

# Competency-Based Framework for Classroom Assessment Practices in TVET: The Role of Technical, Industry 4.0, and Career Adaptability Skills

## ABSTRACT

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Technical and Vocational Education and Training (TVET) play a critical role in equipping the workforce with specialized skills aligned with evolving industry demands. Central to this is effective Classroom Assessment (CA), which is essential for monitoring progress, providing feedback, and fostering career adaptability among students. However, TVET CA practices often face challenges such as limited teacher understanding, insufficient resources, and time constraints. This study investigates teacher perceptions regarding how classroom assessment supports the development of students' Technical Skills, Industry 4.0 Generic Skills, and Career Adaptability Skills. A competency-based framework was developed and tested using Partial Least Squares Structural Equation Modelling (PLS-SEM) with responses from 418 senior TVET teachers (Heads of Programme) across Malaysian Vocational Colleges. The analysis evaluated reliability, convergent and discriminant validity, predictive accuracy, and mediation effects. Findings reveal that Technical Skills ( $\beta = 0.268$ ,  $t = 5.039$ ) and Career Adaptability Skills ( $\beta = 0.389$ ,  $t = 5.007$ ) have significant positive effects on CA Practices. While Industry 4.0 Generic Skills showed a marginal direct effect on CA practices ( $\beta = 0.119$ ,  $t = 1.467$ ,  $p < 0.10$ ), they exert a significant indirect influence through the mediation of Career Adaptability Skills ( $\beta = 0.328$ ,  $t = 4.934$ ,  $p < 0.01$ ). These insights suggest that optimizing classroom assessment can significantly strengthen skill development and graduate employability. The findings offer practical implications for trainers, policymakers, and curriculum developers in enhancing teaching practices through effective assessment strategies.

**Keywords:** Technical Skills, Industry 4.0 Generic Skills, Career Adaptability Skills, Classroom Assessment Practices, TVET, PLS-SEM.

## 1. Introduction

UNESCO defines Technical and Vocational Education and Training (TVET) as education, training and skills development across various occupational fields, including production, services and livelihoods (UNESCO-UNEVOC, 2017). As a key component of lifelong learning, TVET can be delivered at the secondary, post-secondary and tertiary levels, encompassing work-based learning, continuing education and professional development pathways that lead to recognised qualifications. In addition, TVET plays a critical role in achieving the United Nations Sustainable Development Goals (SDGs), particularly in increasing the number of youth and adults equipped with relevant technical and vocational skills to support employment, decent work and entrepreneurship (United Nation, 2020). The SDGs agenda further emphasises the importance of promoting full and productive employment, as well as sustained, inclusive and sustainable economic growth (UNESCO, 2021). In this context, expanding the scope of TVET, strengthening delivery mechanisms, preparing competent trainers and enabling the workforce to adapt to technological advancements are essential strategies for supporting the transition towards a green and knowledge-based economy.

In Malaysia, educational transformation initiatives such as the Malaysia Education Development Plan 2013–2025 highlight the need for a more integrated and holistic approach to student assessment. The Development of an Integrated Assessment System Methodology introduced by the Ministry of Education underscores the importance of evaluating students' knowledge, skills and competencies in a balanced and comprehensive manner (Kementerian Pendidikan Malaysia, 2018). However, assessment practices in Malaysia continue to be largely influenced by centralised and examination-oriented approaches (Adam et al. 2019; Raman & Yamat, 2014; Ratnam-Lim & Tan, 2015). This reliance on examination-based systems has been widely debated among educators, policymakers and the academic community, as such approaches often prioritise cognitive outcomes while overlooking practical skills, values and work-related competencies (Azmanirah Ab Rahman et al. 2020; Rahman et al. 2019).

Within the context of TVET, classroom assessment (CA) plays a pivotal role in evaluating students' competencies and skills through both theoretical and practical learning activities. Nevertheless, inadequately designed assessment practices may negatively affect the employability of TVET graduates. One of the key challenges is that existing CA practices may not sufficiently equip students with real-world skills and knowledge required in the labour market (Winther & Klotz, 2013). For instance, assessments that focus predominantly on theoretical knowledge rather than practical performance may result in graduates who are not adequately prepared to meet technical job requirements (Ahmad Zaidi Husin, 2019). This highlights the need to re-examine current assessment practices to ensure closer alignment with industry expectations.

