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Systematic Review

Digitised Entrepreneurship Education in Tertiary Institutions: A Systematic Literature Review of Research Themes and Entrepreneurial Effectiveness

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Abstract

Entrepreneurship Education (EE) is acknowledged for developing entrepreneurial skills, ideas, and knowledge to support individuals and foster independence, thereby promoting economic growth and national sustainability. Digitised EE has been proposed as a means to strengthen entrepreneurial effectiveness and economic transformation. This literature review classifies studies on digitised EE, emphasises how it supports entrepreneurial effectiveness, and suggests guidelines for digitised EE performance in Tertiary Institutions (TIs). A search strategy was used to identify publications in databases such as Scopus, ScienceDirect, DOAJ, WOS, IEEE, and Cochrane. The publication range spanned from 2012 to 2024. A total of 912 publications were identified in the database, of which 43 met the inclusion criteria. Digitised EE requires considerable study to determine its impact on reducing unemployment, economic development through TIs, and the Sustainable Development Goals (SDGs). A descriptive research design was adopted; the themes selected were acknowledged in the research and discussed based on data extracted from the included criteria. Additionally, most of the included criteria are recent publications, with journals the most frequently identified and quantitative methods the most commonly applied. The lack of improved EE deprives the realisation of entrepreneurial effectiveness, which is attributed to Artificial Intelligence (AI), entrepreneurial knowledge, competitiveness, and strategic decisions. It is imperative to research digitised EE practices for entrepreneurial effectiveness and efficiency in the education sector for a country's growth. Recommendations for related studies are provided in the review.

Keywords: entrepreneurship education; entrepreneurial effectiveness; digitised system; entrepreneurial enthusiasm; SDG; system improvement

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1. Introduction

A digitised education system is characterised as effective support of the learning process through technology, for valuable teaching and learning in education [1]. Entrepreneurship Education (EE) is regarded as a driver of economic growth and development [2]. Digitised

EE can enable entrepreneurial effectiveness by closing the skills gap in the job market for economic development [3]. Thus, digitised EE can foster entrepreneurial enthusiasm, effectiveness, and self-reliance in Tertiary Institutions (TIs) [4]. The implementation of digitised EE can be noteworthy for achieving Sustainable Development Goals (SDGs) numbers 4 [quality education] and 9 [innovation] [5]. Entrepreneurial effectiveness can be defined as the ability to achieve business goals, take effective action, and acquire relevant skills and knowledge [6,7]. The key mechanisms of entrepreneurial effectiveness include taking the right steps resourcefully, with the right characteristics, tenacity, risk, passion, tolerance, vision, and self-efficacy. Several studies on entrepreneurship education exist; however, reviews on digitised EE in TIs for entrepreneurial effectiveness are yet to be identified [8–11]. This warrants studies on digitised EE for effectiveness in entrepreneurial practices.

1.1. Theoretical Perspective

Theoretical perspectives refer to conceptual views or frameworks that are used to analyse and interpret how a review was conducted [12]. Figure 1 illustrates the study's theoretical direction on digitised EE for entrepreneurial effectiveness in TIs, as identified through a literature review. This review aims to classify and synthesise the literature on digitised EE in TIs and to examine how it addresses entrepreneurial effectiveness. The objective is to classify recent studies using a literature review. Thus, EE can support the evolving procurement of entrepreneurial knowledge to help students start a business [13,14]. Knowledge acquisition would require digitised EE procedures for effective growth. Maintaining a digitised EE can create opportunities for entrepreneurial enthusiasm and development [15]. Hence, digitised EE is essential for students'entrepreneurial enthusiasm and economic improvement. Therefore, there is a significant need to highlight the importance of digitised EE for entrepreneurial effectiveness in TIs.

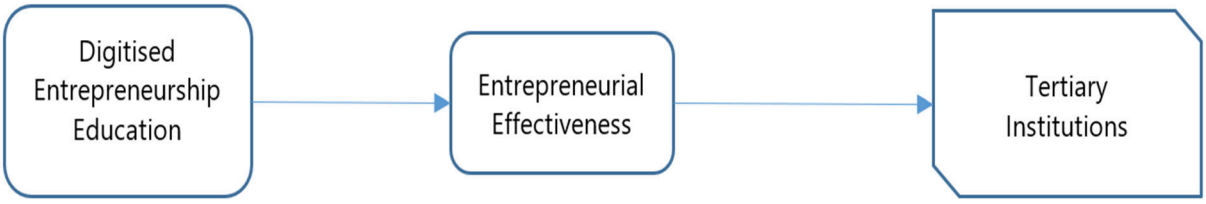


Figure 1. The study direction (authors' own study).

1.2. Description of Entrepreneurship Education

EE could play a critical role in institutions, as importance is placed on digitising dimensions for a better education system [11]. Artificial Intelligence (AI) emancipation has led to a requirement for digitised procedures in the education system [10]. Hence, digitised EE could cultivate growth in the economy through capacity building [16]. EE is referred to as "a part of education that is focused on knowledge, management, ideas, and independence" [17] (p. 139). Thus, EE could encourage entrepreneurial knowledge in students towards idea creation and attention to effectiveness in venture creation [3,18]. Therefore, there is a need to classify the circumstances of digitised EE to realise self-hire and entrepreneurial effectiveness in TIs.

