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Integrating artificial intelligence as a catalyst for entrepreneurship education in higher education: a conceptual framework for Indonesian higher education

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ABSTRACT

This article proposes a conceptual framework for integrating Entrepreneurship Education, Artificial Intelligence Technology, and Educational Technology as a transformative catalyst for Higher Education in Indonesia. Higher education in Indonesia currently faces difficult challenges, where universities are required to produce graduates who are not only competent but also creative, innovative, and adaptive so that they can overcome the high unemployment rate among young people. A systematic literature review, which refers to entrepreneurship theories and the latest trends in Artificial Intelligence and education technology (over the past five years), reveals the synergistic potential of technology in shaping entrepreneurial mindsets and skills that are relevant to the needs of the times. Although Indonesia's digital ecosystem can be said to have developed rapidly and there are national policies from Indonesia Government related to AI, the implementation process faces significant challenges, such as infrastructure gaps and human resource readiness. The framework proposed in this study describes a holistic approach that includes AI-enriched curricula, Educational Technology-driven pedagogy, a robust digital support ecosystem, and AI-based assessment and analysis, all tailored to the Indonesian context. This article recommends strategic investment in digital infrastructure, capacity building for teaching staff, cross-sector and multi-stakeholder partnerships, and a robust AI ethics framework to realize the vision of higher education that produces socially responsible, ethical, and impactful entrepreneurs.

Keywords: entrepreneurship education; artificial intelligence; educational technology; digital transformation; information technology management

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RESEARCH & PUBLISHING



1. INTRODUCTION

This research is situated at the intersection of three pivotal contemporary trends: the transformative global potential of Artificial Intelligence, Indonesia's national strategic ambition to achieve developed country status by 2045, and the critical role of higher education in cultivating the next generation of innovators and entrepreneurs. As outlined in the National Long-Term Development Plan (RPJPN) 2025–2045 ([Ministry of National Development Planning, 2024](#)), Indonesia's vision for a prosperous future is predicated on sustained economic growth of 6–7 percent, a goal that necessitates a significant leap in productivity and innovation. AI stands as a key enabler of this transformation, offering the potential to enhance business efficiency, unlock new data-driven business models, and foster a more competitive economic landscape. Concurrently, universities—especially those aspiring to World Class University (WCU) status—are vital actors within the national innovation ecosystem, tasked with developing the human capital required to lead in this technologically advanced era ([Audretsch et al., 2024](#); [Secundo et al., 2024](#)).

Despite Indonesia's position as a global leader in AI tool adoption—ranking second worldwide in the number of users—a significant disconnect exists between this rapid public uptake and the institutional readiness of its higher education sector. This disparity constitutes the core research problem. While students and lecturers increasingly use tools like ChatGPT, universities face substantial challenges that hinder effective integration. These include a persistent digital divide, with a report noting that "nearly half of all villages in Indonesia (approximately 48%) still lack a basic cellular base transceiver station" ([Public First; Indef, 2025](#)). Furthermore, a critical human capital gap exists, with studies indicating low levels of AI literacy among students and a lack of confidence and training among educators ([Sari et al., 2025](#)). This is compounded by institutional inertia, where the pace of curriculum updates and the development of clear ethical policies lag behind technological advancements ([Chigbu & Makapela, 2025](#)). Consequently, a growing mismatch between graduate capabilities and the demands of an AI-driven market threatens to undermine Indonesia's economic and educational goals.

The landscape of higher education in Indonesia is now at a crucial crossroads, with considerable demand to improve the quality and relevance of its graduates in the face of fast global economic dynamics and the revolution brought about by digital technology. Even though Indonesian higher education institutions (HEIs) are entrusted with the responsibility of developing creative knowledge and contributing to the welfare of the country, they are presently ranked lower in global university rankings when compared to other ASEAN countries such as Singapore, Malaysia, Brunei Darussalam, the Philippines, and Thailand ([Gaus, 2024](#)).

There is a key signal of this difficulty, which is the comparatively low Gross Tertiary Enrollment Rate (GER) in Indonesia, which stood at 31.16% in 2022, a little rise from 30.28% in 2020. This rate is a significant indicator of the challenge. Both Singapore (91% in 2019) and Malaysia (43% in 2019) have far higher rates than this one, which is still significant ([Gaus, 2024](#)). Furthermore, just around 8.5% of the population in Indonesia has finished their college education, a percentage that has remained unchanged since the year 2017 ([Gaus, 2024](#)). GER is more than fifty percent in large cities, while the national average is just twenty-seven percent. This indicates that there is still a significant achievement gap between urban and rural regions in terms of access to higher education.

The high rates of unemployment among young people are making this issue even worse. According to the data, more than 59% of persons in Indonesia who are without jobs are between the ages of 15 and 29. Furthermore, in the year 2023, there were about 9.9 million young people in Indonesia who were not participating in education, employment, or training (NEET) ([Fauziddin et al., 2025](#); [Zaki et al., 2025](#)). In light of this occurrence, it is abundantly evident that higher education must make the transition from just creating job searchers to cultivating job creators among its student body. The enhancement of education in entrepreneurship emerges as a crucial option to bridge the skills-job gap and generate sustainable economic growth ([Paños-Castro et al., 2024](#); [Zheng, 2024](#)).

Artificial intelligence and educational technology (Educational Technology) are functioning as main drivers of innovation in the field of education at the same time as the globe is experiencing a

tremendous digital revolution (Chigbu & Makapela, 2025; Mumi et al., 2025). Personalized learning, intelligent tutoring systems, adaptive assessment, and immersive learning experiences are all examples of areas where artificial intelligence is being used more often, according to global trends (Rahiman & Kodikal, 2024). Educational Technology, which is a discipline that integrates hardware, software, and educational theory, comprises a wide range of tools and pedagogical practices, including blended learning, gamification, and micro-credentials, all of which are aimed at improving engagement and learning results (Akintayo, 2024; Aripadono et al., 2024). There is a significant transition to digital technology taking place in Indonesia. It is anticipated that its digital economy would reach 146 billion US dollars by the year 2025, and the usage of artificial intelligence is anticipated to expand by thirty percent over the same time period (Chen, 2023; Internasional Trade Association, 2025; Rohayati & Abdillah, 2024).

The environment for startups is also expanding, with 2,566 active startups in 2024, which is an almost fifty percent rise from the number of businesses in 2020. A population that is mostly comprised of young people (median age: 28.3 years) and a high internet penetration rate of 79%, with more than 180 million people using smartphones in the year 2024 a very suitable environment for the incorporation of artificial intelligence and educational technology into the education of entrepreneurs (Samaya Dharmaraj, 2025). By capitalizing on this national momentum, Indonesia is able to not only keep up with global trends but also take the lead in nurturing digital and entrepreneurial talent that is relevant to the local environment.

