

Entrepreneurial Digital Competencies and Mindsets Among University Students in the Post-COVID-19 Era: A Systematic Literature Review

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ABSTRACT

Digital transformation has reshaped entrepreneurship education and increased the need for university students to develop entrepreneurial digital competencies and adaptive digital mindsets. However, existing studies have largely examined these dimensions separately, leaving limited synthesis of how they interact within higher education in the post-COVID-19 context. This study employed a systematic literature review following the PRISMA framework. Relevant studies published between 2022 and 2025 were identified using predefined inclusion and exclusion criteria. Following identification, screening, and eligibility assessment, 32 studies were included and analyzed thematically to examine entrepreneurship education, digital entrepreneurial competencies, entrepreneurial characteristics, and digital mindsets among university students. The review indicates that entrepreneurship education, particularly practice-oriented and technology-integrated learning, is positively associated with students' digital entrepreneurial intentions. Key digital entrepreneurial competencies include digital literacy, social media marketing, data analytics, cybersecurity awareness, and the ability to leverage emerging technologies and innovate business models. These competencies are complemented by creativity, innovativeness, proactiveness, resilience, risk-taking, and self-management. The findings further highlight digital rights and responsibilities as an emerging competency involving privacy, data protection, cybersecurity, intellectual property, and ethical technology use. An entrepreneurial digital mindset is characterized by adaptability, innovation orientation, digital proficiency, tolerance of uncertainty, and ethical awareness. The findings suggest that higher education should integrate digital competencies, entrepreneurial mindsets, experiential learning, and responsible digital practices within entrepreneurship curricula. This review provides an integrated basis for designing entrepreneurship education that better prepares university students for technology-driven entrepreneurial environments.

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1. INTRODUCTION

Innovative business models are among the opportunities arising from technological developments in the digital era. The COVID-19 pandemic, which has limited and hindered people's movements, has become a significant factor in driving digital transformation. The impact affects various sectors of life, including entrepreneurship and higher education. Entrepreneurs are required to accelerate digital transformation by developing technology-based products, enhancing business operational efficiency, and expanding their market through a globally open business network (D'Angelo et al., 2024).

In higher education, the COVID-19 pandemic has altered learning methods and processes, ultimately impacting student learning behaviors and habits, including changes in the entrepreneurship curriculum. The shift to an online learning model, which continually adopts technology, accompanied by changes in people's consumption patterns towards technology, has created new opportunities for students to develop digital-based businesses (Xia et al., 2024). Although the transformation process also raises various challenges that cannot be ignored, such as limited digital literacy skills, technology access gaps, and a lack of field practical experience. Behind all that, changes in people's behavior, consumption patterns, and business systems have created new technology-based business opportunities. These opportunities are more open to the younger generation who are more adaptable to an all-digital business environment (Łobejko & Bartczak, 2021; Xia et al., 2024). In the context of higher education, the strategic role in building an innovative and sustainable entrepreneurial ecosystem rests with students. The digital age requires them to master entrepreneurial competencies relevant to technology and global market changes, in addition to a basic understanding of entrepreneurship (Pham et al., 2023). Although various challenges accompany the opening of various business opportunities in the digital era, universities can overcome them by strengthening the supporting ecosystem, such as designing campus business incubator programs, digital internship programs, and collaborations with industry (Kraus et al., 2019).

Before all of this is realized, an understanding of these opportunities and obstacles is needed to design entrepreneurship education policies and curricula that are more responsive to the needs of students in the post-pandemic era. There is no exception to the need for a deep understanding of digital technology competencies and the ability to adapt to the rapidly changing business environment's dynamics, in order to complement traditional business intuition (Nambisan, 2017). To ensure sustainability and increase business competitiveness amid rapid global transformation, it is necessary to reevaluate entrepreneurial competencies and characteristics to remain relevant to the demands of the digital era.

A digital mindset is another essential quality that students must possess in order to face business competition in the increasingly open digital era. Students are required to develop a digital mindset that enables them to think adaptively, creatively, and innovatively. Strengthening students' entrepreneurial competencies and *digital mindsets* is an urgent need to face increasingly complex business and socioeconomic dynamics in the post-COVID-19 pandemic era (Isac et al., 2023; Yáñez-Valdés & Guerrero, 2024). Currently, students, as a generation born and grown with technology, are potential entrepreneurial cadres who have digital competence and have the opportunity to create new businesses (Krieger et al., 2022).

Previous studies have emphasized the importance of mastering entrepreneurial competencies for students as a fundamental asset in establishing new businesses and fostering entrepreneurial intention. These studies generally focus on traditional aspects such as planning, organizational and managerial skills, productive thinking, motivation, and interpersonal skills in building new businesses (González-López et al., 2021; RezaeiZadeh et al., 2017). However, only a small number of studies have highlighted the integration between entrepreneurial competencies and the development of students' digital mindsets, despite this ability being increasingly crucial in the era of digital transformation (Abou Hashish et al., 2025; Awdziej et al., 2023). The digital mindset emphasizes the importance of proficiency in the responsible use of technology and critical thinking in navigating the digitally connected world (Awdziej et al., 2023).

Several post-COVID-19 studies have indeed begun to explore changes in digital mindsets among students and their impact on entrepreneurial behavior. However, the results are still fragmented and do not provide a comprehensive picture (Hsieh & Maritz, 2023). There has been increased attention to this topic; however, the available literature has not integrated two important dimensions, between entrepreneurial competencies and students' digital mindsets, comprehensively in the post-COVID-19 pandemic context. In addition, the studies conducted are generally regional or sectoral, making it difficult to generalize the findings to a global context. Studies on real competencies and deep digital mindsets of students are still rare, because most studies focus more on entrepreneurial intentions (Ganefri et al., 2024; Lesinskas et al., 2023; Liang et al., 2025; Singh & Dwivedi, 2022). This shows a gap, requiring a systematic literature review approach to integrate the latest scientific evidence and provide a comprehensive understanding of students' entrepreneurial competencies and digital mindsets in the post-COVID-19 pandemic digital era. Three main components form the basis of the conceptual framework of this research: (1) student entrepreneurial competence, (2) students' digital mindset, and (3) the impact of entrepreneurship education on students' entrepreneurial intentions in the digital or post-pandemic era. This framework guides researchers in identifying relevant literature, synthesizing findings, and proposing future research agendas.