1.3. Importance of Entrepreneurship Education

EE's importance in the transformation of the economy and support in the making, managing and delivering of knowledge and skills through education for a sustainable economy is highlighted by Ardolino et al. [19] and Rosli et al. [20]. Thus, EE would require the exploration of the structures of digitisation for effective entrepreneurial practices [21]. Sunder [22] also believes that TIs need to provide their students with entrepreneurial

mentorship through digital EE structures. There is also a concern that digitised systems in EE are regarded as complicated procedures [7,23]. Therefore, it is important to conduct a study on the relevance of effective EE to achieve entrepreneurial effectiveness among students in TIs.

1.4. Purpose of the Review

EE is significant in establishing an innovative business mindset among students to encourage growth in the economy [24]. Several TIs seem less effective at fostering entrepreneurial skills and proficiency, warranting studies on the use of digitised EE to enhance students' entrepreneurial effectiveness. This study is important for digitised education's efficacy in TIs. Udekwe and Obadire [25] emphasise that reviews directly identify information on a phenomenon from diverse publications and are systematically presented. This systematic literature study showed that a literature review is vital for enquiry into digitised EE for effective entrepreneurial performance among students in TIs.

2. Methodology

A search plan was conducted across several databases, including Scopus, IEEE, WOS, DOAJ, ScienceDirect, and Cochrane [26]. Although many databases are available on EE research, the authors had to consider credibility and authenticity when reporting, and thus chose the above-listed databases for the search. The study covered the period 2012–2024 and accepted only English-language publications. The search adopted a descriptive research design and was conducted in response to the request for effective digitised systems in the education sector. This systematic literature review protocol was registered on the osf.io website and is publicly accessible with the following DOI: https://doi.org/10.17605/OSF.IO/M5B89 (accessed on 14 June 2026).

2.1. Preferred Reporting Items for Systematic Reviews and Meta-Analysis

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) technique is a reporting standard that assists in transparency, reproducibility, and non-biassed reporting [27,28]. Also, PRISMA assists in assessing literature searches in the databases. [29,30]. Therefore, the PRISMA technique was adopted in the study.

2.2. Publication Screening and Selection

A spreadsheet was used to record the extracted data before screening titles and abstracts and selecting publications that met the inclusion criteria for full-text review [31]. Each manuscript was reviewed by the authors, which allowed for their engagement with the data and information; codes were derived inductively and grouped into seven themes.

2.3. Inclusion and Exclusion Criteria

During the literature selection process, the focus was on publications on digitisation, innovation and transformation in EE research. Also, a range of transformative EE for entrepreneurial effectiveness among students in TIs was considered alongside the selected themes. Hence, publications without information on digitisation in EE or the effectiveness of entrepreneurial activities for economic development were excluded. Also, publications not written in English, not aligned with the topic, and that did not have information relevant to the themes were excluded.

2.4. Data Extraction and Validation

An organised process was carried out to gain information required from the publications through the title, year, keywords, journal, aims and objectives [32]. The titles and abstracts of the publications were reviewed to ensure alignment with the study's themes.

Thus, the screening, data extraction and quality assessment were conducted independently by the authors.

2.5. Theme Selection Process

In this review, several themes were identified through the effort of the authors. In this process, codes were derived inductively and grouped into seven (7) themes. Entrepreneurial effectiveness was highly represented in six (6) of the forty-three (43) studies (Table 1). The authors working together in this process assisted in resolving any form of disagreement and in the production of a quality and non-biassed report. Hence, the appraisal was manually conducted by the authors; no appraisal tools (MMAT/CASP/JBI) were applied.

Table 1. Identified themes and publications aligned in the discussion section (authors' own study).

Themes	Book	Conference Papers	Journal Articles	Working Papers
Evidence base		C37	C03, C11, C13, C15, C18, C19, C22, C25, C41	
Effect		C14	C03, C04, C07, C10, C16, C19, C27, C30, C34, C38	C43
Entrepreneurial enthusiasm		C06, C20	C24, C25, C39	
Knowledge procurement			C01, C05, C23, C28, C32, C40	
Impending features	C31		C13, C42	
Improvement capabilities			C08, C12, C13, C15, C18, C21, C26, C29, C33, C36	
Entrepreneurial effectiveness			C02, C07, C09, C13, C17, C35	

2.6. Search Terms

To identify and include relevant data that met the inclusion criteria from the database search, the authors utilised the search terms listed in Table 2. These terms helped combine and search the database simultaneously.

Table 2. The search terms (authors' own study).

Search Keywords	Synonymous Search Terms	Search Threads
Entrepreneurship education	Entrepreneur Entrepreneurship Entrepreneurial effectiveness, Entrepreneurship education	"Entrepreneur" OR "Entrepreneurship" OR "Entrepreneurial effectiveness" OR "Entrepreneurship education"
WITH		
Digitisation in education	Digitise Digitised Digitisation Technology Innovation Transformation	"Digitise" OR "Digitised" OR "Digitisation" OR "Technology" OR "Innovation" OR "Transformation"
AND/OR		
Tertiary institution	Tertiary education Tertiary institution Higher education institution	"Tertiary education" OR "Tertiary institution" OR "Higher education institution"

3. Result

Figure 2 shows that, overall, 912 papers were identified from the database search. After excluding 637 papers not aligned with the topic, 275 papers were selected. Of these, 88 duplicates were eliminated, while 187 abstracts were eligible for the review. Of the 187, 144 were not satisfactory in terms of content, leading to the final selection of 43 based on the inclusion criteria.

