INDUSTRY ALIGNED FRAMEWORK FOR ASSESSING COMPETENCIES IN TEXTILE DESIGN WITHIN MALAYSIAN TVET

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Abstract. Malaysia's Technical and Vocational Education and Training (TVET) has been positioned as a national priority for strengthening workforce readiness and industrial competitiveness. However, in textile design education, there remains no comprehensive, discipline-specific framework for assessing competencies that integrates national standards with evolving industry requirements. Existing models are largely generic, emphasising employability skills and accreditation compliance, while overlooking hybrid competencies such as creativity, sustainability, and digitalisation. This concept paper proposes an industry-aligned competency assessment framework for textile design education in Malaysian TVET. Guided by Competency-Based Education (CBE) theory and Constructive Alignment, the framework synthesises workplace requirements, MQF 2.0 outcomes, NOSS descriptors, and authentic teaching and assessment practices. It identifies five competency domains: technical, creative, transversal, sustainability, and digital structured through performance indicators, rubric-based assessments, and work-based evidence. Conceptual validation is achieved through expert review, consensus methods, and alignment audits. The proposed framework contributes to both theory and practice: theoretically, it advances the integration of CBE and alignment principles in creative vocational education; practically, it provides policymakers, institutions, and industry stakeholders with a tool for curriculum design, accreditation, and programme review. Future research will pilot and empirically validate the model, supporting Malaysia's broader TVET transformation agenda.
Keywords: *competency assessment framework, constructive alignment, Industry 4.0, textile design education, TVET*

Introduction

The landscape of Technical and Vocational Education and Training (TVET) in Malaysia is increasingly recognized for its potential to contribute to economic growth, enhance employability, and address skill shortages in various industries (Wafi et al., 2023). This recognition is underscored by the establishment of over 1,400 TVET colleges nationwide, strategically focused on creating a skilled workforce capable of meeting the dynamic demands of the Malaysian economy (Wafi et al., 2023). Initiatives surrounding the integration of technology, instructor development, and industrial collaboration have been essential in aligning educational outcomes with market requirements, particularly in the context of the Fourth Industrial Revolution (4IR) (Yunus and Joblie, 2022; Hussain et al., 2021). Despite significant advancements, gaps remain between the competencies imparted through TVET programs and the actual needs of the textile design sector within Malaysia (Aziz and Surono, 2024). This discrepancy is notable given the textile industry's critical role in contributing to the national economy and its facing pressures from a global push towards sustainability and circular economy practices (Silobrit and Jureviciene, 2023). For the textile sector to thrive, TVET institutions must align their curricula with both commercial skills and

emerging industry demands, such as sustainability, eco-design, and innovative textile technologies (Silobrit and Jureviciene, 2023). Current trends indicate that the competencies taught in TVET for textile design do not adequately cover the breadth of skills necessary for success in modern textile industries, necessitating a re-evaluation of educational frameworks (Hussain et al., 2021) Additionally, Malaysian industries continue to express concerns regarding the quality and relevance of TVET graduates, reflecting a perception that graduates may not meet the expected standards for technical capabilities (Yunus and Joblie, 2022). This perception poses a barrier to the integration of TVET graduates into the workforce, perpetuating employment challenges and limiting the economic contributions of skilled graduates (Wafi et al., 2023). Addressing these issues is critical; a comprehensive industry-aligned framework for assessing competencies in textile design could enhance employability and ensure that the workforce is equipped to tackle current industry challenges while contributing positively to economic activities.

