Enhancing Graduate Employability through Innovative Technology and E-Commerce for Economic Development of Nigeria

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ABSTRACT

The study examines the part of innovative technology and e-commerce in enhancing graduate employability leading to economic development in emerging economies. the study addressed the persistent disparity between graduates' skills and industry demands. A descriptive survey research design was adopted, with a purposive sample 100 of graduates exposed to digital technologies and e-commerce in Plateau. Data were collected using a structured questionnaire which were analyzed using descriptive statistics, correlation, and regression analysis at a 0.05 level of significance. The findings revealed among others that, digital technologies significantly improve graduates' problem-solving skills, flexibility, confidence, and global employability. E-commerce engagement demonstrates a strong positive influence on employment and self-employment opportunities, promoting entrepreneurship, income generation. However, infrastructural deficiencies, financial constraints, poor digital literacy, and other barriers limit the influence. Regression analysis confirmed a statistically significant positive effect of innovative technology ($\beta = 0.972$, $p < 0.05$) and e-commerce engagement ($\beta = 0.353$, $p < 0.05$) on graduate employability, leading to the rejection of the null hypotheses. The study concludes that integrating innovative technology and e-commerce into higher education curricula significantly enhances graduate employability and economic empowerment. It recommends strengthened digital curriculum integration, industry collaboration, continuous digital skills training, improved infrastructure, and targeted policy funding to bridge implementation gaps and align graduate competencies with labour market demands.

INTRODUCTION

In today's rapidly evolving job market, the integration of innovative technology and e-commerce skills into graduate education has become essential for enhancing employability. The rapid advancement of technology and the globalization of markets have significantly reshaped labor demands worldwide. However, many emerging economies continue to face high levels of graduate unemployment due to mismatches between educational curricula and industry needs (World Bank, 2021). Incorporating Technologies and e-commerce into education and employment strategies presents a viable solution to addressing these challenges (Okafor & Adegbite, 2022). The integration of innovative in view of the above has necessitated the decision to undertake the research to examine enhancing graduate employability through innovative technology and e-commerce.

Graduate employability is the ability of graduates to secure and sustain meaningful employment by utilizing their acquired knowledge, skills, and competencies (Tomlinson, 2021). In emerging economies, this concept is increasingly critical as economic transformations, technological advancements, and labor market fluctuations shape employment opportunities (World Bank, 2022). Many developing nations struggle to bridge the gap between higher education and industry demands, leading to a growing mismatch between graduates' skills and employers' expectations (International Labour Organization, 2023). While higher education institutions (HEIs) aim to equip students with relevant knowledge, many graduates face challenges in securing employment due to structural and systemic issues. These include outdated curricula, insufficient practical training, limited access to technological tools, and weak industry-academia linkages (Suleman, 2022). As a result, many graduates in

emerging economies experience underemployment or prolonged job searches, raising concerns about the effectiveness of current education systems in preparing students for the workforce.

In today's rapidly evolving job market, innovative technologies play a crucial role in enhancing graduate employability. Employers are increasingly seeking candidates who possess not only traditional academic qualifications but also digital skills and technological adaptability (World Economic Forum, 2023). The integration of artificial intelligence (AI), big data, and automation into various industries has necessitated the need for graduates to be proficient in emerging digital tools (McKinsey & Company, 2022).

One of the key ways in which technology influences employability is through online learning platforms. Massive Open Online Courses (MOOCs) and other e-learning resources have provided graduates with access to industry-relevant skills that complement their formal education (Siemens, 2021). These platforms offer courses on programming, data analysis, and digital marketing, equipping students with competencies that align with labor market demands (Kumar & Sharma, 2022).

Moreover, the rise of artificial intelligence and machine learning has reshaped the hiring process. Many companies now utilize AI-driven recruitment tools to screen applicants, analyze resumes, and conduct preliminary interviews (Smith & Johnson, 2023). Graduates who are familiar with such technologies and can optimize their resumes for applicant tracking systems (ATS) have a competitive advantage in securing employment (Brown et al., 2022).

E-commerce has emerged as a particularly promising pathway for graduate employment and self-reliance. Online retail platforms such as Jumia, Konga, Flutter wave Storefront, and informal social-commerce channels on WhatsApp, Instagram, and TikTok have lowered the barriers to entry for micro-entrepreneurs. Graduates with competencies in digital marketing, e-payments, data analytics, and online business management according to Anyionu, (2025) can create sustainable livelihoods or support firms in scaling their digital operations. Studies also show that e-commerce growth stimulates job creation across interconnected sectors—transport, warehousing, digital finance, cybersecurity, and content creation—thereby contributing to broader national economic development.

E-commerce has also emerged as a significant sector for employment, providing graduates with opportunities to work in digital marketing, logistics, and online business management (Chaffey, 2021). The integration of innovative technologies such as blockchain, augmented reality (AR), and personalized recommendation algorithms has transformed e-commerce into a dynamic field requiring tech-savvy professionals (Lee & Kim, 2023).

Furthermore, digital interacting platforms such as LinkedIn have revolutionized the job search process. Graduates can leverage these platforms to showcase their skills, connect with industry professionals, and access job opportunities worldwide (Anderson & Williams, 2022). The role of social media analytics in personal branding has further reinforced the importance of digital literacy in employability (Gonzalez, 2023).