In spite of the enormous promise that artificial intelligence and educational technology have, the deployment of these technologies in Indonesia is fraught with major difficulties. In particular, the lack of proper internet connectivity and digital devices in rural places is a significant barrier to broad adoption of artificial intelligence. This is especially true in areas that are geographically isolated. In addition, there is a lack of technology knowledge and abilities among educators, which, when combined with inadequate possibilities for professional development and training for teachers, is a barrier to advancement (Fauziddin et al., 2025; Helmiatin et al., 2024). In addition, there is a pressing need to give significant consideration to concerns around data privacy and the ongoing digital divide (Zaki et al., 2025). These obstacles need to be expressly addressed by a thorough conceptual framework in order to guarantee an implementation that is both successful and inclusive.

In order to integrate entrepreneurship education, artificial intelligence, and educational technology into Indonesian higher education, the purpose of this research is to present a complete conceptual framework. It will identify the theoretical underpinnings, pertinent global trends, and local context, and it will provide suggestions that are both strategic and practical for successful implementation.

2. LITERATURE REVIEW

2.1. The Transformation of Entrepreneurship Education (EE)

Entrepreneurship Education (EE) is A critical educational domain recognized as a vital instrument for fostering economic growth, job creation, and innovation (Ayob, 2021; Chen et al., 2021; Lopes et al., 2021). Its primary function is to provide students with the necessary mindset, motivation, and practical skills for self-reliance and to empower them to adapt to rapid societal changes.

The integration of AI and Educational Technology is fundamentally reshaping the core objectives and methodologies of Entrepreneurship Education. The focus is shifting from traditional business planning toward cultivating a new suite of competencies essential for the modern economy, including data analytics, AI literacy, and innovation management (Wu et al., 2026). This shift prepares aspiring entrepreneurs to not only launch ventures but to lead in an environment where technology is a primary driver of value. AI is being applied directly within EE to support key entrepreneurial processes, such as identifying market opportunities, augmenting venture creation, and developing AI-enhanced business models (Klingler-Vidra et al., 2021; Mumi et al., 2025). Research also points to the untapped potential of AI in university incubation centers, where it could be used to help students develop comprehensive business plans and simulate venture scenarios (Thottoli et al., 2025). This transformation positions EE as a critical discipline for fostering a new generation of innovators adept at harnessing technology for

economic and social progress, connecting the analysis of all three domains to a cohesive vision for their integrated future.

2.2. The Role and Impact of Artificial Intelligence Technology

Artificial Intelligence Technology is A branch of computer science focused on developing systems that can mimic human cognitive functions such as learning, reasoning, problem-solving, and language understanding (Singh & Hiran, 2022). AI encompasses a wide range of technologies, including machine learning (ML), artificial neural networks, and Generative AI (GAI)—such as ChatGPT—which are capable of creating novel content and facilitating complex tasks (Chigbu & Makapela, 2025; Singh & Hiran, 2022; Yuan et al., 2025).

The literature presents a consensus on AI's dual role as both a sophisticated pedagogical tool and a powerful administrative system in education. As a tool, AI powers intelligent tutoring systems, virtual assistants, and personalized learning platforms that adapt to individual student needs (Crompton & Burke, 2023; Olszewski & Crompton, 2020). As a system, it is employed to automate assessments, provide rapid feedback, and predict student performance or dropout risk, thereby streamlining institutional operations Crompton. However, this integration is fraught with critical ethical and practical challenges. Recurring themes include the potential for algorithmic bias to perpetuate social inequalities, the need for robust data privacy frameworks (Arthur-Holmes et al., 2022), and profound threats to academic integrity posed by generative AI. This creates a central paradox for educators: the very AI tools that promise personalized learning and administrative efficiency, such as ChatGPT, simultaneously introduce profound threats to academic integrity and authentic assessment, a dilemma underscored by both (Margono et al., 2024) dan (Ratten & Jones, 2023). This dual nature of AI—as both a revolutionary enabler and a source of complex ethical quandaries—necessitates a thoughtful, human-centric approach to its implementation.

2.3. The Evolution of Educational Technology (Educational Technology)

Educational Technology (Educational Technology) is the integration of digital tools, platforms, and technologies into the educational process to enhance teaching methodologies and student learning experiences (Aripadono et al., 2024; Chugh et al., 2023; Njadat et al., 2021). Educational Technology solutions, particularly those powered by AI, aim to create more personalized, interactive, and accessible educational environments.

The proliferation of AI-driven tools is accelerating a fundamental shift in educational delivery, moving pedagogy from traditional, teacher-centric models toward more dynamic, student-centered approaches. Technologies such as AI-powered simulations and personalized learning paths enable educational experiences that are more interactive, adaptive, and tailored to individual learning styles and paces (Yu et al., 2025). Despite this promise, the literature identifies persistent obstacles to equitable Educational Technology integration. A significant barrier is the digital divide, where infrastructural limitations and disparities in technological access create profound inequalities, particularly in developing nations like Indonesia (Sari et al., 2025). This digital divide is not just a barrier to learning; it is a direct impediment to entrepreneurial equity, as the AI-driven tools for opportunity identification and venture creation highlighted by (Klingler-Vidra et al., 2021) become inaccessible to an entire segment of aspiring innovators. Furthermore, the effectiveness of these technologies is often constrained by a lack of comprehensive teacher training, which leaves educators unprepared to fully leverage new tools in their classrooms (Nuryadin, 2023).

3. RESEARCH METHOD

This study employs a systematic literature review (SLR) methodology to synthesize existing knowledge and develop a comprehensive conceptual framework for integrating Artificial Intelligence as a catalyst for entrepreneurial education in higher education, specifically within the Indonesian context. An SLR approach is suitable for this purpose as it allows for a rigorous and transparent analysis of a broad range of scholarly works, identifying key themes, trends, and gaps in the current literature.

3.1. Search Strategy and Data Sources

The review process adhered to established guidelines for systematic reviews, ensuring objectivity and comprehensiveness (Petersen, 2023). The primary databases for literature search included Scopus and Web of Science, given their extensive coverage of reputable, peer-reviewed journals, particularly those relevant to educational technology, entrepreneurship, and artificial intelligence. The search was limited to English-language journal articles published between January 2020 and May 2025 to capture the most recent advancements in generative AI and digital entrepreneurship. The search strategy involved a combination of keywords such as "Entrepreneurship Education," "Artificial Intelligence," "Educational Technology," "Higher Education," and "Indonesia," along with their synonyms and related terms. The search was limited to publications within the last five years (2020-2025) to ensure the inclusion of the most current and relevant research.

