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STAKEHOLDERS' PERCEPTIONS OF DIGITAL SKILLS AND AI FOR EMPLOYABILITY AND CAREER ENGAGEMENT IN TECHNICAL COLLEGES IN LAGOS STATE, NIGERIA

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Abstract

Technical colleges are key to helping students gain the practical skills they need to succeed in today's world of work. As training and workplaces become more digitally driven, technical teachers also need to stay up to date by building modern digital skills that help learners not only use technology confidently but also create with it. This study examines how digital skills and artificial intelligence (AI) can improve technical college students' career involvement and employability, with wider benefits for economic growth and development. The study adopted a descriptive survey design and involved 105 technical college administrators and employers from the organised private sector (OPS). Data were collected using a validated questionnaire rated on a five-point Likert scale, and analysed in SPSS using mean scores and standard deviations. Findings revealed that both administrators and OPS employers were highly satisfied with the digital skills identified, and they agreed that these skills are essential for preparing technical college graduates for career success and employment. Based on these results, the study recommends increased and targeted funding to help institutions and students access the digital tools needed for hands-on training. It also suggests integrating AI-based learning platforms that can personalise instruction, detect students' skill gaps, and provide tailored support and resources that strengthen employability in an evolving economy.

Keywords: Artificial Intelligence, Career Engagement, Digital Skills, Economic Growth, Employability

Introduction

Bringing digital skills and Artificial Intelligence (AI) into Technical and Vocational Education and Training (TVET) in Nigeria can significantly improve how students learn and how ready they are for work. As industries continue to grow and adopt new technologies, TVET institutions can use digital tools and AI-supported learning to strengthen teaching and keep training in line with global workforce expectations (Olabiyi, Ojo, Keshinro, & Okeowo, 2020). When students are taught with digital methods and practical AI applications, learning becomes more flexible and more tailored to individual needs, which better prepares them to succeed in a technology-driven world (Olabiyi, 2014). This approach also helps learners build valuable, in-demand skills such as digital literacy, programming, and basic data analysis—skills that make it easier for them to adapt as jobs and workplace requirements change. In addition, AI-supported course content and digital platforms for job searching, CV building, and professional networking can improve students' exposure to employers, making it easier for them to find opportunities and stay engaged with career planning.

Beyond getting students ready for their first job, integrating digital skills and AI can encourage creativity, innovation, and entrepreneurship. Over time, this can support the growth of new kinds of work and small businesses, strengthen Nigeria's economy, and position the TVET sector as a strong contributor to sustainable national development.

Technical colleges are part of the Technical and Vocational Education and Training (TVET) system. They are specialised institutions set up to prepare students for specific trades and technical occupations by building practical skills, relevant knowledge, and the right work attitudes. Programmes are usually career-focused, covering areas such as mechanical work, construction, and electrical crafts (Olabiyi & Chinedu, 2018). What makes technical colleges distinct is the balance between classroom learning and hands-on practice. Their curricula are structured to ensure students understand the theory behind what they do, while also gaining real experience through workshops, laboratory sessions, and supervised industrial attachments or internships. This blend helps graduates leave school with job-ready skills and competence that employers value (Olabiyi, 2020). Beyond training individuals, technical colleges contribute directly to workforce development. By aligning their programmes with industry needs and labour-market trends, they help supply skilled workers in areas where demand is high (Becker, 2018). In doing so, they support productivity and economic diversification by strengthening the link between training and real workplace requirements. Through their focus on practical skills and employable competence, technical institutions also boost local communities and national development by producing a workforce capable of meeting the needs of different sectors (Bailey & Merriam, 2015).

At the same time, the world of work is changing faster than ever, and many workers find it difficult to keep pace. People who do not actively develop their skills and plan for growth may struggle to remain relevant. The good news is that there are practical ways employees and young professionals can build careers that feel meaningful and rewarding. One idea that helps explain this is career engagement, the level of mental and emotional involvement a person has in their career journey. It reflects how interested, motivated, and purposeful someone feels about their work and future direction (Pickerell, 2013). Career engagement can also be understood as the degree of commitment and active participation an individual brings to their work and career development. It shows up in factors like enthusiasm, inspiration, and willingness to invest effort in career progress. When career engagement is high, people are more likely to experience job satisfaction, perform better, and maintain stronger overall well-being. This positive state is shaped by different influences, including personal qualities, the work environment, growth opportunities, and feedback from others (Rothbard, 2001; Saks, 2006).