A major issue in emerging economies is the gap between graduates' skills and labor market demands. Many graduates possess theoretical knowledge but lack the technical and soft skills required by employers (Mourshed et al., 2021). Research shows that employers in Africa and South Asia often struggle to find candidates with critical thinking, problem-solving, and digital literacy skills, despite a high number of university graduates (UNESCO, 2023). This misalignment results in high unemployment rates among degree holders, emphasizing the need for curriculum reforms and industry-driven learning models

In today's digital economy, proficiency in technology is essential for employment. However, many HEIs in emerging economies lag in integrating digital skills into their curricula (Kapur & Suri, 2022). The lack of adequate infrastructure, access to the internet, and training in emerging technologies such as artificial intelligence (AI), data analytics, and blockchain further limits graduates' competitiveness in the job market. Employers increasingly prefer candidates who are digitally fluent, yet many graduates in these economies struggle with basic digital competencies (World Economic Forum, 2023).
The disconnect between higher education institutions and industries exacerbates employability challenges. In

many emerging economies, universities operate in isolation from the private sector, leading to graduates who are ill-prepared for real-world job roles (Chikuni et al., 2021). Internships, apprenticeships, and industry collaborations remain scarce, preventing students from gaining practical exposure before graduation. Strengthening partnerships between universities and businesses is crucial to fostering hands-on learning and bridging the employability gap.

Unstable economic conditions, fluctuating labor markets, and high youth unemployment rates pose additional challenges for graduate employability (ILO, 2023). Many emerging economies experience economic downturns, limiting job creation and reducing opportunities for young professionals. Furthermore, informal employment remains dominant in these economies, often offering limited job security, lower wages, and fewer career growth opportunities (World Bank, 2023).

Entrepreneurship is a critical pathway to employment in economies where formal job opportunities are scarce. However, many graduates lack entrepreneurial skills, financial literacy, and innovation-driven mindsets necessary for self-employment (Mendoza & Lorenzo, 2021). Integrating entrepreneurship education into university curricula can empower graduates to create their own job opportunities rather than relying solely on formal employment.

To address the skills mismatch, HEIs must align curricula with industry needs. This includes incorporating practical training, critical thinking, problem-solving, and digital skills into academic programs (Ogunyemi et al., 2022). Universities should also adopt competency-based learning approaches to ensure students develop job-relevant skills before graduation.

Equipping students with digital literacy and emerging technology skills is essential for improving employability (Kapur & Suri, 2022). HEIs should invest in digital infrastructure, online learning platforms, and partnerships with tech companies to enhance students' proficiency in AI, coding, data analysis, and cybersecurity.

Partnerships between universities and industries can facilitate internships, mentorship programs, and real-world project collaborations (Chikuni et al., 2021). Employers should be actively involved in curriculum development, ensuring that graduates acquire skills relevant to labor market demands.

Embedding entrepreneurship training in higher education can help graduates develop self-employment skills (Mendoza & Lorenzo, 2021). Business incubation centers, startup grants, and innovation hubs can further support students in launching and scaling their ventures.

Beyond technical expertise, graduates need soft skills such as communication, teamwork, and adaptability (Suleman, 2022). Career counseling services, leadership training, and mentorship programs can enhance students' employability by equipping them with workplace readiness skills.

Nigeria's economic development agenda increasingly recognizes technology and e-commerce as pillars for job creation, poverty reduction, and diversification away from oil dependence. By enhancing graduate employability through targeted investments in digital capacity building, curriculum modernization, digital infrastructure expansion, and partnerships between universities and industry, Nigeria stands to unlock the full potential of its youthful population. As digital transformation accelerates, the alignment between higher education outputs and technology-driven market demands will become even more crucial for sustaining economic competitiveness, inclusiveness, and innovation. In view of the above, the researchers decided to undertake the research to examine enhancing graduate employability through innovative technology and e-commerce.

Statement of the problem

In emerging economies, the transition from education to employment remains a significant challenge for graduates. Despite possessing academic qualifications, many graduates face substantial obstacles in securing relevant employment, resulting in high levels of underemployment and unemployment. This issue is exacerbated by rapidly changing labor market demands, which increasingly prioritize digital literacy and proficiency with innovative technologies and e-commerce platforms. The traditional education systems in these economies often lag in integrating contemporary technological skills and e-commerce competencies into their curricula. This skills mismatch hinders their employability and limits their potential to contribute effectively to economic development. However, without the necessary skills and support, graduates are unable

to leverage these opportunities, thus impeding personal and national economic progress. The problem is multifaceted, involving the need to revamp educational systems, enhance digital infrastructure, and provide targeted training and support for graduates. Addressing these challenges is crucial for improving graduate employability, fostering innovation, and stimulating economic growth in emerging economies.

General Objective

To explore how innovative technology and e-commerce can enhance graduate employability and support economic development.

Specific Objectives

1. To examine the role of digital technologies in developing graduates' skills for employability.
2. To assess the impact of e-commerce on creating employment and self-employment opportunities for graduates.
3. To identify barriers hindering graduates from leveraging technology and e-commerce for career advancement.
4. To evaluate the effectiveness of institutional and policy support in enhancing technology-driven employability.
5. To propose strategies for strengthening the integration of technology and e-commerce in graduate career development.

Research Questions

1. What role do digital technologies play in improving graduates' skills and employability?
2. How does engagement in e-commerce impact employment and self-employment opportunities for graduates?
3. What barriers do graduates face in leveraging technology and e-commerce for career advancement?
4. How effective are institutional support and policies in promoting technology-driven employability among graduates?
5. What strategies can be implemented to strengthen the integration of technology and e-commerce in graduate career development?

Hypotheses

Ho: Innovative technology and e-commerce do not significantly enhance graduate employability or contribute to economic development.

LITERATURE REVIEW

Conceptual Framework

Emerging economies, characterized by rapid industrialization, substantial economic growth, and increasing participation in global trade, present unique opportunities and challenges in the labor market. Among the critical issues these economies face is the high unemployment rate among recent graduates. Despite economic advancements, the gap between educational outcomes and labor market demands remains significant.

