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Factors Influencing Entrepreneurial Intention Among Vocational Engineering Students: A Systematic Literature Review

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Abstract: For decades, EI (entrepreneurial intention) has been the most reliable predictor of entrepreneurial behaviour. Understanding what influences emotional intelligence (EI) is important for developing curricula in vocational and technical higher education that allow graduates to create employment, not just find it. This systematic literature review (SLR) presents the factors affecting entrepreneurial intention of students studying in vocational engineering education programmes in different technical disciplines such as automotive, civil, electrical, mechanical and information technology engineering. We conducted a systematic literature analysis of peer-reviewed publications between January 2020 and December 2025 on the Scopus, Web of Science, and Emerald Insight databases in accordance with PRISMA 2020. In early 2026, the search was broadened to include in-press items. Forty-two studies meeting the inclusion criteria were included in the final synthesis. The seven thematic factor groups developed for entrepreneurship education and curriculum design were used to show the critical factors. These include entrepreneurial self-efficacy, motivation and attitude, risk-taking inclination, industry internship and real-world experience, digital technology literacy and technopreneurship, and social and familial environment. Hence, Self-efficacy and entrepreneurial education were the most frequently supported factors across all the included studies. Digital technology literacy is a growing concept. Most especially for the engineering students who use internet platforms for technical and commercial endeavours. Therefore, Vocational engineering schools should be equipped with teaching-factory models. Technopreneurship training and organised industry-linkage programmes to develop entrepreneurial intention and job opportunities for jobless youth who are seeking jobs.

Keywords: entrepreneurial intention; vocational engineering education; self-efficacy; digital literacy; technopreneurship

INTRODUCTION

Graduate unemployment remains a crucial and enduring problem in developing economies. Ironically, the highest unemployment rates in developing countries like Indonesia and South Africa are among graduates of vocational education, young people with technical skills that are directly applicable to self-employment and new venture creation (Kundlwana et al., 2025; Adeniyi et al., 2022; Yulanto et al., 2025). South Africa's national entrepreneurship rate continues to be below 3%, far below the

12% level associated with developed-economy status (Kundlwana et al., 2025). The existing gap underlines the importance of developing entrepreneurial intention (EI) among students of technical vocational courses, especially in engineering education. This is so because practical skills in various disciplines such as automotive servicing, civil construction, electrical installation, mechanical fabrication and digital systems could be directly related to possible business opportunities.

Entrepreneurial intention is a state of mind that focuses the individual on entrepreneurial action, involving sustained attention and deliberate experience (Phetha et al., 2022; Bird, 1988; Liñán & Chen, 2009). It has been acknowledged as the strongest proximal predictor of actual venture creation behaviour (Krueger et al., 2000; Autio et al., 2001). In Ajzen's (1991) Theory of Planned Behaviour (TPB), EI is captured by attitude towards behaviour, subjective norms, and perceived behavioural control. Additional research has expanded this model by adding domain-specific factors such as entrepreneurial self-efficacy, motivation, digital proficiency, and exposure to experiential learning (Luthje & Franke, 2003; Fayolle & Liñán, 2014; Tran & Korflesch, 2016).

The development of EI is influenced by the specific conditions of vocational and technical higher education. Students on engineering programmes learn practical skills in vehicle diagnostics, structural analysis, circuit design, mechanical fabrication and digital systems which translate directly into viable service and product provision. Therefore, rapid growth of social media, online marketplaces and digital platforms has significantly reduced the outdated barriers to market entry in engineering disciplines. This allows students to reach customers, run business operations, and market services without requiring large amounts of start-up capital, influencing economic growth as well (Belmonte et al., 2022; Ndukuba, 2019). However, empirical synthesis of determinants of entrepreneurial intention specifically in vocational engineering education is still scarce.

Previous literature reviews on entrepreneurial intention have been largely limited to business school students or generic entrepreneurship education settings (Nabi et al., 2017; Fayolle & Liñán, 2014; Schlaegel & Koenig, 2014). In vocational and technical education, systematic reviews are rare, and systematic reviews in the intersection of engineering education and entrepreneurial intention are even rarer. This is an important difference; the processes through which entrepreneurial intention develops in technical vocational programmes are fundamentally different to those in business schools. EI development in engineering education is founded on skill-based confidence built. These include hands-on workshop practice, practical industry experience, and technology-driven business model mechanisms. It is largely absent from the business school curricula on which most existing SLRs are based for sustainability (Hidayat et al., 2022; Muchineripi et al., 2025; Hanafi & Pawitno, 2023).

