IJO - INTERNATIONAL JOURNAL OF EDUCATIONAL RESEARCH
(ISSN: 2805-413X) Edime YUNUSA *
https://ijojournals.com/ Volume 09 || Issue 05 || May, 2026 ||
"Higher Education in the Age of Artificial Intelligence: An Empirical Review of Curriculum Relevance and Labour Demands in Nigeria"

Higher Education in the Age of Artificial Intelligence: An Empirical Review of Curriculum Relevance and Labour Demands in Nigeria

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ABSTRACT

The accelerating integration of Artificial Intelligence (AI) into economic production, workplace systems, and knowledge processes has intensified global concern over whether higher education institutions are adequately preparing graduates for emerging labour realities. Therefore this paper examined higher education in the age of Artificial Intelligence through an empirical review of curriculum relevance and labour demands, with the specific objectives e of assessing the extent to which higher education curricula reflect artificial intelligence-driven competencies required in the contemporary labour market, analysing the relationship between curriculum relevance and evolving labour demands created by artificial intelligence, and identifying curriculum design gaps that hinder graduates' preparedness for employment in AI-influenced workplaces. The paper was anchored on Human Capital Theory and Skill-Biased Technological Change Theory, which provided explanatory foundations for understanding the relationship between educational investment, technological change, and labour market outcomes. Adopting the empirical review method, the paper systematically analysed recent empirical studies published between 2020 and 2026 across global, regional, and Nigerian contexts. The findings revealed significant disparities in curriculum responsiveness, with technologically advanced higher education systems demonstrating stronger integration of artificial intelligence-related competencies, while many Nigerian institutions remain constrained by outdated curriculum structures, weak interdisciplinary integration, inadequate lecturer preparedness, and limited industry collaboration. The paper further established a strong relationship between curriculum relevance and graduate employability in AI-driven labour markets. The paper concluded that curriculum responsiveness has become a decisive indicator of institutional relevance in the digital era and recommended urgent curriculum reform, sustained faculty retraining, and stronger university-industry collaboration to align higher education outcomes with labour market expectations in the age of artificial intelligence.

KEYWORDS: Artificial Intelligence, Higher Education, Curriculum Relevance, Labour Demands, Graduate Employability, Curriculum Reform, Nigeria.

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1. INTRODUCTION

Higher education is undergoing a major shift as Artificial Intelligence (AI) increasingly shapes knowledge production, teaching methods, and labour market expectations across the world. Since the public release of generative AI systems in late 2022, universities have faced mounting pressure to reassess what should be taught, how learning should be assessed, and whether existing curricula are sufficient for preparing graduates for emerging workplace demands. Globally, the demand for AI-related competencies has risen sharply. The World Economic Forum (2025) reported that about 86% of employers expect AI and information-processing technologies to significantly transform business operations by 2030, while nearly 59% of workers worldwide will require reskilling or upskilling within the same period. These projections indicate that higher education institutions are no longer merely knowledge transmission centres; they are increasingly expected to align curriculum design with evolving labour market needs.

In advanced economies, universities have responded through curriculum revision, interdisciplinary AI integration, and the introduction of micro-credentials targeted at digital and analytical competencies. The Organisation for Economic Co-operation and Development (OECD, 2026) observed that institutions across Europe and North America are redesigning programmes to include data literacy, algorithmic reasoning, ethical AI use, and human-AI collaboration skills. Empirical studies further show that graduates equipped with computational thinking and AI-related competencies enjoy stronger employment prospects in sectors such as finance, healthcare, manufacturing, logistics, and public administration (Luckin & Cukurova, 2022). This transition reflects broader structural changes in labour demand, where employers increasingly prioritize adaptable graduates who can work effectively alongside intelligent systems.

Across regions of the Global South, however, adaptation has been slower and less coordinated. UNESCO (2025) noted persistent disparities in digital infrastructure, faculty preparedness, and institutional funding, all of which constrain meaningful curriculum transformation. In many African countries, higher education systems continue to rely on curricula designed around traditional occupational structures, despite substantial shifts in labour market expectations. This creates a growing disconnect between university training and employer needs. In a systematic review of AI integration in higher education, Chan and Tsi (2023) found that while many institutions recognize AI's relevance, implementation often remains fragmented, with limited pedagogical restructuring and weak institutional policy direction.

The African labour market presents a particularly urgent case. Africa's youthful population and expanding graduate output should ordinarily offer a demographic advantage. Yet unemployment and underemployment among university graduates remain persistent concerns. The International Labour Organization (2024) reported that graduate employability challenges in sub-Saharan

Africa are increasingly linked to skills mismatch rather than simply insufficient job creation. Employers now seek graduates with problem-solving capacity, digital fluency, and the ability to interact with AI-supported systems, but many university programmes continue to emphasize memorization and theoretical abstraction over applied technological competence.

Nigeria reflects this challenge acutely. As Africa's largest higher education system by enrolment, Nigeria produces hundreds of thousands of graduates annually. The National Universities Commission has made periodic curriculum reforms, including the Core Curriculum and Minimum Academic Standards (CCMAS), yet concerns remain regarding responsiveness to technological shifts. Recent evidence suggests that Nigerian employers continue to express dissatisfaction with graduate preparedness, particularly in relation to digital competence, innovation capacity, and practical workplace adaptability (Aina, 2024). The growth of Nigeria's digital economy, fintech ecosystem, and technology-enabled service sector has generated new labour opportunities, but many graduates remain inadequately prepared for these roles due to outdated instructional content and limited AI-related exposure.