3.2. Inclusion and Exclusion Criteria

To preserve validity, predefined criteria were established: Inclusion Criteria: (1) Empirical or conceptual studies focused on AI applications in entrepreneurship education; (2) Contextualized within higher education; (3) Peer-reviewed journal publications; (4) Written in English. Exclusion Criteria: (1) Non-peer-reviewed sources (editorials, blogs, conference abstracts without full papers); (2) Studies focused exclusively on technical AI design without educational application; (3) Studies published before 2020.

3.3. Screening Stages and Study Selection

The selection process was conducted systematically following the four stages of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. In the identification phase, initial database searches yielded a total of 420 records, comprising 105 articles from Web of Science (WoS) and 315 from Scopus. During the screening phase, 35 duplicate entries were removed, leaving 385 unique records for title and abstract evaluation. Subsequently, the eligibility phase involved the exclusion of 250 articles that did not align with the specific intersection of Artificial Intelligence (AI) and entrepreneurship education. This resulted in 135 full-text articles being rigorously assessed against the inclusion and exclusion criteria. Ultimately, the inclusion phase culminated in a final sample of 54 articles that met all predetermined quality and thematic requirements for qualitative synthesis.

3.4. Screening Stages and Study Selection

To derive meaningful insights from the selected 54 articles, the data were processed using Reflexive Thematic Analysis, adhering to the six-step framework. The analysis commenced with familiarization, involving an iterative reading of the full texts to grasp the breadth and depth of the discourse. This was followed by generating initial codes, where text segments pertaining to AI tools, pedagogical benefits, implementation barriers, and the Indonesian educational context were systematically labeled. In the third stage, searching for themes, related codes were aggregated into potential thematic clusters, such as "AI as a Productivity Accelerator" and "Infrastructure Deficits." These themes were subsequently reviewed against the entire dataset to ensure evidential accuracy and representativeness. After defining and naming the refined themes—such as "AI-Enriched Curriculum" and "Digital Support Ecosystem"—the process concluded with producing the report, which synthesized the findings into a cohesive conceptual framework and practical implementation recommendations.

4. RESULT AND DISCUSSION

4.1. Artificial Intelligence as an Educational Catalyst

Artificial Intelligence has emerged as a transformative force redefining the educational landscape, offering significant potential to enhance learning experiences and operational efficiency.

4.1.1. Fundamental Concepts of AI and its Applications in Education

At its core, AI refers to computer systems designed to perform tasks that typically require human intelligence, such as understanding natural language, recognizing patterns, making decisions, and learning from data (Vecchiarini & Somià, 2023). AI systems operate by ingesting vast amounts of data, which are then processed by algorithms—sets of instructions guiding the AI in making sense of the data. These systems often incorporate a learning component, allowing them to improve performance over time through a process known as *machine learning* (Vrontis et al., 2022). There are five "big ideas" that underpin AI:

Perception: Computers perceive the world using sensors, extracting meaning from sensory signals. This capability enables computers to "see" and "hear" effectively for practical applications, **Representation & Reasoning:** AI agents maintain representations of the world and use them for reasoning. They construct representations using data structures that support reasoning algorithms to derive new information from existing knowledge. **Learning:** Computers can learn from data. Machine learning is a type of statistical inference that identifies patterns in data, enabling AI to create new representations and improve performance over time. This often requires tremendous amounts of "training data," typically supplied by humans or acquired by the machine itself. **Natural Interaction:** Intelligent agents require various types of knowledge to interact naturally with humans, including the ability to communicate in human languages, recognize expressions and emotions, and draw upon cultural and social conventions to infer intentions from observed behavior. **Societal Impact:** AI can impact society both positively and negatively. It is crucial to discuss AI's societal impacts and develop criteria for the ethical design and deployment of AI-based systems, considering potential biases in training data.

In education, these core AI capabilities directly enable applications such as hyper-personalized learning, intelligent tutoring systems, and adaptive assessment (Chen et al., 2024; Rahiman & Kodikal, 2024). AI can analyze student data (learning), adapt content, interact naturally (natural interaction), and enhance performance (perception of progress), leading to more efficient and effective learning processes. AI can also automate administrative tasks, freeing educators to focus on pedagogy.

4.1.2. Global Trends in AI Utilization in Higher Education (2020-2025)

Global trends indicate an increasingly widespread adoption of AI in higher education, reshaping learning and teaching methodologies:

Hyper-Personalized and Adaptive Learning: Future AI systems will extend beyond academic aspects, considering students' emotions, attention levels, and learning styles to create truly personalized learning experiences. These systems will predict learning difficulties and proactively adjust lessons before problems arise. This enables learning paths tailored to each student's unique needs, interests, and abilities, enhancing engagement and learning outcomes (Joel et al., 2025). **Intelligent Tutoring Systems and AI Teaching Assistants:** AI-powered tutors can offer one-on-one tutoring sessions, provide customized explanations, answer questions, and generate practice problems. They analyze student data to create personalized learning plans and study materials based on individual strengths, weaknesses, and learning styles. AI assistants also support human teachers by handling routine tasks and offering insights into student progress, suggesting personalized strategies for students requiring extra support (Crompton & Burke, 2023). **Automated Assessment and Learning Analytics:** AI systems can grade multiple-choice tests and essays, providing detailed feedback on student performance. AI can also analyze educational trends and outcomes to help educators design effective curricula relevant to current educational standards and student needs (Soelistono & Tanjung, 2025). AI-based learning analytics can track student progress over time, offering a more holistic view of their learning journey and identifying areas for improvement. **Immersive Learning Experiences (VR/AR):** AI enables immersive learning experiences through virtual reality (VR) and augmented reality (AR). Students can undertake virtual field trips to ancient civilizations or conduct chemistry experiments in safe, simulated environments. AI in education will adapt these experiences based on student responses and engagement (Xie & Wang, 2025). Furthermore, gamification is enhanced by AI to personalize experiences and boost student engagement and motivation.

The global shift towards "skills-based learning paths" and preparing students for "AI-integrated workplaces" ¹ indicates that AI in education is not merely about improving traditional academic outcomes but fundamentally reshaping the competencies required for future careers, especially entrepreneurship. This shift necessitates curriculum redesign to focus on digital literacy, AI literacy, and critical engagement with AI tools. AI's ability to adapt learning paths to evolving job markets is crucial in ensuring graduates are prepared for future employment demands.