Accordingly, the development of assessment methodologies, frameworks and instruments must be aligned with industry demands to support the implementation of industry-driven curricula. Assessment practices that fail to reflect industry expectations may result in graduates who lack the required competencies for employment (Rina Febriana et al. 2017). Therefore, curriculum enhancement efforts must be supported by competency-based assessment approaches that effectively measure knowledge, skills and competencies relevant to current industry needs. Such improvements are essential not only for enhancing graduate employability but also for reducing reliance on foreign skilled labour and addressing skill mismatches among TVET graduates (Campbell, 2016).

Despite these developments, limited empirical studies have examined how multiple competency domains—particularly technical skills, Industry 4.0 generic skills and career adaptability skills—interact within the context of classroom assessment practices in TVET. Existing studies have largely focused on individual competencies or employability outcomes, with less emphasis on understanding the structural relationships among these constructs (Mtshali & Ramaligela, 2020; Rasul et al. 2010). Furthermore, many previous studies rely primarily on student self-reports, with limited attention given to teachers' perspectives as primary evaluators of students' competencies in classroom settings (Glogger-Frey et al. 2018; Maisiri et al. 2021; Tan et al. 2017). Given that teachers play a central role

in observing, assessing and reporting students' performance, their professional judgments provide valuable insights into students' competency development.

Therefore, this study aims to examine the relationships between technical skills, Industry 4.0 generic skills, career adaptability skills and classroom assessment practices from the perspective of TVET teachers. Specifically, this study investigates how these competencies influence classroom assessment practices, as well as the mediating role of career adaptability skills in these relationships. By adopting a structural modelling approach, this study contributes to the development of a more comprehensive understanding of competency-based assessment in TVET and provides empirical evidence to support the alignment between curriculum, assessment practices and industry requirements.

Specifically, this study aims:

RQ1: To what extent do teachers perceive students' Technical Skills as influencing their Career Adaptability Skills?

RQ2: To what extent do teachers perceive students' Industry 4.0 Generic Skills as influencing their Career Adaptability Skills?

RQ3: How do teachers perceive the influence of students' Career Adaptability Skills on TVET CA Practices?

RQ4: How do teachers perceive the influence of students' Technical Skills on TVET CA Practices?

RQ5: How do teachers perceive the influence of students' Industry 4.0 Generic Skills on TVET CA Practices?

RQ6: According to teachers' perceptions, do Career Adaptability Skills mediate the relationship between Technical Skills and CA Practices?

RQ7: According to teachers' perceptions, do Career Adaptability Skills mediate the relationship between Industry 4.0 Generic Skills and CA Practices?

The proposed initial model, as presented in Figure 1, is developed based on an extensive literature review. The following hypotheses (Ha) are to evaluate the overall model.

Ha1: Teachers perceive that students' Technical Skills have a significant positive influence on their Career Adaptability Skills.

Ha2: Teachers perceive that students' Industry 4.0 Generic Skills have a significant positive influence on their Career Adaptability Skills.

Ha3: Teachers perceive that students' Career Adaptability Skills have a significant positive influence on TVET CA Practices.

Ha4: Teachers perceive that students' Technical Skills have a significant positive influence on TVET CA Practices.

Ha5: Teachers perceive that students' Industry 4.0 Generic Skills have a significant positive influence on TVET CA Practices.

Ha6: Teachers perceive that Career Adaptability Skills significantly mediate the relationship between Technical Skills and TVET CA Practices.

Ha7: Teachers perceive that Career Adaptability Skills significantly mediate the relationship between Industry 4.0 Generic Skills and TVET CA Practices.

