International Journal of Economic, Finance and Business Statistics (IJEFBS)
Vol. 4, No. 3, 2026: 147-168

Decolonizing AI-Driven Entrepreneurship Education: A Global Bibliometric Synthesis and the Malay Etho-Cultural Framework

Dina Elsa[1]*, Hasnah Faizah AR[2], Mahdum Mahdum[3], Hermandra Hermandra[4], Elmustian Elmustian[5]
Universitas Riau
Corresponding Author: Dina Elsa dina.elsa6271@grad.unri.ac.id

ARTICLEINFO

Keywords: Artificial Intelligence, Entrepreneurship Education, Malay Culture, Bibliometric, Systematic Literature Review

Received : 20, April
Revised : 26, May
Accepted: 15, June

ABSTRACT

The integration of Artificial Intelligence (AI) in global entrepreneurship education is currently burgeoning, but is prone to be dominated by a value-free, Western technocentric approach. The purpose of this study is to map global literature trends and to evaluate the incorporation of local values within them. A bibliometric analysis and a Systematic Literature Review (SLR) of 137 core articles from the Scopus and Web of Science databases revealed five significant theme groupings. The results of the visualization show a gap in the field of geopolitical research, which marginalizes the moral and cultural dimensions. To fill this theoretical gap, this article proposes a Synergistic Framework based on Malay Cultural Principles through three levels of ethical intervention, namely the Principle of Amanah (institutional), the Principle of Gotong Royong (pedagogical), and the Principle of Marwah.

DOI: https://doi.org/10.59890/ijefbs.v4i3.4
ISSSN-E: 3025-9959
http://journalijefbs.my.id/index.php/ijefbs

INTRODUCTION

In the era of contemporary digital transformation, the emergence of Artificial Intelligence (AI)—particularly *Generative AI* and *Machine Learning*—has redefined the global economic landscape and radically revolutionized the dynamics of entrepreneurial practices. In the context of higher education, integrating AI capabilities into the curriculum is no longer merely an optional pedagogical innovation, but rather an urgent institutional necessity to produce graduates who are adaptable and resilient in the face of massive technological disruption. A wide range of global literature empirically confirms that the use of AI tools can optimize the efficiency of strategic decision-making, mitigate market uncertainty (*environmental uncertainty*), and accelerate the innovation of digital business models among new entrepreneurs (Elsa et al., 2025; Jabeen et al., 2017; Wulandari et al., 2025).

However, the majority of technology-based entrepreneurial education models under development remain caught in an over-technocentric approach. These approaches tend to follow Western-centric paradigms that emphasize more individualistic material achievements and tend to ignore the context of local values, local wisdom and the cultural ethics of communities in developing countries.

This gap between theory and practice is particularly crucial given that entrepreneurial activity is, by its very nature, not merely a manifestation of purely economic transactions, but rather a socio-behavioral act deeply rooted in the cultural ecosystem of the local community. In the Nusantara region, particularly within the social structure of Malay culture, commercial activities are guided by noble philosophical values, such as the principles of *Amanah* (high integrity), *Marwah* (self-respect), and the principles enshrined in the "Tunjuk Ajar Melayu" (Effendi, 2025). These values strictly prioritize aspects of spiritual blessing and societal welfare over mere technical profitability and mechanical efficiency (Noviana et al., 2023). When AI technology is implemented in educational curricula without an anchor in local cultural philosophy, there is a significant risk of the degradation of fundamental values. Under these conditions, technology has the potential to steer aspiring entrepreneurs toward business models that are exploitative, individualistic, and detached from the ethics of a harmonious society.

Although the global literature has mapped the impact of entrepreneurship education across various parts of the world—ranging from the challenges of training programs and the internalization of values in higher education in Africa (Ubogu, 2020), to comparative analyses of entrepreneurial orientations in developing Asian countries (Stouraitis et al., 2022) —there is a consistent finding that the adoption of cutting-edge technology requires strict ethical guidance (Hashim et al., 2019) and must be sensitive to the local socio-cultural context (Rizka et al., 2025). This study aims to address this *research gap* by offering a perspective and a reconstruction of Malay cultural values as both an original foundation and an ethical compass for the development of an AI-based entrepreneurship education ecosystem.

A bibliometric analysis of 137 global articles indicates that while AI publications in business education have surged, thematic clusters related to "Culture" and "Values" remain on the periphery. This disconnect highlights a significant research gap; no comprehensive framework currently positions Malay-Nusantara culture as the philosophical foundation of AI-augmented entrepreneurship education. Using AI independently without local sensitivity triggers limitations in authentic innovation, as entrepreneurs tend to merely mimic mechanical machine outputs and lose their cultural identity roots (Mulyono et al., 2025). Integrating Malay Cultural Principles provides students with a solid philosophical-cognitive foundation to innovate authentically, generate contextually relevant digital solutions, and maintain strategic differentiation in the global market.

Given these theoretical and practical imperatives, this study aims to bridge the gap between the sophistication of AI technology and local wisdom through a *Systematic Literature Review* (SLR) and Bibliometric Analysis. To achieve this objective, this scientific investigation focuses on three main research questions (RQs):

RQ1: What are the trends in the development of publications and the global bibliometric intellectual structure map related to artificial intelligence (AI) research in entrepreneurship education?

RQ2: To what extent has the current scientific literature integrated cultural values, local ethics, and cognitive orientations into AI-based entrepreneurship education models?

RQ3: How can an AI-based entrepreneurship education framework grounded in Malay cultural values be developed to create an ethical and sustainable digital business ecosystem?

This reconstruction effort is expected not only to provide new theoretical contributions that enrich the body of literature in the field of *Digital Creative Pedagogy*, but also to formulate practical guidelines for higher education institutions in the Southeast Asian region in cultivating future entrepreneurs (*digital smart entrepreneurs*) who are globally competitive yet remain grounded in their national cultural identity.

The structure of this article is organized systematically. The second section will outline the research methodology and the PRISMA-SLR protocol used. The third section explains the quantitative findings obtained from bibliometric visualization analysis. The fourth section summarizes the main thematic syntheses and in-depth content analysis. The fifth section proposes a new synergy framework model as well as a future research agenda, and the final section will conclude the presentation with findings along with the theoretical and practical implications of the research.

Literature Review

The Acceleration of AI in Contemporary Entrepreneurship Education

In the contemporary era of digital transformation, the penetration of Artificial Intelligence (AI)—particularly through Generative AI and Machine Learning—has radically redefined the global economic landscape. Higher

education institutions face an urgent institutional mandate to integrate these technological capabilities into pedagogical curricula to produce graduates resilient to massive technological disruptions. Empirical evidence confirms that leveraging AI instruments optimizes strategic decision-making for new ventures, mitigates environmental uncertainty, and accelerates the innovation of digital business models (Elsa et al., 2025; Jabeen et al., 2017; Wulandari et al., 2025).