Although various studies have discussed entrepreneurial competencies (Chen & Ifenthaler, 2023; Mahmudah et al., 2023) and digital mindsets separately (Ganefri, Kamdi, Makky, Hidayat, & Rahmawati, 2024; Mirhabibi, Shayan, & Sahraei, 2025), to date, there is still no literature review research that systematically examines the relationship between students' competencies and digital mindsets in the digital era after the COVID-19 pandemic. In fact, the integration of these two aspects is very important to formulate an entrepreneurial education strategy that is more responsive to the dynamics of digital transformation and changes in people's behavior after the global crisis (Garcez, Silva, & Franco, 2022; Volkmann & Grünhagen, 2022). This research gap results in limited references for higher education policymakers, campus entrepreneurship program managers, and business incubators to design effective interventions in shaping digital-based young entrepreneurs. Therefore, a systematic literature review-based study is needed that can collect, evaluate, and synthesize the latest scientific evidence regarding entrepreneurial competencies and students' digital mindsets, as well as identify opportunities and challenges that arise in the post-pandemic era.

The urgency of this research stems from the need to build a strong scientific foundation for the development of entrepreneurship education in higher education that is responsive to changes in the business environment in the digital era after the COVID-19 pandemic. The integration of entrepreneurial competencies with students' digital mindset is an important prerequisite for developing a generation of young entrepreneurs who are adaptable, innovative, and globally competitive (Bachmann, Rose, Maul, & Hölzle, 2024; Sansone, Ghezzi, Landoni, & Rangone, 2024). Based on the background that has been described earlier, which is strengthened by the condition of the literature gap, and the importance of this research being conducted, in general, this study aims to use a literature review approach to systematically synthesize the latest empirical and conceptual literature on student entrepreneurship digital competencies and digital mindsets in the post-COVID-19 era. Meanwhile, the specific objectives are to: (a) identify relevant core competencies of entrepreneurship in the digital age, (b) analyze the characteristics of digital mindsets that influence entrepreneurial intentions, (c) assess the impact of entrepreneurship education on students' digital entrepreneurship mindsets, and (d) highlight gaps and propose conceptual frameworks for entrepreneurship education in higher education. The discussion was more focused on the post-COVID-19 pandemic context, which is relevant to the demands of the digital era. Therefore, this research is expected to provide a scientific basis for the development of entrepreneurial education strategies in universities and become a guideline for the implementation of entrepreneurship student development programs.

To ensure a systematic and focused research approach, this study asks several key research questions designed to in-depth reveal the dimensions of entrepreneurial competencies and students'

digital mindsets in the post-COVID-19 pandemic digital era. The following is a list of questions that will be answered in the results of this study:

1. What is the impact of entrepreneurship education on students' entrepreneurial intentions in the digital era?;
2. What are the basic entrepreneurial competencies that students must have to adapt and develop in the digital era?
3. What are the characteristics that students need to support entrepreneurial development in the digital era?;
1. How does the digital mindset affect students in entrepreneurship in the digital era?

To answer these questions, the reference analysis process involves identifying, selecting, and synthesizing scientific articles that address these questions, thereby providing a comprehensive and evidence-based picture.

This research is believed to make an academic contribution by mapping trends, patterns, and research gaps on entrepreneurial competencies and students' digital mindsets in enriching the existing literature on digital entrepreneurship. Practically, the results of this research can also be a reference for policy makers, educators, and managers of entrepreneurship programs in universities to design curricula, learning strategies, and student entrepreneurship development programs that are more targeted in the era of digital transformation. In addition, this research offers real implications in the higher education environment by developing a digital-based entrepreneurial ecosystem and filling the literature gap.

2. METHODS

This study examines the entrepreneurial competencies and digital mindset that students need to possess in the post-COVID-19 pandemic era. It is a type of qualitative research that uses the Systematic Literature Review (SLR) approach to obtain a comprehensive picture of the topic being researched. The choice of the SLR method is due to its ability to systematically and transparently synthesize empirical evidence scattered in various previous studies (Kitchenham & Charters, 2007). Several stages will be carried out in the literature selection process for this research, namely: (1) formulating research questions: research questions that are formulated focus on identifying entrepreneurial competencies, characteristics of digital mindsets, as well as opportunities and challenges faced by students in the post-pandemic digital era, (2) determining a literature search strategy: searching for literature through a database of internationally reputable scientific journals indexed by Scopus. The search was conducted using a combination of keywords, including digital entrepreneur, entrepreneurial competence, digital mindset, university students, post-pandemic entrepreneurship, and digital era skills, in Google Scholar. The keyword combinations used are:

("digital entrepreneurship" OR "digital entrepreneur") AND ("entrepreneurial competence" OR "entrepreneurial skills") AND ("digital competence" OR "digital mindset") AND ("University Students" OR "Higher Education" OR "College student") AND covid-19."

(3) Article selection process based on inclusion and exclusion criteria: Articles are selected by applying inclusion and exclusion criteria. The selected articles must meet the criteria as seen in Table 1, (4) data extraction: data from the selected articles are extracted using a table format that contains: author name and year, research title, research objectives, methods used, variables (entrepreneurial competence, digital mindset), main findings, and research recommendations, and (5) thematic analysis of the selected study findings: data is analyzed qualitatively with a thematic analysis approach to find Patterns based on the number of articles analyzed, publication trends (year, country, academic impact), main themes consisting of: The influence of entrepreneurship education, competencies, characteristics and digital mindset of students in entrepreneurship in the digital era.