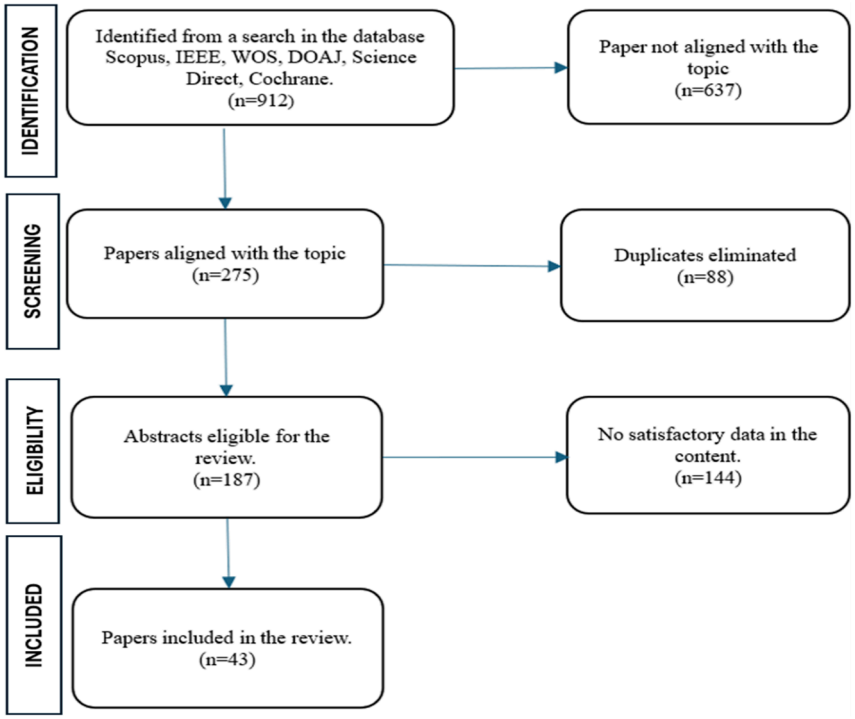


Figure 2. PRISMA technique (authors' own study).

3.1. Year of Publication

Figure 3 shows that, of the 43 selected publications, the majority were published in 2024 (56%), followed by 2021 (14%). The next most frequent year of publication is 2014 at 9%, followed by 2023 at 7%, and 2015 at 5%. The remaining years are as follows: 2012, 2016, 2018, and 2020, at 2% each.

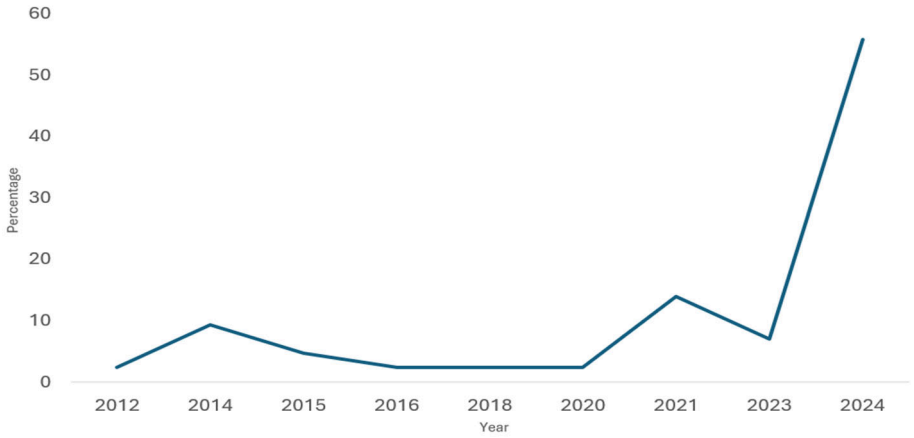


Figure 3. Distribution of selected publications by year (authors' own study).

3.2. Research Design

The research design is detailed through the categories shown in Figures 4–6.

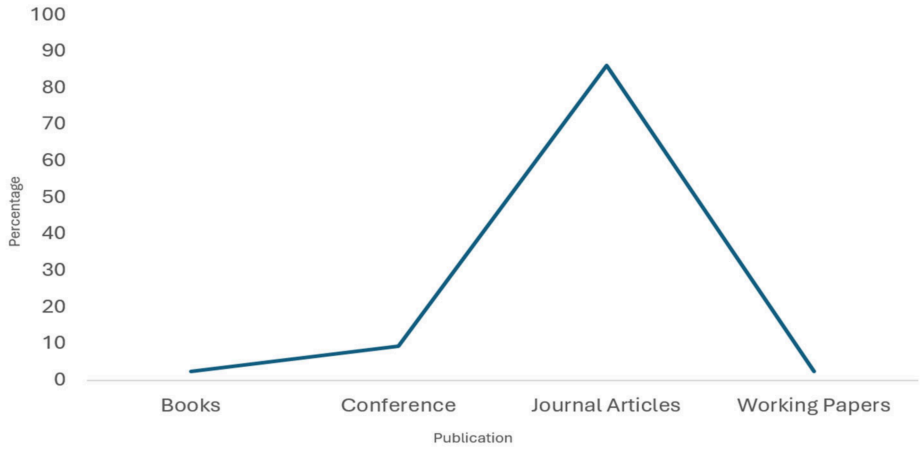


Figure 4. Publication (authors' own study).

