HARNESSING EMERGING TECHNOLOGIES FOR TRANSFORMATIVE ENTREPRENEURSHIP EDUCATION: A PEDAGOGICAL EVALUATION

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Abstract
This study examined emerging technologies for transformative entrepreneurship education in universities in Kwara State. Three research questions guided the study. This study adopted a descriptive survey research design. The population of this study consisted of all the 32 business and business and entrepreneurship educators in universities in Kwara State. The entire population of 32 business and entrepreneurship educators was used as sample size, this means that there is no sampling technique. This sample was selected from University of Ilorin, Kwara State University and Al-Hikmah University. Data were collected through a researcher-designed questionnaire titled 'Emerging Technologies in Entrepreneurship Education Questionnaire (ETEEQ)'. The questionnaire was divided into four sections. Two experts validated the instrument. The instrument was subjected to Cronbach's Alpha reliability test and an overall coefficient of 0.78 was obtained. Data collected were analyzed using descriptive statistics such as mean and standard deviation to answer the research questions. The finding revealed that application of Learning Management Systems (LMS) in personalizing entrepreneurship education in universities in Kwara State is to a low extent. It was found that business and entrepreneurship educators agreed that the Internet of Things (IoT) plays a significant role in entrepreneurship learning in universities in Kwara State. Based on the findings, it was recommended amongst others that university administrators and educators prioritize the adoption and integration of LMS platforms through targeted investments in infrastructure and professional development.

Keywords: Emerging Technologies, Entrepreneurship, Entrepreneurship Education, Transformative Technology.

Introduction

Over time, the focus of entrepreneurship education has shifted from basic business-start-up training to a broader emphasis on instilling entrepreneurial thinking across all disciplines and sectors (European Commission, 2016). This pedagogical reorientation reflects the growing recognition that entrepreneurship is not limited to business creation but

represents a set of transferable competencies such as innovation, adaptability, and opportunity recognition that are essential for navigating today's volatile and technology-driven economies (Oni, Osu & Babatunde, 2025). In the context of developing countries like Nigeria, where structural unemployment and underemployment persist, the relevance of entrepreneurship education becomes even more pronounced. By cultivating creative problem-solving and self-employment capacities, entrepreneurship education can serve as a strategic response to the chronic disconnect between higher education outputs and labour-market realities (Stutz, Sorensen & Viebig, 2025). However, if entrepreneurship education remains marginal or is not fully practiced in tertiary institutions, graduates risk entering the labour market without the adaptive, creative, and practical competencies needed to create viable alternatives to formal employment.

For many young Nigerians, the problem stems from a persistent mismatch between their skills and the demands of the labour market, leading to widespread underemployment and diminished prospects for economic mobility (NBS, 2024a). Transformative entrepreneurship education involves more than the transfer of information; it aims to reshape learners' worldviews and equip them to solve real-world problems creatively and sustainably. Transformative entrepreneurship education reframes teaching from transmission of business facts to deep learner

transformation: it develops not only venture-creation skills but also identity, values, and capacity to address complex social and economic problems (Haleem, Javaid, Qadri & Suman, 2022). Through experiential learning, reflection, and problem-based projects, students reconfigure how they see themselves as actors gaining agency, resilience, and ethical judgement needed for sustained entrepreneurial action. The use of emerging technologies presents an opportunity to achieve this transformation by enabling personalized, immersive, and flexible learning environments.

As the global economy becomes increasingly digitalized, education systems are under pressure to adapt. Emerging technologies are being integrated into classrooms worldwide to improve teaching and learning outcomes (Viberg, Wasson & Kukulska-Hulme, 2020). Emerging technologies are technologies "characterised by rapid development, evolution, novelty and uncertainty in trajectory and impact," requiring anticipatory governance because of their transformative potential (Organisation for Economic Co-operation and Development, 2024). These tools provide dynamic, interactive, and learner-centered experiences that are especially beneficial in entrepreneurship education, where experiential and applied learning is essential. The use of emerging technologies presents an opportunity to achieve this transformation by enabling personalized, immersive, and flexible learning environments. Emerging technologies matter

because they extend and accelerate core mechanisms of transformative learning. This study adopted the three dimensions of emerging technologies by Neergaard, Robinson and Jones (2021) and Eiriemiokhale and James (2022) to include learning management system, internet of things and social media technologies.