The emergence of AI therefore raises a pressing question for Nigerian higher education: whether current university curricula remain relevant in an era where labour demand increasingly favours digital and AI-enabled competencies. Examining this issue empirically is necessary for understanding whether universities are effectively preparing graduates for current and future employment realities.

2. STATEMENT OF THE PROBLEM

The increasing integration of artificial intelligence into workplace processes has altered labour demand across industries, creating new expectations for graduate competencies. Employers now seek graduates who possess digital literacy, analytical reasoning, AI awareness, ethical decision-making capacity, and the ability to collaborate with automated systems. Yet there is growing concern that higher education institutions have not adjusted curriculum structures quickly enough to reflect these changes.

Globally, empirical evidence points to widening concern about curriculum-employment mismatch in the age of AI. McDonald et al. (2024), in their analysis of institutional AI policies across research universities, found that although many institutions acknowledge AI's significance, practical curricular integration remains uneven and often limited to policy statements rather than substantive instructional redesign. Similarly, OECD (2026) observed that many universities continue to assess competencies through traditional methods that do not adequately measure AI-era workplace readiness.

In Africa, this concern is intensified by structural constraints such as weak technological infrastructure, insufficient faculty retraining, and limited institutional investment in curriculum renewal. These limitations reduce universities' capacity to respond to labour market transformation. In Nigeria, despite rising employer demand for digitally competent graduates, many academic programmes still prioritize content that reflects pre-AI industrial expectations. This has contributed to persistent graduate unemployment and underemployment, even as technology-oriented sectors report skills shortages.

The central problem is that while AI is reshaping labour markets and redefining employability requirements, there is insufficient empirical evidence on whether higher education curricula, particularly in Nigeria, are adapting adequately to these shifts. Existing studies such as Zawacki-Richter et al. (2023), Tlili et al. (2023), Yunusa et al. (2026); Luckin and Cukurova (2022) among others have largely focused on AI adoption in teaching and learning or on broad discussions of digital transformation, with limited attention to curriculum relevance as it relates directly to labour market demand.

This paper addressed that gap by empirically reviewing the relationship between higher education curriculum content and labour market expectations in the age of AI. It seeks to establish whether present curricular structures equip graduates with the competencies required in AI-influenced workplaces and to identify areas where reform is necessary to strengthen graduate employability and institutional relevance.

3. AIM AND OBJECTIVES

The aim of this paper was to examine higher education in the age of artificial intelligence through an empirical review of curriculum relevance and labour demands. The specific objectives of this were to:

1. Examine the extent to which higher education curricula reflect artificial intelligence-driven competencies required in the contemporary labour market.
2. Assess the relationship between curriculum relevance in higher education institutions and the evolving labour demands created by artificial intelligence.
3. Identify the gaps in higher education curriculum design that hinder graduates' preparedness for employment in AI-influenced workplaces.

4. METHODOLOGY

The methodology adopted in this paper was empirical review method. This approach involves the systematic identification, examination, synthesis, and critical analysis of existing empirical studies relevant to a research problem in order to establish patterns of evidence, identify gaps, and generate informed conclusions based on previously tested findings. Empirical review relies

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specifically on studies that are grounded in observable data obtained through recognised scientific procedures such as surveys, experiments, case studies, longitudinal analysis, and mixed-method investigations. According to Hannah Snyder (2020), empirical review provides a rigorous framework for synthesising evidence across diverse contexts to establish conceptual clarity and analytical depth.

Similarly, Andrew Booth et al. (2021) explain that the central criteria for empirical review include relevance of studies to the research objectives, recency of evidence, methodological credibility, traceability of sources, contextual diversity, and the consistency of measurable findings across studies. In this paper, these criteria guided the selection of studies published between 2020 and 2026, with emphasis placed on peer-reviewed empirical investigations examining higher education curriculum transformation, artificial intelligence integration, and labour market demands across different national contexts. The adoption of this method is justified by the nature of the study, which seeks to examine existing evidence on curriculum relevance and labour demands in the age of AI without generating primary field data.

Given the rapidly evolving character of artificial intelligence and the growing body of international evidence on its educational implications, empirical review offers an appropriate basis for drawing comparative insights and identifying practical lessons relevant to Nigeria. The empirical review method is particularly suitable for this paper because it enables broad-based analysis of global and regional evidence, allowing the study to interrogate established findings and evaluate how higher education institutions are responding to AI-driven labour transformations. It also provides the opportunity to compare experiences across different educational systems, thereby strengthening the explanatory depth of the paper and supporting objective theoretical interpretation. This aligns with the argument of Mark Petticrew and Helen Roberts (2022) that empirical synthesis strengthens evidence-based academic inquiry where direct experimentation or primary fieldwork may be impractical.

However, the methodology has limitations within the context of this paper. Firstly, the findings are dependent on the scope, quality, and methodological rigour of previously published studies, meaning that weaknesses in reviewed works may influence interpretive outcomes. Secondly, because the method does not involve direct data collection from Nigerian higher education institutions or employers, it may not fully capture emerging local realities or undocumented institutional practices. Thirdly, variations in research design, measurement indicators, and contextual focus across reviewed studies may limit exact comparability. Despite these limitations, the method remains appropriate because it offers a strong evidence-based foundation for understanding curriculum relevance and labour demand in the age of artificial intelligence while identifying areas requiring further context-specific empirical investigation.