In this paper, career is understood in a broad sense. It includes not only paid jobs, but also unpaid work, learning experiences, and the different roles people take on throughout life. When people actively build and maintain career engagement, they are more likely to feel fulfilled, achieve more, and experience their work life as meaningful and worthwhile. Career engagement refers to the mental and emotional investment a person has in their career. It is the feeling of being interested, mentally present, and motivated, where work (and related life activities) feels purposeful rather than exhausting or routine. This engagement is often shaped by how well a person's work demands match their ability to handle them. On one side are challenges, the tasks, responsibilities, and expectations that stretch a person and keep the job stimulating. On the other side is capacity, the skills, resources, support systems, and relationships a person can draw on to meet those challenges. When work demands become too heavy compared to a person's capacity, stress

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increases, and motivation may drop, leading to disengagement. On the other hand, when the job is not challenging enough, people may feel bored, underused, and less driven. For career engagement to last, there needs to be a healthy balance: work should be demanding enough to remain interesting, but not so overwhelming that it drains the person. When this balance is achieved, individuals are more likely to stay enthusiastic, satisfied, and productive. As Becker (2018) noted, stronger career engagement can improve performance, support learning, and enhance employability.

In this study, career engagement is discussed alongside digital skills because these skills are now central to how people learn, work, and stay relevant in a digital economy. When learners develop strong digital competencies, they are better able to handle work demands without feeling overwhelmed. In other words, digital skills help match task difficulty with personal capacity, which keeps learners motivated, flexible, and ready for employment in fast-changing industries. This balance is important for maintaining engagement and supporting long-term career growth in digital settings. As learners become more productive and learn faster through digital training, they also improve their chances of getting and keeping a job, as well as enjoying better job stability. Employability skills are also crucial in today's workplace. Lee (2010) explains that these skills help people cope in a work environment that is complex and constantly changing. They include important non-technical qualities such as teamwork, communication, confidence, and negotiation skills that help individuals compete in the labour market and sustain employment over time. Employability is not a single skill; it is a combination of abilities that support a person to secure a job, perform well, keep the job, and move between roles when necessary.

In Nigeria, many educational programmes are beginning to embed employability outcomes into training by combining these skills with subject knowledge (Partnership for Twenty-First Century Skills, cited in Lee, 2010; Olabiyi, 2022). Interpersonal and organisational abilities like time management, leadership, and delegation are increasingly valued because they contribute directly to workplace performance. Beyond technical know-how, employers also look for graduates who can solve problems proactively, show empathy, stay motivated, make sound decisions, plan effectively, and adapt when circumstances change (Olabiyi, 2022). Because of this, employability skills have become essential for technical college graduates who want to succeed in a rapidly shifting global economy. Effective employability training cannot remain theoretical; it needs to focus on practical, real-life activities that build communication, critical thinking, decision-making, and problem-solving skills. Yet, even when the economy appears to improve, many young people still struggle to find meaningful work, making employability a major issue for economic diversification and development.

Technical colleges, therefore, need fresh and practical strategies to support students as they move from school into the labour market. In today's competitive world, expectations are rising (Lee, 2010), and employers increasingly want graduates who are adaptable and flexible enough to operate in a global knowledge-driven economy (Awofala, Olabiyi, Ogunleye, Udeani, & Fatade, 2017). Meeting this demand requires equipping learners with digital skills and AI-related competencies that strengthen employability and support economic diversification. These competencies can widen job opportunities (Kagaari, 2007; Maher & Graves, 2008) while also developing personal and social strengths that help individuals succeed at work (Lee, 2010). Overall, this combined approach positions technical college graduates to thrive in emerging industries by promoting innovation, resilience, and sustainable workforce readiness.

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Market-driven training today requires more than conventional teaching methods. It calls for the purposeful integration of digital skills and artificial intelligence (AI) so that training institutions can properly assess learning needs and ensure that graduates develop the competencies industries actually require (MacDonald, Nink, & Duggan, 2010). In Nigeria's TVET sector, this means designing clear strategies that strengthen employability and keep graduates actively engaged in their career development. A TVET system that is truly responsive must be able to identify the key digital skills learners need, keep pace with emerging technologies, and update its training content regularly so that graduates remain competitive in the labour market. Olabiyi, Okeowo, Adedayo, and Ipinlaye (2022) highlight that learners also need access to current technological knowledge, environmental awareness, and entrepreneurial skills. When digital skills and AI are used effectively, students are better positioned to perform in different industries, solve problems creatively, and adjust to change. In the long run, this supports innovation and resilience, while also contributing to economic diversification in a world that is increasingly driven by digital technology. As Harvey (2004) notes, gaining relevant knowledge, skills, and abilities plays a major role in improving graduates' career success.