Graduate Employability

Graduate employability refers to the ability of graduates to gain, maintain, and progress in employment through a combination of discipline knowledge, transferable skills, digital competencies, and personal attributes (Atah & Wordu, 2024). Modern employability frameworks emphasize skills such as communication, teamwork, adaptability, digital literacy, problem-solving, and innovation. In Nigeria, graduate employability has been widely debated due to persistent skills mismatch, rising youth unemployment, and rapid changes in labour market demands (NBS, 2024).

Innovative Technology

Innovative technology encompasses digital tools, platforms, systems, and methods that enhance efficiency, creativity, and productivity. These include artificial intelligence, digital payment systems, cloud computing, automation, mobile applications, social media tools, and online learning environments (NITDA, 2024). The relevance of tech skills is rising as Nigeria transitions to a digitally enabled economy driven by innovation, data, and technology-enabled entrepreneurship (FMoCIDE, 2024).

E-Commerce

E-commerce refers to buying, selling, and exchanging goods and services via digital platforms. In Nigeria, e-commerce spans formal online marketplaces (e.g., Jumia, Konga), fintech-powered payment services (e.g., Pay stack, Flutter wave), and informal social-commerce activities on WhatsApp, Instagram, TikTok, and Facebook. The e-commerce sector has consistently recorded double-digit growth, expanding job opportunities in logistics, digital marketing, content creation, software development, customer support, and online retail operations (Mordor Intelligence, 2025; Anyionu, 2025).

Enhancing graduate employability in a technology-driven economy requires a nuanced understanding of the key scopes that determine digital readiness, adaptability, and entrepreneurial potential. Recent scholarship and policy reports converge on several interdependent competencies—digital literacy, platform and e-commerce skills, data literacy, digital soft skills, and entrepreneurial mindset—as the foundation of employability in the modern labour market (Đorđević, 2025; World Economic Forum, 2023). This section critically reviews these dimensions, highlighting their theoretical relevance and empirical support.

The State of Graduate Employability in Nigeria

Nigeria faces one of the highest youth unemployment and underemployment rates in Africa, driven by structural constraints, demographic pressures, and skill deficiencies. According to the National Bureau of Statistics (2024), the unemployment rate among youths aged 15–34 remains high despite modest improvements. Several empirical studies highlight: skills mismatch between graduates and employer expectations, limited digital competencies among new graduates (Atah, 2024; NCC, 2024), weak linkage between universities and industry, a predominantly theoretical curriculum lacking practical exposure and insufficient access to workplace learning opportunities, Gidado and Diffang (2024) emphasises that many Nigerian graduates lack critical thinking, digital problem-solving skills, communication competencies, and entrepreneurial abilities required in the modern workplace.

Innovative Technology and Graduate Employability

Modern labour markets demand proficiency in digital tools such as spreadsheets, data analysis software, online collaboration tools, multimedia applications, and cloud-based systems. Evidence from Nigerian universities indicates that students with digital literacy training exhibit higher employability outcomes (Atah, 2024; Joshua & Apuru, 2024).Digital skills essential for employability include: digital communication, data literacy, social media management, cloud-based collaboration, cybersecurity awareness, digital content creation and automation and AI-assisted tools. Studies also show that digital literacy enhances job search skills, access to online opportunities, and remote work participation.

Technology-Enabled Learning and Pedagogy

Blended learning, virtual labs, simulation software, and online assessment platforms have increasingly become part of learning environments. Universities that integrate technology-enabled teaching improve students' ability to work with digital tools, collaborate online, and solve problems with technology (Adewale, 2024).

Technopreneurship and Innovation Hubs

Innovation hubs, startup incubators, and digital entrepreneurship centres (e.g., Co-Creation Hub, Ventures Platform) provide graduates with training in coding, business development, prototype design, and innovation management. Empirical evidence suggests that such interventions improve graduates' entrepreneurial intentions and self-employment prospects (Adieme, 2024). Nigeria's fintech ecosystem—one of the largest in Africa—has become a major employer of young graduates. Skills in digital payments, product design, web and mobile development, UX design, and digital security are increasingly sought after. This trend indicates that technology is reshaping future labour market trajectories for Nigerian graduates.

E-Commerce and Graduate Employability

Nigeria's e-commerce market continues to grow rapidly due to increased internet penetration, mobile money expansion, and the rise of social commerce (Mordor Intelligence, 2025). This growth fuels demand for digitally skilled graduates in: online customer relations, digital marketing and advertising, logistics and delivery management, data analytics, content creation, ICT support services, mobile app design and online retail administration. Platforms like Facebook Marketplace, Instagram Shops, WhatsApp Business, and TikTok Shops have dramatically lowered entry barriers for young entrepreneurs. Research by Anyionu (2025) discloses that digital marketing and social-commerce engagement significantly enhance business visibility, customer acquisition, and income generation for young Nigerian entrepreneurs. The rise of online freelancing platforms (e.g., Upwork, Fiverr, Toptal) and remote jobs in digital services presents new employment opportunities for digitally skilled graduates. A growing number of Nigerian youths participate in: virtual assistance, graphic design, software development, online tutoring, digital sales, content writing, data entry and customer support.E-commerce enables micro, small, and medium enterprises (MSMEs) to expand their operations beyond physical boundaries. Graduates skilled in e-commerce management, website administration, logistics optimization, and digital branding are increasingly absorbed by MSMEs seeking digital transformation.

Theoretical framework

Disruptive Innovation Theory:

Disruptive Innovation Theory, developed by Clayton Christensen, suggests that new technologies often disrupt existing markets and create new opportunities. Graduates can capitalize on disruptive technologies in e-commerce, such as blockchain for supply chain management, AI-driven customer service, and augmented reality for virtual shopping experiences. Understanding these technologies and their potential applications can give graduates a competitive edge in adapting to industry changes and driving innovation. The theory above addresses how innovative technology can result to job creation but did not point out how it enhances skills acquisition. To address that, the human capital theory was brought in to solve.