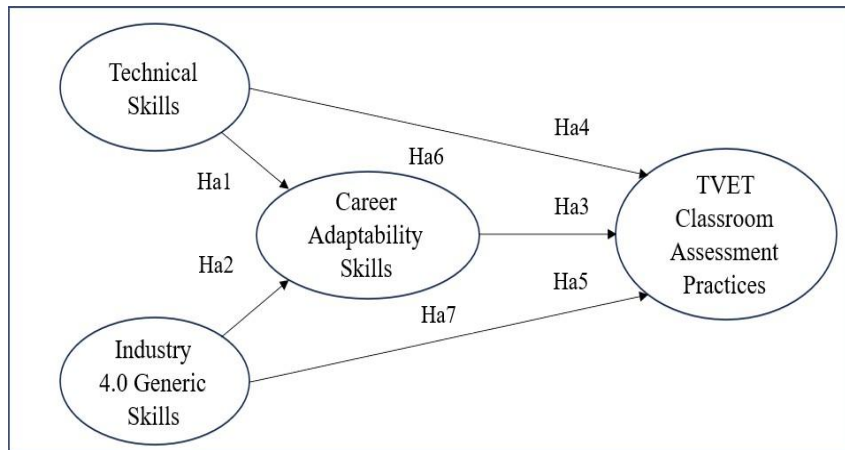


Figure 1. The proposed initial measurement model

Note: Representation of the two exogenous constructs (Technical Skills, Industry 4.0 Generic Skills), the mediator (Career Adaptability Skills), and the endogenous constructs (TVET Classroom Assessment Practices).

## 2. Literature Review

Technical and Vocational Education and Training (TVET) has become a critical educational agenda in developing highly skilled human capital to meet the evolving demands of Industry 4.0 and support Malaysia’s aspiration to become a developed nation. The increasing demand for skilled labour is evident, as the government anticipates the creation of up to 1.5 million new jobs, of which approximately 60% will require skilled workers. However, only about 31% of these positions have been filled, falling short of the targeted 35% and resulting in a 4% skills gap (Makhbul & Latif, 2019). This mismatch highlights a significant challenge in aligning workforce competencies with industry requirements.

Despite continuous efforts to strengthen TVET, concerns remain regarding the misalignment between graduates’ competencies and rapid technological advancements. Previous studies indicate that Malaysian employees’ skills are still not fully aligned with the needs of Industry 4.0 (Aizuddin Saari et al. 2021). Furthermore, insufficient collaboration between industry and educational institutions has limited the effectiveness of curriculum enhancement, contributing to lower competency levels among TVET students (Sohimi et al. 2019). Empirical evidence also supports this concern, as a study involving 136 students across seven TVET learning domains at the Technical University of Malaysia revealed that students’ readiness for Industry 4.0 skills remains inadequate (Affero Ismail et al. 2020). These findings suggest the need for a more structured and industry-aligned approach to competency development within TVET systems.

In response to these challenges, competency-based frameworks such as the COMET model have been introduced to systematically guide the development and assessment of vocational competencies. The COMET competency model, developed by Rauner et al. (2013), provides a comprehensive framework that encompasses six key elements: competence, performance domains, performance statements, levels of mastery, assessment methods and development activities. This model enables educators to define essential capabilities, evaluate observable performance and design appropriate assessment strategies that reflect real workplace requirements. The integration of the COMET model into TVET programmes has been shown to improve the alignment between graduate competencies and industry expectations, thereby enhancing students’ readiness and employability in Industry 4.0 contexts (Lahn & Nore, 2019).

The importance of competency development is further reflected in graduate employability outcomes. Data from the Ministry of Higher Education indicate relatively high employability rates among Malaysian TVET graduates, with Malaysian Technical University Network (MTUN) achieving 87.1%, polytechnics 88.6% and community colleges 97.2%. Similarly, findings from the Mersing Polytechnic

Graduate Tracking Study show that 91% of graduates in 2016 and 86.3% in 2017 secured employment, although the percentage dropped to 41.5% in 2018, with an increasing number of graduates working outside their field of study (Nor Zamira Othman & Siti Farah Hussin, 2019). While these statistics demonstrate positive outcomes, they also indicate potential issues related to job mismatch, suggesting that employability should not only be measured in terms of employment rates but also alignment with relevant competencies. Therefore, strengthening competency-based education and assessment remains essential to ensure that graduates are adequately prepared for industry demands.

### **2.1. Technical Skills in TVET Education**

Technical skills represent the core competencies required for effective performance in vocational and technical occupations. Within the context of TVET, these skills encompass practical knowledge, procedural abilities and specialised expertise that enable individuals to perform job-related tasks efficiently (Mohd Nur Hafiz Fauzi, 2017). Such competencies are typically developed through structured training, hands-on learning and workplace-based experiences, which are fundamental components of vocational education. The role of TVET institutions in developing technical competencies is particularly significant, as these institutions serve as the primary platform for preparing students to meet labour market requirements.