For TVET institutions, employers, and government, the major task is therefore to strengthen workforce skills in ways that expand job opportunities, improve social mobility, and support sustainable economic growth. Employability itself is often described as a person's ability to adapt and remain useful in the workplace, while recognising and pursuing career opportunities (Fugate, Kinicki, & Ashforth, 2004). Rothwell and Arnold (2007) explain employability as the ability to secure and sustain work that matches one's qualifications, while Van der Heijden (2006) stresses that employability is not a one-time achievement; it is something people build and maintain over time through continuous use and development of their skills. Rothwell et al. (2007) also present employability as having four key dimensions: the ability to sustain employment, the relevance of one's qualifications, a future-focused mindset, and an active orientation toward work. Taken together, these show that employability is not a single trait, but a combination of factors that help technical college graduates succeed in changing labour markets and contribute to national development. Van der Heijde (2006) further breaks employability into five dimensions: occupational expertise, anticipation and optimisation, personal flexibility, corporate sense, and balance.

Occupational expertise relates to professional knowledge and practical skills. Anticipation and optimisation reflect being proactive, planning and staying committed to learning. Personal flexibility focuses on adaptability and readiness to adjust roles or responsibilities when needed. Corporate sense involves teamwork, organisational commitment, and positive workplace behaviour. Balance refers to managing stress and maintaining stability between work and personal life. Together, these dimensions explain why employability is so important for technical college graduates, especially in a labour market where roles and expectations can change quickly. At the same time, policymakers and researchers increasingly view economic diversification as essential for developing economies (IMF, 2014; Corinne et al., 2024). Diversification, expanding the range of economic activities within a country, supports steady growth, raises living standards, and reduces vulnerability to economic shocks. When a country develops multiple sectors instead of depending heavily on one commodity or industry, it creates more space for investment, innovation, and job creation. Strengthening sectors such as manufacturing, services, technology, and agriculture improves economic stability and national competitiveness.

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Linking employability development to diversification efforts is therefore strategic: it ensures that technical college graduates have the skills needed to thrive in evolving markets and actively contribute to long-term economic transformation. Economic diversification has long been recognised as a practical route to stronger growth and development. Today, its relevance for technical colleges is even clearer because digital skills and artificial intelligence (AI) are changing how work is organised and where new opportunities emerge. As employers increasingly look for adaptable, multi-skilled graduates, it becomes important to understand how digital skills and AI shape employability. This study, therefore, explores how digital technologies and AI can strengthen the employability of technical college graduates, especially by preparing them to compete in fast-changing labour markets. When technical colleges intentionally build industry-relevant competencies, such as digital problem-solving, data handling, and AI-aware work practices, they can improve workforce readiness and contribute meaningfully to broader economic diversification goals.

In this study, economic diversification is understood as a shift from heavy reliance on traditional sectors such as agriculture and extractive industries toward a wider mix of sectors and higher-value services. This shift can improve resilience, stimulate innovation, and expand access to sustainable employment in a competitive global economy. Diversification is also closely tied to structural transformation, which involves moving labour and resources from lower-productivity activities into more dynamic, knowledge-intensive industries. Sectors such as information technology, covering software development, cybersecurity, and IT consulting, along with telecommunications and specialised engineering services, illustrate how advanced skills can drive productivity and innovation. In many developing economies, this kind of transformation works best when it builds on existing comparative advantages while also developing new capabilities needed for long-term progress (Papageorgiou, Spatafora, & Wang, 2015; McIntyre et al., 2018). As the IMF notes, diversification remains a key foundation for sustained growth and better living standards, particularly in developing contexts (IMF, 2014). More recent global pressures, ranging from climate-related risks (IMF, 2020) to rapid technological change and geo-economic fragmentation (IMF, 2023a), have made the case even stronger. By expanding economic activity beyond a narrow base, diversification can reduce vulnerability to shocks, encourage innovation, and create jobs, helping economies pursue more inclusive and sustainable development (Cherif & Hasanov, 2019; Cherif, Hasanov, & Zhu, 2016).

Economic diversification is often seen as one of the surest ways for developing countries to strengthen growth and reduce overdependence on a few sectors (Papageorgiou, Spatafora, & Wang, 2015; IMF, 2014). Economies that rely heavily on oil, gas, or other exhaustible resources can struggle over time, partly because of issues commonly described as the Dutch disease and the resource curse. At the same time, the relationship between diversification and long-run growth is not always straightforward. Experiences from Latin America and the Caribbean, for example, show that macroeconomic instability can weaken the gains diversification is meant to deliver (IMF, 2015). Where diversification is pursued consistently and supported by the right policies, it can help reduce poverty and inequality by opening space for new industries, creating jobs, and improving household incomes. In particular, involvement in more technology-driven sectors tends to raise productivity and can translate into better wages and career prospects (Acemoglu & Autor, 2011). Climate change also makes the case for diversification more urgent, especially for economies where agriculture remains central but is increasingly exposed to weather shocks and environmental stress. Against this background, this study focuses on how digital skills and artificial intelligence (AI) can support

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career engagement and employability among technical college students. Building these competencies is important for Nigeria as its economy becomes more digitally oriented. Without deliberate investment in such skills, graduates may continue to face unemployment, limited workplace readiness, and increased economic vulnerability in a labour market that is evolving quickly.