Table 1. Inclusion and exclusion criteria

Criteria	Inclusion	Exclusion
Publication Type	Articles of reputable international journals indexed by Scopus	Non-scientific articles, opinions, editorials, and journal articles that Scopus does not index
Year of Publication	2022–2025 (Post-pandemic COVID-19)	Before 2022
Language	English	Other languages
Abstract and Keywords	Contains the words digital entrepreneurship, entrepreneurial competencies, and the <i>digital mindset</i> of students in the digital era	It does not include the terms 'digital entrepreneurship,' 'entrepreneurial competencies,' and the 'digital mindset' of students in the digital era.
Research Methods	Empirical studies, conceptual studies, and literature review studies	Reports without a transparent methodology

2.1 Literature selection process (using the PRISMA model)

The PRISMA model guides the literature selection process to ensure transparency and reduce bias. The literature selection process consists of four main stages, which include (a) Identification: Collecting preliminary data from Google Scholar search results. The literature selection process is carried out based on the type of literature and the year of publication. To ensure quality and relevance, only articles published by Scopus-indexed journals will be selected. (b) Screening: At this stage, a review of the title and abstract of all articles that pass the identification stage is carried out. Articles whose titles or abstracts do not contain the words digital entrepreneurship, entrepreneurial competence, and digital mindset of students in the digital era will be removed from the list. (c) Eligibility: A more in-depth assessment will be conducted by two independent researchers based on the inclusion criteria and research focus. If disagreements arise between researchers, it will be resolved through discussion or intervention by third-party researchers. Articles that pass the screening stage will be read in full, while those that do not meet the requirements will be removed consistently based on the exclusion criteria. (d) Inclusion: All eligible articles will be used as primary references to answer research questions. The results of the data extraction will be presented in the results of the study. To facilitate a clearer understanding of the literature selection process in this study, the stages and explanations are illustrated in Figure 1.

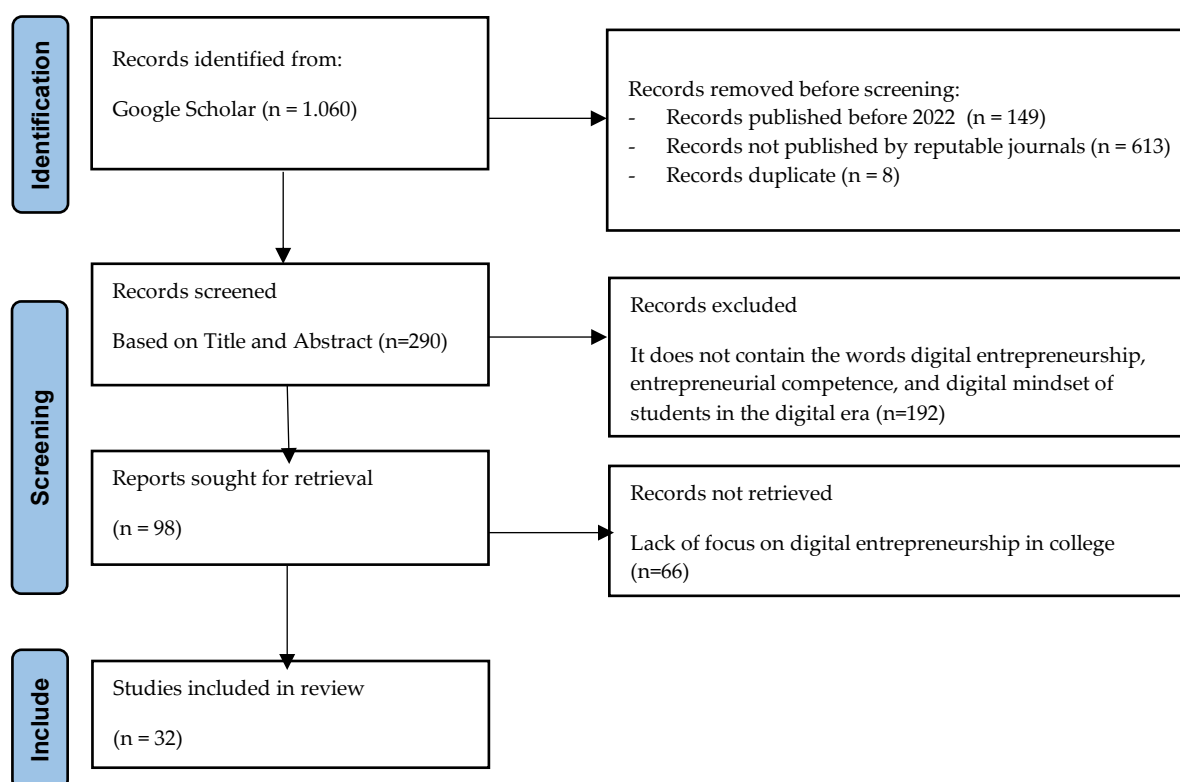


Figure 1. PRISMA Flowchart

The results of the identification using Google Scholar obtained 1,060 articles relevant to the keywords. Before the screening process was carried out, there were 790 articles that were eliminated because the year of publication was irrelevant, the articles were not published by Scopus-indexed journals, and duplicates were identified. The screening process was carried out to select articles whose titles and abstracts contained the words digital entrepreneurship, entrepreneurial competence, and digital mindset of students in the digital era, resulting in 98 relevant articles. The next stage is to choose an article that focuses on discussing digital entrepreneurship in higher education. At this stage, the screening process is carried out by two experts who work as entrepreneurship lecturers. Based on the agreement between the reviewers, 32 articles were obtained that were really relevant to be studied in this study. The identification process is carried out based on the categories that have been determined in Table 1.

