Journal of Emerging Technologies and Industrial Applications
Vol. 5 No. 1 (2026) pp. 1-20
e-ISSN: 2948-507X

Journal homepage: https://jetia.mbot.org.my/index.php/jetia/index

Evolution and Trends of TVET in Malaysia: A Systematic Review

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Abstract: Technical and Vocational Education and Training (TVET) is vital for Malaysia's economic development and workforce readiness. However, existing research is often fragmented, focusing on specific issues rather than providing a comprehensive overview of the sector. This study aims to synthesise the evolution, trends, challenges, and developments of TVET in Malaysia from 2020 to 2026. A systematic literature review was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A total of 105 articles were selected from Web of Science, Scopus, Google Scholar, and national repositories. The studies were analysed based on research design and thematic focus. Findings show that review studies dominate (55, 52.37%), followed by qualitative (24, 22.86%), quantitative (19, 18.10%), and mixed-methods research (7, 6.67%). The results indicate that Malaysia's TVET system has evolved from a trade-based training model to a more structured and coordinated skills ecosystem. Key developments include institutional expansion, national qualification frameworks, and governance reforms. However, challenges such as governance fragmentation, skills mismatch, limited resources, and negative perceptions of TVET persist. In conclusion, current policies emphasise governance coordination, industry collaboration, competency-based training, and integration of digital and green skills. Future research should focus on graduate outcomes and programme effectiveness to address policy needs and support institutional improvement.

Received 10 February 2026; Accepted 01 May 2026; Available online 26 June 2026

Keywords: Challenges, Evolution, Milestones, Stakeholders' Expectations, Transformations, TVET

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1. INTRODUCTION

Technical and Vocational Education and Training (TVET) plays a role in Malaysia's economic growth, productivity, and workforce development [1]. In line with the nation's aspiration to achieve high-income status, TVET is recognised as a key mechanism for developing competent and skilled human capital [2]. National policies and the Industrial Revolution 4.0 (IR 4.0) agenda emphasise its strategic role in strengthening Malaysia's education and labour market ecosystem [3].

TVET functions as a critical bridge between the training institutions and industry [4]. These programmes are designed to address current and advanced sectoral needs by prioritising practical skills, workplace training, and graduate employability [5]. Collaboration between TVET institutions and industry ensures curriculum relevance, reduces skills mismatches, and broadens opportunities in strategic industries such as manufacturing, technology, construction, and services [6].

In recent years, the TVET landscape in Malaysia has undergone a significant transformation [7]. Increasingly diverse student backgrounds, including local and international, require more inclusive and flexible teaching approaches [8]. At the same time, rapid technological advancement and global industry demands have further strengthened the strategic importance of TVET [9].

Despite these developments, there remains a lack of a comprehensive synthesis of Malaysian TVET [10]. Existing studies often focus on specific aspects or isolated issues, limiting a holistic understanding of its milestones, challenges, transformations, and stakeholder expectations [11],[12],[13].

Accordingly, this systematic review synthesises previous research on TVET in Malaysia. The objectives of this study are to:

1. Outline the milestones of TVET development.
2. Identify the challenges faced by the TVET system.
3. Describe the transformation of TVET over time.
4. Summarise stakeholder expectations of TVET.

The review analyses the literature and relevant studies on TVET in Malaysia. Particular attention is given to its role in national development and responsiveness to industry requirements. Furthermore, it situates TVET within the broader global education and workforce context.

2. METHODOLOGY

This study employed a systematic literature review method involving the stages of identification, screening, eligibility assessment, and inclusion [14]. The identification stage followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. These guidelines provide a structured approach for conducting and reporting systematic reviews [15],[16]. The search strings are shown in Table 1.

The reference articles were published in English and Malay. Screening was conducted using the Central Access Database for Impact Assessment (CADIMA), the online tool. The electronic databases searched included Web of Science (WoS), Scopus, Google Scholar, Excellence in Research for Australia (ERA), SpringerLink, Taylor & Francis Online, ResearchGate, and Academia, along with national repositories such as MyCite and

Table 1 - Search strings code

Database	Boolean search string
CADIMA/WoS /Scopus	("TVET" OR "Technical and Vocational Education and Training" OR "Vocational Education" OR "Technical Education") AND ("evolution" OR "trend*" OR "development" OR "change*" OR "transformation*") AND ("challenge*" OR "issue*" OR "problem*") AND ("stakeholder*" OR "policy maker*" OR "educator*" OR "institution*") AND "Malaysia,"
Google Scholar	("TVET" OR "Technical and Vocational Education and Training") AND (evolution OR trend OR development OR transformation) AND (challenge OR issue) AND stakeholder AND Malaysia
SpringerLink/ Taylor & Francis Online /ResearchGate	("TVET" OR "Technical and Vocational Education and Training") AND (evolution OR trend OR development OR transformation) AND (challenge OR issue OR problem) AND (stakeholder OR educator OR "policy maker") AND Malaysia
ERA/MyCite/ Academia	Boolean operators not supported; search conducted using keywords: TVET, evolution, trend, transformation, challenge, stakeholder, Malaysia

selected Malaysian government policy documents.

The search strings were developed based on key concepts related to TVET, including evolution, trends, transformation, challenges, stakeholders, and Malaysia. In CADIMA, Boolean operators (AND, OR, NOT) and parentheses were used to group related terms and systematically search the keywords.