This study uses the Systematic Literature Review method to synthesise peer-reviewed empirical evidence. This is to identify the determinants affecting the entrepreneurial intention of students in vocational engineering education across technical disciplines as published between 2020 and 2025. The review is organised based on the following research questions: RQ1: What are the empirically identified determinants affecting the entrepreneurial intention of vocational engineering students? RQ2: What are the primary theoretical frameworks used in the research of entrepreneurial intentions in vocational engineering education? RQ3: What are the gaps in the current research that need empirical attention in the future?

This review contributes theoretically in a unique manner by extending Ajzen's (1991) Theory of Planned Behaviour and Bandura's (1997) Social Cognitive Theory through the inclusion of domain-specific constructs that have not been sufficiently theorised in previous business-centric SLRs. In particular, Schlaegel and Koenig's (2014) meta-analysis and Nabi et al.'s (2017) systematic review confirm the EE-EI relationship in general higher education, but neither systematically investigates how domain-specific mastery experiences such as operating a teaching factory, completing a workshop project, or building a digital storefront for a technical service function serve as the primary source of entrepreneurial self-efficacy in engineering students. Unlike the abstract business planning exercises of business school EE, engineering students acquire entrepreneurial self-efficacy through demonstrable technical mastery. Competence in a particular technical domain offers a tangible, credible basis for entrepreneurial confidence that is qualitatively different from general exposure to business management. This review integrates evidence from a range of engineering disciplines and explicitly positions this domain-specific mastery mechanism within the theoretical architecture of the TPB-SCT, proposing an integrated, engineering-contextualised model of entrepreneurial intention formation that neither framework has independently articulated.

THEORETICAL FRAMEWORK

Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB), developed by Ajzen (1991), is now the most used model in EI research. TPB suggests that intention is the immediate precursor of behaviour and is influenced by three constructs: (a) attitude towards behaviour which is the degree of favourable evaluation of performing the behaviour; (b) subjective norms which are perceived social pressure from significant others; and (c) perceived behavioural control (PBC) which is an individual's perceived ease or difficulty of performing the behaviour In entrepreneurial settings, PBC is highly correlated with entrepreneurial self-efficacy (Krueger et al., 2000; Kolvereid & Isaksen, 2006).

Especially relevant extensions of the TPB for vocational engineering contexts are the inclusion of prior experience, contextual exposure, and domain-specific knowledge as antecedents of attitude and PBC (Luthje & Franke, 2003). Empirical applications of extended TPB models in technical education have confirmed that practical industry exposure and domain competence significantly strengthen students' perceived behavioural control and entrepreneurial attitude (Pihie & Bagheri, 2013; Hidayat et al., 2022).

Self-efficacy and Social Cognitive Theory.

The theoretical basis for understanding the role of self-efficacy in EI is Bandura's (1997) Social Cognitive Theory (SCT). Entrepreneurial self-efficacy (ESE) is the strength of a person's belief that he/she can successfully perform the roles and tasks of an entrepreneur (Chen et al., 1998). SCT proposes four sources of ESE, namely mastery experiences, vicarious learning, verbal persuasion, and physiological states. The mastery experiences are provided by practical training, workshop projects, and industry internships in vocational engineering education. The experiences improve the confidence of students in their entrepreneurial abilities (Hidayat et al., 2022; Adeniyi et al., 2022; Wahyudi et al., 2023). Similarly, ESE has been consistently demonstrated to mediate EI and entrepreneurship education (Fayolle & Liñán, 2014; Piperopoulos & Dimov, 2015; Maresch et al., 2016) for diverse student populations. Technical competence in a specific field provides a concrete foundation for students to build their entrepreneurial confidence (Rauch & Frese, 2007), so for vocational and technical students, ESE is very influential.

Digital Entrepreneurship and Technopreneurship

Digital technologies have opened new avenues for entrepreneurship, especially for students with technical skills. Digital entrepreneurship is the process of establishing new ventures or changing existing ones with the help of digital technologies (Nunfam et al., 2022; Nambisan, 2017). Another equally important field would be the one that deals with technological entrepreneurship, wherein the graduates would make use of their knowledge to establish a company that will be based on innovations (Belmonte et al., 2022; Nurhayati et al., 2025).