3. FINDINGS AND DISCUSSION

The literature selection process, conducted using the PRISMA framework, has resulted in 32 journal articles published in reputable journals indexed by Scopus (the list of literature is presented in Table 2). Following a systematic literature review process, an overview of research developments related to digital entrepreneurship competencies in higher education after the COVID-19 pandemic was obtained. Overall, the articles are divided into three groups based on the primary focus of this research, namely: (1) characteristics of digital entrepreneurship, (2) digital entrepreneurship competencies, and (3) the influence and impact of entrepreneurship education on students' entrepreneurial intentions.

Table 2. List of selected articles

Author	Year	Citation	Subject	Country
(Biclesanu et al., 2023)	2023	21	Characteristics	Rumania
(Çela et al., 2025)	2025	7	Characteristics	Albania
(Darmanto et al., 2023)	2023	17	Characteristics	Indonesia
(Güven et al., 2024)	2024	0	Characteristics	Turki
(Jintana et al., 2025)	2025	1	Characteristics	Thailand
(Jorge-Vázquez et al., 2022)	2022	3	Characteristics	Polandia
(Lediana et al., 2023)	2023	19	Characteristics	Indonesia
(Li et al., 2025)	2025	2	Characteristics	China
(Patru et al., 2023)	2023	2	Characteristics	Romania
(S. Li et al., 2024)	2024	26	Characteristics	China
(Sunaryo et al., 2025)	2025	1	Characteristics	Indonesia
(Wu & Tien, 2024)	2024	3	Characteristics	Taiwan
(Abina et al., 2025)	2025	3	Competence	Poland
(Abiodun, 2025)	2025	0	Competence	Nigeria
(Araoye et al., 2024)	2024	0	Competence	Nigeria
(Gallego-Arrufat et al., 2023)	2023	5	Competence	Spain
(Ganefri et al., 2024)	2024	3	Competence	Indonesia
(Herold, 2022)	2022	12	Competence	Austria
(Lopes et al., 2025)	2025	9	Competence	Portugal
(Lesinskis et al., 2023).	2023	60	Influence and impact	Latvia
(Liang et al., 2025)	2025	0	Influence and impact	China
(Mohd Noor et al., 2023).	2023	25	Influence and impact	Malaysia
(Sansone et al., 2024)	2024	14	Influence and impact	Italia
(Satar et al., 2024)	2024	13	Influence and impact	Saudi Arabia
(Sayed & Abedelrahim, 2024)	2024	10	Influence and impact	Saudi Arabia
(Setyani et al., 2025)	2025	0	Influence and impact	Indonesia
(Shah et al., 2023)	2023	29	Influence and impact	Indonesia
(Simovic et al., 2023)	2023	23	Influence and impact	Kuwait
(Singh & Dwivedi, 2022)	2022	21	Influence and impact	India
(Wibowo et al., 2023)	2023	78	Influence and impact	Indonesia
(Xiang et al., 2022)	2022	39	Influence and impact	China
(Zhai et al., 2023)	2024	5	Influence and impact	China

The results of data extraction presented in the subject column (Table 2) show that twelve articles focus on discussing the characteristics, motivational factors, and readiness of students to face digital business opportunities. Furthermore, the importance of digital entrepreneurship competencies, including technology skills, digital literacy, digital creativity, and the ability to develop technology-based business strategies, is discussed in seven literatures. Meanwhile, thirteen other articles highlight the influence and impact of digital entrepreneurship education on students' entrepreneurial intentions.

When viewed in terms of the academic impact it produces, based on the number of citations it yields, the selected literature exhibits various impact factors. A total of fourteen articles have collected more than ten citations, including the work of (Wibowo et al., 2023), with 78 citations; (Lesinskis et al., 2023), with 60 citations; (Xiang et al., 2022), with 39 citations; and (Shah et al., 2023), with 29 citations. Of the three main subjects identified, the most cited articles generally discuss the influence and impact of entrepreneurship education on digital entrepreneurship competencies and students' entrepreneurial intentions in the digital era. Meanwhile, the four articles that have not been cited are from the latest year (2024–2025), so there is not enough time for them to be cited. The high number of citations obtained by some literature indicates that the field of digital entrepreneurship is currently still growing and has strong momentum and appeal in the academic literature.

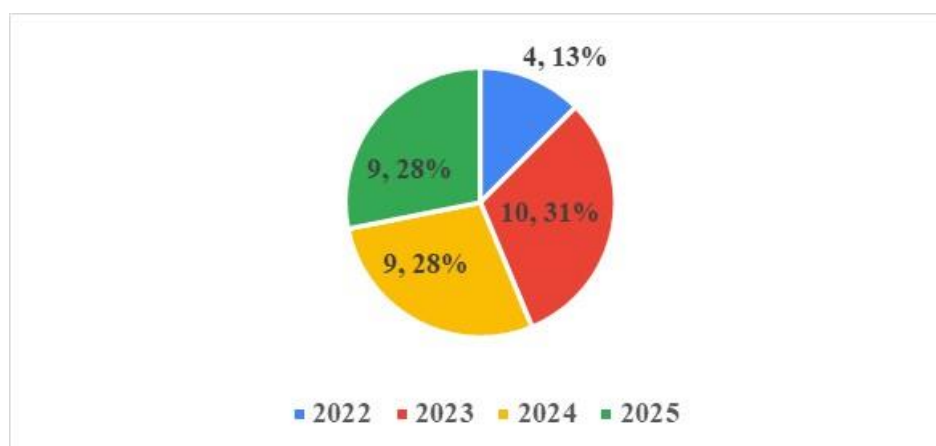


Figure 2. Article Distribution by Year

If viewed based on the number of publications per year, the momentum of increasing the number of publications discussing digital transformation and entrepreneurial behavior after the pandemic crisis occurred in 2023, from four articles in 2022 to ten articles. This momentum persists, with nine articles in 2024. Meanwhile, by 2025, although the calendar year at the time of this study has not been fully completed, six articles have been published. This reinforces the evidence that digital entrepreneurship remains a significant research issue in the context of higher education, and the issue of digital-based entrepreneurship competencies is becoming increasingly relevant in responding to changes in the economic and learning ecosystem, which is increasingly integrated with post-pandemic technology.