The review included studies published between 2020 and 2026. A total of 1,673 articles were identified from the selected databases: WoS (96), Scopus (103), Google Scholar (937), ERA (104), MyCite (88), SpringerLink (42), Taylor & Francis Online (37), ResearchGate (144), Academia (107), and national repositories (15). After screening, 374 duplicate articles were removed. An additional 257 articles were excluded because they were not related to Malaysia, resulting in 1,042 articles.

Subsequently, the screening process excluded studies published in 2019 and earlier. As a result, 173 articles (n = 173) were retained, while the remaining 869 articles were excluded because only studies published between 2020 and 2026 were eligible. Reports were then sought for retrieval (n = 173). Of these, 25 reports could not be retrieved due to access limitations. Consequently, 148 full-text articles were assessed for eligibility.

The eligibility assessment involved reviewing 148 articles based on the criteria of publication in English or Malay. Following this assessment, 8 articles (n = 8) were excluded because they were not published in either language. The remaining articles were further evaluated for relevance to the study scope, which focused on TVET milestones, challenges, transformations, and stakeholders. A total of 35 articles were excluded because they fell outside the scope of the study.

Finally, the inclusion process resulted in 105 eligible articles (n = 105). These studies were included in the systematic review. The results of the screening process based on the PRISMA model are presented in Figure 1.

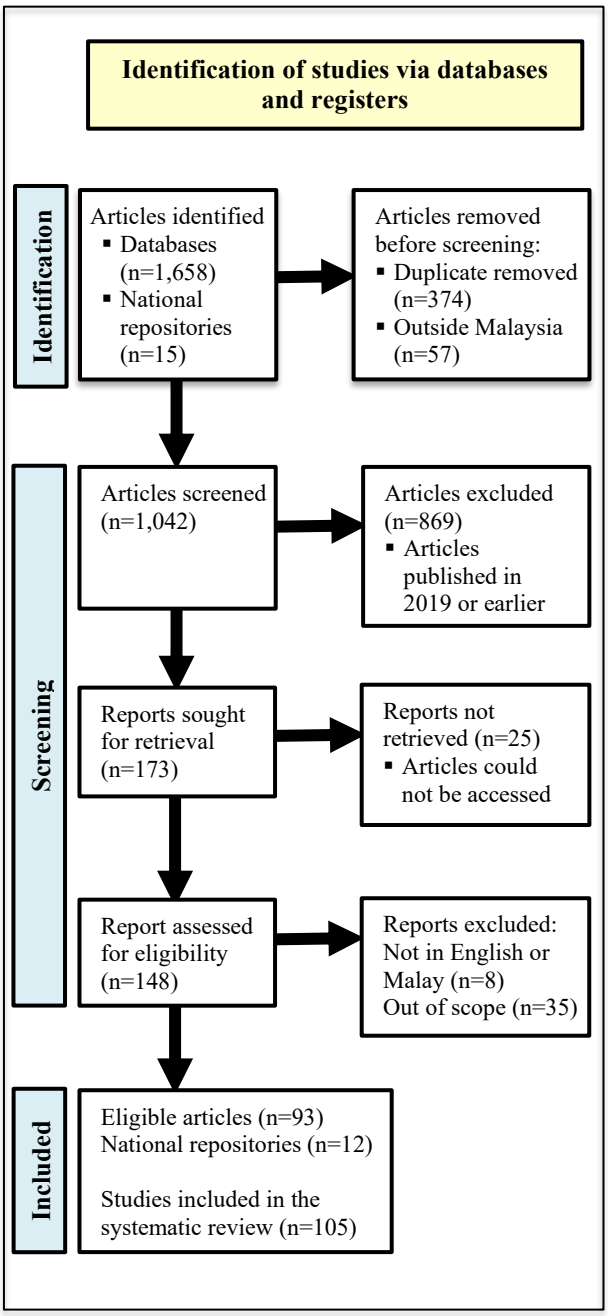

Fig. 1 – Study selection PRISMA flow chart

Table 2 outlines the article filtering process. Thereafter, the remaining articles underwent detailed screening and selection. This stage resulted in the final set of studies included in the systematic review. The selection was conducted in accordance with the PRISMA guidelines.

Table 2 – Article filtering process

Stage	Excluded	Remaining
Initial database search	-	1,673
Duplicates removed	374	1,299
Not focused on Malaysia	257	1,042
Publication years 2020-2026	869	173
Reports not retrieved	25	148
Languages other than English or Malay	8	140
Out of scope	35	105
Final articles included in the systematic review	**-**	**105**

3. RESULTS

This section presents the findings of the systematic review based on the 105 selected studies. Among these, 93 were sourced from database searches, whereas 12 were retrieved from national repositories. The results are organised according to the four objectives. These address the evolution of TVET in Malaysia and emerging trends related to challenges and stakeholder expectations. The discussion integrates evidence across the studies to provide a comprehensive understanding of the development and current direction of TVET in Malaysia.

3.1 Overview of Included Studies

A total of 105 studies were included in this systematic review following the PRISMA screening process. The descriptive analysis provides an overview of publication trends, research designs, and thematic focus. This outlines the research landscape of TVET in Malaysia between 2020 and 2026.

3.2 Publication Trends (2020–2026)

As presented in Table 3, the number of publications on TVET in Malaysia increased steadily from 2020 to 2026, reaching a peak in 2026 (n = 32).