Recent studies indicate that utilizing Generative Artificial Intelligence Supported Entrepreneurship Education (GAISEE) significantly enhances university students' entrepreneurial self-efficacy and entrepreneurial intentions, particularly when supported by an optimized university environment. Furthermore, the adoption of AI within business education curricula positively contributes to transforming students' dynamic capabilities—namely sensing, seizing, and reconfiguring—which subsequently multiplies their AI-enabled digital marketing performance. AI acts as a transformative force that streamlines entrepreneurial learning, from initial idea generation and business model crafting to designing tactical action plans.

However, the theoretical shortcoming of this technological adoption lies in its strictly technocentric approach. The majority of current technology-driven entrepreneurship education models blindly adopt Western-centric paradigms that heavily emphasize individualistic material achievements, thereby marginalizing the ethno-cultural ethical dimensions of societies in developing nations (*the Global South*).

Innovations Limitations and the Imperative of Socio-Cultural Sensitivity

Entrepreneurial activity is inherently not merely a manifestation of pure, mechanical economic transactions, but rather a socio-behavioral action deeply rooted in the local cultural ecosystem. Entrepreneurship education across various developing regions, such as in Africa, reveals significant challenges regarding training techniques and the internalisation of values in higher education (Ubogu, 2020). Comparative analyses of entrepreneurial orientations in developing Asian economies further reinforce that the adoption of cutting-edge technologies requires rigid ethical value guidance (Hashim et al., 2019) and must remain sensitive to the socio-cultural context of the local community (Rizka et al., 2025; Stouraitis et al., 2022).

Even when developing entrepreneurial potential within specific regions, such as the Baltic States, algorithmic proficiency must be backed by close cross-sectoral collaboration to prevent students from becoming detached from regional development orientations. Without ethical value guidance and responsible AI use, utilizing AI independently without mature cognitive disruption triggers constant limitations in the creation of authentic innovation. These innovation limitations arise from the loss of cultural identity roots, which causes nascent entrepreneurs to merely mimic the mechanical outputs of smart machines without possessing local sensitivity (Mulyono et al., 2025). Therefore, to sustain the strategic differentiation of creative products in the global market, the reconstruction of local values is required as an original foundation and ethical compass in AI-augmented entrepreneurship education.

Malay-Nusantara Cultural Philosophy as an Ethical Compass for Digital Business

Within the social fabric of Malay-Nusantara culture, commercial activities are guided by noble ethical philosophies that strictly prioritize spiritual blessings and societal welfare over mere technical profitability. The crystallization of these noble values is comprehensively documented in the socio-cultural treatise of moral guidelines, *Tunjuk Ajar Melayu* (Effendi, 2025). Three core pillars of cultural values serve as the philosophical-cognitive anchor for the community's economic conduct:

- Asas Amanah (The Principle of Trustworthiness)
  Demands the highest moral integrity, accountability, and transparency in data governance and digital business algorithms.
- Asas Marwah (The Principle of Dignity/Honor)
  Preserves personal honor, institutional integrity, and national reputation through the creation of fair, legal, and dignified digital products.
- Asas Gotong Royong (The Principle of Mutual Collaboration)
  Drives an inclusive social entrepreneurship orientation through human-AI co-creation models for the welfare of the community.

When AI technologies are implemented within entrepreneurship education curricula without these local cultural philosophical anchors, an essential risk of fundamental value degradation emerges, steering future entrepreneurs toward exploitative and individualistic business models. The integration of Malay Cultural Principles into Digital Creative Pedagogy in Southeast Asia is positioned as a decolonizing curriculum framework. This step provides a solid philosophical foundation for digital smart entrepreneurs to generate contextually relevant, ethical, and sustainable digital solutions.

METHODOLOGY

This study identified scientific publications on the ethics of artificial intelligence in entrepreneurship education through a systematic literature review using the Scopus database. Scopus was selected because it is one of the largest and most widely used curated databases in interdisciplinary bibliometric analysis (V. K. Singh et al., 2021; Donthu et al., 2021). The literature selection process in this study was systematically documented using the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) flowchart to ensure transparency in data curation (Kraus et al., 2022; Marino-Romero et al., 2024; Page et al., 2021)

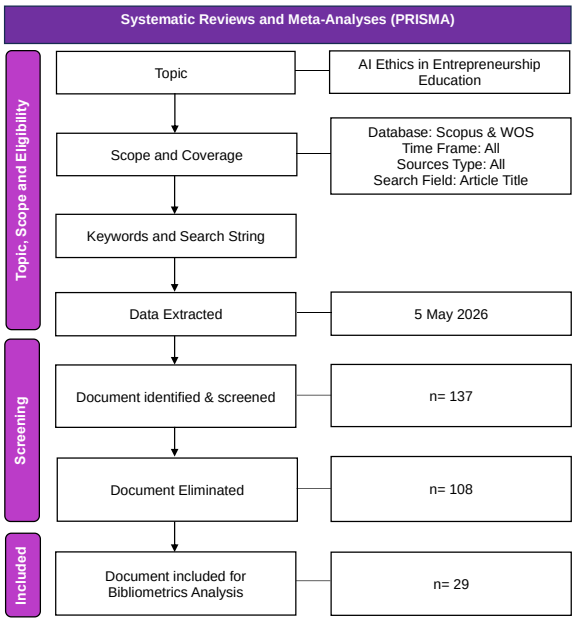

Figure 1. PRISMA Protocol

Data Collection

A comprehensive literature review was conducted using bibliographic data from Scopus. This database was selected because it provides the *Journal Citation Reports* (JCR), which enables an objective evaluation of journal quality, and has a broad temporal scope, thereby supporting the download and analysis of large volumes of citations (Garro-Abarva et al., 2020; S. U. Hassan et al., 2019). Several studies indicate that Scopus generally indexes a larger number of documents compared to WoS across various scientific fields, although the extent of this difference depends heavily on the discipline and the type of documents analyzed. Overall, the use of this database is recommended because it applies strict selection criteria, minimizes duplication, and supports large-scale data extraction for reliable bibliometric analysis.

This study used Boolean search queries to systematically examine various themes related to the application of artificial intelligence in the field of entrepreneurship education. The search queries were carefully formulated to ensure that the search results covered a wide range of relevant topics without straying from the research focus. The search was conducted on titles, abstracts, and keywords using a combination of terms ("entrepreneurship education" OR "entrepreneurial learning") AND ("artificial intelligence" OR "AI" OR "machine learning") AND ("culture" OR "cultural" OR 'values' OR "ethics"), which yielded a number of relevant publications. These keywords were used to identify publications that explore the application of artificial intelligence in various forms of Malay culture-based entrepreneurship education activities.

We did not limit our search to a specific educational level in order to gain a more comprehensive understanding of this field of study. This approach was chosen because many studies related to entrepreneurship education do not explicitly use that term in their publication metadata. This study includes articles published up to May 5, 2026, indexed in the Scopus and Web of Science (WoS)

databases, resulting in 137 articles. The subsequent article selection stage was conducted through content analysis to ensure that each retained publication truly focused on the research topic.