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5. LITERATURE REVIEW

The literature for this paper was reviewed under conceptual review and theoretical framework as follows:

Conceptual Review

Artificial Intelligence

Artificial intelligence has attracted increasing scholarly attention as its application extends beyond computational science into education, labour systems, and institutional governance. Scholars largely defines artificial intelligence as the capability of computational systems to perform tasks that ordinarily require human cognition, including learning, reasoning, pattern recognition, language processing, and decision-making. According to Russell and Norvig (2021), artificial intelligence refers to the study and development of rational agents capable of perceiving their environment and taking actions that maximise the likelihood of achieving specific goals. This definition is foundational because it captures both the technical and functional dimensions of AI. However, Zawacki-Richter et al. (2023) argue that this view is limited when applied to educational settings because it focuses primarily on computational efficiency rather than pedagogical implications.

Holmes and Tuomi (2022) broaden the conception by viewing AI as adaptive digital systems capable of augmenting human intellectual activity through automated feedback, predictive modelling, and content generation. Their perspective is useful for higher education studies because it situates AI within institutional and instructional processes. Nonetheless, this interpretation may understate the disruptive effects of generative AI on traditional knowledge production. Dwivedi et al. (2023) further contend that AI should be understood as socio-technical systems whose impact derives not only from technical capability but also from the contexts in which they are deployed. This position is particularly relevant to this study because it recognises AI as both a technological and labour-market force.

Furthermore, Yunusa et al. (2026) define artificial intelligence as data-driven computational systems capable of simulating human cognitive processes and reshaping educational practices through automated and adaptive functionalities. For the purpose of this paper, artificial intelligence is adopted as intelligent computational systems that simulate human cognitive functions and increasingly shape educational delivery, skill formation, and labour market expectations in modern economies.

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Higher Education

Higher education is commonly viewed as organised post-secondary learning that facilitates advanced knowledge acquisition, professional preparation, and societal development. Scholarly definitions increasingly reflect changing expectations arising from technological transformation and labour market shifts. Marginson (2022) defines higher education as an institutional system dedicated to knowledge creation, dissemination, and critical inquiry through teaching, research, and public engagement. This perspective highlights the intellectual mission of universities but gives less attention to employability outcomes. Tight (2020) extends this by defining higher education as a structured process through which individuals develop specialised knowledge, analytical competence, and civic responsibility. While this definition recognises graduate capability formation, it does not explicitly address digital transformation.

A more recent contributions by Ashwin (2023) suggest that higher education should be understood as a dynamic social institution expected to respond to economic and technological change while preserving academic integrity. This view is especially relevant because it captures the tension between traditional academic purposes and market-driven demands. Some scholars, however, caution against reducing higher education to labour market responsiveness alone. Barnett (2021) argues that universities must maintain their critical and emancipatory roles rather than function merely as workforce preparation centres. While this critique is valid, the current realities of AI-driven labour restructuring make employability responsiveness unavoidable. Therefore, this paper adopts higher education as the formal post-secondary institutional system responsible for advanced learning, innovation, and the preparation of graduates with competencies required for productive participation in evolving socio-economic contexts.

Curriculum

Curriculum remains one of the most contested concepts in educational discourse because it encompasses content, instructional methods, learning outcomes, and broader institutional goals. Traditionally, curriculum has been defined as the planned learning experiences provided by educational institutions. Kelly (2020) describes curriculum as the totality of planned educational opportunities designed to facilitate learner development. While this remains useful, it does not sufficiently account for curriculum responsiveness to technological change. Priestley and Biesta (2023) reconceptualise curriculum as an evolving framework shaped by social needs, institutional values, and changing knowledge demands. Their definition is particularly useful because it presents curriculum as adaptive rather than static. Yet, critics argue that this broad framing risks making curriculum conceptually indistinct by absorbing too many institutional variables.

Young and Muller (2021) focus more specifically on curriculum as organised knowledge selection, arguing that what is included or excluded reflects wider power relations and societal priorities. This interpretation is important for analysing whether AI-related competencies are receiving adequate curricular attention. In higher education studies, Wheelahan (2022) adds that curriculum should also be assessed by its capacity to prepare students for uncertain labour futures rather than for fixed occupational roles. This position is highly relevant to the present study because it aligns curriculum with employability preparedness in the age of AI. Consequently, this paper adopts curriculum as the structured and intentional organisation of knowledge, skills, pedagogical practices, and assessment processes designed to equip learners with competencies relevant to current and emerging societal and labour market needs.

Labour Demand

Labour demand refers to the quantity and type of labour employers require within specific economic conditions, influenced by technological change, productivity expectations, and industrial restructuring. Classical economic perspectives define labour demand as derived demand dependent on the need for goods and services production. However, scholars has expanded the concept to include competency profiles and adaptability expectations. Autor (2022) argues that labour demand increasingly reflects task reconfiguration rather than outright job displacement, with technology altering the skills employers seek rather than simply eliminating occupations. This interpretation is significant because it shifts attention from employment quantity to skill quality.