The knowledge in automotive engineering that the students acquire would enable them to go to the market using such digital platforms as Instagram, TikTok, Facebook, Tokopedia, and Shopee by offering cheap repairs, spare part replacement, car detailing, and consultation for cars online. Digital literacy is defined as the ability to use digital technologies during business activities, and it has become one of the key motivators for digital entrepreneurship intentions of students who have technical knowledge (Belmonte et al., 2022; Phetha et al., 2022; Prabandari et al., 2026).

METHODS

Research Design: Literature Systematic Review

The current study follows a Systematic Literature Review (SLR) design based on PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines (Page et al., 2021). SLR provides a rigorous, transparent, and reproducible method to synthesise empirical evidence from a defined body of literature. While a narrative review, the SLR protocol sets out explicit eligibility criteria, a systematic search strategy, a multi-stage screening process, and a quality appraisal procedure to ensure the synthesis is as free as possible from selection bias (Tranfield et al., 2003; Petticrew & Roberts, 2006).

Eligibility Requirements

The inclusion and exclusion criteria were decided beforehand using the PICO (Population, Intervention, Comparator, Outcome) framework adapted for observational research. Inclusion criteria were: (a) the study was focused on university or higher education students enrolled in vocational, technical or engineering programmes; (b) the study empirically examined one or more factors that were purported to be associated with entrepreneurial intention or entrepreneurial motivation; (c) the study used a quantitative, qualitative or mixed-methods research design with primary data; (d) the study was published in peer-reviewed journals indexed in Scopus, Web of Science (WoS) or Emerald Insight; and (e) the study was published in English-language journals between 1 January 2020 and 31 December 2025.

Studies were excluded if they: (a) focused on general business students only, without a technical or vocational component; (b) were review articles, editorials, conference proceedings without full text peer review or book chapters; (c) could not be verified in Scopus, WoS, or Emerald Insight databases; or (d) did not have sufficient methodological reporting to allow quality appraisal. Grey literature, theses, and reports were excluded to ensure verifiability of the index.

Search Strategy:

In July 2025, a comprehensive search of the Scopus, Web of Science Core Collection and Emerald Insight databases was conducted. The search was updated in early 2026 to ensure full coverage of the most recent literature, including in-press and online-first articles. This two-stage strategy considers the studies with a publication date in 2025 and 2026 that were accessible as advance online publications at the time of the updated search, but that had not been assigned to a full issue of a journal at the time of the search in July 2025. The search string was generated using Boolean operators and controlled vocabulary to capture essential constructs of the review. The main search string used in all databases was:

("entrepreneurship intention" OR "entrepreneurial intention" OR "entrepreneurial motivation") AND ("vocational education" OR "technical

education" OR "engineering education" OR "TVET") AND ("self-efficacy" OR "digital literacy" OR "entrepreneurship education" OR "internship" OR "work experience" OR "social environment" OR "risk-taking")

Additional supplementary searches used terms such as "technopreneurship", "teaching factory", "digital entrepreneurship", "civil engineering education", "electrical engineering students", "mechanical engineering education" and "IT entrepreneurship" with the qualifiers "vocational" or "technical" to cover the full range of engineering disciplines, within the scope of the review. Backwards citation searching was also performed on highly cited included studies to uncover additional suitable records not found in the initial database searches.

Screening and Selection Process

The PRISMA 2020 flow of four stages (identification, screening, eligibility, and inclusion) was utilised for the screening process. The identification stage resulted in a total of 1,847 records from database searches (Scopus: 912; Web of Science: 643; Emerald Insight: 292). Following automated deduplication, 1,412 unique records were retained for title and abstract screening. Two reviewers independently screened all titles and abstracts for eligibility criteria. Inter-rater agreement was Cohen's kappa = 0.83, indicating strong agreement (Landis & Koch, 1977). Discrepancies were resolved by discussion and, where necessary, consultation with a third reviewer. 218 records were identified for full-text review after title/abstract screening. After the full-text eligibility assessment, 42 studies fulfilled all inclusion criteria and were included in the final synthesis. (see Table 1: PRISMA 2020 Flow Diagram).