Establishment of Inclusion and Exclusion Criteria

To ensure the validity, relevance, and rigor of the analysis, this study established a strict document selection protocol based on five comprehensively integrated inclusion and exclusion criteria. Regarding the inclusion criteria, each document must align with at least two of the three main dimensions: the application of AI in the fields of business education and higher entrepreneurship, responsible technology governance (Hashim et al., 2019), as well as the development of entrepreneurial cognitive capabilities sensitive to local values or shared ethnicities in Southeast Asia and the Malay World (Rizka et al., 2025; Stouraitis et al., 2022). Submissions are limited to original English-language scientific journal articles (*original research articles*) that have undergone a peer-review process to ensure compliance with global academic quality standards (Lim & Kumar, 2024; Wilczewski & Alon, 2023).

Conversely, exclusion criteria strictly eliminate non-journal manuscripts—such as book chapters, proceedings, reviews, and editorials—along with general AI ethics or conventional entrepreneurship studies lacking conceptual overlap. Regionally, studies on the Nusantara/Malay geography focusing on large-scale extractive industries (e.g., palm oil), bioenergy, carbon mitigation, or physical infrastructure (e.g., IKN construction) are excluded as they do not represent human capital-based creative entrepreneurship. Finally, metadata cleaning completely eliminates duplicates, methodologically unclear manuscripts, and predatory or discontinued Scopus journals to preserve bibliometric credibility.

Bibliometric Analysis

Following an initial search and selection based on inclusion and exclusion criteria, 137 relevant articles were identified for analysis. Data extraction was conducted using the Scopus and Web of Science databases, and the data was then manually verified to ensure the accuracy and consistency of the information. Once validated, all data were imported into open-source bibliometric analysis tools, namely Bibliometrix and VOSviewer, to support further analysis. This study utilized the Biblioshiny RStudio and VOSviewer 1.6.20 software to understand how Malay-based AI integration is applied in entrepreneurship education. Biblioshiny RStudio was used in the initial stage to generate descriptive analyses covering the distribution of articles, authors, journals, institutions, and countries.

Subsequently, VOSviewer was applied to perform co-occurrence and bibliographic coupling analyses to cluster the literature by theme. The application of strict thresholds aimed to identify the core intellectual structure in this field, in accordance with the principles of knowledge structure mapping. Strict thresholds were set to identify the core intellectual structure of the research field, in line with knowledge structure mapping practices.

Content Analysis

A full-text review of 137 articles was conducted to assess the appropriateness of the concepts, the depth of analysis, and their contribution to

the focus of the study. Through this content-based screening, 29 core articles were identified as having sufficient thematic relevance and scientific quality for further analysis. Article selection was conducted by reviewing the full text of publications deemed relevant to the research theme and published in reputable journals listed in the Q1 quartile according to the Journal Citation Reports, thereby ensuring the quality and credibility of the findings. This multi-layered approach allows for the integration of large-scale quantitative analysis with content-based qualitative assessment, thereby providing a more comprehensive understanding of the development and direction of the research.

RESEARCH RESULT AND DISCUSSION

The results of the bibliometric and content analyses were organized according to the research questions and covered publication productivity trends, the most influential articles, authors, affiliations, and countries, core themes, and future research opportunities, each of which relates to RQ1 through RQ3.

Main Information

Figure 2 presents a summary of the *main information* extracted and *merged* from the Scopus and Web of Science (WoS) databases, which have been rigorously cleaned. The core dataset used for this structural mapping comprises 137 scientific journal articles published between 1993 and 2026, drawn from 102 different interdisciplinary journal sources. The recorded *Annual Growth Rate* of 8.96% indicates that the convergence between artificial intelligence (AI) ethics and entrepreneurship education remains in a very new, fragmented, and unsaturated *emerging field* at the global level.

Scientific collaboration in this field is highly active and partnership-based, involving a total of 406 authors, with an average of 3.15 co-authors per document. This partnership structure is reinforced by a rate of international collaboration (*International Co-authorships*) reaching 25.55%, demonstrating that issues of ethical governance, risk, and accountability in AI education at universities have been studied as a transnational discourse. The diversity of this research focus is represented by the emergence of 553 unique keywords (*Author Keywords*) ranging from technological literacy to moral responsibility.

Figure 2. Tabel main information dari Biblioshiny

In terms of the recency of the literature, the very low average document age—3.26 years—indicates that the body of knowledge in this field is dominated by recent publications released within the last two years. Although this field is still emerging, the resulting scholarly impact is already beginning to show, as

evidenced by an average of 18.03 citations per document. These highly up-to-date, specific, and data-noise-free metrics provide an ideal theoretical foundation for reconstructing a new entrepreneurship curriculum anchored in the ethical values of the Principles of Malay Culture.

Global Research Trends

The chronological evolution of the volume of publications comprising the core dataset was analyzed to understand the accumulation of knowledge and the dynamics of academic attention toward the ethics of Artificial Intelligence (AI) in entrepreneurship education. Figure 3 illustrates the trend in annual scientific production from 1993 through the upcoming 2026 edition.

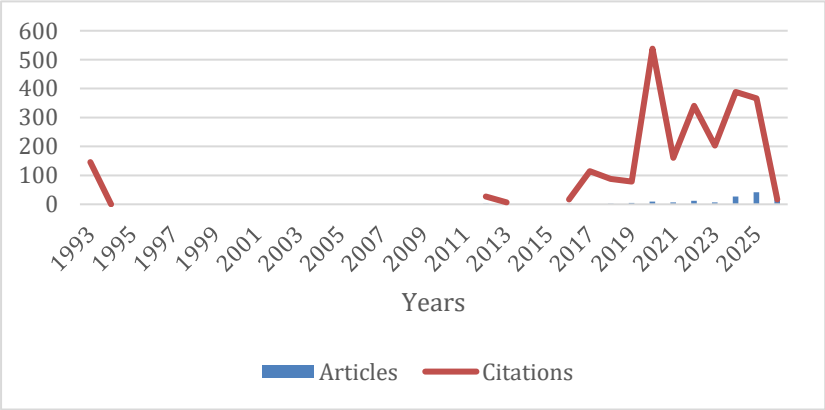

Figure 3. Number of publications per year

Based on this data visualization, the literature trajectory exhibits the highly specific characteristics of an emerging frontier. The research timeline begins with a single anchor document (pioneer paper) from 1993 that examined the foundational aspects of entrepreneurial competence. Following a dormant phase—or a prolonged publication gap spanning nearly three decades—this topic experienced a massive and radical surge in interest (an "academic leap") that began in 2018 (2 articles) and continued in 2020 (9 articles), as well as in 2022 (12 articles).