Technical skills are essential in sectors that require operational precision and specialised knowledge, especially in industries undergoing rapid technological transformation. As automation and advanced technologies become more prevalent, the demand for technically competent workers continues to increase. Moreover, technical skills are strongly associated with employability and workplace performance. Empirical studies suggest that graduates with strong technical competencies are more likely to secure employment and adapt effectively to job requirements (Rina Febriana et al., 2017). However, the effectiveness of technical skill development largely depends on how these competencies are assessed within the educational system. This highlights the importance of aligning technical skill development with appropriate assessment practices to ensure that students are adequately prepared for real-world applications.

### **2.2. Industry 4.0 Generic Skills**

The emergence of Industry 4.0 has significantly transformed the nature of work and the competencies required in modern industries. Industry 4.0 refers to the integration of digital technologies, artificial intelligence, automation and cyber-physical systems into industrial processes (Asnidatul Adilah Ismail & Razali Hassan, 2019). Consequently, the workforce is now expected to possess not only technical expertise but also a range of generic skills that enable them to function effectively in complex and technology-driven environments. Industry 4.0 generic skills include critical thinking, problem-solving, digital literacy, communication, teamwork and adaptability (Teo et al., 2021). These competencies are essential for managing complex tasks, collaborating across disciplines and responding to rapid technological changes.

In this context, technical skills alone are no longer sufficient; instead, a combination of technical and generic competencies is required to ensure workforce readiness. Educational institutions, particularly TVET providers, have increasingly emphasised the integration of Industry 4.0 competencies into their curricula (Khan et al., 2021). This integration aims to ensure that graduates remain relevant and competitive in the evolving labour market. Furthermore, these generic skills are closely linked to individuals' ability to adapt to career transitions and emerging occupational roles, suggesting a strong relationship between Industry 4.0 competencies and broader career-related outcomes.

### **2.3. Career Adaptability Skills**

Career adaptability refers to an individual's readiness and capability to cope with current and anticipated career-related tasks, transitions and challenges. This concept is grounded in career construction theory, which emphasises the importance of adaptability in navigating dynamic and uncertain labour market conditions. Career adaptability is typically conceptualised through four dimensions: concern, control, curiosity and confidence (Savickas & Porfeli, 2012). These dimensions reflect an individual's ability to plan, make informed decisions, explore career opportunities and overcome challenges.

In the context of TVET, career adaptability is particularly important, as graduates often enter industries characterised by rapid technological changes and evolving job roles. Existing literature suggests that both technical skills and generic competencies play a significant role in enhancing career adaptability (Venugopal & Kumar, 2022). Individuals who possess strong technical knowledge and transferable skills are more likely to demonstrate higher levels of confidence, flexibility and resilience in managing their career pathways. Therefore, understanding how different competency domains contribute to career adaptability is essential for preparing students for long-term career success.

#### **2.4. Classroom Assessment Practices in TVET**

Classroom assessment practices are fundamental in evaluating students' learning outcomes and competency development in TVET education. Unlike traditional academic settings, assessment in TVET emphasises competency-based approaches that focus on students' ability to apply knowledge and skills in practical and authentic contexts. Effective classroom assessment involves a combination of formative and summative strategies (Brookhart, 2003; Kang & Furtak, 2021). Formative assessment provides continuous feedback to support learning, while summative assessment evaluates overall competency achievement. In TVET settings, assessment methods often include performance-based tasks, practical demonstrations, project-based learning and competency evaluations aligned with industry standards (Lewkowicz & Leung, 2021). Importantly, classroom assessment practices play a crucial role in shaping how students develop and demonstrate various competencies, including technical skills, Industry 4.0 generic skills and career adaptability. As teachers are directly involved in observing and evaluating students' performance during learning activities, their assessments provide valuable insights into students' competency development (Glogger-Frey et al., 2018). Therefore, examining the relationships between these competencies and classroom assessment practices is essential for improving teaching effectiveness and ensuring that TVET graduates meet industry expectations.