These three dimensions of emerging technologies represents a paradigm shift in the pedagogy of entrepreneurship education. However, in universities within Kwara State their pedagogical integration into entrepreneurship education remains limited. While institutions like the University of Ilorin, Kwara State University, and Al-Hikmah University operate LMS platforms, their use is largely confined to routine administrative tasks such as uploading lecture materials and assessments. The lack of pedagogical redesign, lecturer readiness, and utilization of advanced LMS features such as adaptive learning, analytics, and AI-assisted personalization hinders their potential to support transformative entrepreneurship education.

Similarly, the deployment of IoT technologies and social media tools in entrepreneurship education is fragmented and underutilized. IoT applications are mostly restricted to library automation and student projects, with little integration into entrepreneurial training or innovation labs. Although students actively use social media for informal business activities, its structured use for digital marketing instruction, online business simulations, or faculty-guided entrepreneurial projects is minimal. These gaps highlight a missed opportunity to align emerging technologies with entrepreneurial pedagogy. This study therefore evaluated how LMS, IoT, and social media technologies are harnessed in entrepreneurship education to foster transformative learning in universities in Kwara State. Specifically, the study:

1. determine the application of learning management system in personalizing entrepreneurship education in universities in Kwara State
2. determine the roles of Internet of Things (IoT) on entrepreneurship learning in universities in Kwara State
3. ascertain the potentials of social media technologies in enhancing entrepreneurial networking among students in Kwara State

Research Questions
1. To what extent are learning management systems applied in personalizing entrepreneurship education in universities in Kwara State?
2. What are the roles of the Internet of Things (IoT) in entrepreneurship learning in universities in Kwara State?
3. To what extent has social media technologies enhanced entrepreneurial networking among students in Kwara State?

Literature Review

Concept of Learning Management System

Learning Management Systems (LMS) are programmes created specifically with the purpose of integrating students or learners to learning content in an orderly manner (Isaacs & Hollow, 2017). By recording actions on computers, giving information, and creating plans, they oversee and monitor learning processes and student achievement in addition to managing learning events, themes, and learners. Tertiary institutions in Kwara State operate institutional LMS/ODL platforms. Kwara State University runs KWASU-Virtual as a full LMS with student and instructor guides and orientation materials; the University of Ilorin maintains an e-learning centre and OD/L platforms; Al-Hikmah University and Kwara State Polytechnic also provide distance/ODFeL portals and LMS services (Makinde, et al., 2025). Empirical studies show adaptive learning in LMS improves engagement and outcomes in higher education and supports competency mastery relevant to entrepreneurship (Obiakor, Oguejiofor & Ezenwagu, 2021). For the purpose of this study, a Learning Management System (LMS) is any digital platform used by universities and other higher education institutions to organize, deliver, track, and evaluate teaching and learning activities related to entrepreneurship education. It functions as a unified environment for teaching and learning that connects students, teachers, and digital resources in real time. This allows for sharing of content, monitoring of student performance, managing assessments, and providing feedback.

Concept of Internet of Things (IoT)

IoT technologies support entrepreneurship education by enabling tangible product development and real-world experimentation: students can prototype smart devices, collect real-time user/market data, build sensor-enabled business solutions (agritech, logistics, retail), and test connected business models (Adebayo & Ochayi, 2023). Research and institutional reports show growing but patchy IoT adoption in Kwara State (Makinde, Ajani & Abdulrahman, 2024). Specific evidence: studies on adoption of IoT for service delivery in university libraries in Kwara State document available technologies such as RFID, QR systems and wireless sensor networks used for circulation, tracking and service automation (Makinde, Ibrahim, Ibrahim & Ganiyu, 2025). The Internet of Things (IoT) could be operationalized to mean a network of interconnected technologies that allow students and educators to interact with smart devices, sensors, and data-based systems. These technologies support the development of innovative products and experiments focused on market needs. By connecting physical objects like sensors, machines, and Radio Frequency Identification (RFID) tags to digital systems, IoT promotes hands-on learning experiences, real-time data collection, and testing of business models.