The turning point in the exponential accumulation of research occurred in the post-pandemic period, marked by a surge in publication volume in 2024—yielding 27 articles—and reaching a dramatic peak in 2025 with 42 articles published in a single calendar year. Furthermore, the existence of 17 articles allocated for the 2026 administrative year via the *online first* indexing channel indicates that the intensity of scientific debate regarding governance, ethics, and cognitive shifts resulting from generative AI in business education continues to remain at the forefront (*frontier research*).

This temporal distribution pattern, which shows a rapid increase during the 2024–2026 period, provides a very strong methodological justification for the urgency of this research. This pattern empirically demonstrates that the discourse on integrating AI into entrepreneurship curricula—particularly when grounded in ethical guidance and local socio-cultural values such as the Principles of Malay

Culture—represents a research area that remains highly novel, undersaturated, and is currently being actively shaped by the global scientific community.

The most influential articles

An analysis of total citations (*Total Citations* / TC) was conducted to identify the *landmark papers* that form the theoretical foundation of this field (Table 2). The seminal study by Obschonka and Audretsch (2020) ranked first with 262 citations, marking a new era of AI and *big data* integration in the global entrepreneurship landscape. Ranking second, the study by Popkova and Sergi (2020), with 148 citations, reinforces the focus on human capital through an exploration of AI convergence within the social entrepreneurship corridor.

The dialogue between classical and contemporary literature is represented by the seminal study by Hood and Young (1993), ranked third (146 citations), on the critical area of developing an entrepreneurial mindset, which was subsequently dynamically linked to the modeling of the university's role as a mindset driver by Jabeen et al. (2017) in fourth place (115 citations).

In the central cluster, models of digital technology adoption and entrepreneurial sustainability are represented by the contributions of Upadhyay et al. (2022), with 109 citations, and Gupta et al. (2023), with 107 citations. Meanwhile, the dimensions of pedagogical reconstruction and learning outcomes in the college classroom are led by the study by Xu and Zhang (2021) with 74 citations, followed by a critical exploration of the curriculum in the AI era by Vecchiarini et al. (2023) with 68 citations.

In the final cluster, the future direction of research linking AI to the sustainability of the entrepreneurial ecosystem is led by the work of Bickley et al. (2025), which has garnered 65 citations. Finally, the discourse on instructional design is concluded by the study by Ismail et al. (2018), with 61 citations, which evaluates the paradox of the *teacher-centered* versus *student-centered* approaches in a related higher education setting.

Theoretically, the current global literature remains focused on technical capabilities and digital profitability. This creates a significant research gap that this study aims to address by integrating the pillars of classical philosophy and regional pedagogy into a new model: "An AI-Based Entrepreneurship Curriculum Guided by the Moral Compass of Malay Cultural Principles."

Table 1. Top most cited articles

Rank	*Paper*	*TC*
1	Artificial intelligence and big data in entrepreneurship: a new era have begun (Obschonka M, 2020)	262
2	Human capital and ai in industry 4.0. Convergence and divergence in social entrepreneurship in russia (Popkova E, 2020)	148
3	Entrepreneurships requisite areas of development - a survey of top executives in successful entrepreneurial firms (Hood J, 1993)	146

4	Entrepreneurial mindset and the role of universities as strategic drivers of entrepreneurship: evidence from the united arab emirates (Jabeen F, 2017)	115
5	Theorizing artificial intelligence acceptance and digital entrepreneurship model (Upadhyay N, 2022)	109
6	Analysis of artificial intelligence-based technologies and approaches on sustainable entrepreneurship (Gupta B, 2023)	107
7	Artificial intelligence in business curriculum: the pedagogy and learning outcomes (Xu J, 2021)	74
8	Redefining entrepreneurship education in the age of artificial intelligence: an explorative analysis (Vecchiarini M, 2023)	68
9	Artificial intelligence and big data in sustainable entrepreneurship (Bickley S, 2025)	65
10	Entrepreneurship education pedagogy: teacher-student-centred paradox (ismail a, 2018)	61

Note(s): TC = Total citations

Source: Authors' own work

Most influential journals

An evaluation of publication venues was conducted simultaneously to identify the most productive journals and measure their scientific impact through the accumulation of global citations (*Total Citations* / TC). Table 3 presents a comparison of the top ten journals that dominate the discourse on artificial intelligence (AI) convergence within the scope of business education and entrepreneurship.

Table 3. The most impactful journals

Journals	Articles	Journals	Tc
International journal of management education	7	International journal of management education	220
Frontiers in psychology	5	Education and information technologies	40
Education and information technologies	4	Frontiers in psychology	34
Sustainability	4	Systems research and behavioral science	44
International entrepreneurship and management journal	3	Amfiteatru economic	19
Systems research and behavioral science	3	Cogent business \& management	5

Amfiteatru economic	2	Foundations and trends in entrepreneurship	21
Cogent business \& management	2	International entrepreneurship and management journal	41
Foundations and trends in entrepreneurship	2	International journal of entrepreneurial behavior \& research	133
International journal of entrepreneurial behavior \& research	2	Journal of business venturing	170

Note(s): tc = total citations

Source: Authors' own work

According to the data, the *International Journal of Management Education* leads the research landscape with 7 articles and a superior impact of 220 citations, followed by productive outlets like *Frontiers in Psychology* (5 articles, 34 citations), *Education and Information Technologies* (4 articles, 40 citations), and *Sustainability* (4 articles), alongside elite, low-volume journals with massive scholarly authority such as the *Journal of Business Venturing* (170 citations) and the *International Journal of Entrepreneurial Behavior & Research* (133 citations). This concentration in top-tier Western journals focused primarily on instructional technology and general business performance provides a strong theoretical justification for the novelty of this study; the complete absence of publications integrating local cultural value systems into these reputable outlets presents a golden opportunity to introduce an AI-based entrepreneurship framework anchored by the philosophy of the Principles of Malay Culture to the international academic stage.

Most Productive Affiliations Analysis

A systematic mapping of the authors' home institutions was conducted to identify centers of academic excellence and the institutional distribution driving this research (Figure 4). Based on data visualization of the 250 institutions identified in the corpus, National Economics University (Natl Econ Univ) impressively leads the global research landscape with the highest contribution of 12 articles. The pioneering position held by this institution underscores the strategic commitment of higher education institutions in the Southeast Asian region to exploring the reconstruction of a digital business curriculum that is adaptive to market dynamics.