4.1.3. Ethical Considerations and Challenges of AI Implementation in Education

While AI offers significant benefits in efficiency, personalization, and accessibility (Yu et al., 2025), it also presents substantial risks that must be addressed. Primary concerns include the potential for misinformation, unauthorized data use, and the inability to evaluate AI-generated content. Additionally, there are worries about potential student over-reliance on AI tools, which could diminish the development of critical thinking and problem-solving skills. Other risks include bias in AI training data, which can lead to discriminatory outcomes in assessment or recommendations (Chigbu & Makapela, 2025). Data privacy and security issues are also critical concerns, given AI's reliance on large volumes of personal data (Fauziddin et al., 2025). Intellectual property theft is another emerging risk with generative AI.

The importance of ethical usage guidelines, clear policies, and adequate training for educators and students is emphasized to build skills in leveraging AI's benefits while maintaining academic integrity. AI integration must be implemented thoughtfully and ethically, not solely focusing on its technological aspects. This implies that educational institutions must develop proactive and adaptive governance frameworks, rather than merely reactive regulations, to ensure AI is used for the common good and aligns with ethical values.

4.2. Educational Technology (Educational Technology) and Learning Innovation

Educational Technology (Educational Technology) has become a cornerstone of learning innovation, extending beyond simple digital tool usage to encompass the integration of educational theory and practice.

4.2.1. Definition and Evolution of Educational Technology

Educational Technology, short for *educational technology*, is the combined use of computer hardware, software, and educational theory and practice to facilitate learning and teaching (Januszewski & Molenda, 2013). The term "Educational Technology" also frequently refers to the industry of companies that develop educational technology. This field is not limited to advanced technologies, but includes anything that can enhance classroom learning, whether in blended learning (*blended learning*), face-to-face, or online (Njadat et al., 2021). Educational Technology is rooted in theoretical knowledge from various disciplines such as communication, education, psychology, sociology, artificial intelligence, and computer science. It encompasses several domains, including learning theory, computer-based training, online learning (*online learning*), and mobile learning (*m-learning*) (Olszewski & Crompton, 2020).

Educational Technology also includes learning management systems (LMS), such as tools for student and curriculum management, and education management information systems (EMIS) (Aripadono et al., 2024). The evolution of Educational Technology has seen a shift from instrumental tools (such as spreadsheets or CAD used in educational contexts) and informational tools (such as email) towards instructional tools specifically designed for education, such as online testing systems and *Computer-Aided Instruction* (CAI) (Chugh et al., 2023).

4.2.2. Underlying Learning Theories for Educational Technology

The most effective application of Educational Technology occurs when tools and strategies are selected and applied based on a clear understanding of how students learn. Various learning theories underpin Educational Technology practices:

Behaviorism: In the context of Educational Technology, technology can facilitate training through incentives, such as gamification or repetitive drills (*drill-and-kill*), which provide positive feedback to

reinforce desired behaviors.

Cognitivism: Cognitivism focuses on the internal processes of the mind, such as how information is processed, stored, retrieved, and applied. Educational Technology aids in providing information and learning resources that support the brain in efficiently storing and retrieving information, for example, through the use of mnemonic devices or multiple modalities (video, audio).

Constructivism: This theory states that learning is constructed by learners based on previous experiences and beliefs. Educational Technology can help make abstract concepts more grounded and personalize learning experiences, enabling students to actively construct meaning by interacting with the world around them, such as through experiments or studies.

Humanism: Humanism emphasizes the importance of personal growth, self-actualization, and holistic human development. Educational Technology can support personalized and autonomous learning environments, where students have choices about what to learn, promoting intrinsic motivation.

Connectivism: Considered a 21st-century learning theory, connectivism emphasizes learning through connections within networks. Technology is an essential tool for discovering and filtering information, as well as for forming connections with others and resources.

Social Learning Theory: This theory proposes that individuals learn through observing "models." Educational Technology can facilitate behavioral modeling through videos or simulations, and support collaboration and social interaction. **Experiential Learning Theory:** This theory focuses on "learning by doing." Educational Technology can provide simulated environments and real-world experiences, allowing students to directly apply knowledge and gain practical experience.

4.2.3. Global Educational Technology Trends in Higher Education (2020-2025)

Educational Technology trends in higher education indicate a shift towards more flexible, engaging, and student-centered learning experiences: (1) **Hybrid and Flexible Learning:** This model combines face-to-face and online learning to accommodate diverse learning preferences and enhance accessibility. This shift has become a dominant approach since the COVID-19 pandemic; (2) **Gamification and Experiential Learning (VR/AR):** The use of game elements and immersive technologies like VR and AR is increasing to boost student engagement, motivation, and enable hands-on learning in safe environments; (3) **Micro-credentials and Digital Badges:** These online certifications are gaining popularity as alternative ways to recognize and validate skills and knowledge. This allows students to pursue more flexible learning paths aligned with their career goals. This shift signifies a change in how skills and knowledge are validated, aligning with the trend of "skills-based learning paths", where practical and demonstrable competencies are often more important than traditional degrees; (4) **Microlearning and Nanolearning:** Learning content is broken into small, quick, and easily digestible chunks—such as short videos, infographics, or quizzes—to enhance engagement and retention. This is particularly relevant for addressing decreasing attention spans in the "reel culture" era. This format directly responds to modern digital consumption habits, implying that entrepreneurship education content needs to be delivered in flexible, bite-sized, and engaging formats; (5) **Leveraging Data Analytics for Learning Enhancement:** The collection and analysis of student data on performance, behavior, and outcomes are used to inform adaptive teaching practices and provide personalized support. This enables educators to make data-driven decisions about curriculum design and resource allocation.

4.2.4. The Role of Educational Technology in Building Collaborative and Innovative Learning Environments

Educational Technology plays a crucial role in creating more dynamic and interactive learning environments. Cloud-based platforms enable faculty and students to collaborate and access resources in shared digital spaces in real-time, facilitating discussions and content interaction. Overall, educational technology fosters the development of critical thinking, communication, collaboration, problem-solving, and digital competencies among students. By integrating the latest technologies, institutions can enhance their reputation as leaders in educational innovation, which in turn can attract more students.

4.3. Conceptual Framework: Integrating Entrepreneurship Education, AI, and Educational Technology

The proposed conceptual framework illustrates the dynamic synergy among the theoretical foundations of entrepreneurship, the transformative capabilities of AI, and the innovative pedagogical strategies of Educational Technology. This model positions AI and Educational Technology not merely as supplementary tools but as catalysts that fundamentally alter how entrepreneurship education is delivered, personalized, and assessed, thereby producing graduates better equipped to navigate the challenges and opportunities of the digital era. This framework moves beyond an additive model (AI + Educational Technology + Entrepreneurship) to a truly integrative and synergistic one. This means AI and Educational Technology do not just serve as tools for entrepreneurship education but fundamentally transform its nature, enabling novel pedagogical approaches and fostering entrepreneurial competencies in previously impossible ways. This framework comprises four interconnected main components:

4.3.1. AI-Enriched Entrepreneurship Curriculum

The curriculum must be designed to dynamically adapt to changing markets and technologies, and instill entrepreneurial skills relevant to the digital age.

