing 25.67 per cent to nominal GDP for the quarter, while real growth in manufacturing slowed to 1.13 per cent, lower than both the corresponding quarter of 2024 and the preceding quarter (National Bureau of Statistics, 2026). This sectoral pattern, modest services and construction growth alongside weakening manufacturing momentum, illustrates a structural transformation that has not decisively shifted the economy toward higher-productivity industrial activity.

Table 1. Macroeconomic and Sectoral Growth Indicators, Nigeria

Indicator	Value	Period
Real GDP growth (year-on-year)	4.07%	Q4 2025
Agriculture's contribution to nominal GDP	25.67%	Q4 2025
Real growth in manufacturing	1.13%	Q4 2025 (lower than Q4 2024 and preceding quarter)
Economy size needed to reach $1 trillion by 2030	~5x current growth pace	Projection to 2030

Source: *National Bureau of Statistics (2026); World Bank (2026).*

The World Bank's Nigeria Development Update for 2026 notes that while inflation has eased and external and fiscal positions have strengthened following recent reforms, household incomes have not yet recovered and poverty remains high, such that the economy would need to grow at roughly five times its recent pace to reach a one-trillion-dollar size by 2030 (World Bank, 2026). This is consistent with earlier World Bank analysis showing that although Nigerian employment has shifted substantially from agriculture toward services over the past two decades, with the two sectors effectively swapping shares of the workforce, the productivity premium of services over agriculture in Nigeria is markedly lower than in aspirational peer economies such as Brazil, Malaysia, and South Africa, where the premium is more than double Nigeria's (World Bank, 2024). The same analysis attributes much of Nigeria's new service-sector employment to low-productivity

retail and wholesale trade rather than higher-value business and financial services, suggesting that many workers have moved into services to cope with income shocks rather than to access genuinely more productive work (World Bank, 2024).

Labour market structure compounds this picture. The International Labour Organization estimates that self-employment accounts for close to eighty-seven per cent of Nigerian employment, with informal employment overall exceeding ninety-two per cent of total employment, a rate that rises above ninety-six per cent among employed women (International Labour Organization, 2024). Female labour force participation stood at roughly 48.4 per cent of the total labour force in 2024 (Trading Economics, 2026, citing World Bank data), underscoring both a large latent workforce and a persistent gender gap in formal economic participation.

Table 2. Labour Market Structure Indicators, Nigeria (2024)

Indicator	Value
Self-employment share of total employment	≈87%
Informal employment (overall)	>92%
Informal employment among employed women	>96%
Female labour force participation rate (2024)	≈48.4%

Source: *International Labour Organization (2024); Trading Economics (2026).*

Skills mismatch data reinforce the diagnosis that Nigeria's productivity challenge is substantially a human-capital problem. Industry surveys indicate that seventy per cent of Nigerian employers report difficulty finding qualified candidates due to skills mismatch, even as unemployment remains elevated across most educational categories, with unemployment rates in the first quarter of 2024 standing at 9.0 per cent among persons with post-secondary education, 6.9 per cent among those with secondary education, and 4.0 per cent among those with only primary education, compared with just 2.0 per cent among postgraduate degree holders (MyJobMag, 2026, citing National Bureau of Statistics data). This pattern, in which more education does not straightforwardly translate into employability, is precisely the condition that human capital theory would predict where the content of education fails to track the evolving demands of the labour market.

Table 3. Unemployment Rate by Educational Attainment and Employer-Reported Skills Mismatch

Educational Attainment	Unemployment Rate (Q1 2024)
Postgraduate degree	2.0%
Primary education only	4.0%
Secondary education	6.9%
Post-secondary education	9.0%
Employers reporting skills-mismatch hiring difficulty	70%

Source: *MyJobMag (2026), citing National Bureau of Statistics data.*

Taken together, the data support three conclusions central to this paper's argument. First, Nigeria's growth is not currently translating into commensurate productivity or poverty reduction, and the shortfall is concentrated in the quality, rather than merely the quantity, of jobs being created. Second, the country's labour market is dominated by informal and self-employed work that limits the diffusion of productivity-enhancing technology and practice. Third, the skills mismatch

between what the education and training system produces and what employers require is severe and persistent, even among the formally educated. It is against this empirical backdrop that the state of TVET, examined next, must be understood.