Table 3 - Distribution of studies by year

Year	Number of studies (n)	Percentage (%)
2020	3	2.86%
2021	4	3.81%
2022	6	5.71%
2023	9	8.57%
2024	23	21.9%
2025	28	26.67%
2026	32	30.48%
Total	**105**	**100.00%**

The consistent upward trend from 2020 to 2026 may be associated with several contextual developments. The global pandemic accelerated discussions on digital learning, workforce adaptability, and skills resilience, positioning TVET at the centre of policy and academic interest. Furthermore, national initiatives related to Industry 4.0 and digital transformation stimulated research on employability, curriculum reform, and skills development.

The volume of research has increased over time. This reflects stronger academic and policy recognition of TVET's strategic role in Malaysia's national development.

3.3 Research Design Characteristics

Table 4 illustrates the research design of the studies included in the review. As observed, review papers constitute the largest proportion (52.37%), followed by qualitative studies (22.86%), quantitative studies (18.10%), and mixed methods research (6.67%).

Table 4 - Research design of studies

Research design	Number of studies (n)	Percentage (%)
Qualitative	24	22.86%
Quantitative	19	18.10%
Mixed methods	7	6.67%
Review papers	55	52.37%
Total	**105**	**100.00%**

Qualitative studies frequently used interviews, document analysis, and case studies. These methods were applied to explore governance issues, stakeholder perspectives, and institutional challenges within the TVET ecosystem.

Quantitative research primarily focused on employability outcomes, student readiness, competency measurement, and industry satisfaction. The mixed methods approach provided more comprehensive insights by integrating statistical analysis with interpretive analysis.

The predominance of review papers indicates that much of the literature focuses on synthesising knowledge, policy analysis, and conceptual discussions. Qualitative research remains important for understanding institutional and stakeholder issues. However, fewer quantitative and mixed methods studies suggest a gap in empirical and data-driven research on Malaysia's TVET.

3.4 **Primary Focus Areas of Studies**

The thematic distribution of the included studies is listed in Table 5. The largest category is "Others (funding, inclusivity)" (20.95%), followed by policy and governance (18.10%). This shows strong attention to institutional issues as well as broader concerns such as access, equity, and financing.

Table 5 - Primary focus areas of studies

Focus area	Number of studies (n)	Percentage (%)
Policy and governance	19	18.10%
Graduate employability	17	16.19%
Curriculum reform	10	9.52%
Industry collaboration	12	11.43%
Digitalisation and IR 4.0	14	13.33%
Perception of TVET	11	10.48%
Others (funding, inclusivity)	22	20.95%
Total	**105**	**100.00%**

Graduate employability (16.19%) is also a key focus area. This demonstrates continued concern about workforce readiness and skills mismatch. Digitalisation and IR 4.0 (13.33%) and industry collaboration (11.43%) indicate growing interest in technological adaptation and industry alignment.

Curriculum reform accounts for 9.52% of the studies. These studies focus on improving programme relevance and aligning training with industry needs. Research on the perception of TVET (10.48%) examines societal attitudes, student motivation, and the stigma linked to vocational education.

Taken together, the findings reveal that TVET research in Malaysia focuses on governance, employability, and specialised skills such as digitalisation. At the same time, attention to funding and inclusivity highlights the importance of access and sustainability. These trends exemplify national priorities in strengthening human capital and supporting economic development.

4. DISCUSSION

This discussion synthesizes the findings from the systematic review by examining both the development and recent trends in TVET in Malaysia. It focuses on four key aspects: milestones in the sector's development, challenges faced by the TVET system, transformations that have occurred over time, and stakeholders' expectations. The first two aspects are considered within the historical evolution of TVET. The latter two represent contemporary trends, providing a comprehensive understanding of the sector's progression and current direction.

4.1 **Milestones of TVET Development in Malaysia**

The development of TVET in Malaysia portrays the country's socioeconomic transformation and industrialisation agenda [17]. Over time, the system has evolved from trade-based training into an integrated national skills framework with multiple qualification pathways [18]. Formal vocational education began in 1926 with the creation of trade schools, including the Penang Trade School,

which provided basic skills training such as carpentry and metalwork [19].

Figure 2 shows the chronological development of institutional milestones in Malaysia's TVET. In 1946, Technical College Kuala Lumpur was founded to support post war reconstruction and industrial development [20]. In 1953, *Maktab Teknik* (later University of Technology Malaysia) was introduced, marking an important step in the development of higher technical education [21].

During the 1960s and 1970s, vocational secondary schools and polytechnics expanded to produce mid-level technical manpower, aligned with Malaysia's industrialisation strategy and the New Economic Policy (NEP, 1971-1990) [22].

In the 1980s, institutional diversification increased access to skills training [23]. The establishment of GIATMARA (1986) and the strengthening of Industrial Training Institutes (*Institut Latihan Perindustrian*, ILP) expanded opportunities for school leavers and rural communities [24],[25]. Training programmes gradually incorporated competency-based approaches and stronger industry engagement [26].

In the 1990s and early 2000s, several reforms strengthened qualification structures and learning pathways. The National Dual Training System (NDTS) introduced work-based learning, while the Malaysian Skills Certification (*Sijil Kemahiran Malaysia*, SKM) and the Malaysian Qualifications Framework (MQF) standardised qualifications and quality assurance [27],[28]. Vocational schools were later upgraded into Vocational Colleges, and technical universities were grouped under the Malaysian Technical University Network (MTUN), creating clearer progression pathways from certificate to degree levels [29].

A major governance reform occurred in 2020 with the establishment of the National TVET Council (*Majlis TVET Negara*, MTVET), aimed at improving coordination across multiple ministries involved in TVET provision [30].

