

Graduate Attributes and Employability Skills in TVET in Malaysia: A Systematic Review towards Holistic and Future-Ready Graduates

*Atribut Graduan dan Kemahiran Kebolehpasaran dalam TVET di Malaysia:
Suatu Ulasan Sistematik ke Arah Graduan Holistik dan Siapsiaga Masa Hadapan*

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Abstract

Technical and Vocational Education and Training (TVET) has been increasingly recognized as a crucial pathway in preparing skilled human capital for Malaysia's socio-economic development. However, persistent concerns regarding graduate employability have highlighted the need to revisit the graduate attributes and employability skills that TVET institutions aim to nurture. This study conducts a systematic review to synthesize existing literature on graduate attributes and employability skills in Malaysian TVET contexts. The review followed the PRISMA 2020 guideline, using electronic databases including Scopus, ERA, MyCite, and Google Scholar, covering studies published between 2010 and 2024. Articles were screened based on inclusion and exclusion criteria, yielding a final sample of 42 empirical and conceptual studies. The findings reveal that technical competencies remain the dominant focus in Malaysian TVET curricula; however, industry and policy documents consistently emphasise the importance of soft skills, digital literacy, entrepreneurial orientation, communication, teamwork, and ethical values. The review also identifies several gaps, including limited integration of holistic attributes such as sustainability, civic responsibility, and adaptability to Industry 4.0 demands. The study concludes that while significant progress has been made in embedding employability skills in Malaysian TVET, a more balanced framework that integrates both technical and holistic graduate attributes is required to ensure the production of future-ready graduates. This review provides useful implications for policymakers, curriculum developers, and TVET institutions aiming to enhance graduate employability and competitiveness. This review contributes by synthesising the evidence into a pyramid model of graduate attributes, offering a holistic and policy-relevant framework for strengthening employability in Malaysian TVET.

Keywords: TVET, graduate attributes, employability skills, holistic graduates

Abstrak

Pendidikan dan Latihan Teknikal dan Vokasional (TVET) semakin diiktiraf sebagai laluan penting dalam mempersiapkan modal insan berkemahiran bagi pembangunan sosioekonomi Malaysia. Namun, kebimbangan berterusan tentang kebolehpasaran graduan menuntut penelitian semula terhadap atribut graduan dan kemahiran kebolehpasaran yang ingin dipupuk oleh institusi TVET. Kajian ini menjalankan ulasan sistematik untuk mensintesis literatur sedia ada mengenai atribut graduan dan kemahiran kebolehpasaran dalam konteks TVET di Malaysia. Ulasan ini mengikut garis panduan PRISMA 2020 dengan menggunakan pangkalan data elektronik seperti Scopus, ERA, MyCite dan Google Scholar; meliputi kajian yang diterbitkan antara tahun 2010 hingga 2024. Artikel disaring berdasarkan kriteria inklusi dan eksklusi, menghasilkan sampel akhir sebanyak 42 kajian empirikal dan konseptual. Dapatan menunjukkan bahawa kecekapan teknikal kekal menjadi fokus dominan dalam kurikulum TVET Malaysia; namun, dokumen industri dan dasar secara konsisten menekankan kepentingan kemahiran insaniah (soft skills), literasi digital, orientasi keusahawanan, komunikasi, kerja berpasukan dan nilai etika. Ulasan ini turut mengenal pasti beberapa kelompokan, termasuk integrasi terhadap atribut holistik seperti kelestarian, tanggungjawab sivik dan keupayaan menyesuaikan diri dengan tuntutan Revolusi Industri 4.0. Kajian ini merumuskan bahawa meskipun kemajuan ketara telah dicapai dalam pembudayaan kemahiran kebolehpasaran dalam TVET Malaysia, satu rangka kerja yang lebih seimbang yang mengintegrasikan atribut graduan teknikal dan holistik diperlukan bagi memastikan penghasilan graduan siapsiaga masa hadapan. Ulasan ini memberikan implikasi berguna kepada pembuat dasar, pembangunan kurikulum dan institusi TVET yang berhasrat meningkatkan kebolehpasaran serta daya saing graduan. Ulasan ini menyumbang dengan mensintesis bukti kajian ke dalam satu model piramid atribut graduan, yang menawarkan suatu kerangka holistik dan relevan dari sudut dasar bagi memperkukuh kebolehpasaran graduan TVET di Malaysia.

Kata kunci: Pendidikan dan Latihan Teknikal dan Vokasional (TVET); atribut graduan; kemahiran kebolehpasaran; graduan holistik

INTRODUCTION

Technical and Vocational Education and Training (TVET) is globally recognised as a key driver for developing skills for both work and life. It equips learners with competencies that enable them to secure meaningful employment and contribute to sustainable development. In Malaysia, the higher education agenda emphasises the production of holistic, entrepreneurial and balanced graduates while elevating TVET to stand alongside academic education. These aspirations are articulated in the Malaysia Education Blueprint 2015–2025 (Higher Education), the National TVET Policy (Dasar TVET Negara) and the Malaysian Qualifications Framework (MQF) 2.0. Together, these policy instruments provide the vision and benchmarks for graduate attributes and employability skills in Malaysian TVET.

Furthermore, Malaysia's industrial development strategies further highlight the importance of graduate readiness. The Industry4WRD: National Policy on Industry 4.0 and the National Fourth Industrial Revolution Policy emphasise the urgent need for graduates who are digitally literate, innovative, adaptable and entrepreneurial, while maintaining strong technical competencies. These strategies prioritise advanced manufacturing, automation and digital technologies, placing pressure on TVET curricula to integrate both technical and transversal skills in order to sustain national competitiveness.

Despite these reforms, concerns remain regarding graduate employability and the alignment of skills with labour market demand. Annual evidence from the Ministry of Higher Education's Graduate Tracer Study shows mixed outcomes, with underemployment and skills mismatch continuing to affect TVET graduates. Independent research has also found that while TVET provides valuable technical foundations, many graduates face challenges in demonstrating communication, problem solving and adaptability skills demanded by

employers. These concerns highlight the persistent gap between national aspirations and workplace realities.