5. The State of Technical and Vocational Education in Nigeria

Nigeria's polytechnics were historically conceived as the applied, industry-facing complement to the country's university system, yet the sub-sector today occupies a markedly weaker institutional position than that founding vision implied. Recent stakeholder conferences organised by the Academic Staff Union of Polytechnics report that despite Nigeria's overall tertiary gross enrolment ratio of only 13.5 per cent, enrolment specifically into polytechnics has fallen below five per cent of youths seeking tertiary admission, a decline compounded by admission policy, since the Joint Admissions and Matriculation Board set a minimum qualifying score of 100 for polytechnics and colleges of education for the 2026 admission cycle, compared with 150 for universities, a disparity stakeholders argue entrenches negative public perception of polytechnic education and drives talented candidates away from technical manpower training (Guardian, 2026a; Edugist, 2026).

Table 4. TVET Access and Admission Indicators, Nigeria (2026 Cycle)

Indicator	Value
Nigeria's overall tertiary gross enrolment ratio (GER)	13.5%
Share of tertiary admission-seekers entering polytechnics	<5%
JAMB minimum qualifying score — polytechnics/colleges of education (2026)	100
JAMB minimum qualifying score — universities (2026)	150

Source: *Guardian (2026a); Edugist (2026).*

Beyond admissions, structural challenges identified at these conferences include inadequate funding, obsolete policies, weak linkages with industry, poor digital infrastructure, and limited capacity for research commercialisation, with polytechnics also reportedly excluded from major national development initiatives (Edugist, 2026). These findings echo longer-standing concerns raised by ASUP leadership, including chronic underfunding relative to universities in both direct budgetary allocation and Tertiary Education Trust Fund disbursement, despite the fact that technical and vocational education is inherently capital-intensive, requiring machinery, laboratories, and equipment that cannot be substituted with the largely text-based instruction more common in university lecture settings (Premium Times, 2017). A further structural grievance is the long-standing dichotomy between Higher National Diploma and Bachelor's degree holders in the Nigerian labour market and civil service, a policy inconsistency that ASUP has argued discourages enrolment and devalues polytechnic credentials even where the underlying technical competence of graduates is equal or superior (Vanguard, 2023).

In its most recent national conference, ASUP explicitly linked this institutional neglect to Nigeria's broader productivity and unemployment challenge, arguing that the country's failure to prioritise technical and vocational education has continued to weaken productivity, deepen unemployment, and undermine the nation's capacity to build a globally competitive workforce (Guardian, 2026b). This is not merely a sectoral grievance; it is a direct empirical link between the institutional condition of TVET and the national productivity diagnosis established in section four.

At the same time, there are emerging signals of reform, some of them directly relevant to AI integration. In 2025, the National Board for Technical Education announced the discontinuation of the National Innovation Diploma programme and a harmonisation of the National Diploma

system across the country, intended to establish a more unified progression pathway within technical education (National Board for Technical Education, 2025). More directly relevant to this paper, the Board has begun to experiment with AI in curriculum and materials development: a two-day Trainer-in-the-Loop Artificial Intelligence workshop convened with the Commonwealth of Learning brought together subject-matter experts from nine polytechnics to validate AI-generated Open Educational Resources for the Science Laboratory Technology National Diploma programme (National Board for Technical Education, 2025). Separately, a partnership with Huawei Nigeria has trained polytechnic stakeholders on AI integration, with the Board's Executive Secretary explicitly framing AI as central to TVET reform on the grounds that, properly integrated, it can transform teaching methods, enable personalised learning, and improve student assessment (The News Chronicle, 2026). The overall picture, then, is one of an institutionally weakened but not inert sub-sector. The foundational problems, underfunding, curricular obsolescence, weak industry linkage, and status stigma, remain largely unresolved and predate any AI-related intervention. But the Board's own recent pilots demonstrate institutional appetite for AI-enabled reform. The task, addressed in the remainder of this paper, is to determine how such pilot-scale initiatives can be scaled into a coherent, system-wide framework capable of simultaneously addressing the sub-sector's structural weaknesses and Nigeria's broader productivity challenge.