Adaptive Curriculum Design: Leveraging AI to analyze market trends, industry needs, and future skill demands enables a continuously updated and relevant curriculum. This is crucial for Indonesia, where the digital economy is rapidly evolving, and skill demands are changing quickly. A static curriculum would quickly become obsolete; therefore, an adaptive, AI-driven curriculum that constantly integrates new skills and responds to industry needs is essential.

Digital and AI Skill Development for Entrepreneurs: The curriculum must explicitly integrate modules on AI literacy, AI ethics, and AI applications in business processes, such as using Large Language Models (LLMs) for business ideation, market analysis, and business model development. This will equip students to be "smart AI developers and entrepreneurs," not just users.

AI-Powered Business Simulations: Utilizing AI to create realistic simulation environments for hands-on learning in decision-making, risk management, and problem-solving. These simulations can be customized to specific Indonesian business scenarios, allowing students to practice in a relevant context.

4.3.2. Educational Technology-Driven Innovative Pedagogies

Teaching approaches must be student-centered, leveraging technology to personalize learning and encourage active engagement. First, **Personalized and Adaptive Learning:** Employing AI-powered Educational Technology platforms to tailor content, pace, and learning activities to individual learning styles and preferences. This is supported by learning theories such as Behaviorism (for instant feedback), Cognitivism (for information processing), and Constructivism (for personalized knowledge construction). Second, **Gamification and Project/Experiential-Based Learning:** Implementing gamification elements and VR/AR simulations to enhance student engagement and facilitate experiential learning. Given decreasing attention spans in the digital era, microlearning and nanolearning become effective formats for delivering complex entrepreneurial content in small, quick, and digestible chunks. Third, **Virtual Collaboration:** Utilizing Educational Technology platforms to promote multidisciplinary collaboration and global networking. This aligns with Connectivism, which emphasizes learning through connections, and Social Learning Theory, which encourages learning through observation and interaction. Fourth, **Faculty Role as Facilitator and Mentor:** Shifting the role of faculty from information disseminators to facilitators, mentors, and learning experience designers, with AI handling routine tasks like initial grading and basic feedback provision. This allows faculty to focus on higher-value tasks such as fostering creativity, ethical reasoning, and entrepreneurial mindset development, which cannot be fully replicated by AI.

4.3.3. Digital Support Ecosystem

Successful integration heavily relies on adequate infrastructure and strong institutional support are (1) **Robust Technological Infrastructure:** Continuous investment in internet connectivity, digital devices, and AI data centers is crucial, especially in remote areas, to bridge the digital divide; (2) **Faculty and Staff**

Capacity Building: Comprehensive training programs on digital literacy, AI pedagogy, and the use of Educational Technology tools must be provided to support entrepreneurship education. Given concerns about teacher readiness in Indonesia, this training is crucial; (3) Industry-Academia Partnerships: Fostering strong collaborations between higher education institutions and the private sector (especially startups and technology companies) for curriculum development, practical experiences, and mentorship opportunities. These partnerships will ensure that entrepreneurship education remains relevant to industry needs; (4) Ethical AI Framework and Data Governance: Developing and implementing clear policies regarding responsible AI use, data privacy, and algorithmic bias mitigation. Widespread concerns about AI ethics, bias, and data privacy necessitate proactive and adaptive governance frameworks, which need to be integrated into policies and curriculum.

4.3.4. AI-Based Assessment and Learning Analytics

Assessment systems must be adaptive, provide rapid feedback, and be capable of holistically measuring entrepreneurial competencies. First, Adaptive Formative Assessment: Utilizing AI to provide instant feedback and tailored assessments, enabling students to identify areas for improvement in real-time. Second, Student Progress Monitoring: Analyzing learning data to identify patterns, predict difficulties, and enable timely interventions by educators. This helps ensure no student is left behind. Third, Competency Recognition Through Micro-credentials: Implementing micro-credentialing and digital badge systems to validate specific entrepreneurial skills acquired by students, enhancing their relevance in the job market. This is particularly important for entrepreneurship, where practical skills and demonstrable innovation are often more critical than traditional degrees.

4.3.5. Integration Matrix of Entrepreneurship Grand Theories with AI and Educational Technology Applications

Table 1. Integration Matrix of Entrepreneurship Grand Theories with AI and Educational Technology Applications

Grand Theory of Entrepreneurship	Core Concept	Relevant Entrepreneurial Competencies	Potential AI Applications	Potential Educational Technology Applications
Innovation (Schumpeter)	Creative Destruction, Original Solutions	Creativity, Problem-Solving, Future Anticipation	LLMs for business ideation, Predictive market trend analysis, Virtual prototype generators	Gamified innovation challenges, VR/AR product design simulations, Idea collaboration platforms
Economic (Cantillon)	Risk-taking, Producer/Exchanger, Product Impact	Decision-Making, Risk Management, Supply Chain Analysis	Predictive risk analysis, AI-based supply chain optimization, Decision support systems	Interactive business simulations, Microlearning modules on finance & risk management
Psychological	Locus of Control, Need for Achievement, Personality	Self-Motivation, Resilience, Self-Confidence, Leadership Qualities	Personalized AI tutors for skill development, Sentiment analytics for self-reflection	Adaptive learning applications, Nanolearning modules on growth mindset & leadership
Sociological (Aldrich)	Social Networks, Social Norms, Community Support	Networking, Communication, Cultural Intelligence, Social Responsibility	Social network analysis for collaborator identification, AI for cross-cultural communication	Virtual collaboration platforms, Online discussion forums, Community-based projects with

				Educational Technology support
Resource-based (Barney)	Utilization of Resources (non-financial)	Resource Efficiency, Competitive Strategy, Crowdfunding Access	AI for resource identification & funding opportunities, Optimization of digital platform usage	Simulated crowdfunding platforms, Microlearning modules on leveraging digital tools & startup platforms
Opportunity-based (Shane & Venkataraman)	Identification & Exploitation of Change	Opportunity Recognition, Adaptation, Flexibility	Big data analysis for market trends & new opportunities, AI for competitive landscape mapping ⁶	VR/AR-based case study challenges, Adaptive learning modules on opportunity identification ⁷
Social Entrepreneurship	Social Change, Adaptive Efficiency, Global Challenge Solutions	Ethics, Social Responsibility, Impactful Innovation, Resilience	AI for social impact analysis, Social project simulations, Collaboration platforms for social initiatives	Project-based learning with SDG focus, Digital badges for social contributions, AI ethics modules

Table 1 presents a matrix integrating grand theories of entrepreneurship with potential AI and Educational Technology applications, along with examples of implementation within the Indonesian higher education context. This matrix provides a structured theoretical basis for how AI and Educational Technology can enhance each specific aspect of entrepreneurship education, rather than merely serving as generic tools.