Additionally, the body of literature on graduate attributes and employability in Malaysian TVET is extensive but remains fragmented. Research spans across polytechnics, community colleges, technical universities and skills training institutes, and employs diverse methodologies and frameworks. However, there is limited synthesis that brings these findings together in a way that can inform national policy and institutional practices. Previous reviews of TVET governance have noted gaps in coordination, while broader studies on graduate employability in Malaysia have highlighted conceptual and measurement inconsistencies. This fragmentation points to the need for a rigorous and transparent consolidation of evidence that specifically focuses on Malaysian TVET.

Although a growing body of literature has examined graduate employability and skills development within TVET, existing reviews tend to focus on specific dimensions such as employability factors, curriculum alignment, or governance issues, often without synthesising these elements into an integrated conceptual framework. Moreover, many reviews adopt a broad or international scope, offering limited contextual insight into the Malaysian TVET landscape. Consequently, there remains a lack of a holistic and systematically derived framework that captures the layered development of graduate attributes in Malaysian TVET. Addressing this gap, the present systematic review goes beyond prior studies by focusing explicitly on the Malaysian context and by synthesising evidence across technical competencies, soft skills, future-ready attributes, and values-based qualities. The review culminates in the development of a pyramid model of graduate attributes, which provides an integrated, policy-relevant framework for understanding and strengthening employability in Malaysian TVET.

Therefore, this study addresses that need through a systematic review of literature on graduate attributes and employability skills in Malaysian TVET. Guided by the PRISMA 2020 framework, the review examines empirical and conceptual studies published since 2010, drawing from databases such as Scopus, ERA, MyCite and Google Scholar and Dimensions. The review is designed to answer three questions: (i) What graduate attributes and employability skills are most emphasised within Malaysian TVET? (ii) How do these attributes align with national frameworks such as the MQF 2.0 and policy priorities such as Industry4WRD? (iii) What gaps and directions emerge for future research and policy? By answering these questions, the paper consolidates current evidence, identifies critical gaps and offers insights that can strengthen TVET policy, curriculum design and graduate outcomes in Malaysia.

LITERATURE REVIEW

Industry Perspectives on Employability Skills

A substantial body of literature highlights the importance of employability skills from the perspective of industry stakeholders. Bassah and Noor (2023) reported that Malaysian industries increasingly demand graduates who not only possess strong technical knowledge but also demonstrate communication, interpersonal, problem-solving, and digital literacy skills. Their findings suggest that employers place equal emphasis on soft skills as on technical expertise, reflecting the dynamic requirements of Industry 4.0 workplaces. Similarly, Haron et al. (2019), in a study involving employers of Kolej Vokasional graduates, revealed that the most critical gaps perceived by employers lie in communication and critical thinking. The study recommended that vocational colleges strengthen training in soft skills to

better prepare graduates for employment. These studies consistently show that industries expect TVET graduates to demonstrate workplace readiness beyond technical competencies, positioning employability skills as a critical determinant of hiring decisions.

Overall, these studies indicate a clear convergence in industry expectations, whereby technical competence is regarded as a fundamental requirement but insufficient on its own. Malaysian employers increasingly prioritise graduates who can communicate effectively, adapt to changing work demands, and demonstrate digital readiness. This suggests that employability in TVET is shaped by a balanced integration of technical and transversal skills rather than by occupational proficiency alone.

Graduate Attributes and Job Performance

Graduate attributes have also been examined in relation to workplace performance. Rahmat, Ayub and Buntat (2022) investigated the predictive value of employability skill constructs for the job performance of polytechnic graduates in the field of electrical and electronic engineering. Through expert panel validation, they identified communication, teamwork, problem-solving, technological proficiency, organisational skills, and lifelong learning as significant predictors of workplace success. Their study demonstrated a strong consensus among experts regarding the essential skill set required for sustained career performance. This suggests that employability skills should be understood not merely as complementary to technical competencies but as integral to long-term effectiveness and adaptability in employment.

Although several studies focus on specific disciplines such as electrical and electronic engineering, the patterns observed across these studies suggest that core employability attributes, particularly communication, teamwork, problem-solving, and lifelong learning are broadly applicable across TVET disciplines. This indicates that while technical skills may be sector-specific, many graduate attributes associated with job performance are transferable and relevant across diverse TVET contexts.

TVET Curriculum and Skill Development

The TVET curriculum plays a critical role in shaping graduate attributes and employability. Abd Majid et al. (2024) examined employability skills development within a public university offering TVET programmes and found that hands-on activities and intensive industry engagement are the strongest contributors to employability outcomes. Their regression analysis highlighted that students exposed to real-world industrial problems demonstrated higher readiness for the labour market. The study advocates for curriculum reform that embeds structured, industry-driven experiential learning opportunities. This resonates with global TVET scholarship, which stresses the importance of linking curricula with actual workplace practices to bridge the gap between education and employment.

Taken together, these findings align with curriculum theories that emphasise experiential and practice-oriented learning, such as work-integrated learning and constructive alignment. The evidence suggests that employability skills are most effectively developed when curriculum design intentionally aligns learning outcomes, teaching activities, and assessment with real-world industry practices. This reinforces the role of curriculum structure, rather than content alone, in shaping graduate employability in TVET.

Soft Skills, Life Skills, and Career Readiness

Beyond curriculum, research has also addressed the role of soft skills and life skills in enhancing career readiness. Abdullah (2020) assessed polytechnic diploma students across five departments and found a relatively uniform distribution of life and career skills,

including productivity, accountability, responsibility, leadership, initiative, and social interaction. The study demonstrates that soft skills are embedded in TVET education but highlights variation in the degree of mastery across different cohorts. These findings indicate that while TVET institutions are successful in instilling core life and career skills, further attention is needed to ensure consistent outcomes across programmes and institutions.

Despite the recognised importance of soft and life skills, several studies implicitly highlight challenges in assessing them within TVET programmes. Soft skills such as leadership, responsibility, and social interaction are often measured through self-report or perception-based instruments, raising concerns about consistency and objectivity. This suggests a need for more robust and authentic assessment approaches to capture the development of soft skills in TVET contexts.