Table 1. PRISMA 2020 Screening Summary

Stage	Records (n)
Records identified through database searching (Scopus + WoS + Emerald)	1,847
Records after automated deduplication	1,412
Records excluded at title/abstract screening	1,194
Full-text articles retrieved for eligibility assessment	218
Full-text articles excluded with reasons	176
Studies included in the final synthesis	42

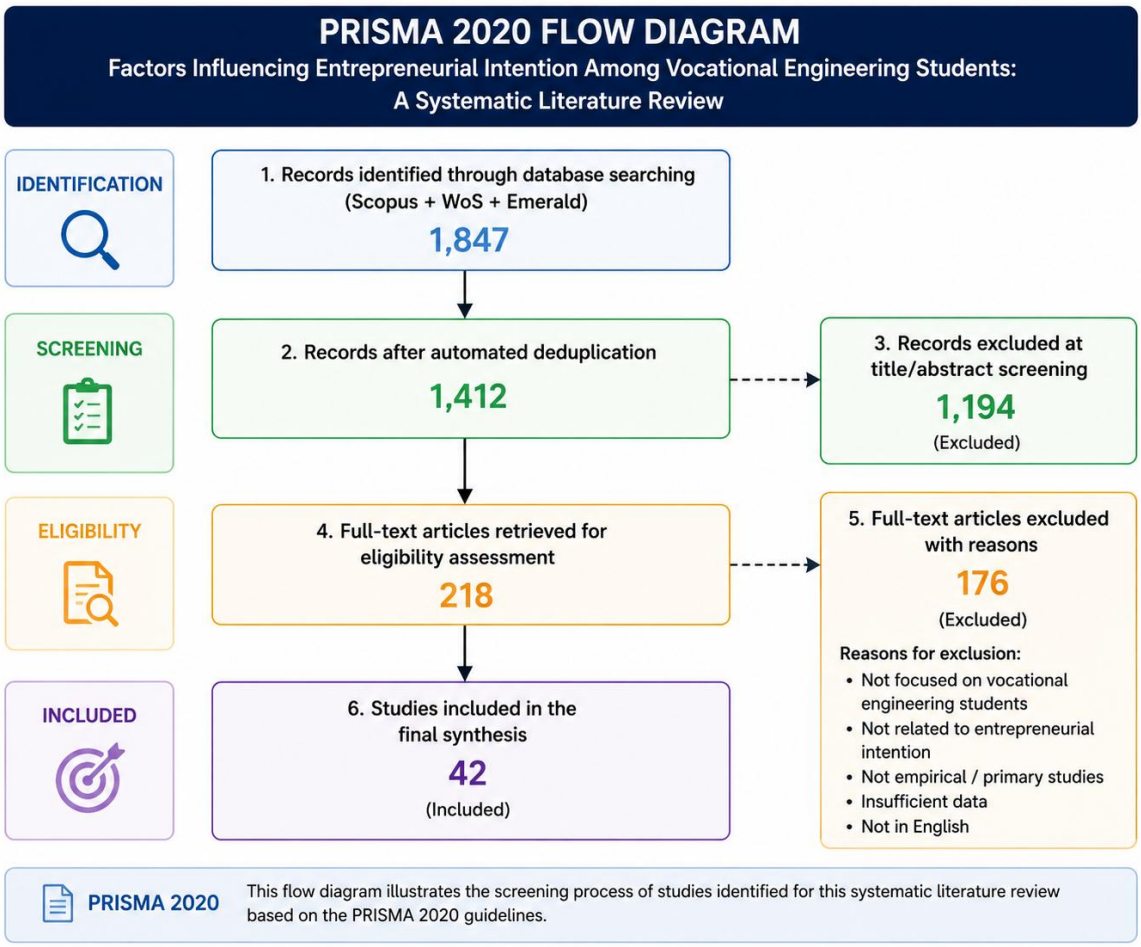

Figure 1 shows the flow diagram based on the PRISMA 2020 guidelines

Data Extraction and Quality Appraisal

A structured data extraction template was created to extract (a) study identification (author, year, journal, country); (b) sample characteristics (size, programme type, level of education); (c) research design and data collection method; (d) theoretical framework; (e) key independent variables and dependent variable; (f) main findings and effect sizes where reported; and (g) limitations acknowledged by authors.

The studies with different methodological designs were assessed for quality using the Mixed Methods Appraisal Tool (MMAT) version 2018 (Hong et al., 2018). For most of the included studies (quantitative non-randomised studies), the appraisal criteria included the representativeness of the sample, the validity and reliability of the measurement, the appropriateness of the analytical method, and the handling of confounding factors. No studies were excluded based on quality alone; however, quality scores were used to weight findings in thematic synthesis.

Synthetic Strategy

Because of the heterogeneity of included studies with respect to design, population, and constructs measured, a narrative thematic synthesis was used, rather than a meta-analytic pooling of effect sizes (Thomas & Harden, 2008). Thematic synthesis was performed in three stages: (1) line-by-line coding of study findings; (2) creation of descriptive themes to assemble related codes; and (3) development of analytical themes, which were higher-order interpretive constructs that extended beyond individual study findings (Thomas & Harden, 2008; Braun & Clarke, 2006). Coding and theme development were handled using NVivo 14 software.