Subsequent policy initiatives continued to shape the sector. The Malaysia Higher Education Blueprint 2026-2035 provides strategic direction for the tertiary education sector [31],[32]. It also outlines implications for technical universities, polytechnics, and TVET institutions in governance, academic quality, industry collaboration, and graduate employability [33]. The National Education Plan 2026-2035 (*Rancangan Pendidikan Negara*, RPN) adopts a system-wide approach across all levels of education [34]. The RPN consists of policy coordination, improved progression pathways, and expanded access to skills-based education [35].

In 2023, the introduction of TVET Madani Malaysia positioned TVET within the broader Malaysia Madani framework [36]. The initiative fosters talent development, industry collaboration, governance, and wider access to technical education [37].

As of January 2026, Malaysia hosts approximately 1,650 TVET institutions,

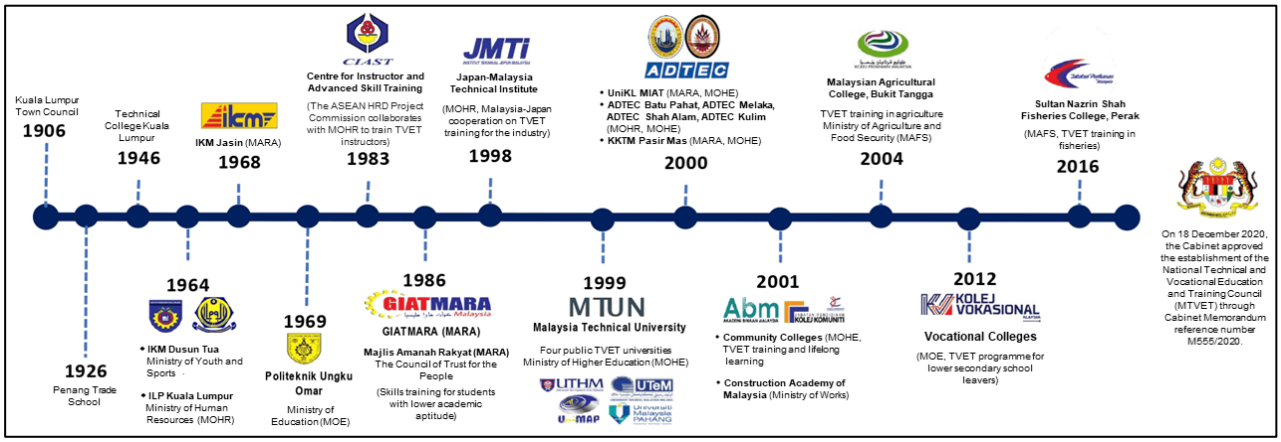

Fig. 2 - Institutional milestones in Malaysia's TVET development

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including 673 public institutions, 28 state-administered institutions, and 949 private institutions [38]. This indicates a significant expansion of training capacity and participation from both public and private providers. Table 6 summarises the major policy and institutional milestones in Malaysia's TVET development.

Table 6 - Policy and system milestones in Malaysia's TVET development

Period	Key development	System significance
1926 - 1950s	Establishment of trade schools, Technical College Kuala Lumpur, *Maktab Teknik* (later University of Technology Malaysia)	Foundation of formal technical education
1960s - 1970s	Expansion of vocational secondary schools and polytechnics (aligned with NEP)	Development of industrial technical workforces
1980s	Establishment of GIATMARA and strengthening of ILP	Institutional diversification and expanded training access
1990s - 2000s	NDTS, SKM, MQF, MTUN	Qualification standardisation and pathway integration
2020	Establishment of National TVET Council (MTVET)	Strengthened governance coordination
2023	Introduction of TVET Madani Malaysia	Strategic repositioning of TVET
2026 - 2035	Malaysia Higher Education Blueprint 2026-2035 National Education Plan 2026-2035	Policy integration and long-term system alignment

These developments signal a gradual transformation of Malaysia's TVET system from divergent training provision to a more coordinated and nationally structured skills system [39]. This evolution reflects closer alignment with workforce and economic needs.

4.2 Challenges in Malaysia's TVET System

TVET in Malaysia faces several persistent challenges that affect its overall effectiveness. This occurs despite the high marketability of TVET graduates, which exceeds 95% [40]. Several structural and systemic issues remain that require further attention [41].

These challenges underscore structural, institutional, and perception-related issues within the TVET system [42]. They also point to domains where concerted efforts among government, industry, and training institutions are necessary [43].

One major challenge is societal perception, as TVET is commonly perceived as a secondary alternative for pursuing higher education [44]. It is frequently associated with school dropouts or low academic achievers [45]. This perception continues to affect public confidence and student participation in TVET programmes [46].

Another issue relates to industry collaboration. Although industry engagement is recognised as essential for effective TVET development, sustained cooperation remains uneven [47]. This limits the alignment between training programmes and labour market requirements [48]. As a result, skill mismatches persist between graduates' competencies and evolving industry demands, particularly in fields influenced by IR 4.0, artificial intelligence (AI), and automation [49],[50].

Governance fragmentation also presents a significant challenge. More than 500 TVET institutions operate under different ministries and agencies [51]. This creates harmonisation difficulties in curriculum standards, certification systems, and quality assurance [52]. Policy inconsistencies and administrative overlap further complicate implementation and system efficiency [53].

Resource constraints continue to affect the development of the sector. These include limitations in financing for institutional development, training facilities, and equipment [54]. There are also challenges in providing sustainable student funding [55]. In some institutions, training equipment is outdated [56]. Additionally, shortages of qualified

instructors impact the quality of training and learning environments [57].