Systematic Reviews of TVET Graduate Employability

Recent scholarship has also attempted to synthesise the fragmented evidence base on TVET graduate employability. Che Rus et al. (2023) conducted a systematic review of graduate marketability in Malaysian TVET, using the PRISMA approach to identify recurring themes. Their analysis showed that the most critical factors influencing employability are curriculum relevance, industry engagement, skill gaps, and stakeholder involvement. They recommend curriculum revision cycles every five years and stronger institutional collaboration with industry to ensure graduate competencies remain aligned with evolving labour market demands. However, the review also noted the lack of empirical studies that directly assess the outcomes of reforms, highlighting a research gap that future studies should address.

Compared to previous systematic reviews, which primarily focus on identifying employability factors, curriculum relevance, or stakeholder roles, the present review adopts a more integrative approach. While earlier reviews offer valuable thematic insights, they rarely propose an explicit conceptual framework to holistically organise graduate attributes. In contrast, this review extends the literature by synthesising findings into a structured pyramid model that captures the hierarchical and interconnected nature of graduate attributes in Malaysian TVET.

Gaps and Emerging Issues in the Literature

Although the literature consistently underscores the importance of employability skills for TVET graduates in Malaysia, several unresolved issues remain. First, there is limited integration of employability research across the multiple subsectors of Malaysian TVET, which include polytechnics, community colleges, technical universities, and private training providers. Second, while national frameworks such as the Malaysian Qualifications Framework (MQF 2.0) and the Malaysia Education Blueprint specify generic learning outcomes, few studies evaluate how effectively these intended attributes are developed in practice. Third, evidence suggests that digital competencies and adaptability to Industry 4.0 remain underexplored in empirical studies, despite being central to Malaysia's industrial policy. Addressing these gaps requires systematic consolidation of existing knowledge, as well as new research linking graduate outcomes with specific curricular and policy interventions.

Collectively, these gaps highlight the absence of an integrated perspective that captures how different graduate attributes interact and develop within Malaysian TVET. This limitation underscores the need for a structured, hierarchical framework, which is conceptualised in this study through the proposed pyramid model of graduate attributes.

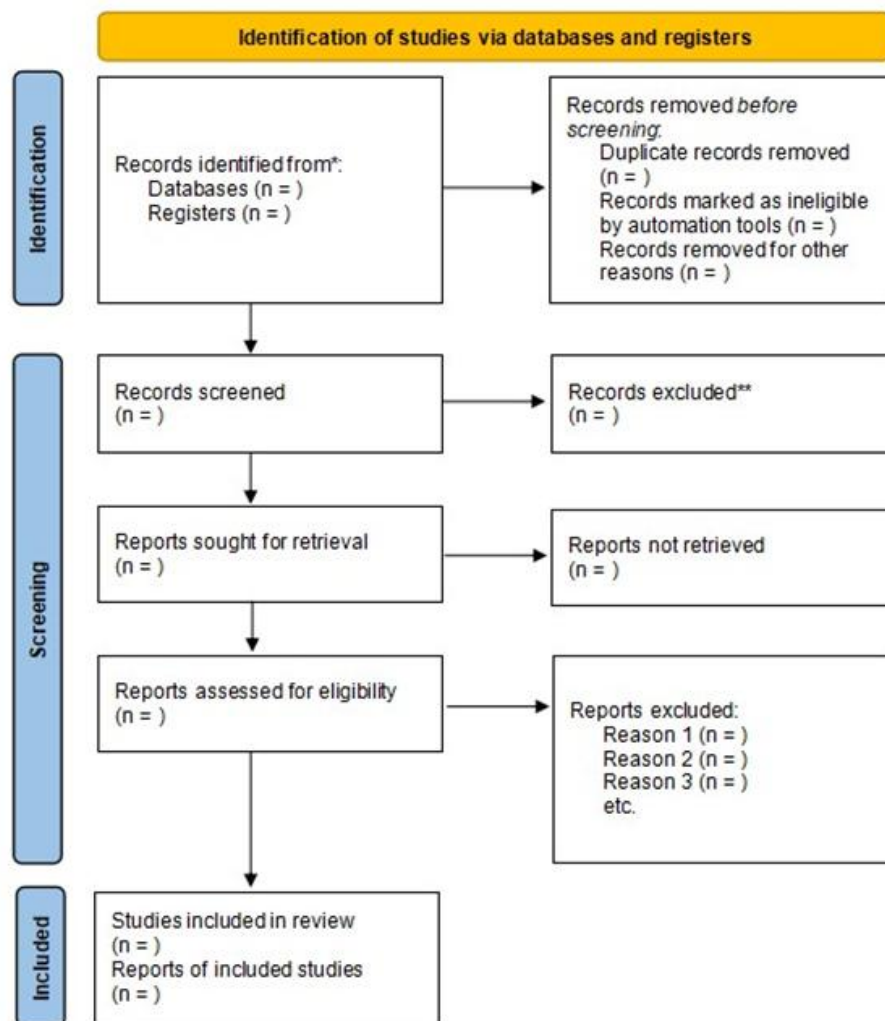
METHODOLOGY

This study adopted a systematic review methodology to synthesise evidence on graduate attributes and employability skills in the Malaysian Technical and Vocational Education and Training (TVET) context. Systematic reviews are widely recognised as a rigorous approach for consolidating findings across diverse studies through transparent and replicable procedures. Accordingly, this review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to enhance methodological transparency and reproducibility. The process of article identification, screening, eligibility assessment, and final inclusion is documented using the PRISMA flowchart, as presented in Figure 1.

This review was not pre-registered, as it was designed as an exploratory and policy-oriented synthesis rather than a hypothesis-driven systematic review. The primary emphasis was on systematically mapping and integrating fragmented evidence on graduate attributes and employability skills to provide a comprehensive understanding of the Malaysian TVET landscape. By adopting this design, the review aims to support evidence-informed policy directions and curriculum development, while also identifying gaps and emerging issues to guide future research.

Figure 1

Template for Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart of the search and selection process.



Source: (PRISMA, 2020)

Research Design

The present study adopted a systematic review design to synthesise the existing body of knowledge on graduate attributes and employability skills in the Malaysian TVET context. Systematic reviews are recognised as a rigorous method for integrating findings across multiple studies, as they rely on transparent, replicable procedures for identifying, selecting, and critically appraising research (Moher et al., 2009). Unlike narrative reviews, which may be more descriptive and prone to author bias, systematic reviews adhere to predefined protocols, thereby increasing the reliability and validity of the findings (Liberati et al., 2009).