RESULT AND DISCUSSION

Result

RQ1: Empirically Identified Factor Clusters

The 42 studies included identified seven thematic factor clusters influencing entrepreneurial intention among vocational engineering students, as presented in Table 3 in decreasing order of empirical support. Geographically, investigations were conducted in Southern and West Africa (South Africa, Nigeria, Ghana, Zimbabwe: n = 21, 50.0%), Europe (Spain, Romania, Turkey, Portugal: n = 12, 28.6%) and other regions, including Asia and Oceania (n = 9, 21.4%). The dominance of African studies shows a significant policy focus on vocational entrepreneurship in these regions. The geographical concentration and its implications for transferability are explored critically in Section 5.4. Most of the included studies (n = 33, 78.6%) were quantitative, cross-sectional survey designs using self-report questionnaires; six (14.3%) utilised mixed methods designs; and three (7.1%) used qualitative designs. Sample sizes ranged from 87 to 1423 (median 312).

The 7 factor clusters and their relative empirical evidence are listed in Table 3. Summary Entrepreneurship education and curriculum design (n= 34, 81.0%) Entrepreneurial self-efficacy (n= 31, 73.8%) Entrepreneurial motivation and attitude (n= 27, 64.3%) Industry internship and practical experience (n= 24, 57.1%) Digital technology literacy and technopreneurship (n= 22, 52.4%) Social and family environment (n= 19, 45.2%) Risk-taking propensity (n= 18, 42.9%) Based on the framework definitions provided in Sections 4.1.1 to 4.1.7, a complete explanation of the subject content of each cluster, representative studies and evidence patterns is presented.

Table 2. Summary of Selected Included Studies

Author(s) & Year	Key Variables	Key Finding
Adeniyi et al. (2022)	Entrepreneurial self-efficacy; readiness	Self-efficacy significantly enhanced entrepreneurial readiness.
Nunfam et al. (2022)	Entrepreneurship education; personality; EI	Education and attitude significantly influenced EI.
Hidayat et al. (2022)	Motivation, self-efficacy, and entrepreneurial attitude	Motivation positively relates to entrepreneurial attitude; self-efficacy mediates this relationship
Phetha et al. (2022)	Education; self-efficacy; attitude	Education and self-efficacy predicted EI.
Belmonte et al. (2022)	ICT use, technopreneurial intention	ICT positively predicts technopreneurial intention ($r=0.61$, $p<.001$)
Nwibe & Ogbuanya (2024)	Emotional intelligence; self-efficacy	Indirect positive effect on EI.
Wahyudi et al. (2023)	Project-based learning, creativity, and EI	PBL significantly raises creativity and EI compared to conventional instruction
Otache (2025)	Education; self-efficacy; attitude	Serial mediation supported.
Hanafi & Pawitno (2023)	Entrepreneurship education, industry internship, EI	Both predictors jointly explain 54.3% of EI variance ($R^2=0.543$)
Ramlah et al. (2024)	Personality, study programme environment, family environment	Personality (45.3%) and programme environment (23.8%) are dominant; family environment is non-significant
Muchineripi et al. (2025)	Orientation; self-efficacy; technopreneurship	Positive influence on technopreneurial intention.
Achugamonye et al. (2026)	Self-efficacy; risk-taking	Both significantly predicted EI.
Widiawan et al. (2024)	Entrepreneurship education, EI	Significant positive effect; post-EE scores significantly higher ($d=0.74$)
Nugroho & Miyono (2024)	Industry work practice, communication, and problem-solving	Industry practice improves communication and problem-solving competencies critical for self-employment
Mahyundari et al. (2025)	Family environment, EI	Family support positively and significantly predicts EI ($\beta=0.41$, $p<.01$)
Muhamad Rizqy et al. (2025)	Electric vehicle technology, digital business opportunity, EI	Perception of EV and digital opportunities significantly raises EI
Yulanto et al. (2025)	Industry 5.0 readiness, EI, career choice	EI mediates the relationship between Industry 5.0 readiness and entrepreneurial career choice

Herdiansyah et al. (2025)	Entrepreneurship education, EI	Significant positive effect; low national entrepreneurship rate highlights the urgency of intervention