Concept of Social media technologies

Social media technologies have emerged as vital tools for entrepreneurial engagement, especially among students in higher education institutions. Platforms such as Instagram**,** Facebook**,** Twitter/X, LinkedIn**,** and WhatsApp serve as cost-effective digital ecosystems that facilitate marketing, networking, and business development (Makinde & Bolaji, 2019). These platforms allow young entrepreneurs to engage in rapid customer discovery, market validation, and real-time feedback for their minimum viable products (MVPs), thereby enhancing innovation and adaptability. Social media also supports digital marketing and brand-building, enabling users to create visibility and foster direct relationships with customers. In the context of Kwara State, empirical evidence shows that many undergraduates leverage social media platforms for informal entrepreneurship, using them for product sales, promotions, and peer mentoring (Oni et al., 2025). This increasing utilization of social media as a business and learning tool highlights its transformative potential in bridging the gap between classroom knowledge and real-world entrepreneurial experience. Social media technologies include interactive digital platforms such as Facebook, Instagram, Twitter/X, WhatsApp, LinkedIn, and YouTube. These platforms enable communication, teamwork, promotion of brands, and networking between students and instructors. They function as both tools for teaching and as ecosystems that support entrepreneurial activities, allowing learners to discover market opportunities, present their innovations, and build social connections.

Theoretical Framework

Many researchers have used different theories like Human Capital Theory (Nnonyelu, 2020), Social Learning Theory (Poortman & Brown, 2023), Diffusion of Innovation Theory (Rogers, 2003), and Connectivism Learning Theory (Siemens, 2005) to understand how technology, entrepreneurship education, and new teaching methods are connected. However, this study uses Connectivism Learning Theory and Diffusion of Innovation Theory as its main ideas. Both of these theories help explain how new technologies can change how we teach entrepreneurship and improve how teaching works in the classroom.

Connectivism Theory

Connectivism was started by George Siemens (2005) and Stephen Downes (2008).
It is a learning theory that helps explain how knowledge is created and shared in the digital age. Unlike older theories that focus on how people learn inside their heads, connectivism says that knowledge is found in networks. These networks include people, groups, online tools, and even things like artificial intelligence and databases. Learning happens when people connect different sources of information to build a network of understanding that keeps growing.

In the case of entrepreneurship education, connectivism shows how using technology can help students learn from real-world experiences through online work, digital tools, and groups of entrepreneurs around the world. Siemens (2017) says that students in digital networks learn by connecting with others, teachers, and technology. In this setting, new technologies like Learning Management Systems (LMS), Virtual Reality (VR), Artificial Intelligence (AI), and Massive Open Online Courses (MOOCs) a   Connectivism supports transformative entrepreneurship education by promoting learning models that go beyond traditional classrooms. It uses interactive tools like virtual incubators, online accelerators, and cloud-based collaboration platforms to help students develop and present their entrepreneurial ideas in digital spaces. This approach fits with modern teaching methods that focus on student autonomy, active participation, and learning through solving real problems. Connectivism also explains how entrepreneurial skills are built through ongoing interaction with digital resources instead of just one-time lessons. It supports the use of AI-driven analytics, digital mentorship systems, and online innovation environments as tools to help students grow in creativity, flexibility, and their ability to keep learning throughout their careers.

In short, Connectivism Learning Theory offers a way to connect technology, education, and entrepreneurship. It shows that in the 21st century, learning happens through connections and in entrepreneurship education, new technologies are the key links that bring together knowledge, opportunities, and innovation.

Diffusion of Innovation Theory

The Diffusion of Innovation (DOI) Theory, developed by Everett Rogers in 2003, explains how new ideas, products, or technologies spread through a society over time.