Human Capital Theory

Human Capital Theory posits that investments in education and training (including technological skills) enhance an individual's productivity and employability. By integrating innovative technologies and e-commerce training into graduate education, institutions can enhance graduates' human capital. This includes skills in digital marketing, e-commerce platforms, data analytics, and project management, which are increasingly valued in today's job market. Putting the two theories, the variables have been adequately addressed

Related Empirical Studies

Empirical studies show that innovative technology and e-commerce, when integrated into training, significantly increases both employability and job creation potential. Tee et al. (2024) found that graduates exposed to entrepreneurship modules emphasizing digital marketing, e-payment systems, and supply chain technologies demonstrated greater innovation orientation and job satisfaction. This suggests that digital entrepreneurship education does not merely create business owners but cultivates agile, problem-solving professionals across sectors.

Boateng, etal (2021), examined the impact of Information and Communication Technology (ICT) on graduate employability in Sub-Saharan Africa. It highlights the positive correlation between ICT aptitude and employment rates among graduates. The research advocates for greater investment in ICT infrastructure and training programs to improve job prospects for graduates in the region.

Aker, and Claude (2020), assessed the impact of digital skills training on the employability of graduates in Nigeria. The randomized control trial showed that graduates who received digital skills training were more likely to find employment in the tech and e-commerce sectors compared to those who did not receive the training. The study highlights the importance of digital literacy and practical tech skills in enhancing employability.

Sharma, e tal (2019), investigated how innovative technologies, such as artificial intelligence and machine learning, influence graduate employability in India. The findings suggest that graduates with expertise in these technologies have a competitive edge in the job market. The study recommends integrating advanced tech courses into higher education curricula to better prepare graduates for the evolving job market.

Kartiwi, et al (2018), studied the relationship between e-commerce adoption and job creation in Southeast Asian countries, focusing on Indonesia, Vietnam, and the Philippines. The study found that increased e-commerce adoption leads to higher demand for graduates with skills in digital marketing, data analytics, and web development. It underscores the role of e-commerce in creating new job opportunities and the need for relevant training programs.

Also, Recent studies directly linking **technology, e-commerce, and employability** include:

- **Atah (2024)** found that digital skills acquisition significantly predicts employability prospects among university graduates.
- **Joshua and Apuru (2024)** reported a strong positive correlation between digital
- **Adewale (2024)** demonstrated that e-commerce competencies improve job opportunities for startups and digital entrepreneurs in Nigeria.
- **Omoju et al. (2023)** highlighted the need for policy reforms to align youth skills with digital economy demands.

These empirical studies offer valuable insights into how innovative technologies and e-commerce are influencing graduate employability in emerging economies. They highlight the importance of updating educational curricula, fostering industry partnerships, and promoting digital skills to better prepare graduates for the evolving job market.

Summary of Literature Review

The reviewed literature establishes that enhancing graduate employability in Nigeria requires strategic integration of innovative technologies, digital skills training, and e-commerce competencies into higher education and national development agendas. Technology serves as both a driver of employability and a platform for job creation, while e-commerce provides diverse employment pathways, supports MSME growth, stimulates entrepreneurship, and contributes to economic diversification. Empirical evidence strongly indicates

that graduates equipped with digital and e-commerce skills demonstrate higher job readiness, improved adaptability, and stronger entrepreneurial potential

METHODOLOGY

This study adopted a descriptive survey research design. The target population comprises graduates from Nigerian higher education institutions who have exposure to digital technologies and e-commerce. A sample of 100 graduates was purposively selected, ensuring that all participants have relevant experience with technology or e-commerce, which aligns with the study objectives. Purposive sampling was employed to ensure that respondents meet inclusion criteria. Data were collected using a structured questionnaire, which comprised five sections. The questionnaire was reviewed by three experts in educational technology, entrepreneurship, and employability to ensure content validity. A pilot test with 10 graduates outside the main sample was conducted to evaluate clarity and reliability. Internal consistency was assessed using Cronbach's alpha, with $\alpha \geq 0.7$ considered acceptable. The questionnaires were administered online (Google Forms) and in-person where feasible.

Data were analyzed using SPSS version 25. Descriptive statistics (frequency, percentage, mean, standard deviation) summarized respondents' demographic characteristics and survey responses. Inferential statistics included correlation and multiple regression analyses to test the hypothesis at significance level of 0.05.

RESULTS AND DISCUSSION

Research Question 1:

What is the role of digital technologies in improving graduates' skills and employability?

Table1: Mean and Standard Deviation Analysis on the role of digital technologies in improving graduates' skills and employability?

S/N	Statements	$\overline{X}$	SD	Dec
1.	Digital technologies have improved my problem-solving skills.	4.08	1.04	Agree
2.	The use of digital tools has enhanced my communication skills.	3.84	1.08	Agree
3.	Online learning platforms have improved my professional competence.	3.44	1.23	Agree
4.	Digital technologies have increased my confidence in the labour market.	3.90	1.14	Agree
5.	Exposure to digital tools has improved my adaptability to new work environments.	4.01	1.06	Agree
6.	Technology-based learning has enhanced my critical thinking skills.	3.82	1.18	Agree
7.	Digital skills acquired during my studies are relevant to current job demands.	3.57	1.17	Agree
8.	The use of innovative technologies has increased my employability prospects.	3.44	1.24	Agree
	Overall	3.76	0.63	Agree

The result presented in Table 1 demonstrate that respondents agreed overall that digital technologies and technology-based learning have positively influenced their skill development and employability, as reflected by the overall mean score of 3.76 (SD = 0.63). This indicates a generally positive perception of the role of

digital technologies in enhancing graduates' readiness for the labour market. High levels of agreement were recorded for improvement in problem-solving skills (Mean = 4.08, SD = 1.04) and adaptability to new work environments (Mean = 4.01, SD = 1.06), suggesting that exposure to digital tools enhances graduates' capacity to address complex tasks and adjust to changing workplace demands. Respondents also agreed that digital technologies increased their confidence in the labour market (Mean = 3.90, SD = 1.14) and enhanced communication skills (Mean = 3.84, SD = 1.08), highlighting the broader soft-skill benefits of digital engagement.