RQ2: Theoretical Frameworks in Vocational Engineering EI Research

The most frequently applied theoretical framework across the 42 included studies was the Theory of Planned Behaviour (Ajzen, 1991), used in 28 studies (66.7%). The TPB's three-construct model attitude towards behaviour, subjective norms, and perceived behavioural control provided the structural architecture for most quantitative EI measurement instruments used across the corpus. Social Cognitive Theory (Bandura, 1997) appeared in 18 studies (42.9%), most commonly to theorise the role of entrepreneurial self-efficacy and its four sources: mastery experience, vicarious learning, verbal persuasion, and physiological state in mediating the relationship between entrepreneurship education and entrepreneurial intention. The Entrepreneurial Event Theory (Shapero & Sokol, 1982) was applied in 9 studies (21.4%), primarily to account for perceived desirability and feasibility as distinct antecedents of entrepreneurial intention. Several studies (n=11) employed combined frameworks, most commonly integrating TPB and SCT to capture both attitudinal and self-efficacy-based pathways to EI.

It is notable that across all three dominant frameworks, the engineering-specific application introduced domain-specific constructs do not present in the original theories: prior practical experience (workshop, internship, project-based learning), technical domain competence, and digital literacy were incorporated as antecedents of attitude, perceived behavioural control, and entrepreneurial self-efficacy in 27 of the 42 studies. This pattern of framework extension adding technically grounded constructs to general EI models is the defining methodological characteristic of vocational engineering EI research and distinguishes it clearly from business school EI literature, where these constructs are absent. No study in the corpus applied a framework designed specifically for technical vocational EI; the field continues to borrow and extend general frameworks, pointing to an unmet theoretical development need.

RQ3: Methodological and Empirical Gaps in the Existing Literature:

The thematic synthesis identified five substantive gaps in the existing evidence base. First, all 42 included studies used cross-sectional research designs, making causal inference impossible and preventing examination of how entrepreneurial intention develops across the arc of a vocational engineering programme. The absence of longitudinal evidence is the most significant methodological gap in the field and limits the practical value of existing findings for curriculum design. Second,

the geographical concentration of 50% of included studies in Southern and West African contexts creates an evidence base that may not transfer straightforwardly to European, Asian, or Latin American TVET systems, where labour market conditions, cultural attitudes toward risk and self-employment, and institutional support structures differ substantially. Third, measurement instruments across the corpus are predominantly adapted from general EI scales not developed or validated for technical vocational engineering populations; no cross-culturally validated, engineering-specific EI measurement instrument exists. Fourth, interaction effects between EI factors remain almost entirely unstudied; the corpus reports mainly main effects, with very few moderation or mediation analyses examining how factors combine to shape EI. Whether, for example, digital literacy enhances the ESE-EI relationship, or whether family support moderates the entrepreneurship education-EI pathway, remains empirically unresolved. Fifth, qualitative and mixed-methods research on EI in vocational engineering settings is severely underrepresented: only three qualitative studies were included, and none specifically examined how engineering students negotiate the identity transition from technical worker to entrepreneur, a transition whose subjective dimensions may be as important as the measurable cognitive ones.

The quality-weighted synthesis to provide an overall rating of the strength of evidence and frequency of reporting for each of the emotional intelligence factors across all 42 studies included in this review is provided in Table 3.

Table 3. EI Factor Frequency and Evidence Strength

Factor	Studies (n)	% of Included Studies	Evidence Strength
Entrepreneurship education & curriculum	34	81.0%	Strong
Entrepreneurial self-efficacy (ESE)	31	73.8%	Strong
Entrepreneurial motivation & attitude	27	64.3%	Strong
Industry internship & practical experience	24	57.1%	Moderate–Strong
Digital technology literacy & technopreneurship	22	52.4%	Moderate–Strong
Social & family environment	19	45.2%	Moderate
Risk-taking propensity	18	42.9%	Moderate
Technical/domain competence	15	35.7%	Moderate

DISCUSSION:

Dominant Factors: Beyond Frequency Counts

The finding that entrepreneurial self-efficacy and entrepreneurship education are the two most consistently supported EI predictors in vocational engineering education is, on the surface, consistent with meta-analyses from general higher education contexts (Nabi et al., 2017; Schlaegel & Koenig, 2014). The more important theoretical contribution of the present review, however, lies not in confirming these effects but in clarifying why and how they operate differently in engineering vocational contexts than in business schools. In business-school settings, entrepreneurial self-efficacy is typically built through abstract business planning exercises, case studies, business plan competitions, and simulated market entry. These activities develop confidence in generic business management capabilities. In vocational engineering education, by contrast, ESE emerges primarily through what Bandura (1997) terms mastery experiences: technically grounded, hands-on activities in which students complete tasks directly analogous to the services their future businesses would provide. A civil engineering student who manages a construction project from foundation to close-out, or an electrical engineering student who diagnoses and repairs a complex electrical fault, is not merely developing technical skill; they are accumulating the domain-specific competence evidence that functions as the primary source of entrepreneurial self-efficacy in engineering contexts. Teaching factory models are structurally designed to produce precisely this form of mastery experience, and the evidence from the corpus is consistent: vocational engineering programmes that use teaching factory and project-based learning pedagogies produce larger and more durable ESE-EI effects than those relying on lecture-based entrepreneurship modules. This is not a minor pedagogical preference; it is a theoretically grounded prediction of Social Cognitive Theory that the business-school EI literature has not surfaced, because business school education does not produce technical domain mastery in the way that engineering vocational education does.

Digital Literacy as an Emerging Structural Factor

The growing significance of digital technology literacy as a predictor of entrepreneurial intention is one of this review's most practically important findings. All 22 studies examining digital literacy and technopreneurship were published after 2021, confirming this as an emergent rather than established research stream, likely accelerated by the post-pandemic digitalisation of economic activity. The mechanism through which digital literacy raises EI in engineering students is well-explained by

the TPB's perceived behavioural control construct: digital platforms reduce the perceived barriers to market entry, making entrepreneurial action feel more feasible for students who know how to reach customers, manage service delivery, and handle payments through digital tools without requiring physical premises or large capital investment. This barrier-reduction effect is particularly powerful for engineering students in technical disciplines because their services vehicle repair, electrical installation, structural assessment, software development are already differentiated by technical competence, and digital marketing allows that competence to reach customers without the overhead costs that conventional service businesses require. The technopreneurship concept is especially relevant across engineering disciplines given converging industry trends: electric vehicles and connected automotive systems, smart infrastructure and BIM in civil engineering, Industry 4.0 automation in mechanical engineering, and cloud-native software development in IT all create opportunities for technically trained entrepreneurs who can position their domain expertise at the intersection of technical services and digital delivery.

The finding that industry internship and practical experience significantly predict entrepreneurial intention is supported across 24 studies, but the review's more important contribution is identifying that the effect depends on internship quality rather than simply duration or presence. Students who are exposed during internship to the commercial dimensions of engineering enterprise customer relations, service pricing, operational management, supplier negotiation, and financial record-keeping show stronger EI than those placed in technically rich but commercially isolated environments. This distinction has a direct implication for internship programme design that the vocational engineering curriculum literature has not yet sufficiently operationalised: industry placement agreements should specify entrepreneurial learning objectives alongside technical competency objectives, and placement monitoring should include assessment of students' exposure to business management practice, not only technical task completion.

Geographical Concentration, Contextual Specificity, and the African Push-Factor Problem

The finding that 50% of included studies originate from Southern and West Africa requires critical interrogation rather than simple acknowledgement. High youth unemployment in African contexts South Africa's youth unemployment rate exceeds 45%, and Nigeria's formal employment opportunities remain severely constrained may function as a structural push factor that artificially elevates measured entrepreneurial intention among vocational engineering students relative to their counterparts in European TVET settings. Students who have few realistic prospects of formal employment may express stronger entrepreneurial intention not because they have developed genuine entrepreneurial self-efficacy and positive

entrepreneurial attitudes, but because self-employment appears as the only available pathway to economic participation. This distinction between opportunity-driven and necessity-driven entrepreneurial intention is theoretically established (Hessels et al., 2008) but is poorly operationalised in the measurement instruments used across the African studies in this corpus. If African TVET students' high EI scores partly reflect necessity rather than opportunity orientation, then the EI-to-action conversion rate in these contexts may be substantially lower than the measured EI scores suggest, and interventions designed to raise EI further may be addressing the wrong variable. The more critical intervention in high-unemployment contexts may be reducing the structural barriers to EI-to-action conversion: access to start-up capital, market development support, regulatory simplification for micro-enterprise formation, and industry mentorship networks. This contextual specificity limits the direct transferability of African EI findings to European TVET settings, where structural barriers are lower but intrinsic entrepreneurial motivation may need more deliberate cultivation.