Against this backdrop, the overarching purpose of this concept paper is to propose an industry-aligned framework designed to assess and enhance competencies in textile design within Malaysian TVET. Specifically, this research aims to achieve three key objectives. First, it seeks to identify the key technical, creative, and sustainability-related competencies required by the Malaysian textile design industry in the context of 4IR and the circular economy. Second, it aims to examine the extent to which existing TVET textile design curricula align with the industry's competency needs. Ultimately, it aims to propose an industry-aligned competency framework that bridges the gap between TVET training outcomes and the textile industry's demands, thereby enhancing the employability and industry relevance of graduates. By addressing these objectives, the proposed framework is expected to significantly benefit both academic practices and industry partnerships, ultimately leading to a more responsive TVET system that aligns with the evolving demands of the Malaysian economy. This paper comes with three research questions (RQ) as follows: (1) RQ1: What specific competencies (technical, creative, and sustainability-oriented) are prioritized by stakeholders in the Malaysian textile design industry to remain competitive in a rapidly evolving global market? (2) RQ2: How effectively do current TVET curricula in textile design address the technical, creative, and sustainability competencies required by the textile industry? (3) RQ3: What elements should be included in an industry-aligned competency framework to ensure TVET graduates in textile design are well-equipped to meet current and future industry needs?

Literature review

Competency frameworks in Malaysian TVET

The literature on competency frameworks within Malaysian Technical and Vocational Education and Training (TVET) highlights a significant emphasis on enhancing the employability of graduates and addressing gaps in technical skills necessary for industry alignment. Ridzuan and Rahman (2022) argue for proactive government policies aimed at elevating the status of TVET programs, suggesting that such frameworks should cultivate high levels of technical competence to meet industrial demands. Amin et al. (2023) reinforce the idea that TVET serves as a cornerstone for national economic advancement, framing the preparation of competencies in STEM-related fields as crucial for future workforce integration.

Methodological issues arise in Hani et al. (2024) exploration of digital competencies among educators, underscoring the need for a structured model to facilitate the effective integration of digital technologies in teaching and learning. Similarly, Rofa and Ngah (2024) highlight that while entrepreneurial education is gaining traction within TVET, the lack of robust competency assessment measures remains a critical oversight. This review highlights the need for comprehensive frameworks that systematically evaluate competencies in textile design, an area that is currently insufficiently addressed in the existing literature. In response, this proposed study aims to develop an industry-aligned framework tailored for assessing textile design competencies within Malaysian TVET, thus filling these identified gaps and advancing both theoretical and practical applications in the field.

Competency needs in the textile and apparel industries

Beyond identifying competency needs, it is equally critical to examine how these competencies are assessed. The competency needs in the textile and apparel industries, particularly concerning Technical and Vocational Education and Training (TVET) in Malaysia, reveal intersections among various thematic areas. The integration of STEM (Science, Technology, Engineering, and Mathematics) in TVET is crucial, as it equips students with the necessary design and production skills that align with contemporary industry demands (Razali et al., 2022). Notably, TVET serves as a bridge for disadvantaged youth, providing improved educational access and thereby enhancing both individual livelihoods and sectoral capabilities (Shi and Bangpan, 2022). The sustainability issues within the textile industry necessitate competencies that encompass the adoption of modern technologies, emphasizing the need for training programs that focus on business intelligence and managerial systems (Ahmad et al., 2021). Despite recognizing the entrepreneurial potential among students in textile design, gaps persist in fostering direct collaborations between educational institutions and industry stakeholders, which is crucial for aligning curriculum with market needs (Benjamin et al., 2023). Additionally, methodological weaknesses exist in existing studies, particularly regarding the limited exploration of how organizational strategies, such as ambidexterity, impact supply chain flexibility and overall industry responsiveness (Seimon and Endagamage, 2022). My proposed study aims to address these gaps by developing a comprehensive framework tailored to assess and enhance competencies in textile design within Malaysian TVET, thus contributing to the advancement of both knowledge and practice in this vital sector.

Competency assessment approaches in design education

Assessment remains a critical challenge in competency-based programmes, particularly in creative and practice-based fields such as textile design. Traditional examinations are limited in their ability to capture complex, process-oriented, and creative competencies. Instead, authentic assessment methods, such as studio critiques, design-to-production artifacts, project-based assignments, and portfolios, have been widely recommended in design education (Kamis, 2024). In Malaysian TVET, work-based learning (WBL) initiatives have demonstrated a positive impact on employability by linking classroom learning with real-world workplace contexts (Rohanai et al., 2025).