Employment outcomes also present challenges [58]. Although graduate employability rates are generally high, some TVET graduates face relatively low starting salaries, particularly in urban locations with higher living costs [59]. Moreover, limited geographic mobility among graduates may restrict employment opportunities [60].

The role of the private sector remains important in strengthening TVET [61]. However, stronger industry participation is still needed [62]. This includes settings such as training materials, curriculum development, policy consultation, and feedback processes between industry and training providers [63].

In response, the Malaysian government has introduced several reforms [64]. The reforms target better integration, augmented funding, upgraded training infrastructure, and the promotion of competency-based, industry-driven training [65]. They enhance TVET effectiveness and help develop a workforce that fills the skill gaps in the labour market.

The key challenges facing Malaysia's TVET system are summarised in Figure 3.

4.3 Malaysia's TVET Transformation Over Time

The transformation of TVET in Malaysia evinces adjustments to the national skills development agenda [66]. These changes respond to technological developments, evolving labour market demands, and global economic shifts [67]. Anchored by the National TVET Policy 2030, these reforms position TVET as an important mechanism for strengthening workforce competitiveness, supporting social mobility, and contributing to economic development [68]. The policy outlines a framework intended to ensure that TVET remains relevant to workforce needs and socially inclusive [69]. It supports institutional arrangements and alignment with priority industries [70].

A central aspect of the transformation is enhancing the system's coherence and alignment. The National TVET Policy 2030 tackles these issues by promoting integrated governance [71] and strengthening the central oversight role of the MTVET, clarifying institutional responsibilities [72]. It also seeks to improve quality assurance mechanisms [73]. These governance efforts aim to reduce inefficiencies and synchronise training programmes with national priorities [74].

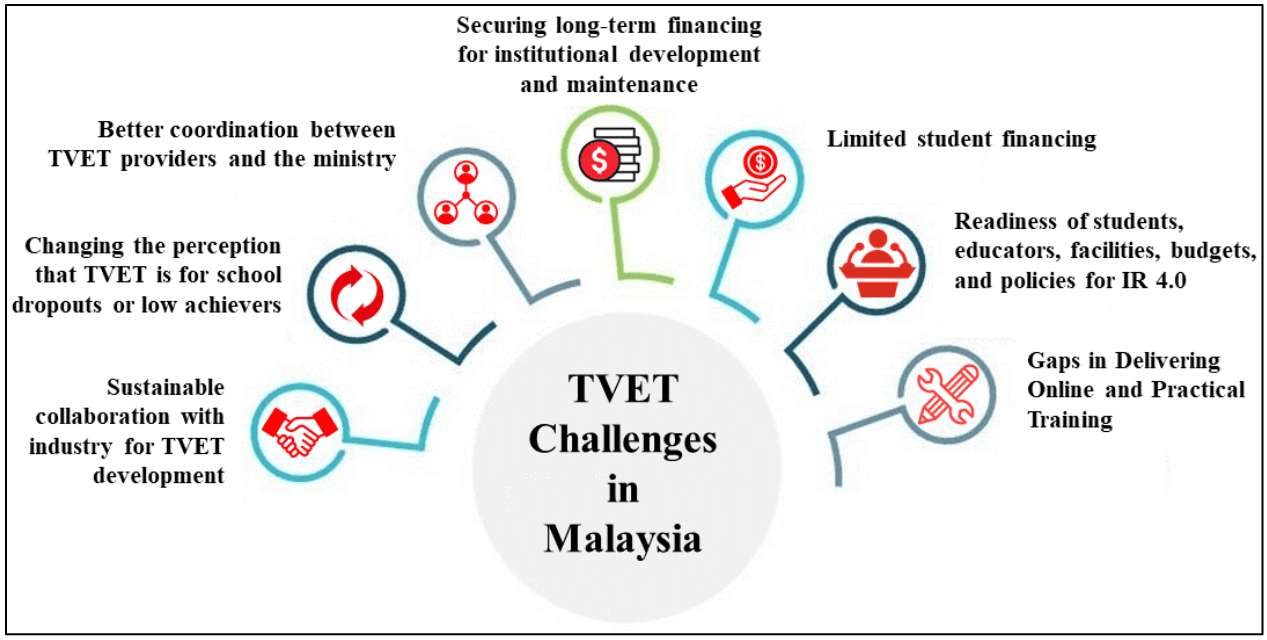

Fig. 3 - Challenges to strengthening TVET in Malaysia

Figure 4 illustrates the Five Strategic Thrusts Framework underpinning Malaysia's National TVET Policy 2030. These thrusts provide the operational framework for the reforms. Comprehensive and responsive governance fosters institutional synergy. Quality education and training pathways seek to improve standards through harmonised accreditation and clearer progression routes from certificate to higher qualifications [73]. This also supports links between vocational and academic pathways.

Responding to workforce imperatives is another important dimension of the transformation. Rapid developments in AI, digitalisation, automation, and industrial restructuring have increased the demand for new skills while also highlighting existing skills mismatches [75]. The policy therefore emphasises competency-based education and training, with greater integration of digital skills, robotics, automation technologies, and green skills into TVET curricula [76],[77]. This approach aims to equip graduates with both technical competencies and the ability to adapt to changing workplace requirements.

Flexible learning pathways have also become more prominent within the TVET system [78]. Modular certification structures and stackable credentials allow learners to upskill and reskill at different stages of their careers. These arrangements support lifelong learning and progression to higher qualifications while working.