Rogers outlines five groups of people who adopt these innovations: innovators, early adopters, early majority, late majority, and laggards. He also identifies five factors that affect how quickly an innovation is accepted: its relative advantage, how well it fits with existing practices, how complicated it is to use, whether it can be tested before full adoption, and how visible its benefits are.

In entrepreneurship education, this theory helps explain how and why schools and universities take up new technologies to improve their teaching methods. For example, digital tools like online learning platforms, blockchain for academic records, AI-powered tutors, and virtual business labs are adopted at different rates depending on how much support there is from leaders, how ready the school's infrastructure is, and how digitally skilled the teachers as parts of the learning network that help people connect and create new ideas (Al-Azawei, Parslow, & Lundqvist, 2023).

The theory says that how fast and how much technology is taken up depends on how much people think it will help and the situation they're in. Schools that see technology as a way to improve how students learn are more likely to include it in their programs about starting businesses. On the other hand, schools that see using technology as complicated or needing a lot of resources tend to take longer to adopt it. When looking at how teaching is evaluated, the DOI Theory gives a way to look at the steps schools go through when they start using new technologies like knowing about the tech, being persuaded to use it, making the decision to adopt it, actually putting it into use, and then confirming that it's working well. Each of these steps is important and can affect how involved students are, how good the teaching is, and how well students develop skills for starting their own businesses.

So, the Diffusion of Innovation Theory helps explain how technology changes education. It shows that for technology to be successfully used, the school's culture, the rules and policies in place, and the goals of teaching need to fit with using new technology in the classroom. It helps leaders and teachers create business programs that are up-to-date with technology and also good for teaching.

Methodology

This study adopted a descriptive survey research design. This design is appropriate because the study seeks to evaluate how technologies such as Learning Management Systems (LMS), Internet of Things (IoT), and social media platforms are currently being utilized, rather than manipulate variables or establish causation. This study was delimited to one Federal university (University of Ilorin), one State university (Kwara State University) and one private university (Al-Hikmah University) in Kwara State. The population of this study consisted of all the 32 business and business and entrepreneurship educators in these three universities in Kwara State. The entire population of 32 business and entrepreneurship educators was used as sample size, this means that there was no sampling technique. This sample was selected from University of Ilorin, Kwara State University and Al-Hikmah University. Data were collected through a researcher-designed questionnaire titled 'Emerging Technologies in Entrepreneurship Education Questionnaire (ETEEQ)'. The questionnaire was divided into our sections. Section A comprised of demographic data of the respondents, Section B, C and D contained statements in line with the specific objectives of the study. Section B was structured on a 4-point scale of Very Great Extent (VGE); Great Extent (GE); Low Extent (LE); and Very Low Extent (VLE) while section B and C was structured on a 4-point Likert scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly

Disagree (SD). Each rating has their respective values of 4, 3, 2 and 1, respectively. Two experts validated the instrument. The instrument was subjected to Cronbach's Alpha reliability test and has internal consistency reliability coefficient of 0.73, 0,77 and 0,83 were derived for Section B, C and D. An overall value of 0.78 was obtained. The questionnaires were administered (both in hard copy and online format, depending on participant accessibility) and a total of 36 copies were retrieved by the researchers and used for data analysis. Data collected were analyzed using descriptive statistics such as mean and standard deviation to answer the research questions

Results

Research Question 1: To what extent are learning management systems applied in personalizing entrepreneurship education in universities in Kwara State?

Table 1: Respondents' ratings on the extent learning management systems are applied in personalizing entrepreneurship education in universities (N = 36)

S/N	To what extent:	X	SD	Remarks
1	Does your university's LMS provide personalized learning paths or modules tailored to students' entrepreneurial interests and progress?	1.78	1.01	Low extent
2	Are LMS tools used to give individualized feedback and mentorship to students in entrepreneurship courses?	1.79	1.04	Low extent
3	Does the LMS integrate adaptive learning features (such as quizzes or recommendations) that adjust to students' performance levels in entrepreneurship learning?	2.67	1.03	High extent
4	Are entrepreneurship course materials on the LMS designed to match students' specific business ideas or project needs?	2.86	0.96	High extent
5	Does the LMS facilitate personalized interaction between students and lecturers (e.g., discussion forums, direct messaging, or virtual office hours)?	2.76	0.99	High extent
6	Is data from the LMS (such as learning analytics or participation reports) used by lecturers to modify teaching strategies for entrepreneurship students?	2.02	1.02	Low extent
7	Does the LMS support the development of individual entrepreneurial portfolios, business plans, or e-project submissions?	2.37	1.03	Low extent
	Cluster Mean	**2.46**		Low extent