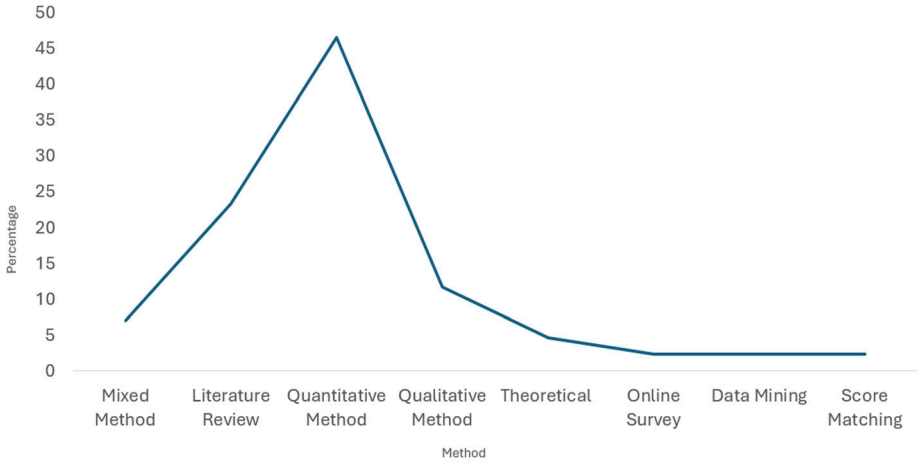


Figure 5. Methodology applied (authors' own study).

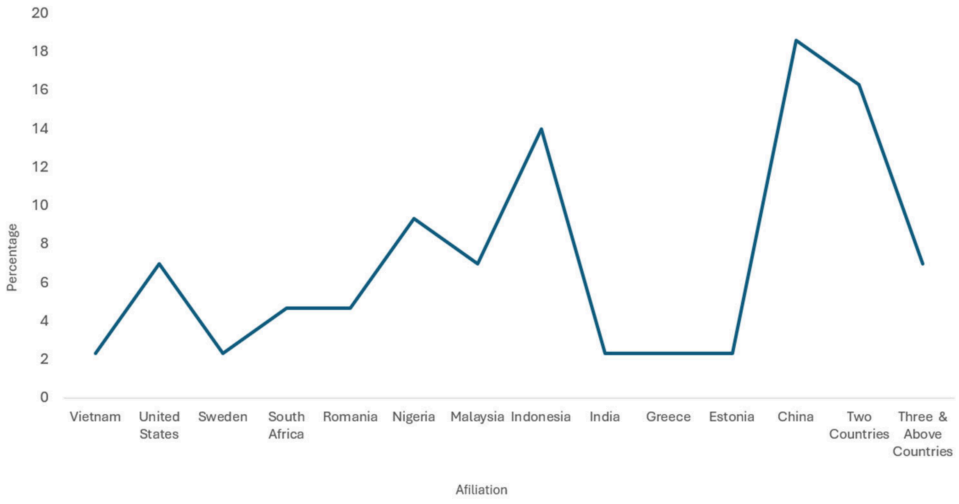


Figure 6. Country (authors' own study).

Figure 4 shows that most publications are journal articles (86%), followed by conference proceedings (9%). Then, books and working papers each comprise 2% of the total number.

Figure 5 indicates that the most common research methods in the selected publications are quantitative, at 47%, followed by literature review, at 23%. The next most common are qualitative, at 12%, then mixed-methods, at 7%, and theoretical, at 5%; online survey, data mining, and score matching are each 2%.

Figure 6 shows China as the most frequent country of publication, at 19%, followed by publications with two collaborations, at 16%. Indonesia comprises 14% and Nigeria 9% of the total. The next most common are the United States of America (USA), Malaysia, and publications with three or more collaborations, at 7% each, and South Africa (SA) and Romania, at 5% each. Vietnam, Sweden, India, Greece and Estonia are 2% each.

Table 3 presents a list of publications meeting the inclusion criteria, including codes, authors, countries, applied methodologies, aims, and objectives.

Table 3. Matrix table of the included criteria within the range (2012–2024) (authors' own study).

Code	Author	Country	Aim	Study Design	Objective
C01	Ehirheme [17]	Nigeria	Explored policies to support graduate students to be entrepreneurs and self-reliant.	Literature	Suggested the digital entrepreneurship concept of training before graduation.
C02	Oyeku et al. [33]	Nigeria	Identified several obstacles to entrepreneurial success.	Literature	Suggested empirical research on entrepreneurial effectiveness in a digital environment.
C03	Hammoda [34]	Estonia	Explored the use of technology in EE courses to develop entrepreneurial competencies.	Literature	Revealed that technology can impact entrepreneurial competencies through efficient funding and perseverance.
C04	Elert et al. [35]	Sweden	Explored the effect of EE through a training programme.	Propensity score matching	Revealed that students should be trained from the time of entry to start a business for long-term sustainability.
C05	Onyebuchi-Igbokwe et al. [36]	Nigeria	Investigated the need for EE focused on employment and expertise procurement.	Quantitative	Revealed that a digitised EE curriculum can contribute to knowledge gains and self-employment.
C06	Liu [37]	China	Explored the defects in digitised EE programmes, including businesses and institutions.	Mixed	Presented a digitised EE programme in training and mentorship to cultivate entrepreneurial enthusiasm.
C07	Ruchiyat et al. [38]	Indonesia	Underlined several challenges that undermine entrepreneurial effectiveness in TIs.	Literature study	Revealed that TIs need to instil an entrepreneurial attitude in students for opportunity identification.