Social and economic inclusivity also forms part of the reform agenda [79]. TVET is increasingly viewed as a pathway for improving employment opportunities and supporting upward mobility [80]. Expanding scholarships, financial assistance, and alternative funding schemes has improved access for students from different socioeconomic backgrounds [81]. These initiatives help widen participation in TVET while supporting more equitable access to skills development.

The development of a supportive environment for TVET includes improvements in infrastructure, instructor capability, institutional capacity, and digital integration [82]. Investments in modern training facilities, updated equipment, and instructor development programmes are intended to support effective training delivery [83]. However, the pace of implementation varies across institutions. Differences in resources, technological readiness, and levels of industry engagement affect the consistency of outcomes [84]. These variations highlight the need for continued coordination and monitoring across the system.

Industry collaboration is another key component of the policy [85]. Partnerships between training institutions and employers are encouraged through apprenticeships, internships, work-based learning, and curriculum development [86]. In addition, sustainable TVET financing is promoted through diversified funding approaches, including public-private partnerships and industry participation [87].

Efforts are also directed toward improving the public perception of TVET as a viable career pathway [88]. Promoting employability,

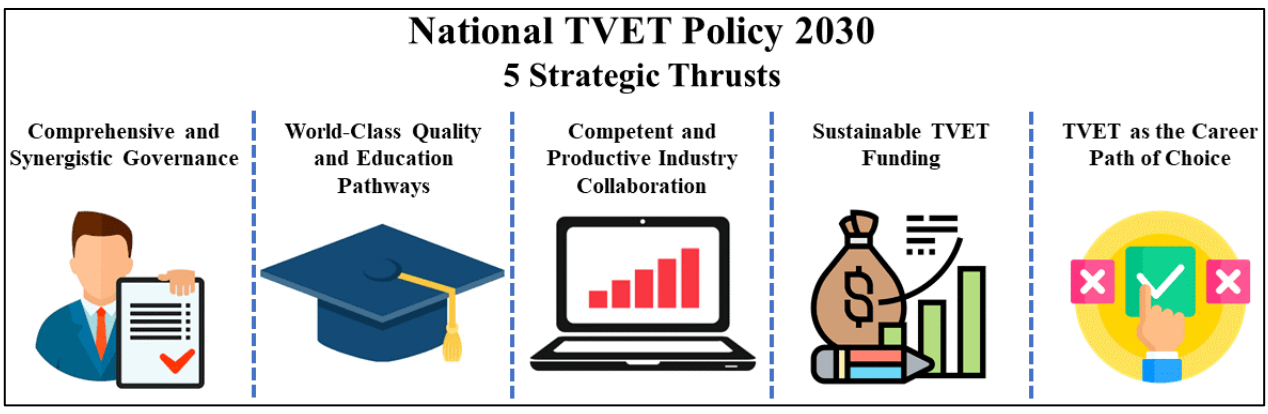

Fig. 4 - The National TVET Policy 2030 of Malaysia

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career progression, and entrepreneurial opportunities increases the attractiveness of TVET among students and society [89].

These measures indicate a gradual shift from a supply-driven training system toward a more demand-responsive and industry-connected skills ecosystem [90]. Progress has been observed in elements such as curriculum updates, governance coordination, and industry engagement [91]. However, challenges remain in achieving consistent implementation, strengthening instructor capabilities in new technologies, and maintaining sustained industry involvement [92].

Overall, the National TVET Policy 2030 provides a framework for strengthening Malaysia's TVET system [93]. The policy focuses on system coordination, industry alignment, inclusive access, and sustainable funding to improve the effectiveness of skills development [94]. Continued collaboration among government agencies, training institutions, industry partners, and communities will be important to support the long-term development of the TVET ecosystem.

4.4 TVET Stakeholders' Expectations in Malaysia

Stakeholder expectations play a significant role in shaping the strategic direction of TVET in Malaysia. Across industry, government, students, and society, a shared priority emerges: TVET must evolve beyond traditional vocational training. Its role now extends to supporting economic transformation, wage growth, social mobility, and sustainable development. This direction is strongly influenced by the New Industrial Master Plan 2030 (NIMP) and the National Energy Transition Roadmap (NETR) [95],[96]. Both frameworks prioritise workforce readiness, technological capability, and the reduction of skills mismatches in high-growth sectors [97].

Figure 5 presents the key manufacturing targets under the NIMP 2030. Based on the systematic review findings, stakeholder expectations converge around four key domains: industry and employers, government

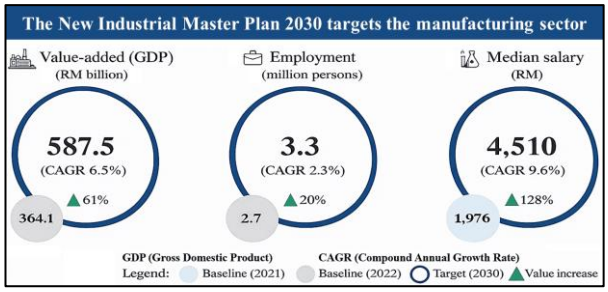

Fig. 5 - The New Industrial Master Plan 2030 of Malaysia

and policy, learners and students, and society and communities. These expectations increasingly align with the development of high-value industries and Malaysia's transition toward a green and knowledge-based economy [98].