Based on the preceding discussion, it is evident that technical skills, Industry 4.0 generic skills and career adaptability skills represent critical competency domains required in contemporary TVET education. These competencies are not only essential for enhancing students' employability but are also closely associated with how learning outcomes are assessed within classroom settings (Ewing, 2017). Classroom assessment practices play a vital role in shaping and evaluating students' competency development through teachers' observations and professional judgments. Therefore, this study examines the relationships between technical skills, Industry 4.0 generic skills, career adaptability skills and classroom assessment practices from the perspective of TVET teachers, leading to the development of the following hypotheses.

#### **2.5. Hypothesis Development**

Based on the reviewed literature, technical skills, Industry 4.0 generic skills and career adaptability skills represent key competency domains required in Technical and Vocational Education and Training (TVET) (Hairi et al., 2019; Suroño et al., 2020). These competencies are not only essential for enhancing students' employability but are also closely related to how learning outcomes are evaluated through classroom assessment practices. In TVET settings, teachers play a central role in observing, evaluating and reporting students' competencies during teaching and learning activities (Griffin et al., 2007). Therefore, this study examines the relationships among these constructs based on teachers' perceptions of students' competencies.

### **2.5.1. Technical Skills and Career Adaptability Skills**

Technical skills constitute the foundational competencies required for effective performance in vocational and technical occupations. These skills enable individuals to perform tasks, solve technical problems and respond to workplace demands. In TVET learning environments, teachers continuously observe students' ability to demonstrate technical competencies during practical activities and assessments. From the perspective of competency development, technical skills may contribute to the development of career adaptability (Miyazaki et al., 2021). Students who demonstrate stronger technical competencies are more likely to exhibit confidence, control and flexibility in handling tasks and challenges. These attributes are closely aligned with the dimensions of career adaptability, including concern, control, curiosity and confidence (Kirchknopf, 2020). Therefore, based on teachers' observations, students with higher levels of technical skills are expected to demonstrate stronger career adaptability.

Ha1: Teachers perceive that students' Technical Skills have a significant positive influence on their Career Adaptability Skills.

### **2.5.2. Industry 4.0 Generic Skills and Career Adaptability Skills**

Industry 4.0 generic skills refer to a set of transferable competencies, including critical thinking, problem-solving, adaptability, communication and collaboration, which are essential in technology-driven environments (Khan et al., 2021). These skills enable individuals to cope with uncertainty, manage complex tasks and adapt to changing work conditions. Within TVET contexts, teachers assess students' ability to demonstrate these competencies through various learning and assessment activities. Students who exhibit stronger Industry 4.0 generic skills are more likely to demonstrate adaptability in responding to new situations, exploring opportunities and managing career-related challenges (Chukwu et al., 2020). As such, these competencies are expected to contribute to the development of career adaptability.

Ha2: Teachers perceive that students' Industry 4.0 Generic Skills have a significant positive influence on their Career Adaptability Skills.

### **2.5.3. Career Adaptability Skills and TVET Classroom Assessment Practices**

Career adaptability reflects students' readiness and capability to engage with learning tasks, respond to feedback and perform effectively in different assessment contexts. In TVET education, classroom assessment practices involve evaluating students' competencies through practical tasks, demonstrations and performance-based activities. Teachers play a key role in assessing how students apply their skills, manage tasks and respond to assessment requirements. Students who demonstrate higher levels of career adaptability are more likely to show confidence, persistence and flexibility in completing assessment tasks (Savickas & Porfeli, 2012). Therefore, from teachers' perspectives, higher levels of career adaptability are expected to be associated with better performance in classroom assessment practices.

Ha3: Teachers perceive that students' Career Adaptability Skills have a significant positive influence on TVET CA Practices.

### **2.5.4. Technical Skills and TVET Classroom Assessment Practices**

Technical skills are directly evaluated in TVET classroom assessment practices through competency-based assessments, practical tasks and performance demonstrations. Teachers assess students' ability to apply technical knowledge and perform specific job-related tasks in structured learning environments (Glogger-Frey et al., 2018). Students who demonstrate stronger technical skills are more likely to

perform effectively in assessment activities, as these skills are closely aligned with the requirements of competency-based evaluation (Tun et al., 2021). Therefore, based on teachers' observations, higher levels of technical skills are expected to be positively associated with classroom assessment practices.

Ha4: Teachers perceive that students' Technical Skills have a significant positive influence on TVET CA Practices.