This design was selected because the literature on TVET employability in Malaysia is expanding but remains fragmented. Studies exist across various subsectors, such as polytechnics, community colleges, technical universities, and private training providers, but their findings are often dispersed and reported using different frameworks. A systematic review consolidates these disparate contributions, providing a holistic and comprehensive overview of the field.

Furthermore, systematic reviews are particularly suited for policy-relevant and practice-oriented areas such as TVET. By aggregating evidence from diverse sources, this approach helps identify common themes, practical strategies, and recurring challenges that may inform curriculum reform, policy development, and institutional practices. The systematic review design also enables the recognition of research gaps, guiding future studies towards underexplored areas of graduate employability and attributes. However, this review was not pre-registered, as it was designed as an exploratory and policy-oriented synthesis rather than a hypothesis-driven systematic review.

The methodology was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 framework (Page et al., 2021). This ensured a structured and transparent process in the identification, screening, eligibility, and inclusion of studies. In addition, quality appraisal was performed using the Mixed Methods Appraisal Tool (MMAT) to evaluate the methodological soundness of the included studies. Together, these frameworks ensured that the review met international standards for systematic evidence synthesis. Thus, by employing this design, the study not only synthesises existing findings but also establishes a benchmark for future research on TVET employability in Malaysia, contributing to both academic discourse and practical decision-making in the field.

Gaps and Emerging Issues in the Literature

The following research questions guided the review:

1. What employability skills and graduate attributes have been identified as critical for TVET graduates in Malaysia?
2. How do Malaysian TVET curricula and industry engagement contribute to the development of these attributes?
3. What gaps remain in the current body of literature regarding TVET graduate employability?

Search Strategy

A comprehensive search was conducted across multiple academic databases to identify relevant studies. The databases included Scopus, Web of Science, ERIC, Google Scholar, and MyCite (Malaysian Citation Index). The search covered articles published between 2010 and 2024, to reflect contemporary issues in TVET and employability aligned with the Malaysia Education Blueprint (2015–2025).

The following keywords and Boolean operators were used:

- “TVET” OR “technical and vocational education”
- “employability skills” OR “graduate attributes” OR “soft skills”
- “Malaysia”

An example of a search string in Scopus:

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("TVET" OR "technical and vocational education") AND ("employability skills" OR "graduate attributes") AND ("Malaysia")
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Inclusion and Exclusion Criteria

Grey literature was excluded to ensure methodological rigour and consistency across included studies, although this may limit the representation of policy-driven and institutional reports in the review. To ensure relevance, studies were selected based on the following criteria (Table 1):

Table 1
Inclusion and Exclusion Criteria

Criteria	Inclusion	Exclusion
Population	Studies focusing on TVET students or graduates in Malaysia	Studies not related to TVET or outside the Malaysian context
Concept	Graduate attributes, employability skills, career readiness, soft skills	Studies focusing solely on technical skills without an employability context
Study Design	Empirical studies, systematic reviews, policy reports, case studies	Opinion pieces, commentaries, editorials, or non-research articles
Language	Publications in English	Non-English publications without translation
Publication	Peer-reviewed journal articles, conference proceedings, official reports	Unpublished theses, dissertations, or grey literature

Screening and Selection Process

After the initial search across multiple databases, all retrieved records were exported into reference management software, and duplicate entries were removed. The remaining articles underwent a two-stage screening process. First, the titles and abstracts were screened to ensure alignment with the research objectives, with particular focus on studies related to graduate attributes and employability skills within the Malaysian Technical and Vocational Education and Training (TVET) context. Studies that were clearly irrelevant, such as those

outside the scope of higher education or unrelated to employability, were excluded at this stage.

In the second stage, full-text screening was conducted on the shortlisted articles. Each article was assessed based on the inclusion and exclusion criteria described earlier to confirm its methodological soundness and relevance. At this stage, studies were excluded if they did not provide sufficient empirical evidence, lacked a clear discussion of employability or graduate attributes, or were not conducted within the Malaysian or TVET context.

The entire selection process was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. The PRISMA flow diagram was used to document each step of the process, including the number of records identified, the number of duplicates removed, the number of records screened, the reasons full-text articles were excluded, and the final number of studies included in the review. This structured approach ensured transparency and reproducibility of the study selection process.

Data Extraction

A structured data extraction form was developed to capture the following information from each study:

1. Author(s) and year of publication
2. Research objectives
3. Methodology (sample, design, instruments)
4. Graduate attributes and employability skills investigated
5. Key findings and implications

This approach ensured consistency and comparability across studies.

Data Analysis

Thematic synthesis was employed to analyse the extracted data. The analysis followed a systematic three-step process: (i) coding the key findings of each included study, (ii) grouping similar codes into analytical categories (such as communication skills, teamwork, problem-solving, and digital literacy), and (iii) developing overarching themes that represent broader employability constructs within the Malaysian TVET context. Coding was conducted independently by two reviewers, with discrepancies resolved through discussion to enhance analytical reliability. This approach enabled the identification of recurring employability skills across studies, while also highlighting areas where empirical evidence remains limited.

Quality Appraisal

To ensure the reliability and robustness of the findings, a systematic quality appraisal was conducted on all studies included in this review. The Mixed Methods Appraisal Tool (MMAT), a validated instrument designed for appraising the methodological quality of qualitative, quantitative, and mixed-methods studies, was employed as the primary assessment tool (Hong et al., 2018). This tool was chosen because it enables consistent evaluation across diverse research designs, which is particularly important in TVET research, which often employs multiple methodological approaches. Each study was evaluated against a set of core criteria, including the clarity and relevance of research questions, the appropriateness of the chosen methodology, the rigour and transparency of data collection methods, and the validity and trustworthiness of findings.