Table 3. *Cont.*

Code	Author	Country	Aim	Study Design	Objective
C08	Xu [39]	China	Poor EE discourages improvement in students' entrepreneurial imagination.	Quantitative	Revealed that digitised EE increases self-support, success and entrepreneurial capabilities.
C09	Hang and Hue [40]	Vietnam	Explored EE prioritising students' entrepreneurial eagerness.	Qualitative	Revealed that EE's tutoring performance improves students' enterprise and venture creation for entrepreneurial effectiveness.
C10	Ghaleb and Bozorov [41]	Saudi Arabia and Uzbekistan	Examined the role EE plays in effective entrepreneurial success.	Quantitative	Proposed digitised EE through apparent educational support to enhance students' abilities.
C11	Rosli et al. [20]	Malaysia	Identified the role of digitised EE in business start-ups.	Theoretical study	Recommended a framework for digitised EE, with incubation programmes to enhance effectiveness.
C12	Han [42]	China	Recognised the talent needed to support digitised EE's driven strategy for economic growth.	Qualitative	Proposed several insights for cultivating the retention of entrepreneurial talent.
C13	Udekwe and Iwu [10]	SA	Recognised the factors preventing the digitisation of EE for entrepreneurial effectiveness.	Literature review	Presented a strategic initiative for digitising EE through policies that enhance entrepreneurial practices.
C14	Xu and Loang [43]	Malaysia	Scrutinised the effect of digitised EE on entrepreneurial success, with financial support.	Quantitative	Revealed that digitised EE programmes are significant for an effective entrepreneurial ecosystem.
C15	Xu [44]	China	Explored how the current state of EE does not support entrepreneurial effectiveness in TIs.	Data mining	Revealed an improved entrepreneurship programme for strategic capability accomplishments.

Table 3. *Cont.*

Code	Author	Country	Aim	Study Design	Objective
C16	Stamboulis and Barlas [45]	Greece	Emphasised that poor entrepreneurial actions by students diminish the benefits they received.	Quantitative	Revealed that entrepreneurial performance improved after attending digitised EE classes.
C17	Opute et al. [46]	Germany, UK, Nigeria and SA	Emphasised that a lack of digital EE reduces effectiveness and economic development.	Literature	Revealed that digital and strategic EE initiatives are necessary to achieve entrepreneurial effectiveness and self-employment.
C18	Ghani et al. [9]	Malaysia	Identified EE performance related to students' attitudes towards entrepreneurial practices.	Literature	Presented a digitised EE designed to improve entrepreneurial capabilities and readiness among students.
C19	Li [47]	China	Explored the security awareness entrepreneurship required in digitised EE.	Quantitative	Revealed the need for a framework for security awareness programmes for entrepreneurship.
C20	Kriswantoa et al. [48]	Indonesia	Highlighted the factors affecting students' intentions and enthusiasm related to venturing into business.	Quantitative	Revealed the need for a digitised EE with practical training to cultivate enthusiasm among students.
C21	Hu [49]	China	Explored the context of EE tutoring courses for strategy measurement.	Theoretical model	Revealed improvements in the use of AI technology in EE tutoring courses.
C22	Fox et al. [50]	USA	Explored AI's involvement in EE tutoring tasks.	Mixed	Revealed that a digitised EE framework using AI will play a significant role in tutoring tasks.
C23	Okeke [51]	Nigeria	Identified a lack of practical entrepreneurship courses, depriving students of the opportunity to acquire knowledge.	Quantitative	Revealed a digital EE with practical entrepreneurship for job creation and knowledge acquisition.

Table 3. *Cont.*

Code	Author	Country	Aim	Study Design	Objective
C24	Aryati et al. [52]	Indonesia	Explored the impact of digitised EE on broadening students' capabilities.	Quantitative	Suggested that digitised EE could assist in cultivating entrepreneurial enthusiasm.
C25	Sopi et al. [53]	Indonesia	Highlighted the effect of EE on the ability to engage in social media ventures.	Quantitative	Revealed that digitised EE can energise students to become social media entrepreneurs.
C26	Qi et al. [54]	China	Explored EE using factor analysis to evaluate entrepreneurial competencies.	Quantitative	Suggested improved EE could include practical skills for modern employment opportunities.
C27	Shinnar et al. [55]	USA	Emphasised the effect of the EE programme on entrepreneurial competence.	Quantitative	Revealed the need to intensify digitised EE to embrace inclusivity and effective business practices.
C28	Omoniyia and Gamede [56]	SA	Identified students' lack of awareness of participating in entrepreneurial events.	Literature	Suggested that EE engages in entrepreneurial events to improve knowledge for better entrepreneurial transformation.
C29	Yu et al. [57]	China	Highlighted the relationship between businesses and TIs in shaping students' self-reliance.	Quantitative	Suggested an improvement through establishing a digitised EE for businesses and TIs to engage in building successful entrepreneurs.
C30	Mueller and Anderson [58]	France and UK	Explored EE learnership from different cultural perspectives.	Qualitative	Revealed that digitised EE can intensify cultural engagement for effective entrepreneurial performance.
C31	Hägg and Kurczewska [59]	USA	Emphasised the relevance of EE in solving social and economic problems.	Literature	Suggested the need for digitised EE in restructuring socio-economic problems.