6. Artificial Intelligence as a Lever for Productivity-Oriented TVET Repositioning

If Nigeria's productivity challenge is, as argued in section four, substantially a human-capital and skills-allocation problem, and if TVET is, as argued in section five, both structurally weakened and tentatively AI-curious, the analytical task becomes specifying precisely how AI can function as a repositioning lever rather than a superficial technological add-on.

The first mechanism is curricular and pedagogical. As NBTE's own leadership has argued, properly integrated AI can personalise learning pathways, adapt instructional pacing to individual student competence, and improve the accuracy and speed of assessment, functions that are especially valuable in a resource-constrained system where student-to-instructor ratios and laboratory access are often inadequate (The News Chronicle, 2026). The Board's pilot use of AI to co-develop Open Educational Resources with subject-matter experts across nine polytechnics demonstrates a scalable model: rather than each institution independently developing scarce technical teaching materials, AI-assisted content development combined with expert validation can accelerate curriculum modernisation across the entire polytechnic system (National Board for Technical Education, 2025). The second mechanism is sectoral alignment with national AI priority areas. The National Artificial Intelligence Strategy identifies agriculture, healthcare, security, and smart infrastructure among its priority sectors for AI adoption, citing examples such as AI-powered precision farming tools and diagnostic support systems (RichlyAI, 2025). Each of these priority sectors maps directly onto existing polytechnic disciplines, agricultural technology, health information technology, computer engineering, and civil and electrical engineering, positioning polytechnics as the natural training ground for the applied, sector-specific AI competencies the national strategy requires, as distinct from the more theoretical AI research capacity that Nigeria's universities are better positioned to supply. The third mechanism is the explicit workforce-skilling architecture of the NAIS itself. The strategy's short-term roadmap for 2024 to 2026 includes upskilling 100,000 professionals in AI, alongside a medium-term ambition to scale AI adoption across ten priority sectors by 2029 (Markets FinancialContent, 2025). The strategy's overarching target of equipping at least seventy per cent of the youth workforce aged sixteen to thirty-five, including fifty per cent women, with AI-related skills (OECD.AI, 2026) cannot plausibly be met

through university-based AI research programmes alone, given their limited enrolment capacity and more theoretical orientation; it requires a delivery system with the reach, practical orientation, and applied pedagogy that polytechnics, at their best, are designed to provide.

Table 5. National Artificial Intelligence Strategy (NAIS): Workforce-Skilling Targets and Structural Constraints

NAIS Target / Constraint	Figure
Youth workforce (16-35) to be AI-skilled	≥70%
Share of that cohort required to be women	≥50%
Professionals to be upskilled in AI (2024-2026 roadmap)	100,000
Priority sectors targeted for AI adoption by 2029	10
Public R&D investment as share of GDP	≈0.2%
Global average public R&D investment (for comparison)	≈2.2%

Source: *OECD.AI (2026); Markets FinancialContent (2025).*

The fourth mechanism concerns risk mitigation and equity. The NAIS itself acknowledges significant constraints, including a national research and development investment of only around 0.2 per cent of GDP against a global average of 2.2 per cent, unreliable digital and electricity infrastructure, and a shortage of skilled AI professionals compounded by brain drain (OECD.AI, 2026). For polytechnics specifically, these national constraints intersect with sub-sector-specific ones already documented in section five, poor digital infrastructure, chronic underfunding, and the exclusion of polytechnics from prior national development initiatives (Edugist, 2026). Any AI-TVET repositioning strategy must therefore treat infrastructure investment, data governance, and equitable access, particularly for rural polytechnics and female students, as preconditions for, rather than afterthoughts to, curricular reform. AI, in short, offers Nigeria's TVET sub-sector a genuine repositioning opportunity along at least four dimensions, curriculum and pedagogy, sectoral relevance, national policy alignment, and, if managed deliberately, equity of access. What is currently missing is a structured institutional framework capable of integrating these four dimensions coherently, rather than allowing them to proceed as isolated pilot projects. Section seven proposes such a framework.