Statement of the Problem

Technical colleges play a key role in preparing a skilled workforce by giving students hands-on, vocational training. However, a major gap continues to weaken their impact: many graduates leave school without the 21st-century skills employers now expect, especially digital skills. This shortfall limits their chances of getting good jobs, progressing in their careers, and adjusting to labour markets that are changing quickly. The effects are not only economic. When graduates struggle to find decent work, the frustration and pressure can take a serious toll on their well-being. In some cases, prolonged unemployment and social expectations contribute to emotional distress and mental health challenges, which research has linked to youth vulnerability, especially in contexts of redundancy and strong social pressures (Cambridge University Press, 2018). Beyond this, the digital gap can deepen inequality. People with limited formal education but strong digital abilities sometimes secure better opportunities than technically trained graduates who lack those skills. Over time, such contrasts can breed resentment, widen social divides, and contribute to broader social problems.

These realities show why technical education needs urgent reform. If nothing changes, technical colleges risk producing graduates who are not ready for modern workplaces, weakening workforce readiness and slowing efforts toward economic diversification. A practical response is to strengthen digital skills training and introduce relevant AI competencies within technical college curricula. Doing so can improve students' career engagement, boost employability, and ensure graduates' skills align with what industries actually need. Findings from this study are expected to support technical college administrators and the Lagos State technical education board by providing evidence for policy decisions and helping shape more practical, future-focused curricula. By closing the digital skills gap, technical colleges can improve graduate employability and engagement, reduce social strain linked to joblessness, and contribute more meaningfully to Nigeria's economic diversification and sustainable development.

Research Questions

1) What digital skills do technical college graduates need most to stay engaged in their careers and improve their chances of employment?
2) In what ways do digital tools and artificial intelligence shape students' employability skills and career engagement in technical colleges?
3) What practical approaches can technical colleges use to embed digital skills and AI into their curriculum to strengthen students' employability and career engagement?

Methods

Research Design

This study used a descriptive survey research design. Descriptive surveys are commonly applied in the social sciences to describe a situation as it exists and provide a clear picture of a phenomenon without manipulating variables (Neuman, 2014; Creswell & Creswell, 2017). The design was

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considered suitable because it allowed the researcher to gather and summarise views from technical college administrators and employers in OPS across the Lagos metropolis in a structured and systematic way.

Population, Sample, and Sampling Technique

The population for the study consisted of technical college administrators and OPS employers in Lagos State, Southwest Nigeria. The sample included two main groups. First, 45 administrators were selected from five state-owned technical colleges. These administrators comprised 5 principals, 10 vice principals, and 30 heads of sections. Second, 60 employers from the organised private sector were selected from organisations with at least 20 employees and a history of accepting students for industrial training or work experience programmes.

Participants were selected using purposive sampling. This approach was chosen because it makes it possible to deliberately select respondents who are knowledgeable and directly relevant to the focus of the study (Ogunleye, 2000). As a result, the final sample included individuals with varying levels of administrative and managerial experience, offering a broad range of perspectives on employability skills, digital competence, AI, and career engagement.

Instrumentation

Data were collected using a structured questionnaire developed specifically to address the study objectives. The questionnaire was organised into four sections (A–D). Section A covered demographic information such as respondent category, years of experience, and professional background. Sections B to D addressed the three research questions, focusing on: (i) the digital competencies considered most important for employability and career engagement, (ii) the influence of digital tools and AI on employability and career engagement, and (iii) strategies for integrating digital skills and AI into technical college curricula. To ensure the instrument measured what it was intended to measure, it was reviewed for face and content validity by three experts in technical education and workforce development. Reliability was assessed using internal consistency testing, and the instrument produced a Cronbach's alpha value of $\alpha = .88$, indicating strong reliability. Questionnaires were administered through research assistants and direct personal contact. Out of 105 questionnaires distributed, 101 were completed and returned, giving a retrieval rate of 96%. This strong response rate improved the quality and credibility of the data collected. Data were analysed using descriptive statistics (mean and standard deviation) with IBM SPSS (version 29), allowing the study to present clear and organised findings in line with the research questions.

Results and Discussion

Research Question One investigates digital competencies essential for career engagement and employability among technical college graduates. Responses from technical college administrators and OPS employers were analysed using mean and standard deviation to assess agreement levels. Findings in Table 1 highlight important competencies needed to prepare technical college graduates for labour market demands and economic diversification.