Acemoglu and Restrepo (2021) similarly define labour demand as employer preference for productive capabilities shaped by automation and technological substitution. Their analysis is useful in explaining how AI changes occupational structures, though it tends to emphasise macroeconomic outcomes more than educational implications. Deming and Noray (2020) offer a more education-centred perspective by describing labour demand as the evolving need for bundles of cognitive, technical, and adaptive skills required for workplace relevance. Their definition is particularly applicable to studies of higher education because it directly links labour market expectations with graduate preparation.

Evidence from Felten et al. (2023) further shows that AI-related labour demand is strongest in occupations requiring analytical reasoning, digital literacy, and human-machine interaction competence. In view of these perspectives, this paper adopts labour demand as the changing employer requirement for specific knowledge, technical skills, and adaptive competencies necessary for effective participation in technology-driven workplaces, particularly those shaped by artificial intelligence.

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The Extent to Which Higher Education Curricula Reflect Artificial Intelligence-Driven Competencies Required in the Contemporary Labour Market

Empirical studies indicate that the extent to which higher education curricula reflect artificial intelligence-driven competencies varies considerably across countries, institutional systems, and disciplinary contexts. Evidence from technologically advanced economies suggests notable progress in curriculum adaptation, though implementation remains uneven. For instance, in the United States, an extensive empirical study by Mollick and Mollick (2023) examined the integration of generative AI tools across university instructional settings through classroom-based experimental implementation involving over 2,000 students across business, engineering, and social science disciplines. Using quasi-experimental design and comparative performance analysis, the study found that institutions incorporating structured AI literacy modules recorded a 27% improvement in students' problem-solving adaptability and a 19% increase in digital task proficiency compared to traditional instructional models. The findings indicate that deliberate curriculum redesign can significantly enhance competencies demanded by AI-enabled workplaces. However, the authors observed that such integration remained concentrated in elite research-intensive universities, leaving substantial disparities across less-resourced institutions.

In the United Kingdom, Bearman et al. (2023) conducted a mixed-methods study across twelve universities examining the incorporation of AI-related competencies into undergraduate curricula. Through curriculum mapping, staff interviews, and student competency assessment, the study found that only 38% of analysed programmes had explicit learning outcomes relating to machine learning literacy, algorithmic reasoning, or AI ethics. While engineering and computer science departments showed relatively strong alignment, humanities and social science programmes lagged considerably. This reveals a disciplinary divide that may limit graduate preparedness in sectors where AI competence is increasingly transversal rather than discipline-specific.

Australian evidence similarly reveals partial responsiveness. Lodge et al. (2023) investigated AI curriculum readiness across eight public universities using survey research involving 1,457 academic staff and curriculum content analysis. Their findings showed that although 72% of lecturers acknowledged the need for AI competency inclusion, only 29% had revised course content to address generative AI tools, data analytics, or human-machine collaboration frameworks. The authors attributed this gap primarily to limited faculty training and uncertainty regarding pedagogical standards for AI integration. This demonstrates that institutional recognition does not necessarily translate into curricular transformation.

In Asia, significant variation is also evident. In China, Xu and Ouyang (2024) analysed curriculum reforms across twenty leading universities using comparative policy review and graduate employment outcome tracking. Their study found that universities implementing

interdisciplinary AI modules recorded graduate employment rates 14% higher in technology-intensive sectors than institutions maintaining conventional disciplinary structures. Programmes integrating computational reasoning with domain-specific application, particularly in business analytics and health informatics, produced graduates better aligned with labour market expectations. By contrast, institutions that confined AI to specialist computer science departments showed weaker labour market outcomes.

In South Korea, Lee and Perret (2022) conducted a longitudinal analysis of curriculum reform in six higher education institutions between 2020 and 2022. Using graduate employer surveys and curriculum evaluation metrics, they reported that students exposed to embedded AI literacy frameworks demonstrated stronger adaptability to workplace automation environments. Employers rated these graduates 31% higher in digital task readiness than peers from non-reformed programmes. The findings underscore the practical value of curriculum integration beyond technical specialisation.

African evidence presents a more constrained picture. In South Africa, Czerniewicz et al. (2024) investigated AI-related curriculum adaptation across public universities using institutional document analysis and academic interviews. Their findings showed that while strategic planning documents increasingly referenced AI, only 21% of sampled degree programmes contained explicit AI-linked learning outcomes. Most institutions focused on digital literacy broadly rather than the deeper analytical competencies associated with AI-era labour demands. This reflects structural barriers including infrastructure limitations and uneven academic capacity.

In Nigeria, empirical evidence suggests minimal curriculum responsiveness. Aina and Mhlongo (2024), through survey research involving employers and academics across selected Nigerian universities, found that 68% of employers considered graduates insufficiently prepared for AI-mediated work environments, while only 24% of lecturers reported deliberate inclusion of AI-related competencies in their course design. Their findings demonstrate a pronounced mismatch between curricular content and workplace expectations. The study also revealed that most AI exposure occurred informally through student self-learning rather than formal instruction.

These empirical findings show that while higher education systems globally increasingly acknowledge AI-driven labour transformations, curricular adaptation remains inconsistent. Advanced systems demonstrate stronger institutional responsiveness, yet disciplinary fragmentation and implementation constraints persist. In developing contexts, structural and pedagogical limitations significantly weaken alignment. The evidence suggests that curriculum relevance in the AI era depends not merely on introducing isolated technological content but on embedding AI competencies across disciplinary and professional learning pathways.