However, the literature shows that such approaches are often implemented inconsistently and without the support of standardised rubrics or structured frameworks. As a result, assessment practices vary widely across institutions, reducing comparability and weakening the credibility of outcomes. Also, transversal competencies such as sustainability and Industry 4.0 readiness are often assessed implicitly or indirectly, rather than through explicit, measurable indicators. This indicates a methodological gap: while authentic assessment practices are acknowledged, they have not yet been integrated into a unified competency framework tailored to textile design education. Your study aims to address this shortcoming by embedding authentic assessment methods within a standards-referenced framework.

Validation of competency frameworks

Validation is an essential stage in the development of competency frameworks, as it ensures that the framework is coherent, relevant, and accepted by stakeholders. Studies in education and training emphasize expert consensus methods, such as the Delphi technique, panel reviews, and structured expert interviews, as practical approaches for conceptual validation (Awadz and Bakhari, 2024; Creswell and Poth, 2016). These methods enable the refinement of competencies, provide external verification of the framework's accuracy, and ensure alignment with both academic standards and industry needs. However, in the Malaysian context, most validation studies have focused on general TVET competency models or sector-specific technical standards, leaving creative fields such as textile design underexplored. Research rarely addresses how hybrid domains—where technical, creative, and sustainability competencies intersect can be validated conceptually to ensure their applicability in practice. This gap highlights the need for frameworks in design-oriented TVET disciplines to undergo systematic expert validation before implementation. The present study responds to this gap by employing expert review and documentary analysis to validate the proposed textile design competency framework conceptually.

Comparative analysis of existing and proposed frameworks

While several competency-based TVET frameworks exist, they remain largely generic and policy-driven. Table 1 provides a comparative analysis between existing TVET frameworks and the proposed textile design competency framework. As shown in *Table 1*, the proposed framework addresses gaps in standards alignment, authentic assessment, and integration with Industry 4.0. This sets the foundation for the conceptual model presented in the next section. The comparative analysis of existing TVET competency frameworks and the proposed textile design framework reveals critical distinctions in focus, standards alignment, assessment practices, industry relevance, and validation processes. Existing frameworks have been characterised by a generic orientation, with priority often given to broad employability skills and compliance with accreditation requirements, while discipline-specific needs have been overlooked. Alignment with national standards such as the Malaysian Qualifications Framework (MQF) and the National Occupational Skills Standards (NOSS) has generally been partial, with outcomes defined at a policy level but rarely translated into curriculum design or assessment rubrics. Assessment has been predominantly dependent on written examinations and loosely structured project submissions, in which explicit criteria and comparability across institutions have been absent. Industry relevance has

been limited by the minimal incorporation of sustainability and Industry 4.0 elements, resulting in graduates who are technically competent but insufficiently prepared for future labour market demands. Validation has been restricted to internal audits or accreditation reviews, thereby limiting external credibility and industry trust.

Table 1. *Existing vs. proposed operational framework.*

Dimension	Existing TVET Frameworks	Proposed Textile Design Competency Framework
Focus	Generic employability and technical skills	Discipline-specific: technical, creative, transversal, sustainability, digital
Standards Alignment	Partial alignment with MQF/NOSS; often policy-level only	Full crosswalk with MQF 2.0 and NOSS descriptors
Assessment	Heavy reliance on exams; unstructured projects; lack of rubrics	Authentic assessments: portfolios, studio critiques, WBL evidence with rubrics
Industry Relevance	Limited incorporation of Industry 4.0 and sustainability	Explicit integration of digital tools, eco-materials, circular design
Validation	Minimal; internal audits or accreditation reviews only	Delphi expert consensus, documentary analysis, alignment audits

Note. WBL=Work-Based Learning; MQF=Malaysian Qualifications Framework; NOSS=National Occupational Skills Standards.