Table 1: influence of Digital competencies on career engagement and employability among technical college graduates (N=101)

No	Items	Mean	SD
EMPLOYABILITY			

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Compt. 1	Competent in operating industry-specific software like AutoCAD to design and install fittings and patterns on constructed projects.	3.71	.48
Compt. 2	Competent in keeping pace with AI tools, IoT, and machine learning applications, and prepared to learn as technologies evolve.	3.80	.40
Compt. 3	Exhibit competency in digital skills, including the use of educational software, online tools, and multimedia resources for teaching	4.50	.51
Compt. 4	Demonstrate the capacity and knowledge of technical and critical skills necessary for integrating digital technology.	3.66	.48
Compt. 5	Engage students with hands-on activities while staying current with rapidly evolving technology	3.68	.86
Compt. 6	Competency in utilising coding platforms, data visualisation software, collaborative tools, and simulation software	3.86	.84
Compt. 7	Competency in effectively utilising digital technology to enhance the management of learning needs and learner experiences.	3.76	.85
Compt. 8	Ability to use digital technology to address the demands of the contemporary labour market within TVET areas	4.34	.73
Compt. 9	Ability to identify and explain digital competencies that will influence future trends in TVET and need to be incorporated into the curriculum.	3.76	.61
CAREER ENGAGEMENT			
Compt. 10	Competency in developing strategies for incorporating digital competencies to enhance the training of TVET educators.	3.69	.65
Compt. 11	Ability to analyse industrial support and initiatives that assist TVET educators in developing competencies for integrating digital tools.	3.66	.84
Compt. 12	Competent in using digital technologies to analyse emerging industrial processes and activities that impact the TVET curriculum	3.79	.58
Compt. 13	Ability to discuss practical ways of using digital technology to improve students' competencies within TVET programmes	3.82	.48
Compt. 14	Competent in the implementation of digital technologies to enhance pedagogical methodologies and practices within TVET education.	4.08	.63
Compt. 15	Proficiency in effective email usage and document creation using word processors, among other digital skills, in the classroom/laboratories	4.27	.72
Compt. 16	Ability to use the specific components of digital citizenship, online safety, and best practices for managing students' data privacy.	4.34	.73
	Total	**4.15**	**.47**

Table 1 presents the mean and SD of responses from technical college administrators and OPS employers regarding the digital competencies important for career engagement and employability among technical college graduates. The overall mean score of 4.15 (SD = 0.47) indicates strong consensus that digital competencies are important for preparing technical college graduates to meet the demands of the contemporary labour market and to drive economic diversification. Respondents identified a range of digital competencies as important for employability and sustained career engagement. Skills in industry-specific software were viewed favourably; for example, proficiency in AutoCAD received a positive rating (Mean = 3.71, SD = 0.48), suggesting that

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graduates are expected to be comfortable with sector-relevant tools. There was also clear agreement that staying current with fast-changing technologies—such as AI, IoT, and machine learning is now a core requirement (Mean = 3.80, SD = 0.40), reflecting the need for adaptability as digital systems continue to evolve.

Notably, the strongest endorsement was for digital teaching competence, especially the ability to use educational software, online tools, and multimedia resources (Mean = 4.50, SD = 0.51). This points to the growing importance of digital pedagogy within modern TVET practice. Respondents also strongly agreed that digital technology should be used to respond directly to labour market needs (Mean = 4.34, SD = 0.73), reinforcing the idea that employability improves when training aligns with industry expectations. Other competencies were similarly rated as important, including innovative teaching approaches enabled by digital tools (Mean = 4.08, SD = 0.63), basic digital literacy such as email use and document preparation (Mean = 4.27, SD = 0.72), and digital citizenship skills—particularly online safety and data privacy (Mean = 4.34, SD = 0.73). Overall, all items exceeded the benchmark mean of 3.50 (range = 3.66–4.50), indicating broad consensus among respondents. The particularly high scores for digital pedagogy, labour-market responsiveness, and digital citizenship suggest these areas are viewed as most critical. However, comparatively lower ratings for technical integration (Mean = 3.66) and practical engagement with emerging technologies (Mean = 3.68) imply that these are weaker areas and may require targeted capacity building to strengthen staff readiness and graduate outcomes.

Research Question Two examined how digital tools and artificial intelligence shape employability outcomes and career engagement in technical colleges. To address this question, the study drew on responses from two key stakeholder groups: technical college administrators and employers in the organised private sector. Their views were analysed using descriptive statistics, specifically the mean and standard deviation, to show the extent to which they agreed or disagreed with each statement. The results are presented in **Table 2,** which summarises how respondents perceive the contribution of digital tools and AI to employability skills development and graduates' career engagement.

Table 2: Influence of Digital Tools and Artificial Intelligence on Employability Outcomes and Career Engagement in Technical Colleges. (N = 101).