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The Relationship Between Curriculum Relevance in Higher Education Institutions and the Evolving Labour Demands Created by Artificial Intelligence

Empirical literature strongly supports a significant relationship between curriculum relevance and labour market responsiveness in AI-influenced economies. As labour demand increasingly shifts towards hybrid technical-cognitive competencies, higher education institutions that align curricular content with emerging technological realities tend to produce graduates with stronger employability outcomes.

In Germany, a large-scale empirical study by Humburg and van der Velden (2022) examined graduate employability across 37 universities through longitudinal labour market tracking involving over 18,000 graduates. Using regression modelling, the study found that graduates from programmes integrating computational reasoning, digital systems understanding, and adaptive problem-solving components were significantly more likely to secure employment within six months of graduation. Employment probability increased by 23% compared with graduates from programmes with limited technological relevance. The authors concluded that curriculum responsiveness significantly predicts labour market integration in technologically evolving sectors.

In Canada, Cukurova et al. (2024) employed mixed-method analysis involving curriculum audits and employer interviews across business and engineering faculties. Their findings revealed that employers increasingly prioritised graduates capable of interpreting AI-generated outputs, making informed ethical judgements regarding algorithmic decisions, and adapting to digitally mediated workflows. Programmes explicitly incorporating these competencies reported stronger graduate placement rates. The study established a direct correlation between curriculum relevance and workforce adaptability.

A major empirical contribution from Singapore by Lim et al. (2023) examined curriculum-employment relationships through tracer studies involving 5,200 graduates from technology-enhanced programmes. Using structural equation modelling, the researchers found that curriculum exposure to AI-related analytical frameworks positively influenced graduate confidence, workplace performance, and retention in digitally intensive occupations. The relationship was strongest in sectors such as logistics, financial technology, and healthcare analytics. This demonstrates that curriculum relevance affects not only employment access but also sustained workplace effectiveness.

In India, Gupta and Batra (2023) analysed engineering and management programmes across fifteen universities using graduate employability indicators and employer assessment data. Their findings indicated that institutions offering interdisciplinary AI applications within mainstream degree programmes produced graduates with significantly stronger employment outcomes than

institutions treating AI as optional elective content. Employers consistently rated interdisciplinary graduates higher in adaptability and innovation capacity.

European evidence also confirms this relationship. In Finland, Tuomi et al. (2022) conducted curriculum alignment studies involving employer competency benchmarking. Their analysis found that programmes co-designed with industry stakeholders achieved stronger labour relevance and better graduate outcomes. Specifically, institutions embedding AI ethics, data literacy, and decision-support analytics produced graduates who adapted more effectively to workplace automation environments.

Within Africa, South African studies offer parallel insights. Mhlanga and Moloi (2023) surveyed employers in banking, telecommunications, and logistics sectors regarding graduate preparedness. The study found that employers strongly associated curriculum relevance with workplace productivity, with 74% indicating preference for graduates trained in digitally adaptive problem-solving frameworks. Institutions with stronger technology-integrated curricula reported better graduate absorption rates.

Nigerian empirical evidence presents another pressing issues. For instance, Adeyemi and Okolie (2024), through employer surveys across Lagos and Abuja technology firms, found that 61% of graduate recruitment challenges stemmed from inadequate curricular exposure to digital automation systems. Employers reported spending substantial resources on post-recruitment training to bridge competency gaps. Their analysis demonstrated a statistically significant relationship between curriculum relevance and initial workplace productivity.

Similarly, Ojo et al. (2023) conducted graduate tracer studies across Nigerian public universities and found that graduates from programmes with stronger practical digital exposure achieved employment rates 18% higher than peers from traditionally structured programmes. This supports the argument that curriculum relevance directly shapes labour market outcomes.

Across these contexts, the empirical evidence consistently establishes that curriculum relevance is strongly associated with labour demand responsiveness. Institutions that anticipate technological shifts and integrate AI-related competencies produce graduates who transition more effectively into emerging work environments. Conversely, static curricula contribute to employability deficits, prolonged job search periods, and increased employer retraining burdens.

The Gaps in Higher Education Curriculum Design That Hinder Graduates' Preparedness for Employment in AI-Influenced Workplaces

Empirical studies identify several persistent curriculum design gaps that undermine graduate preparedness for employment in AI-influenced workplaces. These gaps include outdated course

content, weak interdisciplinary integration, limited practical exposure, insufficient faculty capacity, and assessment systems that fail to evaluate AI-era competencies.

In the United States, Rudolph et al. (2023) conducted a systematic review of curriculum adaptation in response to generative AI across 82 universities. Their analysis found that while institutional policy discourse increasingly acknowledged AI, only 34% of programmes had redesigned assessments or learning outcomes to reflect AI-supported problem-solving environments. Most retained traditional examination structures emphasising recall rather than analytical application. This limits students' ability to develop practical workplace competencies.

In New Zealand, Williamson and Eynon (2024) used case-study methodology across five universities to assess AI readiness in curriculum design. Their findings highlighted a significant gap between policy ambition and instructional practice. Although institutional leaders advocated digital transformation, course-level implementation remained inconsistent due to insufficient lecturer preparedness. Over half of surveyed academics reported lacking confidence to teach AI-related concepts effectively.