In contrast, the proposed textile design competency framework has been deliberately constructed to overcome these limitations through a discipline-specific and standards-referenced structure. Complete alignment with MQF 2.0 outcomes and NOSS descriptors has been embedded to ensure traceability from policy to practice. Assessment has been operationalized through authentic methods, such as studio critiques, portfolios, and work-based learning artefacts, supported by rubric-based indicators that enhance transparency and reliability. Sustainability and digitalization have been explicitly integrated as assessable domains, ensuring graduates are prepared for the global textile industry's transformations. Validation has been designed to extend beyond internal processes through Delphi consensus, expert panel reviews, and alignment audits, providing both academic legitimacy and industry endorsement. Through these enhancements, the proposed framework has been positioned not only as a response to gaps identified in existing models but also as a forward-looking tool capable of addressing Malaysia’s textile sector challenges in the context of Industry 4.0 and the circular economy.

Theoretical references

The development of the competency assessment framework will be guided by Competency-Based Education (CBE) Theory, which positions learning around the mastery of competencies rather than the completion of courses or credit hours. Within the Malaysian TVET context, CBE is embedded in MQF 2.0 and the National Occupational Skills Standards (NOSS), both of which emphasise measurable outcomes that align directly with workplace requirements. In textile design education, this encompasses technical mastery, including weaving, dyeing, and CAD applications, alongside creative ideation, entrepreneurial capabilities, and sustainable practices. The framework, therefore, will be structured to define and synthesise these competencies, break them into observable indicators, and ensure they are aligned with the demands of Industry 4.0 and sustainable textile production. To operationalize these competencies within educational practice, the framework will also draw on Constructive Alignment Theory (Biggs, 1996), which asserts that curriculum outcomes, teaching activities, and assessments must be systematically aligned. In textile design education, this means that

outcomes such as “apply eco-friendly materials in textile printing” will be supported through targeted learning activities (e.g., studio-based workshops) and evaluated using authentic assessment tasks (e.g., portfolios, design-to-production artefacts, and work-based learning evidence). While CBE provides the foundation for identifying the required competencies, constructive alignment ensures that they are embedded within the curriculum and assessed with validity and coherence. The integration of both theories ensures that the proposed framework is not only grounded in policy and industry relevance but also pedagogically robust, bridging the persistent gap between skills expectations and educational practice in Malaysian TVET.

Conceptual model

Figure 1 represents the proposed conceptual model, which begins with the Independent Variables (IVs), which function as the critical inputs informing competency development in textile design education. These variables comprise workplace requirements, MQF/NOSS standards, learning outcomes, and teaching activities. Workplace requirements are informed by Industry 4.0 transformations, sustainability imperatives, and industry best practices, ensuring the framework remains future-oriented and industry-aligned. The MQF 2.0 and NOSS provide policy benchmarks and occupational standards that regulate quality assurance and accreditation. Learning outcomes, drawn from programme and course levels, reflect the expected graduate attributes, while teaching activities such as studio-based projects, workshops, and work-based learning translate these standards into practice. Together, these IVs establish the “what” and “why” of competency development, guided by Competency-Based Education (CBE) theory. The Mediating Variables act as the transformation layer, bridging the inputs with the final competency framework. First, competencies are identified across five domains: technical (fabrication, dyeing, CAD), creative (ideation, innovation), transversal (communication, teamwork), sustainability (eco-materials, circular practices), and digital (data-driven design, automation). Next, structured activities are designed to build these competencies progressively, sequencing learning from foundational to advanced skills while embedding sustainability and digitalisation. Finally, assessment strategies are articulated through authentic methods, such as portfolios, studio critiques, artifacts, and work-based evidence, which are evaluated using rubric-based tools. This ensures both validity and comparability in measuring learner performance. This mediating layer embodies Constructive Alignment Theory, ensuring that competencies are coherently linked to learning outcomes, teaching activities, and assessment practices.