4.3.6. Specific Implementation Recommendations for Indonesian Higher Education

Table 2 translates the conceptual framework into practical and context-specific actions, considering Indonesia's unique challenges (infrastructure, teacher readiness) and opportunities (youth population, digital economy growth, existing policies).

Table 2. Specific Implementation Recommendations for Indonesian Higher Education

Recommendation Area	Specific Recommendations	Rationale (Indonesian Opportunities/Challenges)	Success Indicators
Curriculum	Design AI-adaptive curricula, integrating AI literacy, AI ethics, and AI applications in business.	Addresses the skills-job gap in the digital era & burgeoning startup economy. ⁴ Ensures graduates are not just AI users but developers.	Increased graduate startup rates, Enhanced curriculum relevance to industry needs, Higher student AI literacy scores.
Pedagogy	Provide comprehensive faculty training on AI and Educational Technology pedagogies, and deep understanding of entrepreneurship theories. Utilize AI as a teaching assistant, not a replacement.	Improves limited human resource readiness among educators. Frees faculty to focus on mentoring & critical thinking development.	Increased number of AI/Educational Technology certified faculty, Improved quality of faculty-student interactions, Higher student satisfaction with learning methods.
Support Ecosystem	Invest in robust digital infrastructure, especially in remote areas, to bridge the digital divide. Develop innovation centers & digital incubators providing "living laboratory" environments.	Ensures equitable access & reduces regional disparities in education. ² Fosters practical experience & business idea commercialization.	Reduction in digital divide (percentage of students with internet/device access), Increased number of incubated & successful startups, Higher private

			sector investment in university innovation centers.
Assessment & Recognition	Implement AI-based adaptive formative assessments for instant feedback. Develop micro-credentialing & digital badge systems for entrepreneurial competencies.	Identifies student improvement areas in real-time & enhances learning outcomes. ¹⁷ Validates practical competencies needed by the job market & boosts graduate competitiveness.	Increased graduate employment rates by industry, Higher number of issued & recognized micro-credentials, Improved accuracy of AI assessments & feedback.
Policy & Governance	Develop proactive & adaptive AI ethical frameworks, including data privacy regulations & algorithmic bias mitigation. Foster strong cross-sectoral collaboration among government, academia, & industry.	Addresses widespread ethical & data privacy concerns. Ensures policy coherence & effective implementation of the National AI Strategy.	Adoption of clear AI policies at institutional level, Increased number of strategic partnerships, Enhanced public trust in AI use in education.

The framework proposed here suggests a novel synthesis between grand theories of entrepreneurship and the learning theories underpinning Educational Technology, such as Behaviorism, Cognitivism, Constructivism, Humanism, and Connectivism. This synthesis is fundamentally enriched by AI capabilities. Theoretically, this highlights a paradigm shift from traditional entrepreneurship education to a technology-driven model, emphasizing adaptive, personalized, and experiential learning.

These implications suggest that AI and Educational Technology are not only auxiliary tools, but also transformative agents that enable new pedagogical approaches and foster entrepreneurial competencies in ways previously impossible. For instance, Connectivism, which emphasizes learning through connections within networks, can be significantly enhanced by AI-powered Educational Technology platforms to facilitate global networking and cross-border collaboration, which is important for modern entrepreneurs. This framework provides a robust foundation for further research into the complex interactions among AI, Educational Technology, and entrepreneurial mindset development, particularly within the context of developing nations.

4.3.7. Policy Recommendations for the Government

To realize the full potential of this framework, strong policy support from the government is essential: (1) Digital Infrastructure Investment: Prioritize investments to expand high-speed internet access and digital devices across all regions, especially in remote areas. This is critical to address the existing digital divide and ensure equitable access to technology-enhanced education; (2) Adaptive and Ethical AI Regulatory Framework: Develop and implement a proactive, transparent, and human-centered AI governance framework. This must include robust data privacy legislation (UU PDP) and clear mechanisms for addressing algorithmic bias. It is crucial to ensure that AI is used for the common good and aligns with national ethical values; (3) National Digital Talent Development Programs: Expand and enhance programs like the Digital Talent Scholarship and the Indonesian National Work Competency Standards (SKKNI) in AI. The goal is to ensure an adequate supply of high-quality talent to support the growth of the digital economy and entrepreneurial ecosystem; (4) Promote Cross-Sectoral Collaboration: Facilitate strong partnerships among government, higher education institutions, and industry. This collaboration is crucial for relevant curriculum development, practical experiences, and effective startup incubation.⁴ While Indonesia has a strong AI strategy, the challenge lies in ensuring coherent and effective implementation across various ministries and educational institutions, particularly in addressing infrastructure and human capital gaps. Policies need to foster genuine collaboration among government, academia, and industry.

4.3.8. Recommendations for Higher Education Institutions

Higher education institutions play a central role in implementing this framework: (1) Holistic Curriculum Integration: Redesign entrepreneurship curricula to explicitly integrate AI literacy, AI ethics,

and AI applications in business processes. This must align with grand theories of entrepreneurship, ensuring students learn not only about business but also how AI can be a tool for innovation and growth; (2) Faculty Professional Development: Invest in continuous training for faculty on AI and Educational Technology pedagogies, as well as a deep understanding of entrepreneurship theories and industry trends. This will enhance their capacity to teach effectively in a technology-enriched environment; (3) Development of Innovation Centers and Digital Incubators: Establish or strengthen centers that provide a "living laboratory" environment for students to develop and test technology-based business ideas with AI and Educational Technology support. These centers should facilitate experiential learning and multidisciplinary collaboration; (4) Leverage Learning Analytics: Use data analytics to monitor student progress, identify areas needing support, and continuously improve program effectiveness. This enables timely interventions and personalization of learning; (5) Proactive AI Ethical Governance: Given widespread concerns about AI ethics, bias, and data privacy, institutions must develop proactive and adaptive governance frameworks. This means integrating clear ethical guidelines, data protection laws, and redress mechanisms into policies and curricula, and instilling these principles into entrepreneurship education.

5. CONCLUSION

The integration of Entrepreneurship Education, Artificial Intelligence Technology, and Educational Technology (Educational Technology) represents a crucial catalyst for transforming higher education in Indonesia. By analyzing grand theories of entrepreneurship and the latest global trends in AI and Educational Technology, and aligning them with Indonesia's specific conditions, a comprehensive conceptual framework has been proposed. This framework emphasizes the development of an AI-enriched curriculum, Educational Technology-driven innovative pedagogies, a robust digital support ecosystem, and AI-based assessment and learning analytics.