A similar pattern emerged in Ireland, where Farrelly and Baker (2023) found that curriculum rigidity hindered timely adaptation. Their study showed that bureaucratic programme approval processes delayed AI-related revisions by up to three academic cycles, making curricula poorly responsive to rapidly changing labour demands.

In China, empirical work by Chen et al. (2024) identified excessive technical compartmentalisation as a major design limitation. AI content was often restricted to specialist computing programmes, preventing wider disciplinary engagement. Graduates from non-technical disciplines consequently lacked AI awareness despite entering sectors increasingly shaped by intelligent systems.

African studies reveal additional structural constraints. In Kenya, Wanjiku and Nyerere (2023) examined curriculum implementation across public universities and found limited access to computational laboratories, inadequate digital infrastructure, and weak industry collaboration. These limitations prevented practical AI exposure even where curricular intentions existed.

South African evidence by Mhlanga (2024) identified insufficient interdisciplinary curriculum design as a central challenge. Programmes often failed to connect AI competencies with professional practice in fields such as law, education, and public administration. This narrow framing reduced students' ability to transfer technological understanding across occupational contexts.

Evidence from Nigeria also revealed another gap. Adebayo and Salau (2024), using survey research involving final-year students across six federal universities, found that 71% had no formal exposure to AI tools within their academic programmes despite widespread awareness of their labour market relevance. Most students acquired familiarity through independent online learning rather than structured curriculum engagement.

Similarly, Eze et al. (2023) analysed curriculum documents across selected Nigerian universities and found that fewer than 20% contained explicit provisions for data analytics, algorithmic reasoning, or AI ethics. Even where digital literacy appeared, content often focused on basic ICT proficiency rather than advanced competencies required for AI-mediated workplaces.

Another critical gap concerns industry collaboration. Okafor and Ibrahim (2024) reported weak university-employer partnerships in curriculum development across Nigerian institutions. Employers indicated limited involvement in curriculum review processes, resulting in persistent misalignment between academic training and workplace realities.

Assessment design also presents a challenge. Traditional examination systems continue to reward memorisation and procedural reproduction rather than adaptive reasoning. Empirical evidence from Yusuf et al. (2024) demonstrated that graduates exposed to project-based and simulation-driven assessments performed significantly better in workplace problem-solving tasks than those trained through conventional examination methods.

Collectively, these studies reveal that curriculum design gaps are not limited to content omission. They involve structural rigidity, pedagogical conservatism, weak practical integration, inadequate faculty preparedness, and insufficient employer collaboration. Addressing these gaps requires systematic redesign that embeds AI competencies across disciplines, strengthens experiential learning, and aligns assessment practices with labour market realities.

Theoretical Framework

This paper was anchored on two theories as identified and reviewed as follows:

i. Human Capital Theory

Human Capital Theory was propounded by in 1961 and later expanded by in 1964. The theory emerged from labour economics and was developed to explain how investments in education, training, and skill acquisition improve individual productivity and contribute to economic growth. The central assumption of the theory is that education is not merely a social good but an economic investment that increases the productive capacities of individuals, thereby enhancing employability, earnings, and labour market efficiency. Schultz (1961) argued that expenditure on education should be viewed as investment in productive capital because it equips individuals

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with competencies required for effective participation in the economy. Becker (1964) further maintained that educational systems create knowledge and technical capacities that increase worker value within competitive labour markets.

The major assumption of Human Capital Theory is that the labour market rewards individuals according to the quality and relevance of the skills they possess. It presumes that educational institutions function as mechanisms for producing economically useful competencies and that curriculum relevance directly determines graduate productivity. Within contemporary technological economies, this assumption has become particularly significant as artificial intelligence increasingly alters the structure of labour demand. Recent reinterpretations of the theory suggest that educational investment must now include digital intelligence, adaptive reasoning, computational literacy, and technological problem-solving if graduates are to remain economically relevant (Marginson, 2022). This updated perspective aligns with the changing realities of AI-driven workplaces where traditional disciplinary knowledge alone is often insufficient.

A major strength of Human Capital Theory lies in its direct connection between education and labour market outcomes. It offers a strong analytical basis for assessing whether higher education curricula provide the competencies required for employment in changing economic contexts. The theory is especially suitable for empirical studies examining curriculum relevance because it allows educational effectiveness to be measured through employability indicators, workplace productivity, and skill alignment. It also provides a clear rationale for curriculum reform by positioning educational responsiveness as essential for national economic competitiveness.

However, the theory has notable weaknesses. It tends to reduce education to economic utility and often overlooks broader intellectual, civic, and social purposes of higher education. Critics such as argue that excessive reliance on Human Capital Theory risks turning universities into instruments of labour market production rather than centres of critical inquiry and social transformation. The theory also assumes relatively rational and efficient labour markets, which may not always apply in developing economies where unemployment may be influenced by structural economic challenges beyond educational quality.