Additional considerations included whether the study clearly described its sampling strategy, data analysis procedures, and whether ethical considerations were adequately addressed. The appraisal process was conducted independently by two reviewers to minimise bias, with disagreements resolved through discussion until consensus was reached. Studies

were assigned ratings according to the MMAT guidelines, and only those meeting the minimum quality threshold were retained for synthesis. This ensured that the conclusions drawn from the review were based on methodologically sound and reliable evidence. Importantly, quality ratings were used to guide the interpretation of findings, with greater analytical emphasis placed on high-quality studies when synthesising themes and drawing conclusions. A summary of the quality appraisal outcomes is presented in Table 2.

Table 2

Summary of Quality Appraisal of Included Studies

Quality Rating (MMAT)	Number of Studies	Percentage (%)
High Quality	20	48%
Moderate Quality	15	36%
Low Quality	7	16%
Total	42	100%

RESULT

This section presents the findings of the systematic review based on the final sample of 42 studies on graduate attributes and employability skills in Technical and Vocational Education and Training (TVET) in the Malaysian context. The analysis synthesises evidence across diverse empirical and conceptual works, highlighting recurring themes, distinctive perspectives, and emerging gaps. For clarity, the results are organised into five sub-sections: (i) overview of included studies, (ii) graduate attributes identified in the TVET context, (iii) employability skills in TVET graduates, (iv) curriculum and policy implications, and (v) gaps and challenges in current research.

Overview of Included Studies

A total of 42 studies published between 2010 and 2024 met the inclusion criteria for this systematic review. The selected time frame spans more than a decade of research on graduate attributes and employability skills in the Malaysian TVET context, encompassing both foundational studies and more recent work aligned with evolving policy and labour market demands. Collectively, these studies provide a comprehensive empirical and conceptual basis for examining how employability-related attributes have been discussed and investigated across Malaysian TVET settings.

In terms of publication type, the majority of the included studies were journal articles ($n = 30$), indicating that graduate employability in TVET has been primarily disseminated through peer-reviewed academic outlets. This was followed by conference papers ($n = 8$), which often reported emerging findings or preliminary analyses, and policy or official reports ($n = 4$), which typically addressed institutional or system-level issues. The distribution of publication types suggests a research landscape dominated by academic scholarship, with more limited representation from formal policy documentation.

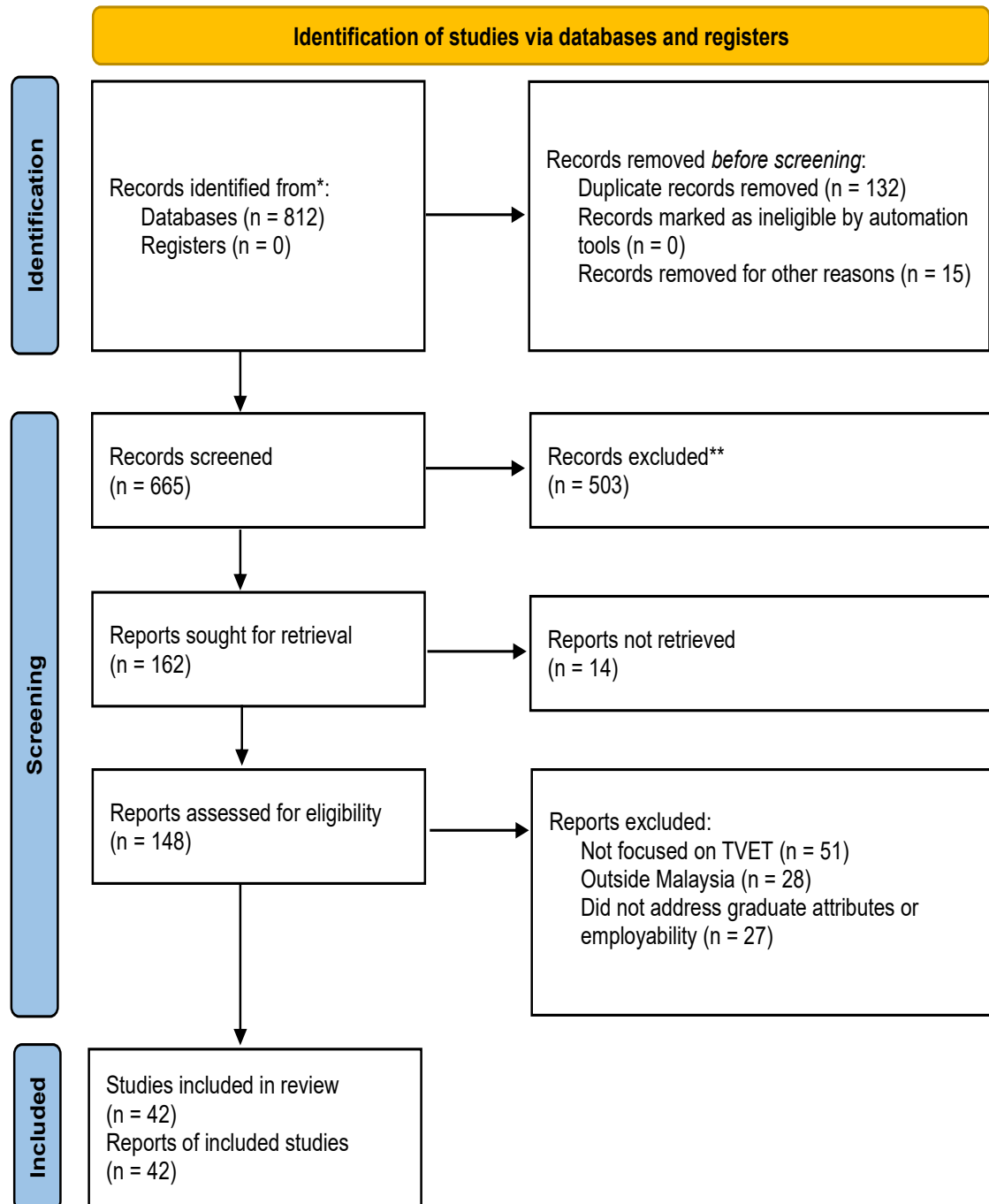
With respect to research design, quantitative approaches were most prevalent ($n = 22$), predominantly in the form of survey-based studies that operationalised employability constructs through structured instruments. Qualitative studies ($n = 12$) employed methods such as interviews, focus groups, and document analysis to capture the perspectives of students, graduates, educators, and industry stakeholders. In addition, mixed-methods designs ($n = 8$) combined quantitative and qualitative techniques, allowing for the triangulation of numerical trends with contextual insights and offering more nuanced interpretations of graduate attributes in practice.