7. The AI-Enabled TVET Productivity Repositioning Framework (ATPRF)

This paper proposes an original six-stage model, the AI-Enabled TVET Productivity Repositioning Framework (ATPRF), designed to operationalize the mechanisms identified in section six as a coherent, recursive institutional process rather than a set of disconnected pilots. The framework is deliberately structured as a cycle rather than a linear sequence, reflecting the reality that curricula, labour markets, and AI capabilities are all moving targets that require continuous recalibration. Figure 1 presents the framework visually; the six stages are then discussed in turn.

Figure 1. *The AI-Enabled TVET Productivity Repositioning Framework (ATPRF): a recursive six-stage cycle*

Stage 1: Curriculum Intelligence

Curriculum Intelligence involves the systematic use of AI-assisted labour-market analysis, drawing on National Bureau of Statistics employment data, employer surveys, and sectoral growth signals, to identify where skills gaps are widest and to redesign polytechnic curricula accordingly, extending the Board's existing AI-assisted Open Educational Resource model beyond single programmes such as Science Laboratory Technology to the full range of polytechnic disciplines (National Board for Technical Education, 2025).

Stage 2: Pedagogical Augmentation

Pedagogical Augmentation embeds AI tools directly into instruction: adaptive learning platforms that pace instruction to individual student mastery, AI-assisted laboratory and workshop simulation where physical equipment is scarce, and AI-supported formative assessment that gives instructors real-time visibility into competency gaps, consistent with the personalisation and assessment improvements NBTE leadership has already identified as achievable through proper AI integration (The News Chronicle, 2026).

Stage 3: Competency Certification

Competency Certification moves polytechnic assessment away from purely time-based, theory-heavy examination toward AI-supported competency-based certification and stackable micro-

credentials that can be independently verified by employers, directly addressing the skills-mismatch and Higher National Diploma stigma problems documented among Nigerian graduates (Verivafrica, 2025; Vanguard, 2023).

Stage 4: Industry-Institution Interfacing

Industry-Institution Interfacing establishes AI-mediated platforms linking polytechnics to employers in real time, matching graduating cohorts to apprenticeship and placement opportunities based on verified competency profiles rather than credential alone, addressing the weak industry linkage repeatedly identified as a structural weakness of the sub-sector (Edugist, 2026).

Stage 5: Institutional Capacity and Governance

Institutional Capacity and Governance addresses the preconditions identified in section six: sustained investment in digital and electrical infrastructure, dedicated AI-literacy training for polytechnic staff, and data governance protocols aligned with the Nigeria Data Protection Act, 2023, ensuring that AI integration does not proceed faster than institutional capacity to manage it responsibly (OECD.AI, 2026; Regulations.AI, 2026).

Stage 6: The Productivity Feedback Loop

The Productivity Feedback Loop closes the cycle by systematically tracking graduate labour-market outcomes, employment rates, wage trajectories, and employer-reported productivity, and feeding this evidence back into stage one, so that curriculum intelligence is continuously updated by real productivity data rather than being redesigned only periodically through top-down curriculum review. The recursive character of the ATPRF is its central design feature: unlike a conventional curriculum reform that is revised once every several years, the framework treats AI-TVET repositioning as an ongoing institutional capability, closing the loop between what is taught, how it is taught, how it is certified, how it connects to employers, how it is governed, and how its productivity effects are measured and fed back into the next curricular cycle.

8. Policy Recommendations

Building on the ATPRF, this paper offers policy recommendations directed at five distinct stakeholder groups whose coordinated action is necessary for the framework to move from concept to practice. For the National Board for Technical Education, the recommendation is to scale the Trainer-in-the-Loop AI model piloted for Science Laboratory Technology (National Board for Technical Education, 2025) across all National Diploma and Higher National Diploma programmes on a defined multi-year timetable, with subject-matter expert validation retained as a non-negotiable quality safeguard, and to formalise competency-based, AI-supported certification as a recognised alternative or complement to conventional examination.