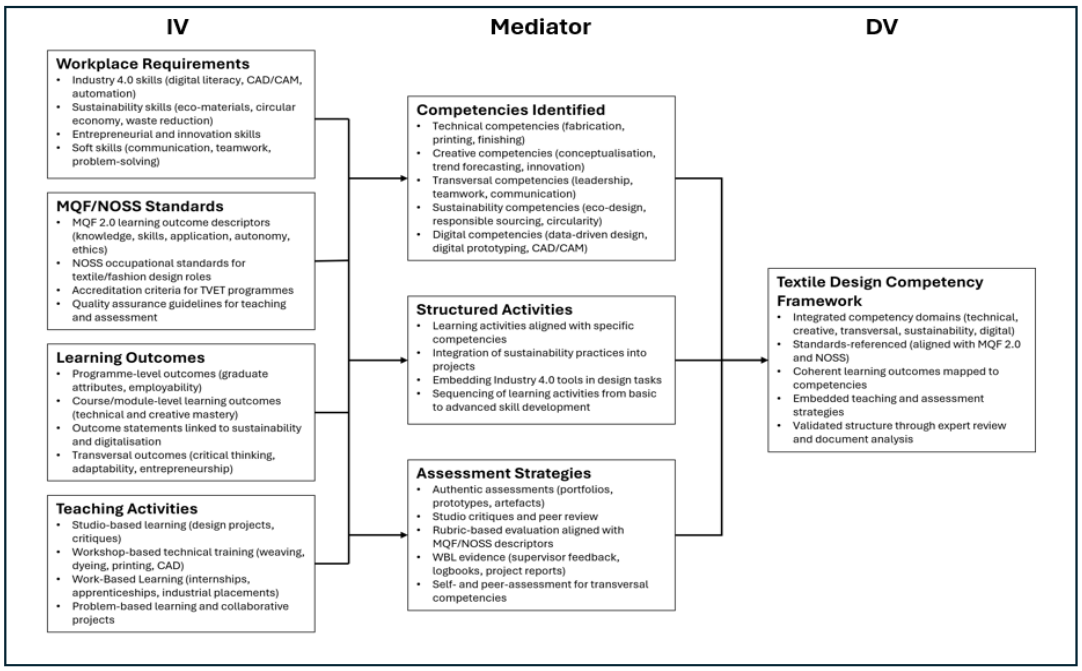

Figure 1. *Conceptual model for assessing competencies in textile design within Malaysian TVET.*

The Dependent Variable (DV), the Textile Design Competency Framework, emerges as the integrated outcome of this process. It provides a discipline-specific, standards-referenced model that connects industry demands, national standards, and pedagogical coherence into a unified structure. Unlike existing frameworks that remain generic or policy-focused, this model offers a practical guide for curriculum design, accreditation, and assessment in Malaysian TVET textile design programmes. By embedding authentic assessments and aligning them with competencies across all domains, the framework ensures that graduates are not only technically proficient but also creative, sustainable, digitally literate, and industry-ready. In this way, the framework addresses the persistent gaps in current TVET practice, serving as both a pedagogical tool for educators and a strategic policy instrument for aligning education with national and global industry needs.

Materials and Methods

This study will adopt an exploratory qualitative methodology, as it will seek to develop, rather than test, a framework for competency assessment in textile design education within Malaysian TVET. An exploratory design will be deemed appropriate because the phenomenon under investigation, the absence of a validated, industry-aligned assessment framework has not been systematically studied in the local context. Instead of hypothesis testing, the research will focus on identifying, synthesising, and structuring competency domains into a coherent and standards-referenced framework. Qualitative methods will be employed through documentary review, content analysis, and expert consultation. Policy and curriculum documents, including MQF 2.0, NOSS descriptors, and national industry roadmaps, will be analysed to identify competency

domains. In parallel, expert insights will be gathered through purposive sampling and iterative Delphi rounds to refine and validate the competency constructs. The emphasis will be placed on understanding how competencies are articulated across different sources and how they can be integrated into a comprehensive framework that aligns with industry requirements, accreditation standards, and educational practices.