Despite significant challenges such as infrastructure gaps, human resource readiness, and data ethics concerns, Indonesia possesses immense opportunities due to its rapidly growing digital economy, dynamic startup ecosystem, and digitally literate youth population. With a well-planned and collaborative approach—involving government investment in infrastructure, faculty capacity building, industry-academia partnerships, and a strong ethical AI framework—Indonesia can overcome these obstacles.

Ultimately, this strategic integration will enable Indonesian higher education to produce a generation of entrepreneurs who are not only innovative and adaptable to the demands of the digital era, but also socially responsible and ethical. This will be a crucial step in creating jobs, fostering sustainable economic growth, and enhancing the nation's global competitiveness.

Ethical Approval

Not Applicable

Informed Consent Statement

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Authors' Contributions

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REFERENCES

- Akintayo, O. T. (2024). Evaluating the impact of educational technology on learning outcomes in the higher education sector: a systematic review. *Open Access Research Journal of Multidisciplinary Studies*, 7(2), 052–072. <https://doi.org/10.53022/oarjms.2024.7.2.0026>
- Aripadono, H. W., Nursyamsi, I., Wahab, A., & Sultan, Z. (2024). Educational technology for digital transformation of higher education institutions into entrepreneurial universities. *Policy & Governance Review (PGR)*, 8(2), 303–322. <https://doi.org/10.30589/pgr.v8i3.1019>
- Arthur-Holmes, F., Abrefa Busia, K., Vazquez-Brust, D. A., & Yakovleva, N. (2022). Graduate unemployment, artisanal and small-scale mining, and rural transformation in Ghana: What does the ‘educated’ youth involvement offer? *Journal of Rural Studies*, 95, 125–139. <https://doi.org/10.1016/j.jrurstud.2022.08.002>
- Audretsch, D. B., Khurana, I., Dutta, D. K., & Tamvada, J. P. (2024). Creating effective university innovation and entrepreneurial ecosystems: a commitment system perspective. *Journal of Technology Transfer*. <https://doi.org/10.1007/s10961-024-10090-w>
- Ayob, A. H. (2021). Entrepreneurship education, institutions and student entrepreneurship: a cross-country analysis. *Compare*, 51(5), 745–763. <https://doi.org/10.1080/03057925.2019.1673701>
- Chen, L., Ifenthaler, D., Yau, J. Y. K., & Sun, W. (2024). Artificial intelligence in entrepreneurship education: a scoping review. *Education and Training*, 66(6), 589–608. <https://doi.org/10.1108/ET-05-2023-0169>
- Chen, L., Ifenthaler, D., & Yau, J. Y.-K. (2021). Online and blended entrepreneurship education: a systematic review of applied educational technologies. *Entrepreneurship Education*, 4(2), 191–232. <https://doi.org/10.1007/s41959-021-00047-7>
- Chen, L. (2023). *Accelerating digital transformation in Indonesia : technology, market, and policy*. Economic Research Institute for ASEAN and East Asia.
- Chigbu, B. I., & Makapela, S. L. (2025). AI in education, sustainability, and the future of work: An integrative review of industry 5.0, education 5.0, and work 5.0. *Journal of Open Innovation: Technology, Market, and Complexity*, 11(4). <https://doi.org/10.1016/j.joitmc.2025.100645>
- Chugh, R., Turnbull, D., Cowling, M. A., Vanderburg, R., & Vanderburg, M. A. (2023). Implementing educational technology in Higher Education Institutions: A review of technologies, stakeholder perceptions, frameworks and metrics. *Education and Information Technologies*, 28(12), 16403–16429. <https://doi.org/10.1007/s10639-023-11846-x>
- Crompton, H., & Burke, D. (2023). Artificial intelligence in higher education: the state of the field. *International Journal of Educational Technology in Higher Education*, 20(1). <https://doi.org/10.1186/s41239-023-00392-8>

- Fauziddin, M., Adha, T. R., Arifiyanti, N., Indriyani, F., Rizki, L. M., Wulandary, V., & Reddy, V. S. V. (2025). The Impact of AI on the Future of Education in Indonesia. *Educative: Jurnal Ilmiah Pendidikan*, 3(1), 11–16. <https://doi.org/10.70437/educative.v3i1.828>
- Gaus, N. (2024). *Higher Education in Southeast Asia* (L. Pe Symaco, Ed.). Emerald Publishing Limited. <https://doi.org/10.1108/S1479-3679202449>
- Helmiatin, Hidayat, A., & Kahar, M. R. (2024). Investigating the adoption of AI in higher education: a study of public universities in Indonesia. *Cogent Education*, 11(1). <https://doi.org/10.1080/2331186X.2024.2380175>
- Internasional Trade Association. (2025, March 13). *Indonesia Digital Transformation*. U.S. Embassy. <https://www.trade.gov/market-intelligence/indonesia-digital-transformation>
- Januszewski, A., & Molenda, M. (2013). Educational technology: A definition with commentary. In *Educational Technology: A Definition with Commentary*. Routledge. <https://doi.org/10.4324/9780203054000>
- Joel, Y., Egbunefu, C., & Tomorrow Onyemaechi, O. (2025). Application of Artificial Intelligence in Business Education Programme for Enhanced Learning Capabilities of Postgraduate Students in Rivers State Universities. *World Journal of Innovation and Modern Technology E*. <https://doi.org/10.56201/wjimt.v9.no1.2025.pg44.67>
- Klingler-Vidra, R., Tran, B. L., & Chalmers, A. W. (2021). Transnational experience and high-performing entrepreneurs in emerging economies: Evidence from Vietnam. *Technology in Society*, 66. <https://doi.org/10.1016/j.techsoc.2021.101605>
- Lopes, J. M., Oliveira, M., Oliveira, J., Sousa, M., Santos, T., & Gomes, S. (2021). Determinants of the entrepreneurial influence on academic entrepreneurship—lessons learned from higher education students in Portugal. *Education Sciences*, 11(12). <https://doi.org/10.3390/educsci11120771>
- Margono, H., Saud, M., & Falahat, M. (2024). Virtual Tutor, Digital Natives and AI: Analyzing the impact of ChatGPT on academia in Indonesia. *Social Sciences and Humanities Open*, 10. <https://doi.org/10.1016/j.ssaho.2024.101069>
- Ministry of National Development Planning. (2024). *Law Regulation Number 59 of 2024 - Indonesia National Long-Term Development Plan for 2025-2045*. <https://indonesia2045.go.id/>
- Mumi, A., Ngammoh, N., & Suwanpakdee, A. (2025). The nexus of artificial intelligence and entrepreneurship research: Bibliometric analysis. In *Sustainable Futures*, 9, Elsevier Ltd. <https://doi.org/10.1016/j.sfr.2025.100688>
- Njadat, E. N. A., Al-Ja'afreh, S., & Almsaiden, A. H. I. (2021). Educational Technology and Its Impact on the Efficiency of the Educational Process in Higher Education. *Cypriot Journal of Educational Sciences*, 16(4), 1384–1394. <https://doi.org/10.18844/cjes.v16i4.5987>
- Nuryadin, R. (2023). *The use of Artificial Intelligence in education (Literature Review)*. *Indonesian Journal of Primary Education*, 7(2). <http://ejournal.upi.edu/index.php/IJPE/>
- Olszewski, B., & Crompton, H. (2020). Educational technology conditions to support the development of digital age skills. *Computers and Education*, 150(2), 103849. <https://doi.org/10.1016/j.compedu.2020.103849>
- Paños-Castro, J., Bezanilla, M. J., & Markuerkiaga, L. (2024). Entrepreneurs' perceptions of their entrepreneurial process: a qualitative analysis of in-depth interviews with education graduates in the Basque Country, Spain. *International Journal of Education Economics and Development*, 15(1–2), 57–81. <https://doi.org/10.1504/IJEED.2024.136209>
- Petersen, F. (2023). Business Simulation Games and Entrepreneurial Education. In *Delivering Entrepreneurship Education in Africa: New Perspectives* (pp. 177–198). <https://doi.org/10.1108/978-1-83753-326-820231007>
- Public First; Indef. (2025). *The AI Transformation: Catalysing Indonesia's next stage in growth*. <https://aiopportunity.publicfirst.co/>
- Rahiman, H. U., & Kodikal, R. (2024). Revolutionizing education: Artificial intelligence empowered learning in higher education. *Cogent Education*, 11(1). <https://doi.org/10.1080/2331186X.2023.2293431>