The cluster mean of 2.46 indicated that the application of Learning Management Systems (LMS) in personalizing entrepreneurship education in universities in Kwara State is to a low extent. The highest mean scores were recorded for the design of entrepreneurship materials matching students' business ideas (Mean = 2.86) and LMS facilitation of personalized interaction (Mean = 2.76), suggesting some functional use of LMS tools. Conversely, low mean values for personalized learning paths (Mean = 1.78)

and individualized mentorship (Mean = 1.79) reflect weak integration of personalized features. The SD values, ranging between 0.96 and 1.04, indicate a moderate variation in responses, meaning participants had differing experiences or perceptions regarding LMS personalization in entrepreneurship education.

Research Question 2: What are the roles of the Internet of Things (IoT) in entrepreneurship learning in universities in Kwara State?

Table 2: Respondents' ratings on the roles of the Internet of Things (IoT) in entrepreneurship learning in universities in Kwara State (N = 36)

S/N	In my institution:	X	SD	Remarks
8	IoT-enabled devices (such as sensors and smart tools) enhance practical demonstrations and experimentation in entrepreneurship courses	3.41	0.54	Agree
9	The integration of IoT technologies helps students develop innovative business ideas based on real-time data and automation	2.18	0.69	Disagree
10	IoT-based projects and simulations are used to improve students' problem-solving and product-design skills in entrepreneurship learning.	1.72	0.99	Disagree
11	IoT facilities in university laboratories or innovation hubs support prototype development for entrepreneurial ventures.	2.07	0.88	Disagree
12	IoT applications are effectively used to connect entrepreneurship students with local industries for experiential learning.	2.58	0.89	Agree
13	IoT systems are used for monitoring students' project progress and providing feedback in entrepreneurship-related courses.	2.68	0.91	Agree
14	IoT integration in entrepreneurship education has improved students' readiness for technology-driven business opportunities.	3.93	0.85	Disagree
	Cluster Mean	**2.53**		**Agree**

The cluster mean of 2.53 indicates that respondents agreed that the Internet of Things (IoT) plays a significant role in entrepreneurship learning in universities in Kwara State. While items such as IoT-enabled demonstrations ($\bar{X} = 3.41$) and the use of IoT for experiential learning ($\bar{X} = 2.58$) were moderately agreed upon, most other areas such as prototype development ($\bar{X} = 2.07$) and technology-driven readiness ($\bar{X} = 2.09$) showed low levels of agreement. The average SD of 0.82 suggests moderate variability, implying that while some universities show progress, others lag in IoT integration for entrepreneurship learning.

Research Question 3: To what extent has social media technologies enhanced entrepreneurial networking among students in Kwara State?

Table 3: Respondents' ratings on the extent social media technologies enhanced entrepreneurial networking among students in Kwara State   (N = 36)

S/N	To what extent:	X	SD	Remarks
15	Have social media platforms (e.g., Facebook, Instagram, WhatsApp) enabled students to connect with potential customers and clients for their entrepreneurial ventures	2.55	0.58	High extent
16	Do students use social media to collaborate with peers on business ideas and start-up projects	2.87	0.82	High extent
17	Has social media facilitated mentorship and knowledge sharing between students and successful entrepreneurs	3.11	0.92	High extent
18	Are social media platforms used by students to promote and market their business products or services	2.69	0.69	High extent
19	Has social media enhanced students' access to entrepreneurial communities and business networks beyond their universities	2.53	0.88	High extent
20	Do educators leverage social media to create virtual networking opportunities and industry linkages for entrepreneurship students	2.59	0.79	High extent
21	Has social media exposure helped students identify emerging business trends and innovations relevant to their fields	2.72	0.74	High extent
	Cluster Mean	**2.72**		**High extent**