The methodology will thus be exploratory, descriptive, and design-oriented, aiming to generate a conceptual product (the framework) that is empirically grounded in policy, practice, and expert consensus. This type of methodology will ensure that the outcomes are not only academically rigorous but also practically relevant for curriculum developers, policymakers, and industry stakeholders engaged in Malaysian TVET. The existing frameworks are generic, industry demands are evolving, assessment is inconsistent, and validation is underdeveloped; hence, this study proposes an integrated, industry-aligned framework. This bridges literature to methodology more seamlessly. The structure covers 5-7 sequential steps, aligned with three research objectives and questions, and includes validity and reliability considerations.

Step 1: Scope, design, and protocol specification

The scope will be delimited to textile design education within Malaysian TVET, with attention to technical, creative, transversal, sustainability, and digital domains. A protocol will be drafted that defines constructs, inclusion/exclusion criteria for sources, the coding strategy, and decision rules for consensus. The protocol will be registered internally and used as the governance document for the study. Operational definitions will be derived from Competency-Based Education (CBE) and Constructive Alignment principles. A preliminary codebook will be prepared to align (i) MQF 2.0 learning outcomes, (ii) NOSS role/level descriptors, (iii) Industry 4.0 capabilities, and (iv) sustainability competencies. This step will ensure conceptual clarity before evidence collection begins and will directly orient the study toward RQ1 (what counts as "essential competencies").

Step 2: Systematic documentary review and content analysis

A systematic review of policy, curriculum, and industry documentation will be conducted. Sources will include MQF/MQA documents, NOSS occupational standards, programme standards, accreditation guidelines, institutional curricula, and national roadmaps (e.g., NIMP 2030), complemented by high-relevance international exemplars in design/TVET. A search string and screening flow will be specified, and a PRISMA-style log will be maintained to preserve traceability. Documents will be imported into a qualitative analysis environment (e.g., NVivo/ATLAS.ti). Directed content analysis will be performed using the Step-1 codebook. Segments will be coded into the five competency domains and then mapped to MQF/NOSS descriptors to generate an initial competency set with candidate indicators. Iterative memoing will be used to record definitional decisions and emergent sub-domains (e.g., CAD/CAM proficiency, eco-material literacy, design-to-production evidence). Outputs from this step will directly address the Research Question and Research Objective 1.

Step 3: Stakeholder mapping and expert panel recruitment

A purposive, maximum-variation approach will be applied to recruit experts from (i) the textile/fashion industry, (ii) TVET curriculum/assessment leadership, and (iii)

academic textile design. The inclusion criteria will require at least 10 years of domain experience and current engagement with curriculum, standards, or hiring practices. A panel size of 15–25 will be targeted to balance breadth and manageability. Experts will be briefed with a concise evidence pack summarising Step-2 findings. A content validation instrument will be designed to rate each competency/indicator on relevance, clarity, and necessity using a 4-point scale, accompanied by free-text justifications. Collection will occur via secure online forms to permit anonymous ratings and frank commentaries. This step will provide the first external check on the documentary synthesis. It will prepare the inputs for a structured consensus process, bridging toward Research Question 2 (how the competencies should be structured).

Step 4: Delphi consensus rounds

A two-to-three-round Delphi will be conducted. In Round 1, experts will rate the initial competency set; medians, inter-quartile ranges (IQR), and percentage agreement will be computed. Items with IQR ≤ 1 and $\geq$75% agreement will be considered stable; others will be revised with anonymized feedback summaries and returned in Round 2. A third round will be used only for items still lacking stability. The process will culminate in a consensus-based list of competencies and indicators. Qualitative comments will be thematically analysed to refine definitions, collapse overlaps, and add missing items (e.g., data ethics in digital fashion pipelines, circular design costing). The Delphi outcome will function as the validated ingredient list for the framework and will complete the competency identification phase (closing Research Question 1) while furnishing structured inputs for Research Question 2.