Table 3. *Cont.*

Code	Author	Country	Aim	Study Design	Objective
C32	Sinaga et al. [60]	Indonesia	Examined EE's engagement with family businesses to acquire knowledge.	Quantitative	Suggested an enhanced EE that portrays family business as a platform for acquiring entrepreneurial skills.
C33	Rahman et al. [61]	Bangladesh and Finland	Explored entrepreneurial antecedents through digitised EE and reactions to AI technology.	Quantitative	Revealed that the use of AI technology in digitised EE could improve students' entrepreneurial attitudes.
C34	Cui et al. [8]	China and UK	Identified a dearth in EE focused on building an entrepreneurial mindset.	Quantitative	Suggested enhanced EE to cultivate an entrepreneurial attitude among students.
C35	Boldureanu et al. [62]	Romania	Emphasised the digitisation of EE attribution to role models for entrepreneurial confidence and effectiveness.	Mixed	Recommended using entrepreneurial role models to enable the economy to realise its full potential.
C36	Xianhang et al. [63]	China and Malaysia	Emphasised the lack of application-oriented digital EE, reducing improvements in entrepreneurial skills.	Qualitative	Suggested improving entrepreneurial capabilities through digitised EE and optimal training for students.
C37	Petrescu and Suciu [64]	Romania	Explored the digitised EE programmes to facilitate entrepreneurial development.	Online exploratory survey	Revealed the importance of embracing digitised EE to advance students' business aims.
C38	Maresch et al. [65]	Australia and Netherlands	Examined EE knowledge to identify its effect on students' understanding of an entrepreneurship course.	Quantitative	Suggested a digitised EE restructuring to enhance students' understanding of the course's relevance.
C39	Lestari et al. [66]	Indonesia	Emphasised inclusivity and engagement in EE activities to cultivate entrepreneurial enthusiasm.	Literature	Recommended EE with improved accessibility, training and inspiration without discrimination.

Table 3. *Cont.*

Code	Author	Country	Aim	Study Design	Objective
C40	Brixiova et al. [67]	Tunisia, Germany, USA, UK and SA	A lack of digitised EE could hinder students' acquisition of entrepreneurial knowledge and start-up rates.	Quantitative	Suggested that effective training aligned with digitised EE can influence entrepreneurial knowledge and inspiration among students.
C41	Ben Youssefa et al. [68]	France, Kosovo and Vietnam	Emphasised the lack of support for the transition of technology in EE.	Quantitative	Recommended that technology and digitised EE could improve behavioural content and intention among students.
C42	Igwe et al. [69]	UK and Nigeria	Explored EE's impact on reducing unemployment.	Qualitative	Suggested a digitised EE model with features that connect several fields of entrepreneurship.
C43	Sunder [22]	India	Emphasised the effect of EE on entrepreneurial interest and desire among students after graduating.	Quantitative	Suggested awareness of entrepreneurship as an effective career after exposure to entrepreneurial struggles.

Table 1 shows that, of the publications used in the study, the effect of digitised EE was most frequently discussed, at 23%, followed by evidence base and improvement capabilities, at 19% and 18%, respectively. The next most popular topics are knowledge procurement and effectiveness, at 12% each. Enthusiasm is at 10% and impending features at 6%.

4. Discussion

4.1. Evidence Base on Digitised Entrepreneurship Education

A digitised education system is an innovative transformation through technology in education [9]. There is a notion that a technology-initiated framework on digitised EE can assist in resolving unemployment issues in an economy [20,64]. Therefore, there is a significant need for a framework for digitised EE that includes incubation programmes in TIs to achieve transformation in entrepreneurial practices.

Xu [44] highlighted that the initiation of security technology awareness through EE could increase students' courage, helping them to venture into security awareness entrepreneurial sectors. Hence, digitisation in EE may be necessary to achieve entrepreneurial success. There is an emphasis on engagement with theoretical cyber technology awareness through EE, which suggests a proposed theory of AI in alliance with EE procedures as an optimistic step to entrepreneurial success through TIs [47,50].

A digitised EE in accordance with social media entrepreneurship can impact students' intention regarding social media ventures [34,53]. Thus, there is a need for technology initiation in EE to cultivate entrepreneurial capabilities, knowledge, and persistence among students regarding digital businesses. Udekwe and Iwu [10] mentioned that EE requires

policies to instigate an entrepreneurial mindset, and a digitised structure encourages entrepreneurial attitudes, behaviour and strategy in TIs [68].

4.2. Effect of Digitised Entrepreneurship Education

Digitised EE can serve as a yardstick for entrepreneurial performance in an economy's education sector. Also, technology-embracing EE can impact students' participation in entrepreneurial activities [35,38]. Ideally, students' ability to identify available business opportunities would be improved via a technology-supported education system in TIs.

The notion that EE can impact students' intention to develop an entrepreneurial mindset warrants the need for multifaceted involvement in digitised EE to ensure accomplishment in TIs [8,65]. Therefore, improved EE through digitisation would encourage the attainment of venture creation, as the struggles of unemployment affect the consciousness of students choosing entrepreneurship as a career [22,55].

Ghaleb and Bozorov [41] and Stamboulis and Barlas [45] indicated that EE can impact knowledge fulfilment among students in TIs; however, achieving effective entrepreneurial performance among students would require a digitised EE system. Hammoda [34] also mentioned that entrepreneurial competencies could be improved through the use of digitised EE programmes in institutions.