The data in Table 3 shows the item by item analysis on the extent social media technologies enhanced entrepreneurial networking among students in Kwara State. The data revealed that items 15 – 21 with mean scores 2.55, 2.87, 3.11, 2.69, 2.53, 2.59 and 2.72 were rated to a high extent. The cluster mean of 2.72 summarized that to a high extent social media technology enhanced entrepreneurial networking among students in Kwara State. The average SD of 0.77 suggests moderate variability among respondents, indicating some differences in the extent to which universities utilize social media for entrepreneurial networking.

Discussion of Findings

The findings in research question one revealed that application of Learning Management Systems (LMS) in personalizing entrepreneurship education in universities in Kwara State is to a low extent. This finding agreed with that of Yakubu, Dasuko, Abubakar and Kah (2020) that only a handful of African tertiary institutions have fully deployed LMS and that adoption depends strongly on facilitating conditions, system quality and instructor/student acceptance. The finding of Chigozie-Okwum, Ezranyeji and Odii (2018) agreed with the present finding that 55% of respondents indicated no adoption and a further 25% reported very low adoption of LMS.

The finding in research question two revealed that business and entrepreneurship educators agreed that the Internet of Things

(IoT) plays a significant role in entrepreneurship learning in universities in Kwara State. This finding was in line with that of Mahto and McDowell (2018) that the Internet of Things (IoT) can transform entrepreneurship education by enabling the customization of course content for individual students, allowing faculty and universities to tailor learning experiences to personal needs and offer enriching experiential learning opportunities. This finding of Mustafa and Schademan (2023) supported that IoT-focused project-based learning shows that implementing IoT activities in university engineering classes promotes an entrepreneurial mindset, with students designing IoT-based systems to address real-world problems, leading to improvements in problem-solving, communication, and teamwork skills through hands-on experiential learning.

The finding in research question three revealed that entrepreneurial educators to a high extent social media technology enhanced entrepreneurial networking among students in Kwara State. This finding agreed with that of Sanni, Kazeem and Azeez (2023) that students routinely use a broad range of social media (WhatsApp, Instagram, Facebook, LinkedIn, YouTube, Twitter, Pinterest) to market goods, find customers, and collaborate with peers practices that create dense, practical business networks among undergraduates. The finding of Fan, Qalati, Khan, Shah and He (2021) that social media adoption significantly improves market reach,

customer engagement and firm performance; social media depth of use correlates with better networking and business outcomes.

Conclusion

Entrepreneurship education in universities within Kwara State is gradually being transformed by emerging technologies, yet the depth and consistency of this transformation remain uneven across different digital tools. The findings of this study paint a mixed but insightful picture of how technology is shaping teaching and learning in this vital field. Specifically, while the application of Learning Management Systems (LMS) in personalizing entrepreneurship education was found to be low, suggesting limited integration of adaptive or learner-centered digital environments, business and entrepreneurship educators acknowledged the significant role of the Internet of Things (IoT) in enriching entrepreneurial learning experiences through connectivity, real-time data, and innovation-driven approaches. Furthermore, the study revealed that social media technologies have enhanced entrepreneurial networking among students to a high extent.

Recommendations

Based on the findings, the following recommendations were drawn:

1. university administrators and educators prioritize the adoption and integration of LMS platforms through targeted investments in infrastructure and professional development. This could involve conducting workshops for faculty on utilizing LMS features for customized learning paths, such as adaptive modules and student progress tracking, to enhance personalization

2. It is recommended that educational institutions further embed IoT technologies into the curriculum by developing hands-on projects and collaborations with industry partners. This might include establishing IoT labs equipped with sensors and devices for students to prototype entrepreneurial solutions, such as smart agriculture or health monitoring systems relevant to local challenges.

3. Universities in Kwara State should leverage this strength by formalizing social media strategies within entrepreneurship programs, such as creating dedicated online communities or mentorship networks on platforms like LinkedIn and Twitter.

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