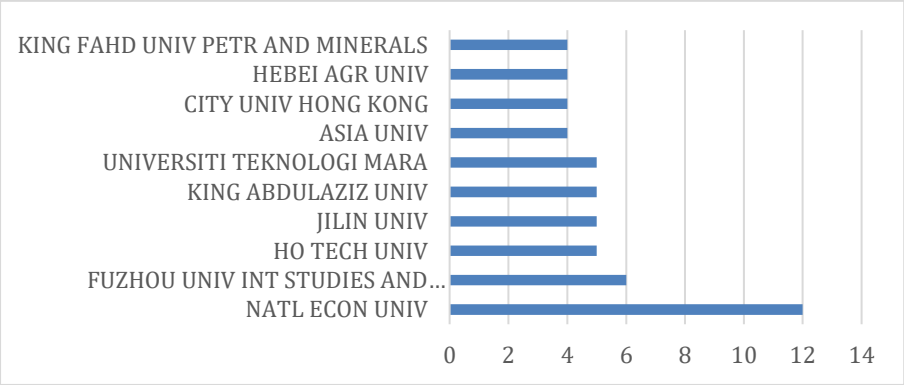

Figure 4. Most relevant affiliations
Source: Biblioshiny output

Structurally, research in this field remains concentrated in a handful of institutions, with only nine global institutions capable of producing at least four publications. This contribution landscape is led by National Economics University (12 articles), followed by Fuzhou University of International Studies and Trade (6 articles), a group of universities including Ho Tech Univ, Jilin Univ, King Abdulaziz University, and UiTM (5 articles each), as well as Asia University, Hebei Agr Univ, and King Fahd University (4 articles each). This high concentration of metrics also shapes a similar contribution pattern at the national level. However, the fact that the majority of the 250 institutions in the corpus still fall within the minimum contribution threshold confirms that this research ecosystem—which converges technology governance and entrepreneurship education—remains generally in its early growth phase (*emerging fields*). This vast, still-open gap in the international literature presents a strong opportunity for novelty in this research to introduce a new curriculum framework anchored by ethical values and local wisdom.

Co-occurrence Network analysis

Based on the co-occurrence analysis visualization using VOSviewer (Fig. 5), synonyms and variations of keyword abbreviations were standardized using a thesaurus file; for example, "artificial intelligence" and "AI," "generative AI" and "generative artificial intelligence," "genai" and "generative artificial intelligence," "business educations" and "business education," and "block-chain" and "blockchain." After standardizing the terms, a minimum occurrence threshold of three times was applied, while all keywords were counted using the full-counting method with a minimum threshold of three occurrences. This process yielded six main thematic clusters from the 563 keywords identified, each representing an intellectual structure within this research landscape. The mapping results show that there are 29 nodes distributed across the six clusters, connected by 139 relationships with a total relationship strength of 257. Each keyword is connected to its respective group, indicating thematic relationships between topics.

In this analysis, the terms "entrepreneur" and "entrepreneurs" were maintained as separate nodes in the initial analysis stage to preserve the integrity

of the keyword network structure. Nevertheless, both terms are within the same cluster, indicating a strong conceptual connection. In the advanced analysis stage, term normalization was performed by consolidating lexical variations into a single form for thematic interpretation purposes.

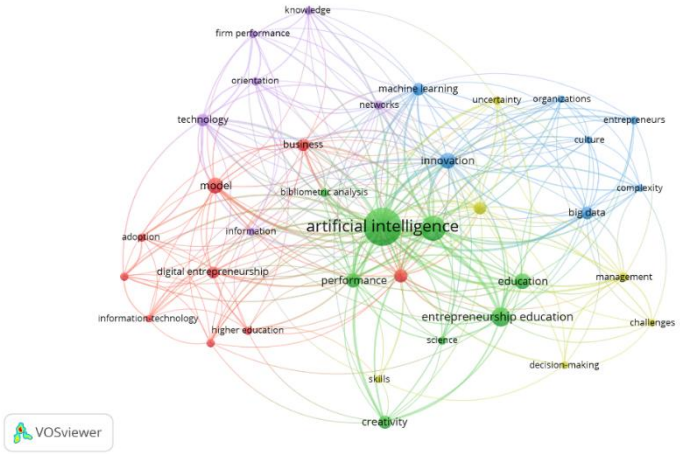

Figure 5. Keyword co-occurrence network

Systematizing the words included in the cluster themes allows for the identification of the key concepts that form the conceptual structure of this line of research, resulting in the following classifications: Red Cluster – "*Model*"; Green Cluster – "*Artificial intelligence*"; Blue Cluster – "*Innovation*"; Yellow Cluster – "*Opportunities*"; Purple Cluster – "*Technology*". Below, we present the systematization of these five clusters.

Red Cluster – "Model". In the landscape of higher education, the integration of technology into entrepreneurship curricula demands the reconstruction of more adaptive structural and pedagogical models; however, the implementation of Western models such as the *Triple Helix* (Yu, 2018) or the *GAIN Framework* (Dwivedi, 2025) often faces internal policy barriers in developing countries and tends to overlook specific sociocultural and spiritual contexts. This research aims to decolonize these models by integrating the Principle of Amanah from Malay culture as an *institutional accountability framework*. By anchoring these noble values as a moral compass, AI technology is no longer viewed merely as a tool for materialistic efficiency but is responsibly steered for the common good of the community in accordance with the philosophy of *Tunjuk Ajar Melayu*, thereby fostering an educational ecosystem that is digitally advanced yet spiritually grounded.

Green Cluster – "Artificial intelligence". This cluster serves as the definitive justification for rejecting value-neutral technology, positioning the Malay Ethical Principles as the primary moral compass guiding the use of AI. The focus of global research is now shifting toward the importance of moral aspects in technology adoption. Jiang (2026) radically criticizes current AI education models, which are disconnected between technical training and ideological and character guidance in universities. The cultural clash in business resulting from these AI moral risks is further emphasized by Diab & El Hajj (2024). In the context

of behavior, Mumtaz et al. (2025) empirically demonstrate that cultural values significantly influence students' perceptions of ethical AI use, while Duong (2026) highlights the importance of *AI Literacy* and *AI self-efficacy* in fostering healthy digital entrepreneurial intentions. Criticism of this secular-capitalist competency model is supported by Hashim et al. (2019), who offer an alternative model based on related ethical-religious values.

Blue Cluster – "Innovation." This cluster examines the *human-AI symbiosis* within the academic sphere. Xu et al. (2026) developed a mediation framework based on the SOR model to demonstrate that AI can enhance students' cognitive competencies without supplanting the essential role of humans. This machine-assisted creativity (*AI-augmented creativity*) is explored qualitatively by Li & Byun (2026) in the context of sustainable *startup* development. On a practical level, Ji et al. (2025) highlight the cognitive load students experience when collaborating with ChatGPT, which requires a *Human-AI collaborative teaching* model between instructors and intelligent technology (Lin & Chen, 2025) to foster students' superior dynamic capabilities (Gong et al., 2025). Digital innovation co-creation is anchored by the principle of Gotong Royong, preventing the emergence of an individualistic-exploitative business mentality.