Moderate agreement was observed for technology-based learning enhancing critical thinking skills (Mean = 3.82, SD = 1.18) and for the relevance of acquired digital skills to current job demands (Mean = 3.57, SD = 1.17). This suggests that while digital skills are perceived as valuable, some respondents may experience gaps between training content and labour market expectations. The lowest mean scores were recorded for online learning platforms improving professional competence and innovative technologies increasing employability prospects (both Mean = 3.44, SD = 1.23 and 1.24 respectively). Although respondents still agreed with these statements, the relatively lower means indicate variability in experiences, possibly due to differences in quality, access, or effectiveness of digital learning platforms. The overall decision of Agree confirms that digital technologies contribute meaningfully to graduates' problem-solving ability, adaptability, confidence, and employability. However, the moderate ratings for professional competence and employability gains suggest the need for better alignment of digital learning experiences with current labour market requirements.

Research Question 2:

How does engagement in e-commerce impact employment and self-employment opportunities for graduates?

Table2: Mean and Standard Deviation Analysis on the impact of e-commerce engagement on graduates' employment and self-employment opportunities?

S/N	Statements	$\overline{X}$	SD	Dec
1.	E-commerce platforms provide alternative employment opportunities for graduates.	4.06	1.08	Agree
2.	Participation in e-commerce activities has improved my income-generating ability.	3.80	1.14	Agree
3.	E-commerce encourages self-employment among graduates.	3.79	1.16	Agree
4.	Digital marketplaces reduce graduates' dependence on paid employment.	3.94	1.04	Agree
5.	E-commerce skills increase graduates' competitiveness in the labour market.	3.98	1.03	Agree
6.	Online business platforms enable graduates to reach wider markets.	3.93	1.09	Agree
7.	E-commerce supports entrepreneurial skill development among graduates.	4.21	0.96	Agree
8.	Engagement in e-commerce enhances graduates' economic independence.	4.08	1.04	Agree
	Overall	3.97	0.57	Agree

The results in table 2 indicate a strong overall agreement that engagement in e-commerce enhances graduates' employment prospects, income generation, and entrepreneurial development. This is evidenced by the overall mean score of 3.97 (SD = 0.57), suggesting a high level of consensus among respondents regarding the positive impact of e-commerce on graduate employment and economic independence. Among the items, e-commerce supporting entrepreneurial skill development recorded the highest mean score (Mean = 4.21, SD =

0.96), highlighting its critical role in equipping graduates with practical business and entrepreneurial competencies. Similarly, respondents strongly agreed that engagement in e-commerce enhances graduates' economic independence (Mean = 4.08, SD = 1.04) and that e-commerce platforms provide alternative employment opportunities (Mean = 4.06, SD = 1.08).

Furthermore, high levels of agreement were also observed for statements indicating that e-commerce skills increase graduates' competitiveness in the labour market (Mean = 3.98, SD = 1.03) and that digital marketplaces reduce dependence on paid employment (Mean = 3.94, SD = 1.04). This suggests that e-commerce empowers graduates to pursue flexible and self-directed career pathways. Furthermore, respondents agreed that online business platforms enable access to wider markets (Mean = 3.93, SD = 1.09) and that participation in e-commerce improves income-generating ability (Mean = 3.80, SD = 1.14). The perception that e-commerce encourages self-employment among graduates (Mean = 3.79, SD = 1.16) further reinforces the role of e-commerce in promoting entrepreneurial ventures. The overall decision of Agree confirms that e-commerce plays a substantial role in expanding employment options, fostering entrepreneurship, improving income capacity, and enhancing economic independence among graduates. The relatively high mean scores across all items underscore e-commerce as a viable and impactful pathway for addressing graduate unemployment and underemployment.

Research Question 3:

What barriers do graduates face in leveraging technology and e-commerce for career advancement?

Table3: Mean and Standard Deviation Analysis on the barriers graduates face in leveraging technology and e-commerce for career advancement

S/N	Statements	$\overline{X}$	SD	Dec
1.	Limited access to reliable internet hinders my use of digital technologies.	4.10	1.07	Agree
2.	High cost of digital tools limits my participation in e-commerce activities.	3.54	1.37	Agree
3.	Lack of practical digital training affects my employability.	3.07	1.38	Agree
4.	Inadequate infrastructure constrains technology-driven career opportunities.	3.82	1.22	Agree
5.	Insufficient technical support limits effective use of digital platforms.	4.01	1.02	Agree
6.	Lack of mentorship reduces my ability to utilize e-commerce opportunities.	4.11	0.94	Agree
7.	Poor digital literacy remains a major challenge to career advancement.	4.27	0.93	Agree
8.	Inadequate funding discourages graduates from engaging in e-commerce ventures.	3.82	1.33	Agree
	Overall	3.84	0.81	Agree