Institutional coverage across the included studies was broad but largely concentrated within public TVET providers. Polytechnics ($n = 18$) and community colleges ($n = 9$) were most frequently examined, followed by public technical universities ($n = 7$). In contrast, relatively fewer studies focused on private TVET providers ($n = 5$) or conducted cross-sectoral comparisons across different types of institutions ($n = 3$). The participants represented in these studies were primarily diploma and certificate students and recent graduates. However, a subset of studies also surveyed employers and TVET educators to capture external and institutional perspectives on employability.

Quality appraisal using the Mixed Methods Appraisal Tool (MMAT) indicated generally acceptable methodological standards across the reviewed studies. Of the 42 studies, 20 were rated high quality, 15 moderate quality, and seven low qualities. Common strengths identified among higher-rated studies included clearly articulated research aims and appropriate sampling strategies. In contrast, common weaknesses among lower-rated studies involved limited reporting of instrument validity and reliability, as well as insufficient detail regarding analytic procedures. The overall process of article identification, screening, eligibility assessment, and final inclusion is summarised in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart, as shown in Figure 2.

Figure 2

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart of the search and selection process.



Graduate Attributes Identified in TVET Context

Across the 42 studies, graduate attributes clustered into recurring domains that align with national learning outcome frameworks and institutional graduate profiles. Table 3 summarises the frequency with which each attribute was reported.

Table 3*Frequency of graduate attributes reported across included studies (n = 42)*

Graduate attribute	Studies reporting (n)	% of studies
Technical and vocational competence	36	86%
Communication	28	67%
Teamwork, collaboration and leadership	26	62%
Problem solving and critical thinking	22	52%
Digital literacy and ICT competence	19	45%
Entrepreneurial orientation	17	40%
Lifelong learning and adaptability	15	36%
Ethics and professional values	12	29%
Global and intercultural awareness	7	17%

Three cross cutting observations can be drawn from the synthesis of the reviewed studies. First, technical mastery continues to dominate as the most frequently highlighted graduate attribute. This reflects the strong emphasis placed by employers on job ready proficiency, occupational competence, and adherence to industry standards. The consistent demand for graduates who are technically capable underscores the foundational role of TVET in supplying skilled manpower to Malaysia's economic sectors.

Second, soft skills such as communication, teamwork, leadership and problem solving repeatedly emerge as critical factors that differentiate graduates in the workplace. While technical expertise may secure initial employment, it is these interpersonal and cognitive skills that contribute to long term career progression and workplace effectiveness. The findings echo global research that emphasises the complementary role of soft skills alongside technical knowledge in sustaining employability in rapidly changing work environments.

Third, future ready attributes including digital literacy, adaptability, and an entrepreneurial mindset have become increasingly prominent in studies published after 2018. This trend aligns with Malaysia's national priorities on digitalisation, innovation, and Industry 4.0 readiness. The growing recognition of these attributes suggests that TVET institutions are under pressure to prepare graduates not only for current labour market demands but also for future challenges shaped by technological disruptions and global competition.

In addition, a smaller yet meaningful cluster of studies draws attention to values-based attributes such as ethics, professionalism, and civic responsibility. The emphasis on these attributes reflects a shift toward a more holistic conception of graduate development, one that recognises the importance of character, social responsibility, and integrity in shaping well rounded citizens as well as competent workers. This emerging dimension indicates that TVET is increasingly seen as not only an economic driver but also a platform for cultivating socially responsible and ethically grounded graduates.

Employability Skills in TVET Graduates

Employability skills represent the applied dimensions of graduate attributes and are crucial for the transition from education to the labour market. Across the reviewed studies, communication skills consistently emerged as one of the most decisive factors in workplace success. Employers have emphasised oral fluency, written clarity, and the ability to interact across diverse cultural and professional settings as key differentiators of high performing graduates (Abdullah-Al-Mamun et al., 2020). In particular, employers in Malaysia expect TVET graduates to communicate effectively not only with supervisors and peers but also with clients and stakeholders, thereby supporting productivity and organisational performance (Ismail et al., 2018).

In addition, teamwork and collaboration were frequently highlighted in the reviewed studies. Graduates who actively engaged in group projects or cooperative learning during training were found to be better prepared for collective tasks in the workplace (Osman et al., 2019). These skills are particularly critical in industries where project-based and cross-functional collaboration is the norm. Similarly, problem solving and critical thinking were repeatedly cited as central to workplace performance, enabling graduates to troubleshoot technical challenges, provide innovative solutions, and adapt to rapidly changing work demands (Chin & Chia, 2021; Suhairom et al., 2014). Simultaneously, digital skills gained prominence in more recent studies, reflecting the acceleration of digitalisation, automation, and Industry 4.0 transformations. Employers now express strong preferences for graduates who can confidently use ICT tools, specialised industry software, and emerging technologies relevant to their occupations (Hassan & Ahmad, 2021; Sang et al., 2020). These skills not only improve efficiency but also enhance adaptability to technological disruptions.

Another frequently mentioned dimension is the entrepreneurial mindset, which encompasses initiative, creativity, opportunity recognition, and the capacity to innovate within resource-constrained environments. This skillset is increasingly valuable in Malaysia's growing small and medium enterprise ecosystem and aligns with the national agenda to cultivate entrepreneurial graduates (Lee, 2021; Rahim & Singh, 2019). Entrepreneurial attributes are also viewed as enhancing resilience, enabling graduates to generate employment opportunities for themselves and others in a competitive labour market. Collectively, these findings suggest that while technical competence remains the foundation of employability in TVET, the integration of soft skills, digital literacy, and entrepreneurial attributes significantly enhances graduates' readiness for both immediate employment and long-term career advancement. The convergence of these skills reflects a shift towards holistic employability, where TVET graduates are expected to combine occupational proficiency with adaptability, innovation, and professional values.