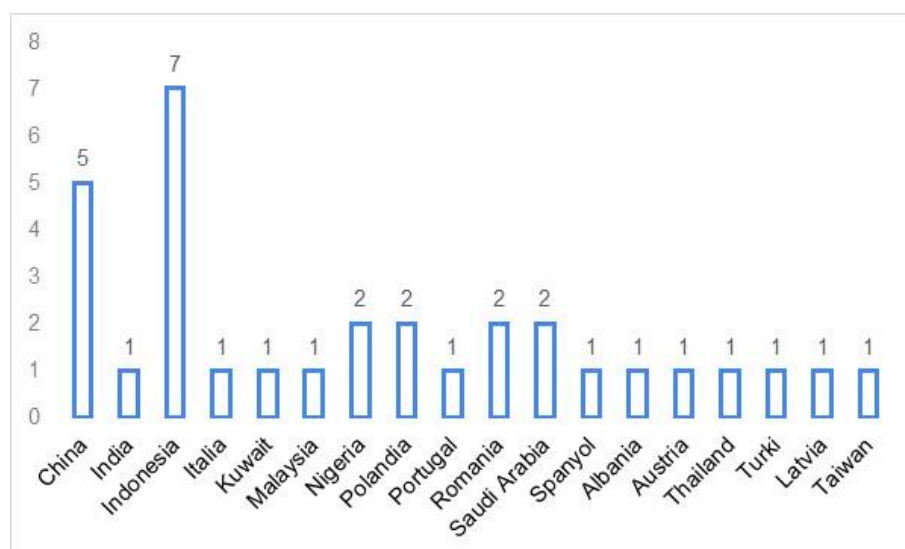


Figure 3. Article Distribution by Country

In terms of country distribution, this study shows a wide geographical coverage with significant contributions from Asian, European, and African countries. Thirty-two articles were selected using the PRISMA model, spread across eighteen countries. Most of the literature was published in Indonesia (7 articles), followed by China with four articles, and the remaining articles were spread evenly across 16 other countries. The country's high distribution shows that the issue of digital entrepreneurship in college has become a global concern. When associated with the research subject, the characteristics and focus of research vary by country, influenced by social, cultural, and technological developments. Developed countries tend to discuss more strategic aspects and models of digital integration in

entrepreneurship education, while developing countries place more emphasis on the competence and impact of digital education.

3.1 The Impact of Entrepreneurship Education

Entrepreneurship education (EE) plays an important role in fostering entrepreneurial intention (EI) among university students. Of the studies included in this review, 13 examined the influence of entrepreneurship education on entrepreneurial outcomes. The evidence generally indicates a positive relationship between EE and students' entrepreneurial intentions (Lesinskis et al., 2023; Wibowo et al., 2023), with entrepreneurship education contributing to students' willingness to pursue entrepreneurial activities (Ganefri et al., 2024; Wibowo et al., 2023). This relationship appears particularly evident when entrepreneurship education emphasizes experiential and practice-oriented learning rather than predominantly theoretical instruction (Liang et al., 2025). In the context of digital transformation, digital entrepreneurship competency (DEC) also emerges as an important factor associated with digital entrepreneurial intention (DEI) (Singh & Dwivedi, 2022). Digital literacy further contributes to the development of entrepreneurial intention (Ganefri et al., 2024), while digital and coding skills are positively associated with students' entrepreneurial engagement and entrepreneurship activities (Sansone et al., 2024).

The relationship between entrepreneurship education and entrepreneurial intention is further shaped by several cognitive and psychological mechanisms. Entrepreneurial mindset has been identified as a mediator linking entrepreneurship education with entrepreneurial intention, suggesting that the benefits of entrepreneurship education extend beyond knowledge acquisition to the development of entrepreneurial ways of thinking (Ganefri et al., 2024). Similarly, creativity mediates the relationship between practice-based entrepreneurship education and digital entrepreneurial intention (Liang et al., 2025), while entrepreneurial motivation mediates the relationship between digital entrepreneurship competency and digital entrepreneurial intention (Singh & Dwivedi, 2022). Self-efficacy also plays an important, although potentially complex, role in entrepreneurial outcomes. It has been associated with the relationships among institutional support, sociocultural factors, and new venture performance (Mohd Noor et al., 2023), as well as with students' entrepreneurial aspirations and entrepreneurial mindset (Ganefri et al., 2024). However, Ganefri et al. (2024) also reported an unexpected diminishing effect of self-efficacy in one of the examined relationships, indicating that its role may vary across entrepreneurial contexts and warrants further investigation.

3.2 Basic entrepreneurial competencies

The competencies required for entrepreneurship have evolved substantially in response to rapid technological development and the increasing digitalization of business activities. Seven studies included in this review specifically addressed the core competencies required for entrepreneurship in the digital era. The synthesis of these studies identifies three interrelated competency domains: digital and technical competencies, managerial and entrepreneurial mindset competencies, and digital rights and responsibilities.