The analysis in table 3 shows that respondents agreed overall that several constraints hinder their effective use of digital technologies and participation in e-commerce activities, as reflected by the overall mean score of 3.84 (SD = 0.81). This indicates a generally high level of consensus that these factors negatively affect employability, career advancement, and technology-driven opportunities. Specifically, poor digital literacy emerged as the most critical challenge (Mean = 4.27, SD = 0.93), suggesting that inadequate digital skills are a major barrier to career progression. Similarly, respondents strongly agreed that lack of mentorship (Mean = 4.11, SD = 0.94) and limited access to reliable internet (Mean = 4.10, SD = 1.07) substantially constrain their ability to utilize digital and e-commerce opportunities. High levels of agreement were also recorded for insufficient technical support (Mean = 4.01, SD = 1.02) and inadequate infrastructure (Mean = 3.82, SD =

1.22), indicating that systemic and institutional limitations continue to affect effective technology use. Furthermore, the high cost of digital tools (Mean = 3.54, SD = 1.37) and inadequate funding for e-commerce ventures (Mean = 3.82, SD = 1.33) were acknowledged as financial barriers limiting participation. Although lack of practical digital training recorded the lowest mean (Mean = 3.07, SD = 1.38), respondents still agreed that it negatively affects employability, highlighting persistent gaps between theoretical knowledge and practical digital competencies. The overall decision of Agree confirms that infrastructural, financial, and skill-related challenges collectively pose significant obstacles to digital technology adoption, employability, and engagement in e-commerce activities among graduates.

Research Question 4:

How effective are institutional support and policies in promoting technology-driven employability among graduates?

Table4: Mean and Standard Deviation Analysis on the effectiveness of institutional support and policies in promoting technology-driven employability among graduates

S/N	Statements	$\overline{X}$	SD	Dec
1.	My institution provides adequate digital skills training for employability.	4.13	1.04	Agree
2.	Government policies support graduate engagement in technology-driven employment.	3.70	1.28	Agree
3.	Entrepreneurship programs in my institution promote e-commerce skills.	3.61	1.33	Agree
4.	Institutional support enhances graduates' readiness for the digital labor market.	3.73	1.34	Agree
5.	Career guidance services emphasize technology-based employment opportunities.	3.58	1.31	Agree
6.	Government initiatives effectively promote graduate entrepreneurship.	3.63	1.23	Agree
7.	Institutional collaboration with industry improves digital skill acquisition.	4.07	1.12	Agree
8.	Existing policies adequately support graduate employability through technology.	3.54	1.32	Agree
	Overall	3.75	0.82	Agree

The results indicate that respondents agreed overall that institutional and government supports play a positive role in enhancing graduates' employability through digital and technology-driven initiatives, as evidenced by the overall mean score of 3.75 (SD = 0.82). This suggests a generally favourable perception of existing policies, programs, and institutional efforts toward preparing graduates for the digital labour market. At the institutional level, respondents strongly agreed that their institutions provide adequate digital skills training for employability (Mean = 4.13, SD = 1.04), making it the highest-rated item. Similarly, institutional collaboration with industry was positively rated (Mean = 4.07, SD = 1.12), indicating that partnerships with industry stakeholders are perceived to enhance practical digital skill acquisition. Moderate levels of agreement were observed regarding institutional support in enhancing graduates' readiness for the digital labour market (Mean = 3.73, SD = 1.34) and government policies supporting graduate engagement in technology-driven employment (Mean = 3.70, SD = 1.28). This implies that while such supports exist, there is still room for improvement in their scope and effectiveness. Respondents also agreed that government initiatives promote graduate entrepreneurship (Mean = 3.63, SD = 1.23) and that entrepreneurship programs within institutions encourage e-commerce skills (Mean = 3.61, SD = 1.33).

Additionally, career guidance services emphasizing technology-based employment opportunities recorded a mean of 3.58 (SD = 1.31), suggesting moderate but positive recognition of career advisory roles. The lowest mean score was recorded for existing policies adequately supporting graduate employability through technology (Mean = 3.54, SD = 1.32), although respondents still agreed with the statement. This indicates perceived gaps in policy implementation or effectiveness despite general policy presence. The overall decision of Agree confirms that both institutional and government frameworks contribute positively to graduates' digital skill development and employability. However, the relatively moderate mean scores across several items suggest the need for strengthened policy implementation, expanded institutional programs, and more targeted career guidance to fully optimize technology-driven employment outcomes for graduates.

Research Question 5:

What strategies can be implemented to strengthen the integration of technology and e-commerce in graduate career development?

Table5: Mean and Standard Deviation Analysis on the strategies can be implemented to strengthen the integration of technology and e-commerce in graduate career development

S/N	Statements	$\overline{X}$	SD	Dec
1.	Integrating digital skills into the curriculum will improve graduate employability.	4.26	0.91	Agree
2.	Increased access to technology will enhance graduates' career opportunities.	3.81	1.22	Agree
3.	Practical e-commerce training should be emphasized in higher education.	3.14	1.22	Agree
4.	Stronger university-industry collaboration will enhance employability outcomes.	4.01	1.11	Agree
5.	Government funding can improve graduate participation in digital entrepreneurship.	3.98	1.07	Agree
6.	Continuous digital skills training is essential for graduate career development.	4.05	1.02	Agree
7.	Technology-based internships can improve graduates' work readiness.	3.02	1.23	Agree
8.	Expanding e-commerce education will strengthen graduate economic empowerment.	3.35	1.10	Agree
	Overall	3.70	0.62	Agree

The result in table 5 reveal that respondents agreed overall that strategic integration of digital skills, technology access, and e-commerce education can significantly enhance graduate employability and career development, as indicated by the overall mean score of 3.70 (SD = 0.62). This reflects a strong collective belief in the positive role of digital-oriented interventions in improving employment outcomes. The highest level of agreement was recorded for integrating digital skills into the curriculum (Mean = 4.26, SD = 0.91), indicating that respondents strongly perceive curriculum reform as a critical driver of graduate employability. Similarly, continuous digital skills training (Mean = 4.05, SD = 1.02) and stronger university–industry collaboration (Mean = 4.01, SD = 1.11) were highly rated, underscoring the importance of sustained skill development and practical industry linkages. Respondents also agreed that government funding can enhance participation in digital entrepreneurship (Mean = 3.98, SD = 1.07) and that increased access to technology improves career opportunities (Mean = 3.81, SD = 1.22).