### **2.5.5. Industry 4.0 Generic Skills and TVET Classroom Assessment Practices**

In addition to technical competencies, classroom assessment practices increasingly incorporate the evaluation of Industry 4.0 generic skills, such as problem-solving, teamwork and communication. These competencies are often assessed through project-based learning, collaborative activities and performance tasks. Teachers evaluate students' ability to demonstrate these skills during assessment activities (Hagos Baraki et al., 2016). Students who exhibit stronger Industry 4.0 generic skills are more likely to engage effectively in assessment tasks and demonstrate better overall performance (Ana et al., 2020). Therefore, it is expected that Industry 4.0 generic skills are positively related to classroom assessment practices.

Ha5: Teachers perceive that students' Industry 4.0 Generic Skills have a significant positive influence on TVET CA Practices.

### **2.5.6. The Mediating Role of Career Adaptability Skills**

Career adaptability may also function as a mediating mechanism in the relationships between competency domains and classroom assessment practices. From a theoretical perspective, both technical skills and Industry 4.0 generic skills contribute to students' ability to adapt to learning and assessment environments (Savickas & Porfeli, 2012). Students with stronger technical and generic competencies are more likely to develop confidence, flexibility and control in performing tasks, which enhances their adaptability (de Guzman & Choi, 2013). This increased adaptability may subsequently influence how students perform in classroom assessment practices, as perceived by teachers. Accordingly, career adaptability is expected to mediate the relationships between technical skills, Industry 4.0 generic skills and classroom assessment practices.

Ha6: Teachers perceive that Career Adaptability Skills significantly mediate the relationship between Technical Skills and TVET CA Practices.

Ha7: Teachers perceive that Career Adaptability Skills significantly mediate the relationship between Industry 4.0 Generic Skills and TVET CA Practices.

Based on the reviewed literature, it is evident that technical skills, Industry 4.0 generic skills and career adaptability skills are interrelated competencies that influence students' performance in TVET learning environments. As teachers play a central role in assessing students' competencies through classroom assessment practices, their perceptions provide valuable insights into students' competency development. Therefore, this study proposes a structural model to examine the relationships among these constructs, leading to the following hypotheses.

## **3. Methodology**

This study conducted two types of data analysis, namely descriptive analysis and inferential analysis. The survey instruments were administered using both Google Forms and printed copies. Data collection was conducted over a period of thirty (30) days. The initial seven (7) days were dedicated to distributing

the instruments to the respondents involved, while the remaining three (3) weeks were allocated for receiving the completed instruments for analysis.

### 3.1. Descriptive Analysis

Descriptive analysis was performed to identify the demographic characteristics of respondents, including gender, work experience, educational attainment, and other relevant variables. The analysis utilized frequency, percentage, and mean score values. The Statistical Package for the Social Sciences (SPSS) version 27 was employed for this purpose.

### 3.2. Inferential Analysis

Inferential analysis was used to answer the research questions and test the hypotheses. For this analysis, SmartPLS version 4.0 software was used to assess the measurement model, evaluate the structural model, compute the Variance Accounted For (VAF) for mediating effects, and examine the predictive accuracy of the overall model. Structural Equation Modeling (SEM) was applied to examine the theoretical relationships among the dimensions in the proposed model and simultaneous estimation of relationships between latent variables and their observed indicators. The process of SEM model development consists of two main stages: (1) development of the measurement model, and (2) development of the structural model.

#### 3.2.1. Measurement Model

The measurement model was employed to test the observed variables derived from theory that represent the hypothesized latent constructs. It also explains the relationships between latent constructs and their respective indicators. This model further establishes the validity and reliability of the constructs. Table 1 presents the aspects and criteria applied in the measurement model.

Table 1. Aspects and Criteria for Measurement Model Evaluation

Aspect	Criteria
Internal Consistency Reliability	Composite Reliability (CR); Cronbach’s Alpha
Convergent Validity	Outer Loading; Average Variance Extracted (AVE)
Discriminant Validity	Heterotrait-Monotrait Ratio of Correlations (HTMT)

Reliability refers to the consistency of scores obtained from an instrument, indicating that results remain stable and reproducible across different occasions (Creswell & Creswell, 2018). This study employed internal consistency reliability to assess the reliability of items, which measures the degree to which the items consistently represent the same construct. Composite Reliability (CR) is used to evaluate internal consistency. CR values range from 0 to 1, with higher values reflecting greater reliability. Specifically, CR values between 0.6 and 0.7 are acceptable for exploratory research (Nunnally & Bernstein, 1994) as shown at Table 2.