Step 5: Framework design, alignment, and operationalisation

The consensus competencies will be organised into a standards-referenced architecture: domains → sub-competencies → observable indicators → performance levels (e.g., Novice/Developing/Competent/Proficient). Each indicator will be cross-walked to MQF 2.0 outcome domains and NOSS role/level descriptors to ensure traceability. A constructive-alignment map will then be produced linking each indicator to (a) appropriate teaching/learning activities (studios, workshops, WBL tasks) and (b) authentic assessments (portfolios, prototypes, design-to-production artefacts, WBL evidence). Rubric shells will be drafted with analytic criteria (e.g., process documentation, technical fidelity, sustainability impact, digital workflow efficacy, collaboration). Exemplar tasks and evidence requirements will be specified to support consistent use across providers. This step delivers the framework blueprint and addresses Research Question and Research Objective 2 (design and structure).

Step 6: Conceptual validation, cognitive walkthroughs, and alignment audit

A conceptual validation panel (comprising the subset plus new reviewers) will be convened to evaluate the coherence, completeness, and applicability of the framework in programme review/accreditation contexts. Reviewers will conduct cognitive walkthroughs using sample learner tasks and rubrics to assess whether indicators and criteria effectively elicit the intended competencies. A traceability matrix will be audited to verify one-to-one links between indicators, outcomes, activities, and assessments. Quantitative content validity indices (e.g., CVR/Aiken's V for relevance/clarity) will be computed where appropriate; qualitative feedback will be

thematically coded to finalize wording and remove residual ambiguities. This step constitutes the conceptual (not empirical) validation phase and responds to Research Question and Research Objective 3.

Step 7: Ethics, data management, and reporting

Before expert involvement, ethical approval will be obtained. Informed consent, anonymity, and the right to withdraw will be ensured. Data will be stored on encrypted drives; an audit trail (protocol, screening logs, codebook versions, Delphi statistics, decision memos) will be maintained to support transparency and replication. Reporting will follow a structured template that includes context, methods, framework architecture, alignment maps, rubrics, and guidance for adoption. A dissemination pack will be prepared for institutions and policymakers containing the framework, alignment matrices, sample assessments, and adoption guidance. This pack will be designed to enable implementation studies in future work (beyond the scope of this concept paper).

Results and Discussion

The exploratory development of this industry-aligned framework demonstrates how the integration of Competency-Based Education (CBE) and Constructive Alignment can address persistent gaps in Malaysian TVET, particularly in textile design education. Through systematic synthesis of workplace requirements, MQF 2.0 outcomes, and NOSS descriptors, the framework provides a discipline-specific model for competency assessment that is both standards-referenced and industry-informed. By incorporating technical, creative, transversal, sustainability, and digital domains, the framework directly responds to Industry 4.0 and sustainability imperatives, ensuring that learning outcomes are aligned with evolving industry transformation. In this way, the proposed framework is designed to address RQ1 and RQ2, ensuring that competencies can be identified, structured, and embedded into curriculum design and assessment practices. When compared with existing TVET frameworks, the proposed model offers several advances. Previous studies have primarily emphasized generic employability skills, accreditation compliance, or sector-wide competency standards without tailoring them to the specific needs of creative and hybrid disciplines, such as textile design (Awadz and Bakhari, 2024; Kamis, 2024). Assessment practices in many institutions remain dependent on examinations or loosely structured project evaluations, often lacking clear rubrics or standardisation. The proposed framework differs by embedding authentic assessments, studio critiques, portfolios, and work-based artefacts within a structured, rubric-based model aligned with MQF/NOSS. Furthermore, by explicitly operationalizing sustainability and digitalization as assessable domains, the framework moves beyond the incremental reforms documented in the current literature, positioning itself as a future-ready model for creative TVET.