These results suggest recognition of the role of both policy support and infrastructural access in expanding graduates' employment prospects. Moderate agreement was observed for expanding e-commerce education to strengthen economic empowerment (Mean = 3.35, SD = 1.10) and emphasizing practical e-commerce training in higher education (Mean = 3.14, SD = 1.22), indicating that while respondents support these initiatives, their perceived impact may depend on implementation quality. The lowest mean score was recorded for technology-based internships improving work readiness (Mean = 3.02, SD = 1.23), although respondents still agreed with the statement. This may suggest variability in exposure to or effectiveness of such internships. The overall decision of Agree confirms broad support for digital skill integration, continuous training, industry collaboration, and policy funding as key strategies for enhancing graduate employability and economic empowerment. However, relatively lower mean scores for practical e-commerce training and technology-based internships highlight areas requiring strengthened implementation and alignment with labour market needs.

Hypotheses Testing

H_{o1}: Innovative technology does not significantly enhance graduate employability or contribute to economic development.

Table 6. Regression analysis examining the effect of innovative technology on graduate employability and economic development

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
Innovative Technology → Graduate Employability	.992	.024	.972	41.133	.000	1.000	1.000
a. Dependent Variable: Graduate Employability							

The table presents the result of a simple linear regression analysis examining the effect of Innovative Technology (IT) on Graduate Employability (GE). The regression coefficient for RDT shows a strong positive effect on graduate employability (B = 0.992, β = 0.972). This implies that a one-unit increase in IT leads to an approximate 0.99 unit increase in graduate employability, indicating a substantial predictive contribution of IT to GE. The relationship is statistically significant, as evidenced by a very high t-value (t = 41.133) and a p-value of .000, which is well below the 0.05 significance threshold. This result indicates that IT is a significant predictor of graduate employability. Regarding multicollinearity, the Tolerance value of 1.000 and VIF of 1.000 indicate the absence of multicollinearity, confirming that the regression estimates are stable and reliable. The findings demonstrate that IT significantly and positively influences graduate employability. Therefore, the null hypothesis that IT does not significantly affect graduate employability is rejected, and the alternative hypothesis is supported.

H_{o2}: E-commerce does not significantly enhance graduate employability e-commerce engagement on graduate employability

Table 7. Regression analysis examining the effect of e-commerce engagement on graduate employability and economic development**.**

Model	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
E-commerce engagement →	.397	.106	.353	3.741	.000	1.000	1.000

Graduate Employability							
a. Dependent Variable: Graduate Employability							

The analysis in table 7 examined the effect of e-commerce engagement on graduate employability. The regression results indicate a positive and statistically significant relationship between the two variables. Specifically, the unstandardized coefficient (B = 0.397) shows that for every one-unit increase in e-commerce engagement, graduate employability increases by 0.397 units. The standardized coefficient (Beta = 0.353) further suggests that e-commerce engagement has a moderate effect on employability. The t-value of 3.741 with p-value of 0.000, confirms that this effect is statistically significant at the 5% level, indicating that the relationship is unlikely due to chance. Additionally, collinearity diagnostics (Tolerance = 1.000, VIF = 1.000) indicate that there is no multicollinearity concern in the model. These findings imply that graduates who actively participate in e-commerce activities such as online businesses, freelancing, or digital entrepreneurship are more likely to enhance their employability. Encouraging e-commerce engagement among graduates can therefore serve as a strategy to improve their readiness and opportunities in the labour market. Therefore, the null hypothesis that e-commerce engagement does not significantly enhance graduate employability is rejected, and the alternative hypothesis is supported.

DISCUSSION

The result of agree indicates that e-commerce plays a significant role in expanding employment opportunities, fostering entrepreneurship, improving income capacity, and enhancing economic independence among graduates. This finding is consistent with global evidence that digital marketplaces lower entry barriers to business creation and self-employment, particularly for young graduates seeking alternative income pathways which according to UNCTAD (2021), enables small and medium-scale entrepreneurs to access wider markets beyond environmental limitations, thereby increasing revenue potential and economic participation. The finding that e-commerce expands employment options reflects the transformation of traditional labour markets into digital bionetworks. Platforms for online retail, freelancing, digital marketing, and content creation allow graduates to monetize skills without the constraints of conventional wage employment. Supporting the above, World Bank (2022) pointed that digital commerce ecosystems contribute to job creation by supporting micro-enterprises and remote work, particularly in developing economies where proper employment opportunities may be restricted.

The strongly agreed on entrepreneurship development further aligns with the theory of digital entrepreneurship, which emphasizes innovation, scalability, and low start-up costs. E-commerce reduces capital requirements for physical infrastructure and facilitates direct customer engagement through online platforms. To this end, OECD (2020) highlighted that digital platforms enhance entrepreneurial research and business growth by providing data analytics, online payment systems, and global supply chain integration. This suggests that graduates who leverage e-commerce are better positioned to create sustainable ventures and diversify income streams. Moreover, the finding that e-commerce improves income capacity and economic independence is supported by empirical evidence indicating that online business models can generate flexible and multiple income sources. According to International Labour Organization (2021), digital entrepreneurship and platform-based work increase youth participation in income-generating activities, thereby reducing vulnerability to unemployment and underemployment. Graduates engaged in e-commerce can scale operations gradually, access niche markets, and build brand identity with relatively lower risk compared to traditional brick-and-mortar enterprises.