Mueller and Anderson [58] believe that entrepreneurial competencies can impact students' business mindset and growth through cultural diversity. According to Xu and Loang [43], government policies and funding criteria have the capacity to impact the effectiveness of digitised EE. Li [47] made it known that effective entrepreneurial competencies could be created through digitised EE and financial support for economic growth and development. Therefore, instigating government policies on digitised EE would foster strategy accomplishment in modern-day entrepreneurship [10].

4.3. Entrepreneurial Enthusiasm Through Digitised Entrepreneurship Education

Entrepreneurial enthusiasm is regarded as a strong positive sentiment and inspiration in an individual related to entrepreneurial passion, commitment, and anticipation of achieving goals [70]. Thus, entrepreneurial enthusiasm not only drives creativity and effort but also attracts entrepreneurial investment. Hence, the enthusiasm for recognising opportunities and the intention to establish a business venture through an effective plan of action are significant [71]. Therefore, enthusiasm could trigger the intention to become an entrepreneur, which could be supported through digitised EE.

Lestari et al. [66] highlighted that creating enthusiasm to become an entrepreneur among less privileged students requires digitised systems and infrastructure for effectiveness. Sopi et al. [53] also highlighted that the effect of social media technology through digitised EE could energise entrepreneurial enthusiasm among students in TIs. Thus, digitisation in entrepreneurial performance can accelerate enthusiasm for venture creation among students.

Kriswanto et al. [48] identified several factors that deprive students of entrepreneurial enthusiasm and accomplishment, such as the environment, early work exposure, experience, the education model, and training. Aryati et al. [52] emphasised that digitised EE initiatives can assist in cultivating students' entrepreneurial enthusiasm in their environment. Therefore, a digitised EE curriculum with the involvement of businesses and other stakeholders could have an impact on entrepreneurial enthusiasm among students, which will cultivate awareness and interactions in entrepreneurial activities in the TIs [37].

4.4. Knowledge Procurement Through Digitised Entrepreneurship Education

The increasing rate of unemployment in nations has brought the need for digitised EE to assist in cultivating entrepreneurial knowledge among students in TIs [67]. According

to Onyebuchi-Igbokwe et al. [36], an improvement in the EE curriculum would require digitised systems to foster entrepreneurial knowledge among students, especially those in business education courses at TIs. A practical entrepreneurial activity would also instigate knowledge related to job creation and self-reliance [51]. There is also a belief that policies promoting on-the-job training could boost knowledge of entrepreneurship among students before graduating from TIs [17].

Several authors have indicated that entrepreneurial knowledge could be attained through engagement in family businesses supported through digitised EE [56,60]. A lack of entrepreneurial knowledge does affect students' intention, showing the need for digitised EE that embraces skills' improvement [67].

4.5. Impending Features of Digitised Entrepreneurship Education

The features of EE that could encourage entrepreneurial knowledge are limited, warranting the need for digitised systems to align with the economic growth strategy [72,73]. According to Igwe et al. [69], the impending digitisation of EE is envisioned to drive economic growth and the transformation of intellectual learning in TIs. Such a transformation is required to help elevate students' entrepreneurial capacity within institutions. Hägg and Kurczewska [59] emphasised the demand for digitised EE transformation as an impending feature of effective entrepreneurial success and development. Therefore, the initiation of strategic policies that embrace digitised EE to enhance entrepreneurial capabilities is critical in TIs [10,74].

4.6. Improvement Capabilities Through Digitised Entrepreneurship Education

The improvement capabilities that can be achieved through EE are pertinent when creating opportunities to encourage students to become entrepreneurs and to become leaders and managers with entrepreneurship skills [45,57]. Students need to exercise their entrepreneurial practice to ensure effective operation, which requires digitised EE to improve their entrepreneurial capabilities.

The current state of EE formalities is discouraging and necessitates an improved EE programme that structures and shapes entrepreneurs in a digitised environment [44,54]. Hence, improving entrepreneurship capabilities would require integrating practical entrepreneurship with technology to enable effective entrepreneurial activities through digitised EE. Han [42] and Xianhang et al. [63] maintained that a digitised EE programme with structured learning could be a strategy for improved entrepreneurial capacity and growth in a nation.

Hu [49] highlighted that an improvement in entrepreneurial ability would require digitised EE with training procedures as a strategy for effective entrepreneurial success. Thus, there is an emphasis on improving entrepreneurial capabilities to achieve strategic occupational procurement among students, which would require digitised EE to improve their entrepreneurial aptitude and self-reliance [10,39]. Ghani et al. [9] and Rahman et al. [61] also maintained that a digitised EE programme with tutoring can increase students' eagerness to become entrepreneurs, which would assist in improving their capabilities, inspiration and willingness regarding technology-driven entrepreneurship.

4.7. Entrepreneurial Effectiveness Through Digitised Entrepreneurship Education

Digitised EE can achieve success in increasing students' intention and ability to become entrepreneurs. Oyeku et al. [33] and Opute et al. [46] emphasised that EE is a strategic exercise for entrepreneurial effectiveness, and the lack of support from stakeholders in implementing digitised EE to realise its effectiveness and economic growth is less substantial.

It is emphasised that prioritising digitised EE can promote entrepreneurial effectiveness by enabling interaction with established entrepreneurs to procure knowledge, which

would require policies that foster strategic vision and effective entrepreneurial capacity in TIs [10,40]. Boldureanu et al. [62] found that students' engagement with established entrepreneurs helps create effective role models for future entrepreneurs, who will have an impact on a nation's economy. Therefore, initiating digitised EE for sustained engagement among students to achieve entrepreneurial effectiveness in an economy is important [38].