No	Items	Mean	SD
EMPLOYABILITY			
Role1	Digital tools and AI give students access to online lessons, simulations, and virtual lab practice that build both technical know-how and soft skills.	4.08	.63
Role 2	Digital platforms help students interact with industry professionals and other learners, making it easier to build useful professional connections.	3.71	.61
Role 3	AI can personalise learning by matching content to each student's needs, helping them improve weak areas while strengthening what they already do well.	4.34	.73
Role 4	When students understand AI and digital tools, they find it easier to adjust to new technologies in the workplace.	4.40	.74

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Role 5	AI-supported learning can guide students at their own pace, giving extra support where needed and helping them progress faster in their stronger areas.	3.82	.48
Role 6	Digital tools allow students to present their work—such as designs, projects, or technical solutions, in ways that make them more attractive to employers.	4.27	.72
Role 7	AI tools can support job readiness by helping students improve their CVs and practise interviews through mock sessions and feedback.	4.15	.63
Role 8	AI-based simulations expose students to real work situations, helping them gain practical experience in areas like programming, robotics, and data analysis.	3.71	.61
CAREER ENGAGEMENT			
Role 9	Digital tools keep students updated on labour market trends, in-demand skills, and new opportunities, helping them stay prepared as their field changes.	3.82	.48
Role 10	AI-powered platforms can help students explore suitable career options by linking their interests, strengths, and goals to relevant industries and job roles.	4.27	.72
Role 11	Industry-focused online networks make it easier for students to meet professionals and potential employers, which can open up career opportunities.	3.58	.52
Role 12	Digital tools can help students intentionally develop key soft skills—like communication, teamwork, and adaptability—that employers value for long-term success	4.70	.51
Role 13	AI systems can help match students to internship and entry-level job opportunities that fit their skills and background, improving their chances of getting placed.	3.71	.61
Role 14	With digital certificates, badges, and portfolios, students can clearly show employers what they can do and provide evidence of their competence.	4.34	.73
Role 15	Gamified learning and AI-driven simulations can make skill-building more interesting and interactive, keeping students motivated to grow professionally.	3.58	.52
	Total	**4.35**	**.47**

Table 2 summarises the views of technical college administrators and OPS employers on how digital tools and artificial intelligence support employability and career engagement among technical college graduates. The overall mean score of 4.35 (SD = 0.47) indicates a strong consensus that these technologies play a major role in preparing graduates for labour market expectations and, by extension, in supporting economic diversification. On the employability dimension, respondents agreed that digital tools and AI expand learning opportunities by providing access to online courses, simulations, and virtual laboratory experiences (Mean = 4.08, SD = 0.63), which help students build both technical competence and soft skills. They also acknowledged that digital platforms can connect students with industry experts and peers (Mean = 3.71, SD = 0.61), supporting networking and exposure to professional communities. Strong support was recorded for AI-driven personalised learning (Mean = 4.34, SD = 0.73), suggesting that respondents believe students benefit when

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learning materials are adjusted to their individual strengths and weaknesses. In addition, competence in AI and digital tools was rated highly (Mean = 4.40, SD = 0.74), indicating that such knowledge makes graduates more flexible and better able to cope with technological changes in the workplace. Respondents also agreed that digital platforms that allow students to display their work, such as projects, designs, and technical solutions, can improve employability (Mean = 4.27, SD = 0.72). Other recognised benefits include AI-supported resume development and interview practice (Mean = 4.15, SD = 0.63) and technology-based simulations that build practical exposure to tasks such as robotics and programming (Mean = 3.71, SD = 0.61).

Regarding career engagement, respondents agreed that digital tools help students stay informed about labour market trends, required skills, and emerging opportunities (Mean = **3.82**, SD = 0.48). They also rated AI-powered career guidance positively, particularly for helping students explore career paths that align with their interests and abilities (Mean = 4.27, SD = 0.72). Although slightly lower, respondents still agreed that online professional networks can support connections with employers and other professionals (Mean = 3.58, SD = 0.52). The highest-rated item in the table related to developing soft skills, especially communication, teamwork, and adaptability (Mean = 4.70, SD = 0.51), shows that respondents strongly believe these abilities are critical for career success and can be strengthened through digital learning. AI was also perceived as helpful for linking students to internships and entry-level opportunities (Mean = 3.71, SD = 0.61), validating competence through digital certifications and portfolios (Mean = 4.34, SD = 0.73), and sustaining motivation through gamified learning and AI-driven simulations (Mean = 3.58, SD = 0.52). Overall, the mean scores range from 3.58 to 4.70, and all items are above the 3.50 cut-off point. This confirms broad agreement among respondents that digital tools and AI are important contributors to improving employability skills and strengthening career engagement in technical colleges.