Yellow Cluster – "Opportunities". The use of AI is aimed at capturing new market opportunities through the cultivation of an entrepreneurial mindset. Xie & Wang (2025) empirically demonstrated that the use of GenAI in the classroom directly increases students' entrepreneurial intentions through the mediation of self-efficacy and university support. The alignment between digital literacy (*tech literacy*) and the refinement of the *entrepreneurial mindset* is key to success in the era of disruption (Wulandari et al., 2025). In emerging markets, Stouraitis et al. (2022) emphasize the importance of fostering individual entrepreneurial orientation through higher education. To avoid the phenomenon of *AI Hype*, Kostis et al. (2024) propose the concept of *Learning-by-conversing with GenAI* in designing business models, the effectiveness of which is validated through a cross-cultural approach by Le et al. (2026). Efforts to seize digital opportunities are strictly guided by the Marwah Principle, which educates students to build businesses that are halal, fair, dignified, and uphold professional integrity.

Purple Cluster – "Technology". This cluster serves as the empirical foundation for your regional research. Mulyono et al. (2025) leveled harsh criticism at the individualistic nature of the West and emphasized the importance of contextualizing local values in the *Global South*. Operationally, Djubaedi et al. (2024) and Rizka et al. (2025) provide concrete guidance on successfully integrating local wisdom and local culture into the core competencies of entrepreneurship education curricula. The characteristics of motivation and ethnicity in this region are validated by Looi (2019), while Khalid (2020) provides empirical evidence that AI technology learning activities in Malaysian institutions are positively correlated with improved student business performance. This bridge for creativity development rooted in local culture is reinforced by the study by Larso & Saphiranti (2016), whose conceptual framework is grounded in the four classical pillars of entrepreneurship development (Hood & Young, 1993). This cluster provides the strongest data-

backed justification that the Nusantara region and the Malay World urgently require the integration of Local Cultural Values into learning technologies to counteract the destructive effects of Western digital individualism.

Future Research Agenda

Through co-occurrence mapping and bibliographic coupling analysis of 29 core articles, this study successfully mapped the intellectual structure and minimized bias in identifying global sociomaterial research gaps. To bridge the theoretical gap between artificial intelligence and local ethics, a future agenda encompassing three main domains was formulated. First, the empirical validation of an AI-based entrepreneurship curriculum integrated with the principles of Malay Culture at various universities in Southeast Asia to test students' AI self-efficacy (Duong, 2026) and entrepreneurial intentions (Xie & Wang, 2025). Second, drawing on critiques by Jiang (2026) and Ji et al. (2025), longitudinal research is essential to evaluate how the internalization of moral values from *Tunjuk Ajar Melayu* can mitigate cognitive load while preventing academic dishonesty when students engage in co-creation with GenAI. Third, researchers are challenged to operationalize indicators of local wisdom from the principles of Amanah, Marwah, and Gotong Royong into standardized psychometric instruments to measure the contextual resilience of digital entrepreneurs in the *Global South* (Mulyono et al., 2025).

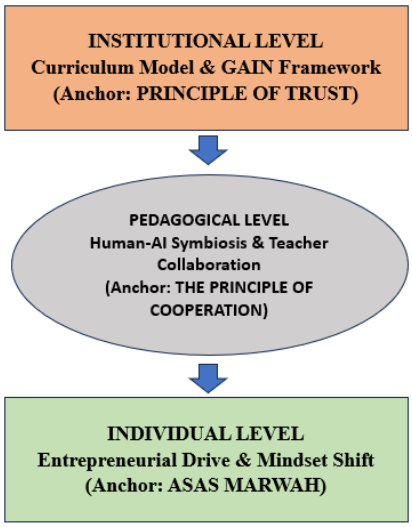

Figure 5. Framework for Integrating Artificial Intelligence and Entrepreneurship Education

To operationalize this agenda, Figure 5 presents a Synergistic Framework for AI-Based Digital Entrepreneurship Education Grounded in Malay Cultural Principles. This framework converges global technological pillars with local ethical anchors through three levels of sociomaterial intervention:

1. Institutional Level (*Institutional Level* – Principle of Stewardship)

Adapted from the *GAIN Framework* blueprint (Dwivedi, 2025) and macro-governance (Yu, 2018). Universities hold the institutional mandate to develop a balanced curriculum; not only facilitating AI technology infrastructure, but also

strictly enforcing policies on character guidance and social responsibility (Yang et al., 2022).

2. Pedagogical Level (*Pedagogical Level* – Principle of Gotong Royong)

Focuses on the classroom through the *Human-AI collaborative teaching* model (Lin & Chen, 2025) and the acceleration of creativity (Li & Byun, 2026). The co-creation process between students, faculty, and intelligent technology is not conducted in a Western individualistic manner but is bound by the principle of Gotong Royong for the common good of the community and an inclusive social entrepreneurship orientation (Rahman et al., 2019).

3. Individual Level (*Individual Level* – Principle of Marwah)

Aims at students' cognitive transformation. Enhancing digital literacy (*tech literacy*) and self-efficacy (Wulandari et al., 2025; Duong, 2026) is aimed at seizing business opportunities ethically (Elsa et al., 2026). The moral compass of the Asas Marwah principle ensures students build digital startups that are fair, legal, dignified, and uphold their personal and national honor on the global stage.

CONCLUSIONS AND RECOMMENDATIONS

This bibliometric study and systematic literature review (SLR) successfully and comprehensively mapped the global intellectual landscape regarding the convergence of artificial intelligence (AI) in higher education entrepreneurship while identifying critical gaps for the integration of local values. Regarding the first research question (RQ1) on global intellectual trends and structures over the past decade, the metric analysis reveals exponential growth in publications, particularly following the technological disruption of *Generative AI*. However, this academic structure remains subject to a centralized geopolitical power dynamic, as it is predominantly led by technology institutions from China and the United States (Dwivedi, 2025; Yu, 2018).

Although the mapping of five main conceptual clusters (*Model, Artificial Intelligence, Innovation, Opportunities,* and *Technology*) confirms that the global higher education ecosystem is infrastructure-ready to facilitate human-AI symbiosis (Xu et al., 2026), this finding actually reveals a major paradox regarding the second research question (RQ2). Current international scientific literature remains dominated by a Western technocentric paradigm that is value-free, where the cultural and ethical aspects examined are generally limited to data privacy regulations or purely algorithmic bias (Jiang, 2026; Mumtaz et al., 2025). The integration of local cultural values as the foundation of an entrepreneur's moral character remains in a peripheral position, isolated from the global mainstream, despite the high urgency of its decolonization and contextualization in the *Global South* (Mulyono et al., 2025).

To fill this gap in the literature, the third research question (RQ3) is addressed through the formulation of a Synergistic Framework for AI-Based Digital Entrepreneurship Education and Malay Cultural Principles, designed through three levels of comprehensive sociomaterial intervention. At the institutional level, this framework is anchored by the Principle of Amanah to ensure accountability in curriculum policy and campus social responsibility (Yang et al., 2022). Next, at the pedagogical level, interventions are guided by the

Gotong Royong Principle to promote a collaborative Human-AI learning model oriented toward social welfare (Lin & Chen, 2025; Rahman et al., 2019). Finally, at the individual level, the transformation is guided by the Principle of Dignity to ensure that the enhancement of students' digital self-efficacy (Duong, 2026) is directed toward seizing business opportunities in a halal, fair, dignified, and sustainable manner on the global stage.