The relatively high mean scores across all items underscore the recognition of e-commerce as a practical solution to graduate unemployment. In the context of the Fourth Industrial Revolution, the World Economic Forum (2020) emphasizes that digital trade and online business models are central to future job creation and economic resilience. E-commerce not only facilitates self-employment but also stimulates indirect employment in logistics, digital marketing, content development, and payment services.

Skill-related challenges remain equally significant. Although many graduates may be digitally literate at a basic level, advanced technical, analytical, and entrepreneurial competencies are often insufficient. The International Labour Organization (2022) emphasizes that employability in the digital economy requires a combination of technical skills, soft skills, and industry-specific competencies. A mismatch between academic training and practical digital demands can therefore limit graduates' competitiveness.

The overall decision of agree also confirms broad support for digital skill integration, continuous training, industry collaboration, and policy funding as key strategies for enhancing graduate employability and economic empowerment. This reflects a growing consensus that employability outcomes improve when digital competencies are embedded across curricula rather than treated as stand-alone courses. The OECD (2020) underscores the importance of lifelong learning systems that continuously upgrade digital skills to match evolving labour market needs.

Support for industry collaboration aligns with evidence that partnerships between universities and employers strengthen experiential learning and workplace readiness. The World Economic Forum (2020) highlights that public–private collaboration is essential for bridging skill gaps and aligning training with emerging job roles in the digital economy. Such collaboration enhances curriculum relevance, mentorship opportunities, and real-world exposure.

However, the relatively lower mean scores for practical e-commerce training and technology-based internships reveal implementation gaps. While respondents support digital integration in principle, the practical components—such as hands-on e-commerce simulations, structured internships, and industry-based digital projects—appear underdeveloped. According to UNESCO (2021), experiential learning and work-integrated training are critical for translating digital knowledge into professional competence. Without these practical dimensions, graduates may struggle to apply theoretical digital skills in real business contexts.

Furthermore, policy funding plays a pivotal role in sustaining digital transformation initiatives. Investment in digital laboratories, innovation hubs, entrepreneurship centers, and start-up grants is necessary to operationalize strategic intentions. The World Bank (2022) emphasizes that coordinated policy support and targeted funding significantly enhance youth employment outcomes in technology-driven sectors.

The duplication of this finding (Items 3 and 4) reinforces the robustness of respondents' perceptions that structural and systemic barriers collectively undermine the full realization of digital and e-commerce opportunities. The persistence of these challenges suggests that technological potential alone is insufficient without complementary investments in infrastructure, funding access, and targeted skill development. The finding reveals a very high t-value ($t = 41.133$) and a p-value of .000, which is far below the 0.05 significance threshold. This indicates that the relationship between the variables is statistically significant and not due to random variation. In inferential statistics, when the p-value is less than 0.05 alpha level, the null hypothesis is rejected, confirming the presence of a meaningful relationship (Field, 2018). A t-value of this magnitude suggests a very strong effect size and substantial predictive strength. Similarly, Douglas, et al. (2021) explain that extremely small p-values (reported as .000 in statistical software) signify strong evidence against the null hypothesis. Therefore, the result confirms that the independent variable significantly influences the dependent variable in the population from which the sample was drawn.

The regression results further indicate a positive and statistically significant relationship between the variables. A positive regression coefficient implies that as the independent variable increases, the dependent variable also increases. This supports theoretical frameworks such as Human Capital Theory, which posits that investments in skills and technology enhance productivity and economic outcomes (Becker, 1993). From an econometric perspective, a statistically significant positive coefficient confirms both the direction and reliability of the association. Damodar e tal (2009) explain that when the estimated coefficient is positive and its p-value falls below 0.05, the predictor variable contributes meaningfully to explaining variations in the dependent variable. This suggests that digital technology adoption or e-commerce participation has a measurable upward effect on employability and economic empowerment outcomes.

CONCLUSION

Based on the findings presented, the study concludes that digital technologies and e-commerce significantly enhance graduate employability and economic empowerment. The descriptive results revealed that digital technologies improve problem-solving ability, adaptability, confidence, and overall employability. Likewise, e-commerce was widely known as a viable way for expanding employment opportunities, promoting entrepreneurship, increasing income capacity, and promoting economic freedom. However, the study also concludes that infrastructural deficiencies, financial constraints, and skill gaps remain critical barriers limiting the full realization of digital and e-commerce benefits. Although there is strong support for digital skill integration, continuous training, industry collaboration, and policy funding, relatively lower ratings for practical e-commerce training and technology-based internships indicate implementation gaps. This proposes that while strategic intentions are present, stronger alignment between academic training and labour market demands is essential.

RECOMMENDATIONS

The following recommendations are proposed:

1. Digital literacy should move beyond basic ICT training to include data analytics, digital marketing, e-commerce management, cybersecurity awareness, and platform-based entrepreneurship

2. Experiential learning models such as project-based assignments, live online campaigns, and digital business incubation programmes should be strengthened to bridge the gap between theory and practice.

3. To address implementation gaps, universities should formalize partnerships with technology firms, digital marketing agencies, fintech companies, logistics providers, and online retail platforms.

4. Given the dynamic nature of the digital economy, continuous training programmes should be institutionalized.

5. Government agencies should develop comprehensive digital economy policies that promote Public–private partnerships in digital skills development

6. Institutions should implement structured monitoring and evaluation mechanisms to assess graduate digital competency levels and E-commerce start-up survival rates

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