Pyramid Model of Graduate Attributes and Employability Skills in Malaysian TVET

The pyramid model of graduate attributes presented in this study is inductively derived from the thematic synthesis of the reviewed literature, rather than being imposed a priori. It emerged through the systematic aggregation and organisation of recurring themes identified across the included studies, which consistently pointed to the existence of multiple, interrelated layers of attributes shaping graduate employability in the Malaysian TVET context. The model therefore reflects an evidence-based conceptualisation of how different categories of attributes are structured and developed in relation to one another.

1) Layer 1: Technical Mastery (Foundation)

At the foundational level of the pyramid, technical mastery constitutes the core requirement for occupational proficiency and job readiness. This layer reflects the dominant emphasis

across the reviewed studies on technical mastery, adherence to industry standards, and the acquisition of work-related skills as essential entry-level attributes for TVET graduates. As the most frequently reported attribute, technical competence forms the base upon which other employability-related attributes are developed.

2) Layer 2: Soft Skills Competencies

The second layer of the pyramid comprises soft skills such as communication, teamwork, leadership, and problem-solving. These attributes were consistently reported as critical for effective workplace integration and sustained job performance. Positioned above technical competence, soft skills function as enabling competencies that allow graduates to apply their technical knowledge productively within organisational, collaborative, and social work environments.

3) Layer 3: Future-Ready Attributes

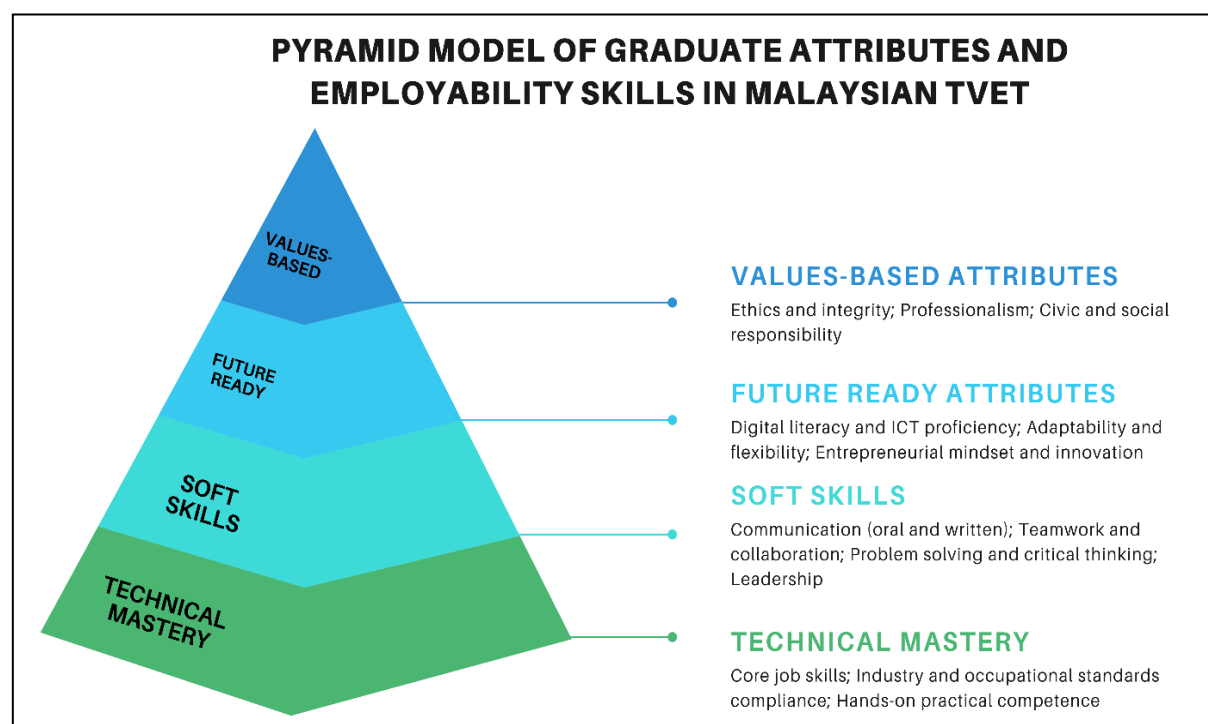
The third layer represents future-ready attributes, including digital literacy, adaptability, and entrepreneurial mindset. These attributes were more prominently reflected in studies published in recent years, particularly those aligned with Industry 4.0 and digitalisation agendas. Their placement above technical and soft skills highlights their role in supporting graduates' capacity to respond to evolving labour market demands, technological change, and emerging forms of work.

4) Layer 4: Values-Based Attributes (Apex)

At the apex of the pyramid are values-based attributes such as ethics, professionalism, and civic responsibility. Although these attributes were less frequently discussed in the reviewed studies, they were increasingly recognised as integral to holistic graduate development. Unlike existing employability frameworks that present attributes as flat or parallel constructs, this pyramid model conceptualises graduate attributes hierarchically, illustrating their layered and interrelated development. The structure provides a coherent representation of how technical, soft, future-ready, and values-based competencies collectively shape graduate employability in the Malaysian TVET context, as summarised in Figure 3.

Figure 3

Pyramid Model of Graduate Attributes and Employability Skills in Malaysian TVET



Curriculum and Policy Implications

The findings of this review highlight significant implications for curriculum development and policy formulation within Malaysian TVET. First, the consistent emphasis on technical mastery underscores the importance of maintaining strong alignment between TVET curricula and industry standards. This requires continuous collaboration between training institutions, employers, and accreditation bodies to ensure that graduates acquire up to date competencies that match occupational demands (Rasul et al., 2013). Industry advisory panels and sector specific qualification frameworks can serve as effective mechanisms to strengthen this alignment.

Second, the importance of communication, teamwork, and problem solving as core employability skills suggests that TVET curricula should integrate structured opportunities for the development of soft skills. Project based learning, cooperative education, and work integrated learning have been identified as effective approaches to strengthen these competencies (Mustapha & Greenan, 2002; Alias et al., 2018). Embedding these activities within mainstream curricula would prepare students not only for technical roles but also for collaborative and dynamic work environments.

Third, the prominence of digital literacy and entrepreneurial mindset in recent studies reflects the growing demand for future ready graduates. Policy initiatives such as Malaysia's TVET Empowerment Agenda and the Malaysia Education Blueprint (Higher Education) 2015–2025 emphasise the need to integrate Industry 4.0 related competencies across programmes. Curricular reforms that introduce digital tools, coding, automation, and entrepreneurship modules can enhance graduate adaptability to technological disruptions and evolving job markets (Hassan & Ahmad, 2021).