4.8. Key Messages

Digitised EE and entrepreneurial effectiveness in tertiary education are underexplored, particularly amid rising unemployment among graduates. Several studies on EE and entrepreneurial effectiveness have identified gaps in the literature that require a review of previous studies that conceptualised themes such as digitisation, effectiveness, enthusiasm, impending features, knowledge procurement, and improvement capabilities. This systematic literature review was pertinent in identifying both encouraging and adverse results related to selected criteria by highlighting the implications of TIs not embracing digital EE.

4.9. Contradictions and Gaps

This review comprised research from several publications on digitisation, entrepreneurship and education. Papers not aligning with the requirements were excluded. The review period is from 2012 to 2024. Duplicate publications were eliminated, and papers not written in English were excluded. This exclusion made it difficult to identify some relevant information published in some of the excluded papers. In the inclusion criteria, journal articles were the most frequently identified format, and quantitative research was mostly utilised, which indicates gaps in the methodology and publications not included in this review, such as academic theses and research reports. Further empirical, theoretical and other studies are needed to identify the implications of not embracing innovative and digital technologies for modern entrepreneurial applications in developing economies. Finally, with the rapidly evolving trend in the literature on AI, there is a need for studies to identify its impact on current EE and entrepreneurial practices in the modern-day environment.

5. Contribution of This Review

The selected (43) papers originated mostly from developing/emerging economies. China, which straddles both categories, ranked highest among the chosen papers. As the world's second-largest overall economy, this review thus contributes towards better and more automated entrepreneurial practices in the realisation of entrepreneurial effectiveness, attributable to artificial intelligence, entrepreneurial knowledge, competitiveness, and strategic decisions. We equally underscore the contribution of papers from Indonesia, Malaysia, the USA, South Africa, Romania and Nigeria in uncovering effective awareness strategy achievements for relevant stakeholders, such as entrepreneurship educators, students, TIs, government and policymakers, through digital transformative practices in entrepreneurship.

6. Conclusions and Recommendations

This study provided a review of digitised EE and its effectiveness in TIs. This study conducted a data search across various databases, identifying 912 publications, of which 43 were selected for inclusion based on the criteria. The most identified method was quantitative research (47%), and journal articles (86%) were the most common research output. The most current publications were from 2024 (56%). Asian countries, primarily China (19%) and Indonesia (14%), contributed the most publications. In Africa, Nigeria and South Africa contributed the greatest number; Nigeria (9%) in particular showed a high number of publications. This indicates a demand for research on digitised EE in strained economies.

This study showed that the achievement of entrepreneurial capabilities would require practical entrepreneurship to be integrated with technology for effective entrepreneurial practices through digitised EE. EE using AI technology is highly significant for improving students' entrepreneurial capacity and effectiveness. AI technology is an advanced system that needs to be implemented to energise students' entrepreneurial enthusiasm and venture creation. Technology-driven entrepreneurship is also needed to cultivate students' entrepreneurial enthusiasm, capabilities, inspiration, and willingness to be self-reliant.

This study also identified security awareness entrepreneurship ventures that need to be encouraged among students through a digitised EE programme. Also, a digitised EE framework that includes incubator programmes is significant for transformative entrepreneurial performance. Therefore, digitised EE can be of great importance in building the necessary entrepreneurial knowledge among students to become entrepreneurs. An increase in the number of technology-embraced entrepreneurs will help reduce the unemployment rate and spur economic growth in nations.

This study also indicated that digitised EE that fosters engagement between TIs and businesses creates entrepreneurial role models, driving economic growth. Ideally, digitised systems that incorporate practical entrepreneurial exercises can help develop entrepreneurial knowledge and expertise among students in TIs. Therefore, digitised entrepreneurial knowledge is vital in addressing the skills related to venture creation in the business environment, and such knowledge can also be acquired through engagement in family businesses supported by digitised EE.

This study further showed that digitised EE is categorised as a strategic exercise of entrepreneurial efficacy, and a lack of support for this from stakeholders would discourage economic growth. This study further highlighted a need for policies that instigate an entrepreneurial mindset for strategy accomplishment. Hence, digitised EE would foster easy access to market information, self-employment, strategic decisions, competitiveness, entrepreneurial effectiveness, institutional success, economic development, and the SDGs.

This study's recommendation for further studies, based on empirical data and other research outputs not identified in this manuscript, aims to gather different perspectives on the use of digitised EE to improve entrepreneurial effectiveness among students and graduates.

7. Future Research

The authors recommended the following topics for future research: (i) empirical data research on digitised EE in TIs, (ii) research that involves theories and frameworks on digitised EE in TIs, (iii) the inclusion of other published and unpublished research work not identified in this review to obtain a different view of the research, (iv) research on the rapidly evolving literature on AI in EE and entrepreneurial performance, (v) the impact of digitised EE in strained economies, (vi) the inclusion of more recent years to identify the progress made to date, (vii) identifying reasons for the significant differences in publications between geographical contexts, and (viii) researching how such reviews will benefit stakeholders such as entrepreneurship educators, students, institutions and government/policy makers.

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Abbreviations

AI = Artificial Intelligence; EE = Entrepreneurship Education; PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analysis; SA = South Africa; SDG = Sustainable Development Goal; TI = Tertiary Institution; UK = United Kingdom; USA = United States of America.

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