The manufacturing sector remains a central driver of Malaysia's economic transformation, particularly through the strategic targets outlined in the NIMP 2030 [99]. These targets include a projected increase in manufacturing output to RM587.5 billion, expansion of employment to 3.3 million workers, and a rise in the median manufacturing salary to RM4,510 by 2030 [100]. Together, they reflect a shift toward technology-intensive and higher-value production. Achieving these outcomes requires a workforce equipped with stronger technical, digital, and problem-solving capabilities. Therefore, TVET institutions serve as a key driver of industrial upgrading and workforce development.

Industry stakeholders consistently stress the importance of job-ready graduates [101]. They should possess both technical competencies and essential soft skills such as communication, teamwork, adaptability, and problem-solving. Employers also expect graduates to be prepared for 3D (Dirty, Difficult, and Dangerous) work environments [102]. These are commonly found in sectors such as manufacturing, construction, energy, and heavy industries [103]. Compliance with occupational safety standards, regulatory requirements, and ethical workplace conduct is increasingly viewed as essential for workforce readiness [104]. These expectations reflect the growing complexity of modern production

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systems. Such systems increasingly incorporate automation, robotics, digitalisation, and advanced manufacturing technologies.

From a policy perspective, the Malaysian government positions TVET as a key enabler of economic transformation, industrial competitiveness, and inclusive growth [105]. National strategies advocate talent development, workforce reskilling, and stronger alignment between education and industry needs [106]. The NIMP 2030 outlines several strategic priorities [107]. These include advancing economic complexity, accelerating digital transformation, supporting the transition to net-zero emissions, and strengthening economic resilience [108]. The priorities drive expansion in high-growth sectors such as electrical and electronics (E&E), machinery and equipment (M&E), pharmaceuticals, and electric vehicles (EVs) [109]. The institutions are expected to continuously adapt curricula, training approaches, and industry collaboration mechanisms. This ensures they support cutting-edge technological and industrial requirements [110].

Integration with high-growth industries has become a key focus of TVET reform in Malaysia [111]. National development strategies prioritise sectors such as energy transition, digital technology, advanced manufacturing, green mobility, hydrogen, and bioenergy [112]. Aligning TVET programmes with these sectors can strengthen workforce readiness. It can also reduce reliance on low-skilled labour and support Malaysia's participation in global value chains. Industry-driven curriculum design, sector-specific centres of excellence, and public-private partnerships are increasingly recognised as important mechanisms for achieving this alignment [113].

Environmental sustainability has also emerged as a key expectation shaping the future of TVET [114]. The NETR outlines Malaysia's pathway to net-zero emissions by 2050. It also plans to expand renewable energy capacity to 70% of the national energy mix. The roadmap highlights substantial investment opportunities across the energy transition value chain. More than 23,000 jobs are projected in nascent green sectors. These sectors include solar photovoltaic (PV), hydrogen production, bioenergy, electric mobility, and carbon capture, utilisation, and storage (CCUS) [115]. TVET's role is expanding to prepare workers with competencies in renewable energy technologies, energy efficiency systems, and sustainable industrial practices.

Table 7 summarises the key benefits of the NETR for major stakeholder groups, including people, businesses, and government.

Table 7 - Benefits of the NETR

Stakeholder	Key benefits
People	• Addition of 310,000 jobs in future-proof sectors across the country • Balanced economic outcomes, with 70% of income gains benefiting medium- and low-income households • Better quality of life and improved health outcomes due to lower emissions • Greater empowerment to reduce carbon footprint • Upskilling support for a just transition
Business	• RM120-180 billion investment opportunities through co-funded government facilities for energy transition • Investment opportunities for green growth across the energy transition value chain, up to RM1.2-1.3 trillion • Lower carbon footprint through a cleaner energy mix and improved energy efficiency • Enhanced talent development through workforce upskilling
Government	• 10-15% uplift in GDP value through new growth areas, 32% reduction in energy sector emissions, supporting national climate commitments • Enhanced energy self-sufficiency • Diversification of fiscal income through new growth sectors • Reduced carbon footprint and increased potential for Green Foreign Direct Investment (FDI)

For training providers, the shift to a low-carbon economy requires integrating green skills and sustainability into training. Reskilling and upskilling are needed in fields including solar PV, energy auditing, hydrogen, EV maintenance, battery systems, and CCUS. The roadmap also stresses Small and Medium-sized Enterprises (SMEs) participation in the green economy [116].

Students and society also shape expectations for TVET development. Students increasingly prioritise employability outcomes, wage prospects, and flexible learning pathways. This enables progression to higher education and professional certification. The projected growth of high-skilled manufacturing and green economy jobs further strengthens the attractiveness of TVET [117]. Consequently, TVET institutions are expected to provide clearer progression routes through modular training, micro-credentials, and industry-recognised qualifications. These facilitate lifelong learning and career advancement [118].

At the societal level, expectations go beyond workforce preparation. TVET is expected to contribute to inclusive education, improved employment opportunities, and regional economic participation [119]. National strategies promote balanced industrial development, SME participation, and stronger supply chain resilience [120]. In this context, TVET plays a broader developmental role. It supports productivity growth, reduces unemployment, and strengthens local industries [121].

Overall, Malaysia's TVET development depends on economic competitiveness, environmental sustainability, and social inclusivity, reflecting the priorities of industry, policymakers, and learners. The system is being repositioned under NIMP 2030 and NETR to support high-value manufacturing, renewable energy, and inclusive growth. Its success depends on coherent policies, strong industry collaboration, responsive curricula, and continuous skills investment.