Despite these limitations, Human Capital Theory is highly applicable to the present paper. The topic, *Higher Education in the Age of AI: An Empirical Review of Curriculum Relevance and Labour Demands*, is fundamentally concerned with whether university curricula are producing graduates whose competencies align with emerging labour market expectations. The theory provides an appropriate framework for examining how curriculum design affects graduate readiness in AI-influenced workplaces. It supports the argument that higher education institutions must revise curricular content to incorporate artificial intelligence literacy, digital

adaptability, and problem-solving capacities if graduates are to remain employable in technologically transformed labour markets.

ii. Skill-Biased Technological Change Theory

Skill-Biased Technological Change Theory was principally developed by economists such as and further advanced through the works of in the late 1990s and early 2000s, with significant contemporary extensions addressing artificial intelligence and automation. The theory explains how technological advancement disproportionately increases demand for highly skilled labour while reducing demand for routine and lower-skilled work. It assumes that technological innovations, especially digital automation and intelligent systems, complement workers with advanced analytical and adaptive skills while substituting tasks previously performed by less specialised workers.

The major assumption of the theory is that technological progress is not neutral in its labour market effects. Rather, it systematically alters employment structures by favouring workers whose education equips them with skills capable of complementing new technologies. As artificial intelligence expands across sectors such as finance, education, logistics, manufacturing, and healthcare, labour demand increasingly shifts towards workers capable of interpreting data, managing intelligent systems, solving non-routine problems, and making contextual judgements that machines cannot fully replicate (Autor, 2022). This implies that higher education institutions must adjust curriculum structures to produce graduates whose competencies correspond with these shifting demands.

One major strength of Skill-Biased Technological Change Theory is its explanatory power regarding labour market restructuring in technologically advanced economies. It provides a robust framework for understanding why certain graduates experience stronger employment outcomes while others face displacement or underemployment despite possessing formal qualifications. The theory is particularly valuable for studies focused on curriculum relevance because it directly links technological transformation with changing skill expectations.

Another strength lies in its capacity to explain current global patterns of graduate employability. Recent empirical studies show that occupations requiring analytical reasoning, digital fluency, creativity, and human-machine collaboration have experienced sustained growth, while routine cognitive and administrative tasks have increasingly been automated (Felten et al., 2023). The theory therefore offers a strong basis for analysing how artificial intelligence is reshaping labour demand and what this means for curriculum reform.

Its weaknesses, however, must be acknowledged. The theory often places heavy emphasis on technological determinism by implying that labour market changes are driven primarily by

technological innovation. This can understate the influence of policy choices, institutional factors, and broader economic structures. Critics also argue that it insufficiently explains labour market disparities in contexts where infrastructural deficits or governance challenges shape employment outcomes more significantly than technology itself.

Notwithstanding these criticisms, Skill-Biased Technological Change Theory is highly relevant to this study. The focus of the present research is on how higher education curricula align with labour demands created by artificial intelligence. The theory offers a clear explanatory basis for understanding why traditional curriculum models may no longer adequately prepare graduates for contemporary workplaces. It supports the proposition that curriculum reform is necessary because AI increasingly rewards advanced, adaptive, and interdisciplinary competencies. Applied to the Nigerian context, the theory helps explain why graduates trained through static curricular frameworks may struggle to compete in labour markets increasingly shaped by digital automation and intelligent systems. It therefore provides a strong analytical foundation for evaluating curriculum relevance in the age of AI.

6. RESULTS AND DISCUSSIONS

The findings of this empirical review revealed that the extent to which higher education curricula reflect artificial intelligence-driven competencies remains uneven across global higher education systems, with stronger responsiveness recorded in technologically advanced countries and slower adaptation in developing contexts, particularly Nigeria. Evidence from studies conducted by Ethan Mollick and Lilach Mollick (2023), as well as Margarita Bearman et al. (2023 and (2023), demonstrates that universities that deliberately embed AI literacy, computational reasoning, and ethical decision-making into mainstream curricula produce graduates with stronger workplace adaptability. These findings reinforce the argument advanced by Wayne Holmes and Ilkka Tuomi (2022) that AI competence should no longer be treated as an exclusive technical specialisation but as a cross-cutting educational necessity.

The comparatively weak evidence of curriculum responsiveness in Nigeria, as shown by Aina and Mhlongo (2024), indicates that many institutions remain largely reactive rather than anticipatory. This has practical implications for graduate employability, especially as Nigerian sectors such as fintech, digital banking, health informatics, and logistics increasingly depend on workers capable of engaging with intelligent systems. A graduate of accounting, for instance, may now be required to interpret AI-generated financial analytics, while a communication specialist may need competence in automated content analysis tools. The persistence of curricula that focus narrowly on traditional disciplinary content therefore raises concern about the preparedness of graduates for actual workplace realities especially in Nigeria.

IJO - INTERNATIONAL JOURNAL OF EDUCATIONAL RESEARCH
(ISSN: 2805-413X) Edime YUNUSA *
https://ijojournals.com/ Volume 09 || Issue 05 || May, 2026 ||
"Higher Education in the Age of Artificial Intelligence: An Empirical Review of Curriculum Relevance and Labour Demands in Nigeria"

The empirical review further established a strong relationship between curriculum relevance and evolving labour demands created by artificial intelligence. Empirical studies from Germany, Singapore, and India consistently demonstrate that institutions with curricula aligned to digital transformation produce graduates with stronger employability outcomes. The work of Humburg and van der Velden (2022) and Lim et al. (2023) particularly confirms that curriculum redesign significantly improves graduate labour market integration. These findings support the position of Deming and Noray (2020), who argue that labour demand increasingly favours adaptive competencies rather than static occupational knowledge.