Finally, the recognition of values-based attributes, including ethics and civic responsibility, suggests that TVET should not only focus on producing skilled workers but also holistic graduates who embody professionalism and social accountability. Policy makers can encourage institutions to embed values education and civic engagement components into training programmes, aligning with Malaysia's aspiration to develop balanced human capital (Ismail et al., 2018).

Gaps and Challenges in Current Research

While the body of literature on TVET graduate attributes and employability skills in Malaysia has expanded, several gaps and challenges remain. First, many studies focus on employer perspectives, with limited attention given to graduate and student voices. This creates an incomplete understanding of how employability skills are developed, experienced, and applied in practice (Chin & Chia, 2021). Future studies should employ longitudinal designs that track graduates' skill development across training and employment phases.

Second, there is a predominance of descriptive and cross-sectional studies, while rigorous empirical research employing experimental or longitudinal designs remains scarce. This limits the ability to establish causal relationships between curriculum interventions and employability outcomes (Osman et al., 2019). A more diverse methodological approach, including mixed methods and large scale of surveys, could generate stronger evidence for policy and practice.

Third, research on digital skills and entrepreneurial mindset in TVET remains emergent. Although these attributes are increasingly recognised as essential, few studies have systematically examined how such competencies can be effectively taught, assessed, and sustained over time (Lee, 2021). This represents a crucial gap given Malaysia's national priority for digitalisation and entrepreneurship.

Finally, there is a notable lack of comparative research across TVET subsectors, institutions, and regions. The heterogeneity of TVET in Malaysia means that findings from one context may not be generalisable to others. More comparative and cross institutional studies are needed to identify best practices and to develop scalable models of employability skill integration (Suhairom et al., 2014).

DISCUSSION

The systematic review demonstrates that the integration of technical mastery, soft skills, future-ready attributes, and values-based competencies shapes the employability of TVET graduates in Malaysia. This aligns with the broader discourse in higher education, which emphasises that employability is a multidimensional construct rather than a singular outcome of technical training (Chin & Chia, 2021). The prominence of communication, teamwork, and problem-solving skills in the reviewed studies reinforces the idea that graduates must be equipped with both occupational and transferable skills to thrive in dynamic workplaces. This finding resonates with global perspectives, where employers consistently rank soft skills as equal to or more important than technical skills (OECD, 2019).

A notable theme in the findings is the growing recognition of digital literacy and an entrepreneurial mindset. The demand for digital skills reflects the rapid adoption of Industry 4.0 technologies across Malaysian industries, a transformation that TVET institutions are expected to respond to with curriculum reform and targeted training (Hassan & Ahmad, 2021). Similarly, entrepreneurship education has gained traction as a mechanism to empower graduates not only to seek employment but also to create it, particularly within the small and medium enterprise sector that drives much of Malaysia's economic growth (Lee, 2021). This aligns with the Malaysia Education Blueprint (Higher Education) 2015–2025, which positions entrepreneurship as a key driver of graduate competitiveness.

The emphasis on values-based attributes, including ethics, professionalism, and civic responsibility, highlights the shift towards holistic graduate development. While these attributes have historically received less attention in TVET research than technical and soft skills, recent studies suggest they are increasingly valued by employers and society (Ismail et al., 2018). This trend underscores the importance of balancing employability with character development, thereby producing graduates who contribute positively to workplaces and communities. The findings echo the aspirations of Malaysia's Shared Prosperity Vision 2030, which calls for a skilled, ethically grounded human capital.

However, the findings also reveal persistent challenges. Many studies continue to emphasise employer perspectives while giving limited attention to graduate voices. This imbalance raises questions about whether employability is defined primarily by labour-market demands rather than by the broader aspirations of graduates themselves. A more inclusive approach that incorporates multiple stakeholder perspectives would strengthen the discourse on graduate attributes in TVET (Rahim et al., 2020). Furthermore, while digital and entrepreneurial skills are frequently cited as important, there remains limited empirical evidence on effective pedagogical strategies for embedding these attributes into TVET curricula (Cheng et al., 2020). Addressing these gaps requires both curriculum innovation and research rigour.

Finally, this review reinforces the need for greater alignment among research, curriculum, and policy. Policy frameworks such as the TVET Empowerment Agenda provide broad directions, but their effectiveness depends on evidence-based implementation at the institutional level. For instance, embedding work-integrated learning, industry partnerships, and assessment mechanisms for employability skills are critical for ensuring that policies translate into graduate outcomes (Alias et al., 2018). The integration of these elements will

not only enhance employability but also ensure that Malaysian TVET graduates remain competitive in an increasingly digital and globalised economy.

From a conceptual perspective, the findings of this review align with the notion of employability as capital rather than a discrete set of skills. The layered attributes identified in the pyramid model reflect the accumulation of technical, social, and personal resources that graduates draw upon across their careers. In this sense, employability in Malaysian TVET can be understood as a dynamic capacity that extends beyond immediate job readiness. Furthermore, the inclusion of values-based attributes at the apex of the model reinforces the broader discourse on holistic graduate development, which positions TVET not only as a mechanism for workforce preparation but also as a platform for cultivating ethically grounded and socially responsible individuals.

CONCLUSION

This study's key contribution lies in the proposed pyramid model, which offers a coherent framework for aligning research, curriculum and policy in Malaysian TVET. This systematic review concludes that the employability of Malaysian TVET graduates relies on the integration of technical mastery, soft skills, future-ready attributes, and values-based competencies. While technical competence forms the essential foundation, attributes such as communication, teamwork, digital literacy, entrepreneurial mindset, and ethical responsibility increasingly define graduate success in dynamic workplaces. The findings emphasise the need for closer collaboration among policymakers, institutions, and industry to align curricula with evolving labour market demands, while also highlighting research gaps in digital skills, entrepreneurship, and graduate perspectives. Strengthening these dimensions will ensure that Malaysian TVET not only produces job-ready graduates but also cultivates adaptable, ethical, and resilient individuals who can contribute meaningfully to sustainable national development.

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