Research Question Three focused on the strategies that can be used to successfully embed digital skills and artificial intelligence into technical college curricula in ways that improve students' employability and strengthen their career engagement. To address this question, the study analysed responses from the participants using descriptive statistics. Specifically, the mean and standard deviation were used to show how strongly respondents agreed or disagreed with each proposed strategy in the questionnaire. The findings highlighting the most practical and effective ways to integrate digital skills and AI into the curriculum are presented in Table 3 below.

Table 3: Strategies for integrating digital skills and AI into technical college curricula to enhance students' employability and career engagement (N = 101).

No	Items	Mean	SD
Stra. 1	Build digital skills and AI topics into the TVET curriculum, so students get hands-on practice with relevant technologies.	4.27	.72
Stra. 2	Add industry-specific software and AI tools to the curriculum to match what employers currently need.	4.15	.63
Stra. 3	Run regular training and development programmes for TVET teachers to strengthen their skills in digital tools and AI.	3.71	.61
Stra. 4	Support TVET teachers to use modern teaching approaches, such as flipped learning and AI-supported personalised instruction.	4.15	.70

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Stra. 5	Provide technical colleges with updated computers, software, and reliable internet so students can learn and practise digital skills effectively.	4.08	.63
Stra. 6	Partner with companies and relevant organisations to expose students to real projects, internships, and mentorship.	3.71	.61
Stra. 7	Hold workshops and seminars on new technologies to help students understand why digital skills and AI matter for their careers.	4.34	.73
Stra. 8	Use AI to assess students and give timely feedback, so they can monitor progress and improve steadily.	4.40	.74
Stra. 9	Use digital tools to teach communication, teamwork, and problem-solving skills, which are critical for employability and career engagement.	3.82	.48
Stra. 10	Use AI-driven learning platforms to personalise instruction, spot skill gaps, and recommend resources that help each student improve.	4.27	.72
Stra. 11	Use AI and digital tools to recreate workplace scenarios, helping students prepare for real digital work environments.	4.40	.74
Stra. 12	Give students practical projects that require AI and digital tools to solve real problems, building critical thinking and innovation.	3.82	.48
Stra. 13	Promote a growth mindset by stressing lifelong learning and adaptability as key to long-term career engagement.	4.27	.72
Stra. 14	Apply AI-based analytics to track students' career development, showing where they are strong and where they still need improvement.	4.15	.63
Stra. 15	Teach students how to use digital platforms for professional networking—such as strengthening LinkedIn profiles and joining relevant professional communities.	3.71	.61
	Total	**4.05**	**.64**

Table 3 presents respondents' ratings of strategies for integrating digital skills and artificial intelligence (AI) into technical college curricula in ways that can enhance employability and deepen career engagement. The overall mean score of 4.05 (SD = 0.64) indicates broad agreement that the proposed strategies are both relevant and feasible. In particular, respondents endorsed making digital skills and AI explicit components of the curriculum, with strong emphasis on practical and hands-on learning. They further stressed that curriculum content should reflect labour-market realities through the use of industry-relevant software and contextualised AI applications. Beyond curriculum revisions, respondents highlighted enabling conditions for effective implementation, including continuous teacher capacity development, more innovative instructional approaches, and the provision of adequate institutional infrastructure such as updated hardware, appropriate software, and reliable internet access. They also recommended routine workshops and seminars on emerging technologies to keep students informed about evolving workplace expectations. In addition, respondents agreed that AI-enabled tools can support personalised learning, timely feedback, and improved performance through continuous assessment. The simulation of workplace conditions using digital tools and AI was similarly viewed as a practical pathway for preparing students for real work environments, complemented by the use of analytics to monitor learners' progress and career development over time.

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Respondents also identified strategies that sustain career engagement beyond graduation. These include cultivating a lifelong-learning orientation, strengthening industry linkages through internships, mentoring, and authentic projects, and equipping students to use digital platforms for professional networking and visibility (for example, optimising LinkedIn profiles and participating in relevant professional communities). Taken together, the findings suggest that meaningful integration of digital skills and AI requires a combined approach, curriculum enhancement, teacher support, institutional resourcing, and structured collaboration with industry. With item mean scores ranging from 3.71 to 4.40 (all above the 3.50 cut-off), respondents consider these strategies essential for preparing graduates to meet labour-market demands and contribute to economic diversification. This position aligns with Olabiyi (2020), who argues that technical college graduates can only compete effectively in today's labour market when they possess digital competencies that underpin employability. In practical terms, these competencies strengthen graduates' ability to meet employer expectations, respond to technological change, and deliver value in contemporary workplaces.