First, digital and technical competencies represent a fundamental component of contemporary entrepreneurship. Students need entrepreneurial digital competencies (DEC), including knowledge and effective application of information and communication technology (ICT) in entrepreneurial activities (Araoye et al., 2024). Higher levels of DEC are associated with stronger intentions to engage in digital entrepreneurship (Abina et al., 2025), while social media management competencies and participation in digital training have also been identified as important factors supporting entrepreneurial development (Abiodun, 2025). These competencies extend beyond operational technology skills to the strategic use of ICT and the internet across entrepreneurial processes, including opportunity identification and evaluation, content creation, distribution, and digital marketing (Araoye et al., 2024). Specific technical competencies include social media marketing, cloud computing, cybersecurity, data analytics, and user experience (UX) design. Students also need the capacity to

manage digital branding, marketing, and communication processes while addressing risks associated with digital business environments (Araoye et al., 2024). Complementing these technical capabilities, business knowledge, business model innovation (BMI), understanding of emerging technologies, and the ability to act under conditions of uncertainty are important capabilities for digital entrepreneurship (Herold, 2022).

Second, managerial competencies and an entrepreneurial mindset complement technical capabilities by enabling students to translate digital knowledge into entrepreneurial action. Digital entrepreneurs require leadership and management competencies that respond to the challenges of digitally transformed work and business environments (Herold, 2022). Proactiveness, innovativeness, and self-management are particularly important elements of a digital entrepreneurial mindset (Araoye et al., 2024; Herold, 2022). These attributes support students in recognizing entrepreneurial opportunities arising from technological developments, generating valuable ideas, collaborating through diverse forms of teamwork, and responding effectively to uncertainty (Herold, 2022). Moreover, students need a broader entrepreneurial perspective that enables them to respond to both global and local challenges while incorporating sustainability through a triple-bottom-line approach to humane entrepreneurship (Herold, 2022).

Third, digital rights and responsibilities (DR&R) emerge as an important but frequently overlooked dimension of digital entrepreneurship education (Gallego-Arrufat et al., 2023). Beyond developing technological proficiency, students need sufficient legal and ethical knowledge to understand their rights and responsibilities when conducting entrepreneurial activities in digital environments. The DR&R framework encompasses three main dimensions: rights to equality and participation, including universal access, participation, access to information, freedom of expression, and digital education; rights to freedom, including privacy, digital identity, cybersecurity, and data protection; and rights to development, creation, and sustainability, including authorship, intellectual property, participation in digital environments, and sustainable digital practices (Gallego-Arrufat et al., 2023). These competencies are particularly relevant to entrepreneurship education because students must be prepared not only to exploit digital business opportunities but also to manage data responsibly, protect privacy and intellectual property, and address the ethical and legal implications of technology-based entrepreneurial activities (Gallego-Arrufat et al., 2023).

3.3 Entrepreneurial characteristics

This review identified 12 studies that examined the entrepreneurial characteristics required by university students in the digital era. The synthesis indicates that these characteristics encompass three interrelated dimensions: cognitive and innovative characteristics, psychological and behavioral characteristics, and functional and digital capabilities.

First, cognitive and innovative characteristics are central to students' ability to recognize and pursue entrepreneurial opportunities. Creativity and innovativeness consistently emerge as important attributes associated with digital entrepreneurial intention and behavior (Darmanto et al., 2022; Jintana et al., 2025; Lediana et al., 2023; Q. Li et al., 2025; S. Li et al., 2024; Wu & Tien, 2024). Innovativeness, in particular, has been positively associated with entrepreneurial tendencies among university students (Güven et al., 2024), while creativity supports the generation of original ideas and the identification of potential business opportunities (Darmanto et al., 2022). Proactiveness is another important characteristic that enables students to anticipate changes, take initiative, and respond to emerging opportunities within the digital entrepreneurship ecosystem (Adam et al., 2025).

Second, psychological and behavioral characteristics influence students' readiness to translate entrepreneurial opportunities into action. Self-efficacy, or individuals' belief in their ability to successfully perform entrepreneurial tasks, is consistently associated with entrepreneurial intention (Darmanto et al., 2022; Jintana et al., 2025; Q. Li et al., 2025; Sunaryo et al., 2025). Other relevant psychological attributes include passion and initiative, which encourage students to pursue entrepreneurial opportunities (Laptev & Shaytan, 2022; Q. Li et al., 2025), and a willingness to take risks

when facing uncertain business conditions (Biclesanu et al., 2023; Laptev & Shaytan, 2022). Resilience is also important for navigating the challenges and uncertainties associated with digital entrepreneurship (Çela et al., 2025), while achievement motivation contributes to students' willingness to engage in entrepreneurial behavior (Wu & Tien, 2024).

Third, functional and digital capabilities enable students to apply entrepreneurial attributes effectively within technology-driven environments. Technological readiness and digital literacy are particularly important in preparing students to identify and exploit digital business opportunities (Biclesanu et al., 2023; Güven et al., 2024). Digital literacy is also positively associated with innovativeness and entrepreneurial intention, indicating that technological proficiency and entrepreneurial characteristics are increasingly interconnected in digital entrepreneurship (Güven et al., 2024). These digital capabilities are complemented by managerial and interpersonal competencies, including leadership, communication, decision-making, and teamwork (Patru et al., 2023). Collectively, these cognitive, psychological, behavioral, managerial, and digital characteristics provide students with the capabilities required to transform entrepreneurial ideas into innovative activities within increasingly digitalized business environments (Çela et al., 2025).

3.4 Entrepreneurship digital mindset

A digital entrepreneurial mindset can be understood as a multidimensional cognitive orientation that enables students to adapt to technological change, recognize emerging opportunities, develop innovative solutions, and use digital technologies responsibly. In the context of entrepreneurship, this mindset extends beyond basic technological knowledge to include the ability to respond to changes in the digital environment and develop new products or business solutions (F. Li & Sukpasjaroen, 2024). It is characterized by an adaptive orientation through which students effectively use digital platforms, engage in technology-supported learning, and continuously adjust their knowledge and strategies in response to evolving digital resources and environments (Satar et al., 2024). Such adaptability enables students to navigate both the opportunities and constraints created by rapid technological change (Liang et al., 2025).