Table 2. Acceptable Range for Composite Reliability (CR)

CR Value	Criteria
> 0.78	Good
0.6 – 0.7	Acceptable for exploratory research
0.95	Accepted/rejected based on item review

Indicator reliability (outer loading) and Average Variance Extracted (AVE) were used to assess convergent validity, which evaluates the extent to which indicators of a construct correlate with each other. High variance explained by items within a construct demonstrates good construct validity.



### 3.3. Sample of the study

The population of this study comprised senior vocational teachers (Heads of Programme) in Malaysian Vocational Colleges (N = 1,989) across 86 Vocational Colleges nationwide as of 2026 (BPLTV, 2026). These senior vocational teachers are responsible for monitoring teaching practices and ensuring alignment between curriculum, instruction, and assessment within their respective colleges.

Based on the sample size determination table proposed by Krejcie & Morgan (1970), a population exceeding 1,900 requires a minimum sample of 320 respondents. Because this study involves descriptive analyses to estimate means and standard deviations, the minimum sample size was increased by 20%, as recommended by Fraenkel et al. (2006). In addition, L. Cohen et al., (2017) suggested a minimum sample size of 322 for a population of approximately 2,000 at a 0.05 significance level (95% confidence level). Accordingly, the minimum required sample size for this study was set at 384 respondents.

To account for potential data loss during the PLS-SEM data screening and cleaning process, the study adopted an oversampling strategy, resulting in 504 questionnaires being distributed. All 504 questionnaires were returned. During data screening, 86 cases were excluded due to straight-lining patterns, and outliers. After the full PLS-SEM data-cleaning procedures were applied, 418 valid cases met all inclusion criteria and were retained for the final analysis. Table 5 show the sample selection and data screening for Heads of Programme.

Table 5. Sample Selection and Data Screening

Stage	Description	n
Population	Senior vocational teachers (Heads of Programme) in 86 Malaysian Vocational Colleges nationwide (TVET Division, 2026)	1,989
Sampling frame	Senior vocational teachers (Heads of Programme) in 86 Malaysian Vocational Colleges nationwide (TVET Division, 2026) + 20% as recommended by Fraenkel et al. (2006).	384
Invited to participate	Questionnaires distributed to eligible Heads of Programme across all strata	504
Responses received	Questionnaires returned	504
Excluded during data screening		86
	Straight-lining	9
	Multivariate outliers removed (Mahalanobis $p < .001$ )	77
Final valid sample (N)	Cases meeting all PLS-SEM inclusion criteria and used in analysis	418

Because this study focuses on human behavioural responses, testing for common method bias is strongly recommended (Podsakoff et al., 2012). Accordingly, the Harman’s single-factor test was conducted to assess the presence of common method variance. As shown in Table 6, the unrotated factor solution extracted 155 factors, with the largest single factor accounting for 47.19% of the total variance. Importantly, no single factor explained more than 50% of the variance, indicating the absence of a dominant general factor. Therefore, common method bias is not a serious concern in this study. While Harman’s single-factor test has recognised limitations in detecting all forms of method variance, procedural remedies such as ensuring respondent anonymity were also implemented to minimise potential bias (Podsakoff et al., 2012).

Table 6. Summary of Factor Analysis for Common Method Bias

Factor	% Varian	Cumulative Variance Explained (%)
1	47.186	47.186

### 3.4 Validity and reliability of the instrument

The instrument has four sections: (1) Section A: Demographic Information (four items) Section B: B1. Technical Skills (20 items), B2. Industry 4.0 Generic Skills (55 items), B3. Career Adaptability Skills (23 items) and B4. TVET CA Practices (44 items). The instrument was initially developed based on an extensive literature review and validated for content validity by six (6) experts aligning with the number of experts in studies by (Mohd Matore & Khairani, 2020). These experts have over ten (10) years of working experience and from university lecturers holding a Doctor of Philosophy related to TVET. The minimum requirement for expertise in the field and research issue necessitated a duration of no less than three years, focusing on achieving consensus (Mohr & Shelton, 2017). This process ensures that the concept and information from the literature are accurately interpreted in the instrument (Drost, 2011).