ADVANCED RESEARCH

Although it makes a strong original contribution, this study has methodological limitations that must be honestly acknowledged. The first limitation lies in the global database restrictions, whereby the analyzed dataset is limited to documents indexed in the Scopus and Web of Science (WoS) databases in order to maintain international standing. Consequently, studies with a local focus and in-depth texts on the philosophy of *Tunjuk Ajar Melayu* or purely religious models in related regions have not been fully and extensively explored by these global indexing algorithms (Hashim et al., 2019; Looi, 2019).

The second limitation concerns the nature of the analysis, which remains at the conceptual-procedural stage, where this study has only formulated a theoretical curriculum model reconstruction and structural mapping through a review of secondary literature (Dwivedi, 2025; Ismail et al., 2018). This study has not yet evaluated the empirical effectiveness, levels of *AI self-efficacy* (Duong, 2026), or the actual formation of students' digital entrepreneurial intentions in the classroom (Xie & Wang, 2025) through direct primary data collection in the field, which opens up significant opportunities for future research agendas.

ACKNOWLEDGMENT

This research received no external funding.

REFERENCES

Aria, M., & Cuccurullo, C. (2026). Science Mapping Analysis - A primer with Biblioshiny. *McGraw-Hill*, ISBN: 978-88-386-2297-7.

Diab, B., & El Hajj, M. (2024). Ethics in the age of artificial intelligence: unveiling challenges and opportunities in business culture. *Journal of Business Culture & Ethics*, 14(2), 112–129.

Djubaedi, D., Rohadi, T., Hidayat, A., & Kodama, Y. (2024). Analysis of entrepreneurship core competency and curriculum integrated with local culture and products. *International Journal of Evaluation and Research in Education*, 13(5), 3526–3534. https://doi.org/10.11591/ijere.v13i5.28147.

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, *133*, 285–296. https://doi.org/10.1016/j.jbusres.2021.04.070

Duong, T. (2026). AI literacy and higher education students' digital entrepreneurial intention: A moderated mediation model of AI self-efficacy and digital entrepreneurial self-efficacy. *Computers and Education: Artificial Intelligence*, 8(1), 100240.

Dwivedi, Y. K. (2025). Generative Artificial Intelligence (GenAI) in entrepreneurial education and practice: emerging insights, the GAIN Framework, and research agenda. *International Journal of Information Management*, 79(3), 102810.

Dwivedi, Y. K. (2025). Generative Artificial Intelligence (GenAI) in entrepreneurial education and practice: emerging insights, the GAIN Framework, and research agenda. *International Entrepreneurship and Management Journal*, *21*(1). https://doi.org/10.1007/s11365-025-01089-2

Effendy, T. (2025). *Tunjuk Ajar Melayu*. Lembaga Adat Melayu Riau.

Elsa, D., Indrawati, H., & Caska. (2025). Digital transformation in SMEs: global maps and trends of research. *Strategy and Leadership*, *53*(2), 132–159. https://doi.org/10.1108/SL-09-2024-0104.

Elsa, D., Islami, N., Mahdum, M. Copriady, J., Putra, Z. H. (2026). Transforming entrepreneurship education in the age of artificial intelligence: a bibliometric review and future research agenda. *Entrepreneurship Education*. https://doi.org/10.1007/s41959-026-00174-z

Garro-Abarca, V. M., Palos-Sánchez, P. R., & Rus-Arias, E. (2020). Working in virtual teams: A systematic literature review and a bibliometric analysis. *IEEE Access*, *8*, 168923–168940. https://doi.org/10.1109/ACCESS.2020.3023546

Gong, X., Wang, Y., & Zhang, L. (2025). Integrating artificial intelligence in entrepreneurship education: Dynamic capabilities and marketing performance among student entrepreneurs. *Journal of Innovation & Knowledge*, 10(1), 100412.

Hashim, N., Othman, A., Hussin, N., & Mohamad, A. (2019). Islamic entrepreneurship education model for higher education institution. *Journal of Advanced Research in Dynamical and Control Systems*, 11(5 Special Issue), 511–526.

Hassan, S. U., Visvizi, A., & Waheed, H. (2019). The 'who' and the 'what' in international migration research: data-driven analysis of Scopus-indexed scientific literature. *Behaviour and Information Technology*, *38*(9), 924–939. https://doi.org/10.1080/0144929X.2019.1583282

Hood, J. N., & Young, J. E. (1993). Entrepreneurship's requisite areas of development: A survey of top executives in successful entrepreneurial firms. *Journal of Business Venturing*, 8(2), 115–135. https://doi.org/10.1016/0883-9026(93)90015-W

Ismail, A. B. T., Sawang, S., & Zolin, R. (2018). Entrepreneurship education pedagogy: teacher-student-centred paradox. *Education and Training*, 60(2), 168–184. https://doi.org/10.1108/ET-07-2017-0106

Jabeen, F., Faisal, M. N., & Katsioloudes, M. I. (2017). Entrepreneurial mindset and the role of universities as strategic drivers of entrepreneurship: Evidence from the United Arab Emirates. *Journal of Small Business and Enterprise Development*, 24(1), 136–157. https://doi.org/10.1108/JSBED-07-2016-0117

Ji, Y., Chen, H., & Liu, X. (2025). Human-Machine Cocreation: The Effects of ChatGPT on Students' Learning Performance, AI Awareness, Critical

Thinking, and Cognitive Load in a STEM Course Toward Entrepreneurship. *Educational Technology Research and Development*, 73(2), 345–368.

Jiang, L. (2026). Socio-Political Values in AI-Empowered University Innovation and Entrepreneurship Education. *Higher Education Policy and Practice*, 19(1), 45–62.

Khalid, M. (2020). Artificial intelligence learning and entrepreneurial performance among university students: evidence from malaysian higher educational institutions. *Journal of Technical Education and Training*, 12(3), 89–102.

Kostis, A., Ritala, P., & Oghazi, P. (2024). Too Much AI Hype, Too Little Emphasis on Learning? Entrepreneurs Designing Business Models Through Learning-by-Conversing with Generative AI. *California Management Review*, 66(4), 55–78.

Kraus, S., Durst, S., Ferreira, J. J., Veiga, P. M., Kailer, N., & Weinmann, A. (2022). Digital transformation in business and management research: An overview of the current status quo. *International Journal of Information Management*, *63*. https://doi.org/10.1016/j.ijinfomgt.2021.102466

Larso, D., & Saphiranti, D. (2016). The role of creative courses in entrepreneurship education: A case study in Indonesia. *International Journal of Business*, 21(3), 216–225.