The synthesis of the reviewed studies identifies four key dimensions of a digital entrepreneurial mindset. First, innovative and creative orientation enables students to generate, develop, and implement new ideas within digital entrepreneurial environments (Satar et al., 2024). Innovation represents an important component of the entrepreneurial mindset (Ganefri et al., 2024), while creativity enables students to envision and develop entrepreneurial solutions in response to emerging needs and opportunities (Liang et al., 2025). Second, proactiveness and tolerance of ambiguity reflect students' capacity to take initiative and respond constructively to uncertainty. Proactiveness supports an entrepreneurial orientation toward anticipating and shaping future opportunities (Ganefri et al., 2024), whereas the ability to act under uncertain conditions is particularly important in rapidly changing digital environments (Herold, 2022). This dimension also involves cognitive readiness to reflect on and respond to ambiguous entrepreneurial situations (Ganefri et al., 2024).

Third, digital proficiency involves more than the ability to operate digital technologies. It encompasses digital literacy, self-management, and problem-solving skills that enable students to use technology strategically in entrepreneurial activities (Satar et al., 2024). Digital proficiency also supports adaptability and responsiveness in developing new products and recognizing opportunities created by digital transformation (F. Li & Sukpasjaroen, 2024). These capabilities can be manifested through purposeful digital practices, including the strategic use of social media for entrepreneurial growth and opportunity development (Liang et al., 2025). Fourth, an ethical and holistic orientation enables students to recognize entrepreneurship as part of a broader digital ecosystem involving multiple actors, responsibilities, and consequences (Garcez et al., 2022). This orientation requires the integration of technological and legal knowledge, particularly regarding data protection, privacy, digital rights, and responsible technology use (Gallego-Arrufat et al., 2023). It also highlights the need to develop management and leadership capabilities that enable students to navigate digital

transformation responsibly (Herold, 2022). Collectively, these dimensions suggest that a digital entrepreneurial mindset combines adaptability, creativity, proactive thinking, digital proficiency, and ethical awareness to prepare students for entrepreneurship in dynamic and technology-driven environments.

Discussion

The results of this study show that, in general, research on digital entrepreneurship competencies and digital mindsets among students in higher education has increased significantly after the COVID-19 pandemic. The increase shows that issues about students' digital competencies, characteristics, and mindsets have become an important theme in contemporary entrepreneurship research. These findings support the argument Xia et al. (2024) that the pandemic has been a significant catalyst for digital transformation in the fields of education and entrepreneurship. These findings contrast with traditional studies conducted before the pandemic, which focused more on managerial skills and business planning aspects (Liang et al., 2025; Sansone et al., 2024). It is undeniable that the COVID-19 pandemic has not only changed learning systems and models, but has also had a significant impact on the evolving entrepreneurial landscape in colleges, which continues to evolve.

Entrepreneurship Education (EE) is one of the indicators of entrepreneurial development in higher education. Based on the results of this study, EE is one of the important foundations in the development of entrepreneurial competencies and has a consistent and significant influence on students' entrepreneurial intentions in the digital era. These findings support the arguments presented in previous studies by González-López et al. (2021) and RezaeiZadeh et al. (2017). EE not only acts as a means of knowledge transfer but also as a cognitive-psychological factor that shapes students' readiness to become entrepreneurs in the digital ecosystem. In addition, the results of SLR show that *entrepreneurial mindset* and *self-efficacy* play an important role as mediators in the relationship between EE and entrepreneurial intentions emphasizing the need to adapt entrepreneurial mindset to digital market dynamics (Ganefri et al., 2024; Mohd Noor et al., 2023).

Furthermore, the results of the SLR also reveal that, in general, entrepreneurial competencies in the digital era can be divided into two categories, namely: (1) *digital competencies*, which include digital literacy competencies, social media marketing, data analysis, and understanding of new technologies. (2) *Core Competencies of Entrepreneurship*, which consists of innovation, productivity, problem-solving, and the ability to manage uncertainty. These results reinforce the argument of Nambisan (2017) & Pham et al. (2023) who assert that technological mastery and innovation-based mindset are indispensable in digital entrepreneurship. The next finding is that digital rights and responsibilities turn out to be one of the entrepreneurial competencies that must be owned and cannot be ruled out in the digital era (Gallego-Arrufat et al., 2023). Until now, in traditional entrepreneurship studies or pre-pandemic research, this competency has not been emphasized. These results are in line with the findings of Abou Hashish & Alnajjar (2024), who noted that the integration of digital competencies into the curriculum is still not optimal. SLR data shows that, although students have good technology readiness, there is still a significant gap in mastering advanced digital skills, such as cybersecurity, process automation, and user experience design.

Beyond the role of entrepreneurship education, this review shows that entrepreneurial competencies have evolved into a broader set of integrated digital capabilities. The literature consistently identifies digital literacy, social media marketing, cybersecurity awareness, cloud computing, data analytics, business model innovation, and user experience design as fundamental competencies for digital entrepreneurs (Araoye et al., 2024; Jardim, 2021; Liang et al., 2025). This competency expands on traditional entrepreneurship theory by emphasizing that entrepreneurs must have technological expertise and strategic business knowledge (Maghsoudi et al., 2025). Therefore, these findings support the Dynamic Capabilities perspective, which emphasizes the importance of continuing to perceive new opportunities, leveraging emerging technologies, and reconfiguring

organizational resources in response to changing environments (Mishra & Singh Kaurav, 2024). In the post-pandemic digital economy, entrepreneurial competitiveness increasingly depends on the ability of entrepreneurs to adapt quickly to technological disruption rather than on static managerial competence alone (Odugbesan et al., 2026).