The results further reinforce the perspectives of Garry (2020) and Olabiyi and Chinedu (2018), who contend that students' preparation must extend beyond tool use to include a broader understanding of the competencies required to work productively, safely, and ethically in digitally mediated environments. This argument underscores that digital competence involves not only operational skills, but also responsible use of digital resources in ways that support safety, security, and sustainability. Consistent with Borthwick and Hansen (2017), the findings indicate that employability and sustained career engagement increasingly depend on a range of digital capabilities that help graduates navigate complex workforce demands, remain employable, and succeed in rapidly changing professional contexts. Beyond improving job prospects, such competencies can also strengthen graduates' engagement with career opportunities, workplace performance, and long-term adaptability in an evolving digital economy.

With respect to perceived roles, respondents, technical college administrators, and employers in the organised private sector (OPS) generally viewed digital tools and AI as central to repositioning technical colleges to produce competent graduates for employability and career engagement in support of economic diversification. They noted that emerging technologies are reshaping manpower requirements, shifting emphasis from narrowly defined occupational skills to a workforce that is technologically capable and able to learn continuously. Respondents further indicated that digital tools can support motivation and engagement by facilitating the development of workplace-relevant skills. These views are consistent with Olabiyi (2014) and Ottestad, Kelentrić, and Guðmundsdóttir (2014), who maintain that the impact of technology in the world of work depends not only on the availability of tools but also on the presence of workers who are sufficiently knowledgeable and skilled to use them effectively. Digital skills, in this sense, expand access to resources and enable the critical analysis of information, while also supporting communication, collaboration, and higher-order thinking. As argued in related studies, digital literacy also strengthens teaching and learning by enabling teachers to guide students in effective communication, collaboration, and informed engagement with digital systems (Abiwo, Olabiyi, Olafare, & Odumuyiwa, 2023; Awofala et al., 2020).

Moreover, respondents recognised digital competence as important for connecting teachers and learners to online instructional resources and sustaining interaction regardless of location, thereby extending access and flexibility in teaching and learning (Sánchez, 2024; Preston, 2024). The implication is that digital tools are not peripheral additions but increasingly constitute an essential

element of contemporary teaching and training in the twenty-first century. In line with this, respondents' support for the proposed improvement strategies mirrors the position of Nkechinyere, Amos, and Chiedu (2022), who emphasise the need for a supportive technology framework to guide digital integration. Respondents also acknowledged the importance of policy and institutional measures that promote equity and participation, including the need for legal protections that strengthen gender equality and reduce discriminatory practices. Finally, consistent with Erwin and Mohammed (2022), the findings suggest that improved teacher attitudes and sustained adoption are more likely when teachers receive access to appropriate technologies, relevant training, and incentives. For technical college administrators and teachers, this implies prioritising acceptance and effective use of digital tools, exposing students to authentic digital learning experiences, and expanding partnerships with industry to provide real-world projects, internships, and mentorship opportunities that strengthen employability and long-term career engagement.

Conclusion and Recommendations

Technical colleges were established to equip learners with practical occupational skills, relevant knowledge, and the work attitudes required for entry into employment, career progression, and meaningful contribution to national development. However, as workplaces become increasingly shaped by digital technologies and artificial intelligence (AI), the mandate of technical colleges now extends beyond traditional trade competence to the development of technology-enabled capabilities that can support productivity and economic diversification. Against this background, the present study examined students' employability and career engagement in relation to digital skills and AI, and the evidence reinforces a widely held position in contemporary workforce literature: digital competence and AI-related capabilities have become essential for effective teaching and learning, as well as for preparing a workforce that can thrive in the digital era. In the Nigerian context, strengthening digital skills and AI integration in technical colleges has the potential to improve institutional effectiveness, promote more learner-centred instruction through personalisation, and enhance graduates' readiness for the labour market. This implies that the government, working collaboratively with technical institutions and relevant agencies, should prioritise the development of practical digital competence rather than sustaining an overreliance on theory-driven instruction. A stronger practical focus will also expand access to contemporary teaching approaches, improve exposure to best practices, and increase the availability and use of quality learning resources that reflect current industry standards.

To prepare learners for a rapidly changing workplace, investment must also be directed toward the foundational conditions that make digital learning possible. This includes providing up-to-date hardware and licensed software, alongside reliable internet connectivity that enables students to learn, practise, and refine employability-relevant digital skills over time. In addition, AI-enabled learning platforms can be deployed to tailor learning experiences, diagnose skill gaps early, and recommend personalised learning resources and tasks that support continuous improvement. Finally, targeted financial support should be made available to institutions and learners to facilitate access to essential digital tools for practical training, while structured in-service professional development should be strengthened to build teachers' capacity to integrate digital tools and AI effectively in classroom and workshop instruction. Collectively, these measures will position technical colleges to produce adaptable, future-ready graduates who can sustain employability, remain engaged in long-term career development, and contribute meaningfully to Nigeria's drive for economic diversification.

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