- Ratten, V., & Jones, P. (2023). Generative artificial intelligence (ChatGPT): Implications for management educators. *International Journal of Management Education*, 21(3). <https://doi.org/10.1016/j.ijme.2023.100857>
- Rohayati, Y., & Abdillah, A. (2024). Digital Transformation for Era Society 5.0 and Resilience: Urgent Issues from Indonesia. *Societies*, 14(12). <https://doi.org/10.3390/soc14120266>
- Samaya Dharmaraj. (2025, May 24). *Indonesia Accelerates Inclusive AI Innovation for Digital Growth*. OpenGov Asia. <https://archive.opengovasia.com/2025/05/24/indonesia-accelerates-inclusive-ai-innovation-for-digital-growth/?c=id>
- Sari, D. K., Supahar, S., Rosana, D., Dinata, P. A. C., & Istiqlal, M. (2025). Measuring artificial intelligence literacy: The perspective of Indonesian higher education students. *Journal of Pedagogical Research*, 9(2), 143–157. <https://doi.org/10.33902/JPR.202531879>
- Secundo, G., Massaro, A., Vecchio, P. D., & Garzoni, A. (2024). An Entrepreneurial University Ecosystem for Sustaining the Twin Transition Through a Complex Adaptive System Approach. *IEEE Transactions on Engineering Management*, 71, 10966–10983. <https://doi.org/10.1109/TEM.2024.3405021>
- Singh, S. V., & Hiran, K. K. (2022). The Impact of AI on Teaching and Learning in Higher Education Technology. *Journal of Higher Education Theory and Practice*, 22(13), 135. <https://doi.org/10.33423/jhetp.v22i13.5514>
- Soelistono, S., & Tanjung, R. (2025). Education Beyond AI: Building Integrity Through Authentic Assessment. In *ENDLESS: International Journal of Futures Studies* 8(2). <http://endless-journal.com/index.php/endless>
- Thottoli, M. M., Cruz, M. E., & Al Abri, S. S. S. (2025). The incubation revolution: transforming entrepreneurial education with artificial intelligence. *Asia Pacific Journal of Innovation and Entrepreneurship*, 19(1), 2–23. <https://doi.org/10.1108/apjie-11-2023-0221>
- Vecchiarini, M., & Somià, T. (2023). Redefining entrepreneurship education in the age of artificial intelligence: An explorative analysis. *International Journal of Management Education*, 21(3). <https://doi.org/10.1016/j.ijme.2023.100879>
- Vrontis, D., Christofi, M., Pereira, V., Tarba, S., Makrides, A., & Trichina, E. (2022). Artificial intelligence, robotics, advanced technologies and human resource management: a systematic review. *International Journal of Human Resource Management*, 33(6), 1237–1266. <https://doi.org/10.1080/09585192.2020.1871398>
- Wu, Q., Chen, L., Chen, M., & Huang, Y. (2026). Exploring the impact of artificial intelligence on business talent development in higher education: A systematic literature review and research agenda. *The International Journal of Management Education*, 24(1), 101287. <https://doi.org/10.1016/j.ijme.2025.101287>
- Xie, Y., & Wang, S. (2025). Generative artificial intelligence in entrepreneurship education enhances entrepreneurial intention through self-efficacy and university support. *Scientific Reports*, 15(1). <https://doi.org/10.1038/s41598-025-09545-3>
- Yu, G., Ramayah, T., & Lin, Z. (2025). Toward understanding the role of generative AI in entrepreneurship education: A systematic review. In *Computers and Education: Artificial Intelligence*, 9, Elsevier B.V. <https://doi.org/10.1016/j.caeai.2025.100470>
- Yuan, C., Yin, Y., Wang, S., Zhang, Z., & Moon, H. (2025). Exploring technology, organization and environmental factors driving firms generative AI adoption intention: the moderating role of trans-parasocial relation. *Journal of Business & Industrial Marketing*, ahead-of-print(ahead-of-print). <https://doi.org/10.1108/JBIM-04-2024-0257>
- Zaki, A., Tegar Gunung Koraag, S., Kusumawardani, M., & Ratu Chantika, S. (2025). Mapping Actors and Policies in Indonesia's Digital Entrepreneurial Ecosystem. *SHS Web of Conferences*, 212, 04007. <https://doi.org/10.1051/shsconf/202521204007>
- Zheng, W. (2024). The construction of a new model for the development of innovation and entrepreneurship education in economic and management colleges and universities under the Kruskal

algorithm of numerical analysis. *Applied Mathematics and Nonlinear Sciences*, 9(1).
<https://doi.org/10.2478/amns.2023.2.00778>