4.5 **Integrative Synthesis**

The historical development of TVET in Malaysia traces a gradual transition from trade-based training to a coordinated national skills system. Early initiatives, such as trade schools established in 1926, provided foundational vocational instruction for technical occupations. Over time, technical colleges, polytechnics, GIATMARA centres, ILP, and the NDTS institutionalised vocational education as a mechanism for workforce development. Subsequent reforms introduced structured qualification frameworks, including the SKM and the MQF. These strengthened national standards and enabled articulation between vocational and academic pathways. The establishment of the MTVET in 2020 marked a significant governance milestone to improve cohesion across institutions. Together, these endeavours illustrate Malaysia's shift from decentralized training provision toward a nationally structured and competency-based TVET ecosystem.

Despite these advancements, several structural challenges continue to affect the sector's effectiveness. Societal perceptions that view TVET as a second-choice educational option remain a persistent barrier. The dispersed governance structure across multiple ministries has contributed to inconsistencies in programme standards and quality assurance. Resource constraints reduce the responsiveness of institutions to evolving industry needs. These include outdated equipment, insufficient funding, and a shortage of instructors with prior industry experience, providing students with practical, industry-applied expertise. Skills mismatches continue as advances in automation, digitalisation, AI, and IR 4.0 outpace curriculum adaptation.

Recent policy reforms indicate a strategic recalibration of the TVET ecosystem. These aim to address challenges and align workforce development with national economic priorities. The National TVET Policy 2030 emphasises governance coordination, industry-driven training models, competency-based curricula, and sustainable financing. It also highlights the integration of digital technologies, automation,

and green competencies within training programmes. Flexible learning pathways, including modular training and micro-credentials, reflect a shift toward lifelong learning and continuous workforce reskilling.

Table 8 - TVET stakeholder expectations in Malaysia

No.	Stakeholders and expectations
1	Industry / Employers • Job-ready graduates and soft skills • Preparedness for 3D (Dirty, Difficult, Dangerous) work • Compliance with safety and regulatory standards
2	Government / Policy • Economic competitiveness and high-growth sectors • Workforce readiness and addressing skills mismatch • Digital transformation and technological upgrading
3	Students / Learners • Strong employability and industry-relevant careers • Recognized qualifications and progression pathways
4	Society / Community • Inclusive access and social mobility • Reduced unemployment and improved livelihoods • Affordable education and student financial support
5	High-Growth Industries • Sector-aligned, adaptable workforces in Electrical & Electronics Engineering and Mechanical Engineering • Pharmaceuticals, hydrogen, bioenergy, electric vehicles, and CCUS
6	NETR 2050 / Green Economy • Green skills and renewable energy (70% by 2050) • Net-zero transition generating 23,000 green jobs • Workforce reskilling for low-carbon technologies
7	NIMP 2030 • RM587.5 billion value-added Gross Domestic Product • 3.3 million workers and a RM4,510 median salary

Table 8 summarises the key stakeholder expectations influencing the development of TVET in Malaysia.

Stakeholder expectations reinforce these trends, as industry increasingly seeks job-ready graduates with both technical competencies and cross-functional skills. Government frameworks, such as the NIMP 2030 and the NETR, position TVET as a mechanism for industrial upgrading, green transition, and workforce readiness. Students expect stronger employability outcomes and a clearer progression stream. Society views TVET as a driver of inclusive growth and social mobility.

In brief, Malaysia's TVET system is evolving into a more integrated and demand-responsive skills landscape. It supports national economic transformation and sustainable development goals. From a theoretical perspective, this review contributes to the literature by synthesising historical development, system challenges, policy transformation, and stakeholder expectations. The result is a holistic framework that explains how national TVET systems adapt and respond to industrial, technological, and sustainability transitions.

5. CONCLUSION

This systematic review examined the evolution and trends of TVET in Malaysia based on 105 studies published between 2020 and 2026. The review focused on development milestones, system challenges, sector transformation, and stakeholder expectations.

The findings indicate that TVET in Malaysia has undergone several institutional and policy phases of evolution. Early trade schools laid the foundation for vocational training. Subsequent expansion included vocational schools, polytechnics, and specialised training institutes. National qualification frameworks and work-based training systems strengthened standardisation and learning pathways. Recent reforms emphasise coordination and closer industry engagement.

The public's perception of TVET continues to influence participation. Governance fragmentation creates coordination difficulties.

Some institutions face resource limitations, including outdated equipment and a shortage of instructors in developing technologies. Skills mismatch persists amid the ongoing evolution and specialised skills trends in the labour market.

Policy reforms signal a continuous transformation within the system. The National TVET Policy 2030 promotes coordinated governance, competency-based training, and stronger industry collaboration. Training programmes increasingly integrate AI, digital, automation, and green skills. Flexible pathways, such as modular certification and micro-credentials, support lifelong education.

Industry expects graduates to be technically competent and versatile. Government strategies position TVET as a mechanism for workforce development and economic transformation. Students aim for enhanced employability and occupational incentives.

In summary, the evolution and prevailing trends of the Malaysian TVET system underscore its transition toward a more integrated and industry-responsive skills ecosystem. Continued policy refinement, industry engagement, and curriculum adaptation remain important for strengthening its overall performance. Future research is recommended to examine the long-term labour market outcomes of TVET graduates. Studies that assess programme effectiveness, industry alignment, and graduate career progression would provide further evidence to support policy and institutional improvement.

ACKNOWLEDGEMENT

The authors gratefully acknowledge the support provided by the Department of Manpower, Ministry of Human Resources Malaysia, and the National University of Malaysia.

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