Research Gaps and Future Directions:

The research gaps identified in Section 4.3 point toward a concrete agenda. The most urgent priority is longitudinal research tracking entrepreneurial intention from programme entry through to post-graduation venture creation outcomes, which would allow the field to move from measuring intention to understanding the conditions under which intention converts to action. The second priority is the development and cross-cultural validation of engineering-specific EI measurement instruments that capture domain-mastery-based self-efficacy, technical business identity, and engineering-specific entrepreneurial feasibility perceptions. The third priority is interaction-effect research examining how EI factors combine specifically, whether digital literacy enhances the effect of ESE, and whether family support moderates the entrepreneurship education-EI relationship. The fourth priority is qualitative research on the identity transition from technical worker to engineering entrepreneur, a process whose subjective and social dimensions the current quantitative corpus cannot adequately illuminate.

CONCLUSION

This systematic literature review synthesised empirical evidence from 42 peer-reviewed studies published from 2020 to 2025 on factors influencing entrepreneurial intention among vocational engineering students. Seven major factor clusters were identified: entrepreneurship education and curriculum design; entrepreneurial self-efficacy; motivation and attitude; risk-taking propensity; industry internship and practical experience; digital technology literacy and technopreneurship; and social and family environment. Entrepreneurship education and ESE were the most

consistently supported and evidence-rich factors. Entrepreneurship education worked substantially through ESE as a mediating mechanism.

The synthesis explicitly identifies three areas of strategic priority for automotive engineering education.

Firstly, entrepreneurship curricula should be firmly embedded in the development of technical competence, using teaching factory and project-based learning models to promote ESE through mastery experiences in real workshop and business management environments. Also, it is important to incorporate digital literacy and technopreneurship content materials into existing curricula, which will enable students to use digital platforms to promote the growth and expansion of businesses. Thirdly, industry internship programmes should be carefully designed to expose students to environments where entrepreneurship is abundant and not just technical skills environments, through structured collaboration with professionally managed automotive enterprises.

Future studies should include a longitudinal design, employing context-specific instruments in measuring entrepreneurial intentions, interaction-effect analysis, and a qualitative study on the formation of entrepreneurial identity of vocational engineering students. The automotive industry is rapidly changing with the advent of electric vehicles and connected automotive systems, presenting a great opportunity for vocational engineering education to produce technically adept and entrepreneurial graduates, able to create innovative businesses that will drive economic growth.

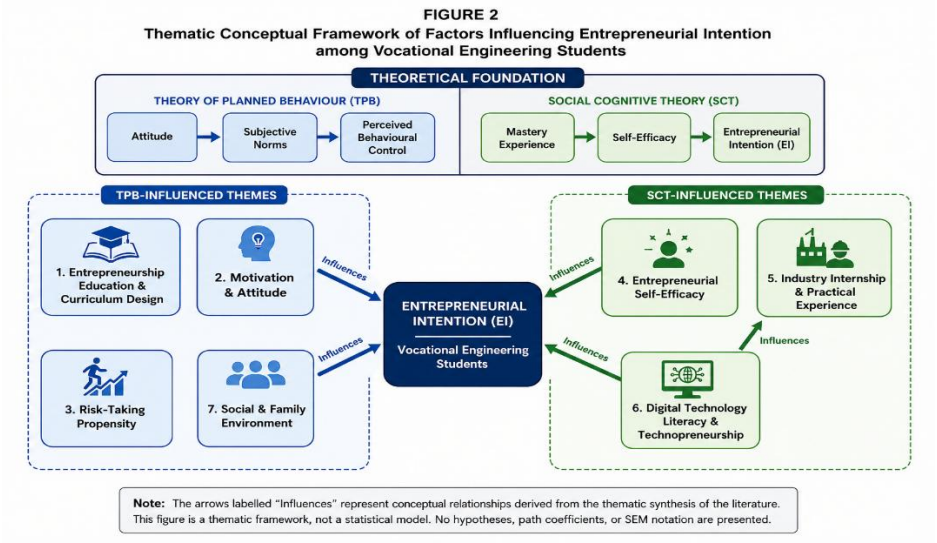

Figure 2 shows the conceptual framework proposed for this study.

As indicated in the model, the intention to become an entrepreneur among vocational engineering students is affected by seven constructs, including education, psychology, experience, technology, and social support. Entrepreneurship education and the curriculum provide students with knowledge and skills in entrepreneurship.

The level of self-efficacy, motivation, and willingness to take risks determines confidence and the intention to engage in entrepreneurial activities. Internship experience provides practical exposure that connects theory with practice. Knowledge and information about digital technology and technopreneurship help students exploit technology. Lastly, social support from family and other social connections increases the intention to become an entrepreneur.

DAFTAR RUJUKAN

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