Le, T., Kowalski, M., & Nguyen, H. (2026). GenAI incorporation in entrepreneurship education and higher education students' Fintech entrepreneurship: a cross-cultural approach in Vietnam and Poland. *Journal of Cross-Cultural Management*, 31(1), 74–95.

Li, X., & Byun, J. (2026). A Qualitative Study on Postgraduate Social Entrepreneurship Students' Experiences with and Perceptions of AI-Augmented Creativity in Sustainable Startup Development. *Studies in Higher Education*, 51(2), 188–207.

Lim, W. M., & Kumar, S. (2024). Guidelines for interpreting the results of bibliometric analysis: A sensemaking approach. *Global Business and Organizational Excellence*, *43*(2), 17–26. https://doi.org/10.1002/joe.22229

Lin, Z., & Chen, Y. (2025). Human-AI collaborative teaching for entrepreneurship learning in vocational higher education. *Vocational Education Research*, 40(3), 215–231.

Looi, K. H. (2019). Undergraduates' motivations for entrepreneurial intentions: the role of individualistic values and ethnicity. *Journal of Education and Work*, 32(5), 465–483. https://doi.org/10.1080/13639080.2019.1640866

Marino-Romero, J. A., Palos-Sánchez, P. R., & Velicia-Martin, F. (2024). Evolution of digital transformation in SMEs management through a bibliometric analysis. *Technological Forecasting and Social Change*, *199*. https://doi.org/10.1016/j.techfore.2023.123014

Mulyono, K. B., Susilaningsih, S., Hindrayani, A., & Totalia, S. A. (2025). Is entrepreneurial resilience enough? A critique of individualism and a call for contextualization in the Global South. *Journal of Entrepreneurship in*

Emerging Economies, ahead-of-print. https://doi.org/10.1108/JEEE-06-2025-0362

Mumtaz, S., Al-Mansoori, M., & Smith, J. (2025). Ethical use of artificial intelligence-based tools in higher education: are future business leaders ready? *Ethics and Information Technology*, 27(1), 14–31.

Noviana E., Faizah H., Mustafa M., et al (2023). Understanding 'Tunjuk Ajar Melayu Riau': Integrating local knowledge into environmental conservation and disaster education. *Heliyon*, *9* (9).

Obschonka, M., & Audretsch, D. B. (2020). Artificial intelligence and big data in entrepreneurship: a new era have begun. *Small Business Economics*, *55*(3), 529–539. https://doi.org/10.1007/s11187-019-00202-4

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J. M., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S. J., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *International Journal of Surgery*, *88*. https://doi.org/10.1016/j.ijsu.2021.105906

Qiu, Y., Cheng, C., Garcia-Aracil, A., Isusi-Fagoaga, R., & Qiao, X. (2026). Analysis of how artificial intelligence empowers the COIL teaching model to promote educational internationalisation and social entrepreneurship education. Sustainability, 18(8), 4072. https://doi.org/10.3390/su18084072

Rahman, R. S. A. R. A., Ismail, M. F., & Sahid, S. (2019). Strategic domains of social entrepreneurship among students in Malaysian higher education institutions. *Academy of Strategic Management Journal*, 18(1), 1–15.

Rizka, R., Anwar, A., Nasir, N., Sinala, A., Imam, G., Faridy, N., & Anaconda Bangkara, B. M. A. S. (2025). INTEGRATING LOCAL WISDOM INTO ENTREPRENEURSHIP EDUCATION FOR SUSTAINABLE TOURISM IN PULO ACEH, INDONESIA. *Jurnal Ilmiah Peuradeun*, 13(3), 1909–1940. https://doi.org/10.26811/peuradeun.v13i3.1909

Setiawan, M. E., Suwono, H., Alias, S. H., Sulisetijono, S., & Nur, H. (2025). Qualitative exploration of factors influencing the development of entrepreneurship courses in select Indonesian universities with fuzzy logic integration. *Qualitative Research Journal*, 25(2), 203–226. https://doi.org/10.1108/QRJ-03-2024-0051

Singh, V. K., Singh, P., Karmakar, M., Leta, J., & Mayr, P. (2021). The journal coverage of Web of Science, Scopus and Dimensions: A comparative analysis. *Scientometrics*, *126*(6), 5113–5142. https://doi.org/10.1007/s11192-021-03948-5

Stouraitis, V., Harun, M. H. M., & Kyritsis, M. (2022). Exploring individual entrepreneurial orientation through education in emerging market conditions: the case of Malaysia and Thailand. *International Journal of Entrepreneurship and Small Business*, 45(4), 489–517. https://doi.org/10.1504/ijesb.2022.122659

Ubogu R (2020), "Entrepreneurship Education: Challenges and Strategies towards Promoting Entrepreneurship in Higher Education in Nigeria". *Academic Journal of Interdisciplinary Studies*, *9*(5), 125. https://doi.org/10.36941/ajis-2020-0091

Vecchiarini, M., & Somià, T. (2023). Redefining entrepreneurship education in the age of artificial intelligence: An explorative analysis. International Journal of Management Education, 21(3), 100879. https://doi.org/10.1016/j.ijme.2023.100879

Voronov, V., Menshikov, V., & Ruza, O. (2023). Artificial intelligence: A catalyst for entrepreneurship education in the Baltics. Baltic Region, 15(3), 45-65. https://doi.org/10.5922/2079-8555-2023-3-3

Wilczewski, M., & ALON, I. (2023). Language and communication in international students' adaptation: a bibliometric and content analysis review. *Higher Education*, *85*(6), 1235–1256. https://doi.org/10.1007/s10734-022-00888-8

Wulandari, S. S., Diah, M. L. B. M., & Asari, A. (2025). Digital Proficiency and Entrepreneurial Mindset for SME Success through Market Savvy and Tech Literacy. *APTISI Transactions on Technopreneurship*, 7(1), 26–36. https://doi.org/10.34306/att.v7i1.527

Xie, X., & Wang, S. (2025). Generative artificial intelligence in entrepreneurship education enhances entrepreneurial intention through self-efficacy and university support. *Journal of Business Research*, 186, 114980.

Xu, L., Wang, T., & Zheng, Y. (2026). Beyond AI substitution and cultivation of entrepreneurial competencies: a mediation framework based on the SOR model. *Technological Forecasting and Social Change*, 203, 123450.

Yang, C., Lin, C., & Fan, X. (2022). Cultivation Model of Entrepreneurship from the Perspective of Artificial Intelligence Ethics. *Frontiers in Psychology*, *13*. https://doi.org/10.3389/fpsyg.2022.885376

Yu, C. W. (2018). Understanding the ecosystems of Chinese and American entrepreneurship education. *Journal of Entrepreneurship Education*, 21(2), 1–18.

Yu, T., Dai, J., Chen, X., & Wang, C. (2026). To use or not to use? Generative AI adoption in Chinese business schools. *International Journal of Management Education*, *24*(1). https://doi.org/10.1016/j.ijme.2025.101323