An important point that can be identified from the findings of this study is that the dominant characteristics of students who are ready to be entrepreneurial in the digital era must have creativity, innovation, productivity, resilience, and risk-taking skills, as revealed in the research findings of Güven et al., (2024), which place creativity and innovation as strong predictors of entrepreneurship. However, in the context of digital opportunities, the effects of creativity and innovation are more prominent when combined with adequate digital literacy skills.

Interestingly, the characteristics of self-efficacy show a more complex pattern. Although previous research has shown a positive relationship between self-efficacy and entrepreneurial intention (Isac et al., 2023), one of the findings in this SLR suggests that self-efficacy may weaken the relationship between entrepreneurial knowledge and the tendency to start a business (Ganefri et al., 2024). These findings pave the way for new research, especially in relation to how overconfidence or optimism bias can hinder the translation of business knowledge into practical action in a digital ecosystem characterized by uncertainty.

The discussion in SLR reveals that the digital mindset is a multidimensional construct that includes adaptability, innovation, digital literacy, and ethical awareness in the use of technology. These findings are in line with the views of Mirhabibi et al. (2025) and Yáñez-Valdés & Guerrero (2024) regarding the importance of a digital mindset for Generation Z in the context of learning and work. However, this SLR reveals that the digital mindset includes not only the ability to use technology but also strategic thinking in dealing with digital ambiguity, risk management, and data-driven decision-making (Herold, 2022). In this context, the latest research is more comprehensive than previous research, which still views the digital mindset as a single dimension of technical capabilities.

Another important finding is the close relationship between a digital mindset and the ability to find digital opportunities (Liang et al., 2025). This pattern supports Namibian's theoretical model of the introduction of digital entrepreneurship opportunities, but this study shows that students need more than just competencies, namely cognitive and affective readiness that are in harmony with the dynamics of digital technology.

Overall, the results of SLR expand on the findings of previous research by showing that the development of digital entrepreneurial competencies and post-pandemic students' digital mindset is not only influenced by entrepreneurship education, but also by personal characteristics, technical competence, as well as psychological and ethical factors. Previous research that emphasizes the importance of basic entrepreneurial competencies is now strengthened by evidence that digital elements, both in the form of skills and mindsets, have become an inseparable dimension in the process of forming young entrepreneurs.

The SLR also identifies gaps in the literature, particularly the lack of integration between entrepreneurial competencies and digital mindsets within a comprehensive conceptual framework. Thus, this study not only confirms the results of previous research but also provides a new direction for curriculum design, learning models, and student entrepreneurship development interventions that are more relevant to the demands of the digital age.

Regarding the interpretation of the results, this study has several limitations that must be considered. The lack of heterogeneity of country contexts, research methods, and variations of digital competency measurement instruments and digital mindsets make research findings too focused on universities and not focused on specific regions, as well as vulnerable to perception bias. Therefore, further research is needed to develop an integrated theoretical model that comprehensively links digital entrepreneurial competencies, digital mindsets, and students' psychological factors, with a focus on specific regional regions. In addition, it is necessary to add contextual factors such as digital culture,

technological infrastructure, and campus innovation ecosystem support to shape students' digital entrepreneurial behavior and the development of standardized measurement instruments.

4. CONCLUSION

This research aims to provide a comprehensive understanding of the competencies and digital mindsets needed for student entrepreneurship by identifying various relevant competencies and analyzing the characteristics of digital mindsets that support the development of student entrepreneurship post-COVID-19 pandemic. The results of this study show that the pandemic has become a major catalyst in accelerating the digital transformation process in the education and entrepreneurship sectors. To enter the business world, students are required to master digital literacy competencies, including the ability to adapt to technology and innovate, as well as ethical awareness in utilizing the digital space, in addition to basic entrepreneurial competencies. Based on the results of SLR in the main literature, it was revealed that entrepreneurial competence and digital mindset are important points in determining students' readiness to enter the entrepreneurial ecosystem in the post-COVID-19 pandemic era. Entrepreneurship education has been shown to have a significant influence on students' digital entrepreneurial intentions, especially when it combines a practice-based learning approach, digital experiences, and the development of cognitive aspects such as entrepreneurial mindset and self-efficacy. In addition, personal characteristics such as creativity, productivity, and resilience are increasingly showing high relevance in the context of digital entrepreneurship.

In general, there is collaboration and linkage between digital competencies, digital mindsets, and entrepreneurial behaviors in forming the foundation for technology-based young entrepreneur development, even though digital competencies develop differently in different countries. This is influenced by the readiness of technology and the education ecosystem in each country. These findings also yield some practical implications. Colleges must redesign the entrepreneurship curriculum by integrating experiential learning, digital technologies, interdisciplinary collaboration, business incubation, and responsible digital innovation into entrepreneurship education. Policymakers and higher education institutions must strengthen digital infrastructure and innovation ecosystems that facilitate students' transition from entrepreneurial intent to venture creation. Such initiatives are essential to prepare graduates who are able to compete in the era of the digital economy that makes technology its main foundation.

Apart from the contributions generated, research has some limitations that must be acknowledged. The studies reviewed differed greatly in the context of the research, methodological approaches, and measurement instruments, thus limiting the comparability and generalization of the existing evidence. In addition, most empirical studies continue to focus on entrepreneurial intent rather than entrepreneurial behavior and actual business performance. Therefore, future research should develop an integrated theoretical model that examines the dynamic relationship between entrepreneurial competencies, digital mindsets, institutional support, and the maturity of digital ecosystems. Longitudinal and cross-border comparative studies are also needed to better understand how contextual factors, including digital infrastructure, culture, public policy, and new technologies such as artificial intelligence, shape the development of sustainable digital entrepreneurship and entrepreneurship competencies in higher education.

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