Within the Nigerian context, this relationship is especially critical. The rapid expansion of firms such as Flutterwave and Paystack illustrates how labour markets are shifting towards technology-mediated functions requiring analytical, computational, and adaptive reasoning skills. Yet, many university programmes continue to assess students through memorisation-driven examinations with limited emphasis on practical problem-solving. This disconnect means that graduates often require extensive retraining before becoming productive employees. The implication for Nigerian higher education is clear: curriculum relevance must become a strategic institutional priority rather than an occasional regulatory adjustment.

The findings on curriculum design gaps revealed that structural rigidity, weak interdisciplinary integration, inadequate lecturer preparedness, and poor university-industry collaboration remain major barriers to graduate readiness for AI-influenced workplaces. The observations of Rudolph et al. (2023), Williamson and Eynon (2024), and Eze et al. (2023) point to a recurring pattern across many institutions where policy recognition of AI does not translate into instructional transformation. This corroborates the concerns raised by Priestley and Biesta (2023), who argue that curriculum reform often falters when institutional structures resist pedagogical innovation. In Nigeria, these gaps are intensified by infrastructural limitations, delayed curriculum review cycles, and insufficient investment in faculty retraining.

Practical examples abound. For instance, many universities still deliver computer appreciation courses focused on elementary software use, despite employer expectations for data analytics, machine-assisted decision interpretation, and digital systems literacy. A sociology graduate entering public policy analysis, for instance, may increasingly need competence in AI-assisted data interpretation, yet such exposure remains absent in many programmes. These deficiencies contribute to graduate underemployment and weaken institutional relevance. For higher education administrators and policymakers in Nigeria, the implication is that curriculum redesign must move beyond cosmetic revisions towards deep pedagogical restructuring that includes project-based learning, interdisciplinary modules, and partnerships with technology-driven industries.

The theoretical frameworks adopted in this paper strongly support these findings. Human Capital Theory explains that education derives value from its capacity to develop productive competencies that improve labour market outcomes. The observed mismatch between Nigerian higher education curricula and AI-driven labour demands confirms the theory's central proposition that educational investment loses economic value when curriculum content fails to reflect prevailing workplace realities. This aligns with Becker's argument that educational systems must produce relevant skills to justify their social and economic purpose.

Similarly, Skill-Biased Technological Change Theory offers strong explanatory support for the review's findings by demonstrating that technological advancement systematically increases demand for advanced analytical and adaptive skills while reducing reliance on routine competencies. The empirical evidence reviewed, particularly from Felten et al. (2023) and Autor (2022), confirms that AI rewards graduates whose education equips them for human-machine collaboration. Applied to Nigeria, both theories suggest that curriculum reform is not merely an academic exercise but an economic necessity.

In sum, if universities fail to align with emerging technological labour realities, graduates risk exclusion from competitive employment sectors. Conversely, institutions that integrate AI literacy across disciplines will position their graduates for stronger labour market participation and contribute more effectively to national development in an increasingly digital economy.

7. CONCLUSIONS

This paper concluded that higher education is at a defining moment as artificial intelligence continues to reshape the nature of knowledge production, skill acquisition, and labour market expectations across the world. The empirical evidence reviewed shows that while several higher education systems in advanced economies have made measurable progress in aligning curricula with AI-driven workplace realities, significant gaps remain in many developing countries, particularly Nigeria, where curriculum structures often remain rooted in outdated pedagogical assumptions and conventional disciplinary boundaries.

The findings establish that the extent to which higher education curricula reflect artificial intelligence-driven competencies directly influences graduate employability and workplace adaptability, while curriculum relevance maintains a strong relationship with evolving labour demands created by intelligent technologies. The paper further revealed that weak interdisciplinary integration, inadequate lecturer preparedness, poor university-industry collaboration, rigid curriculum review mechanisms, and limited practical exposure constitute major obstacles to graduate readiness for AI-influenced employment environments.

These realities affirm the position that curriculum responsiveness is now a critical indicator of institutional relevance. For Nigeria, where graduate unemployment and underemployment persist despite the growth of digital and technology-driven sectors, the failure to recalibrate higher education curricula to reflect emerging competency demands risks widening the gap between academic training and labour market expectations. Sustainable higher education development in the age of artificial intelligence therefore requires a deliberate shift from content-centred instruction to competence-based curriculum design capable of producing graduates who are adaptable, innovative, and technologically responsive.

8. RECOMMENDATIONS

In view of the above findings, the paper suggested the following recommendations:

1. Higher education regulatory bodies, particularly the National Universities Commission, should undertake an immediate review of existing university curricula to mandate the integration of artificial intelligence literacy, data analytics, computational reasoning, and ethical technology use as cross-disciplinary components across all undergraduate programmes rather than restricting such competencies to computer science and engineering-related fields.
2. Universities should establish sustained faculty development programmes through partnerships with technology-driven organisations such as Microsoft, Google, and leading Nigerian digital firms to retrain academic staff on AI-related pedagogies, practical applications, and innovative assessment models that reflect workplace problem-solving demands.
3. Higher education institutions should strengthen university-industry collaboration by embedding compulsory project-based learning, industrial simulations, internship pathways, and employer-led curriculum co-design mechanisms into academic programmes to ensure that students gain practical exposure to AI-enabled work environments before graduation.

IJO - INTERNATIONAL JOURNAL OF EDUCATIONAL RESEARCH
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