For the National Information Technology Development Agency and the Federal Ministry of Communications, Innovation and Digital Economy, the recommendation is to explicitly ring-fence a defined share of the National Artificial Intelligence Strategy's short-term target of upskilling 100,000 professionals (Markets FinancialContent, 2025) for polytechnic staff and students specifically, rather than leaving polytechnic participation to incidental uptake, given that the strategy's broader seventy per cent youth workforce target cannot realistically be met without a strong TVET delivery channel. For the Tertiary Education Trust Fund and the Federal Ministry of Education, the recommendation is to establish a dedicated capital intervention line for AI-TVET infrastructure, covering digital connectivity, computing hardware, and reliable electricity supply

at polytechnics, directly responding to stakeholder reports that polytechnics currently receive disproportionately low shares of both budgetary allocation and Tertiary Education Trust Fund disbursement relative to universities despite the capital-intensive nature of technical training (Premium Times, 2017; Edugist, 2026). For polytechnic management and governing councils, the recommendation is to establish institutional AI literacy programmes for teaching staff as a condition of curriculum modernisation, since AI-assisted teaching materials and assessment tools cannot be effectively deployed by instructors who have not themselves been trained in their use, and to formally resolve outstanding Higher National Diploma and Bachelor's degree parity concerns at the institutional level where national policy permits, to protect enrolment incentives (Vanguard, 2023). For private-sector and development partners already engaged in Nigeria's AI ecosystem, including firms such as Huawei and Google that have supported NITDA and NBTE initiatives to date (The News Chronicle, 2026; NITDA, 2026), the recommendation is to formalise apprenticeship and structured internship pipelines directly with polytechnics rather than exclusively with universities, and to co-design curriculum content for high-demand, AI-adjacent technical roles such as data annotation quality control, applied machine learning support, and AI-assisted diagnostic and precision-agriculture technicians.

Across all five recommendations, particular attention should be paid to gender and rural-urban equity, given that female labour force participation remains below fifty per cent nationally (Trading Economics, 2026) and that current AI initiatives risk concentrating in urban, better-resourced institutions unless deliberate targeting mechanisms are built into implementation from the outset.

9. Conclusion

Nigeria's productivity challenge is not a problem that artificial intelligence will solve on its own, nor is it a problem that Technical and Vocational Education reform can solve without artificial intelligence. This paper has argued that the two must be understood as jointly necessary: AI without a repositioned TVET delivery system will remain confined to isolated pilots and urban technology hubs, while TVET reform without AI integration will continue to reproduce the theory-heavy, industry-disconnected curricula that have contributed to Nigeria's persistent skills mismatch and productivity shortfall.

The evidence reviewed in this paper shows that Nigeria possesses the policy architecture for change, in the form of the National Artificial Intelligence Strategy's explicit workforce-skilling targets, and the institutional appetite for change, in the form of NBTE's own emerging AI pilot initiatives. What has been missing is a structured framework capable of integrating curriculum design, pedagogy, certification, industry linkage, institutional governance, and productivity feedback into a single, recursive institutional process. The AI-Enabled TVET Productivity Repositioning Framework proposed here, visualised in Figure 1 and grounded in the empirical indicators of Tables 1 through 5, is offered as one contribution toward closing that gap.

The argument carries a direct institutional implication for the polytechnic community: polytechnics need not wait to be assigned a role in Nigeria's AI-enabled future by universities, government ministries, or international technology partners. The sub-sector's founding mandate, the production of applied, industry-ready technical competence, positions it as the natural institutional home for translating Nigeria's national AI ambitions into measurable gains in productivity, employment quality, and human capability. Realising that potential will require sustained investment, deliberate institutional reform, and coordinated action across government,

industry, and the polytechnics themselves, but the underlying opportunity, and the underlying necessity, are clear.

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