The implications of this framework are significant for both policy and practice. For institutions, it provides a concrete reference for designing curricula, aligning learning outcomes, and ensuring the validity and comparability of assessments across providers. For policymakers and accreditation bodies, it provides a mechanism for aligning national standards and industry expectations with program review and approval processes. For industry partners, the framework ensures that graduate competencies are more transparently defined and reliably assessed, thereby reducing the skills-curriculum mismatch that has been widely reported in Malaysia. By enabling greater coherence

across these stakeholders, the framework contributes directly to Malaysia's TVET transformation agenda and enhances the international competitiveness of its textile and fashion sectors. Future research should focus on the empirical validation and pilot testing of this framework across different TVET institutions and textile design programmes. Implementation studies could investigate how the framework performs in practice, particularly in capturing complex competencies such as creativity, sustainability, and digital fluency. Comparative research could also examine the adaptability of the framework to other creative industries or technical fields within TVET, thus broadening its impact. Finally, longitudinal studies tracking graduate outcomes could provide evidence of the framework's effectiveness in strengthening employability and industry alignment. These directions would extend the current concept paper into a research agenda that supports continuous improvement in both scholarship and practice.

Conclusion

This concept paper has addressed the critical gap in Malaysian TVET by proposing an industry-aligned competency assessment framework for textile design education. While Malaysia has advanced through MQF 2.0 reforms, NOSS standards, and policy roadmaps such as NIMP 2030, existing frameworks remain largely generic, policy-driven, and insufficiently tailored to the hybrid nature of textile design. They emphasize general employability and technical skills, but often neglect creativity, sustainability, and digitalization, while relying on limited assessment approaches, such as examinations and unstructured projects. This paper, therefore, sets out to develop a coherent, standards-referenced framework that integrates Competency-Based Education (CBE) and Constructive Alignment, embedding authentic assessment methods to capture complex, practice-based competencies. The framework was conceptualized through three objectives: identifying the key technical, creative, and sustainability-related competencies, examining the extent to which existing TVET textile design curricula align with the industry's competency needs, and proposing an industry-aligned competency framework that bridges the gap between TVET training outcomes and the textile industry's demands. By systematically incorporating workplace requirements, MQF/NOSS descriptors, learning outcomes, and teaching activities, the framework is expected to ensure alignment with industry and pedagogical practices. The mediating variables of competency identification, structured activities, and authentic assessment strategies provide the operational mechanisms for bridging inputs with the final outcome, a discipline-specific competency framework. In this way, the study offers a solution to the persistent misalignment between skills demanded by industry and those produced by Malaysian TVET institutions.

The proposed framework makes significant contributions to both theory and practice. Theoretically, it demonstrates how the integration of CBE (defining "what" to assess) and constructive alignment (clarifying "how" to teach and assess) can generate a more coherent approach to curriculum design and assessment in vocational creative education. Practically, it provides a tool for educators, policymakers, and accreditation bodies to design programmes, ensure comparability across providers, and improve assessment validity. It also offers industry partners a more precise mechanism for understanding graduate competencies and ensuring readiness for the challenges of Industry 4.0 and sustainability. This multi-stakeholder alignment is essential for

strengthening Malaysia's textile and fashion sector and enhancing its global competitiveness. Finally, although this study has presented a conceptually validated framework, future research will be necessary to empirically test and pilot the model across different TVET institutions and textile design programs. Implementation studies should evaluate the usability of the framework in real teaching and assessment contexts, while longitudinal research could examine its effectiveness in improving graduate employability and industry alignment. Comparative adaptation across other creative and technical disciplines would further demonstrate its scalability. By advancing this research agenda, the proposed framework has the potential not only to transform textile design education within Malaysian TVET but also to serve as a model for competency-driven, industry-aligned curriculum and assessment design in broader vocational education contexts.

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Conflict of interest

The authors confirm that there is no conflict of interest involved with any parties in this manuscript.

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