The experts suggested adding several items, such as the ability to produce marketing literature and the use of online and contextualized learning activities. However, they also suggested removing an item such as the ability to deliver a speech to the audience. The Content Validity Ratio (CVR) is a statistical approach to evaluate content validity. The computation employs a formula that was developed by Lawshe (1975) and has gained popularity among academics for assessing the statistical significance of content validity (Azwan Masuwai et al., 2016; Nor Azizah Ahmad et al., 2019; Zamanzadeh et al., 2015). The CVR number is the mean level of appropriateness of the items derived from the comprehensive content validity panel. According to Mohd Matore & Khairani (2020), using the CVR value facilitates determining the retention or elimination of items, owing to the expert appraisal of content validity involved a three-point scale assigned to each instrument item, indicating the importance level. These points correspond to (1) Very Essential, (2) Less Essential, and (3) Not Essential. After collecting replies from all the panels, the number of issues the experts designated "Very Essential" was tallied (Ayre & Scally, 2014; Lawshe, 1975) and it has been determined that the crucial value of the CVR for a panel consisting of six experts is 1.

According to Lawshe (1975), there are two recommended approaches for updating or removing things that fall below the critical value of 1. These approaches involve either upgrading the items that fall below this value or eliminating them (Mohammed Afandi Zainal et al., 2020). Following the computation of the value for each CVR item, items exhibiting a value of 0.33 are excluded, items with a value of 0.67 necessitate enhancement, and items with a value of 1 are preserved. The number of items was reduced after the content validity assessment, and the number of items was subsequently adjusted and augmented per expert recommendations. The final items were going through evaluations conducted by experts on the item for each construct, leading the researchers to enhance the item following the advice provided by those experts.

After modification based on the experts' suggestions, the instrument was piloted to 114 TVET lecturers at Malaysian Polytechnic to ensure a high return rate and understanding of the instrument (Chua Yan Piaw, 2014). According to Hertzog (2008), it is recommended to employ a sample size ranging from 10 to 30 participants for instrument development during the pilot phase. The sample selection for this pilot study is based on a study sample in a context with almost the same characteristics as the actual study, namely among TVET trainers. An online questionnaire using the Google Form platform was also developed to facilitate quick feedback from the pilot study participants. Because the analysis of this study will use PLS-SEM, the data inspection method will follow the recommendations made by (Hair Jr. et al., 2021), such as exploratory analysis, which is Exploratory Factor Analysis (EFA), and calculate item reliability through Cronbach's alpha value.

The primary purpose of EFA is to summarize the data so that the relationships between the components are easily explained and understood (Yong & Pearce, 2013). EFA is also essential to test the factor structure hypothesis for the measurement set and find redundancy. EFA is a data exploration using principal component extraction with varimax rotation (variation maximization) on all items that measure each construct. Bartlett's Test of Sphericity was determined, and all constructs reached a significant value of  $p < 0.05$ .

In addition, the measurement of sample accuracy using Kaiser Meyer Olkin (KMO) is that all items must meet the set value above 0.5 (Kaiser, 1974). Based on Table 7, both results, which are KMO > 0.5 and Bartlett's Test of Sphericity, are significant for all of them, namely the construct of Technical Skills (TS) = (0.926), Industry 4.0 generic skills (IR4.0-GS) = (0.902), Career Adaptability Skills (CAS) = (0.954) and TVET CA Practices (CAP) = (0.911), and the data is suitable for proceeding to the following procedure.

Table 7. Finding of KMO and Bartlett's Test of Sphericity for Each Construct

Constructs/Type of Assessment		TS	IR4.0-GS	CAS	TVET CAP
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.926	0.902	0.954	0.911
Bartlett's Test of Sphericity	Approx. Chi-Square	1916.116	8743.728	2826.658	8392.237
	df	120	1891	190	1596
	Sig.	0.000	0.000	0.000	0.000

Next, the Total Variance Explained value for each construct is considered. The Total Variance Explained value at Table 8 shows that the number of items of each construct is appropriate to measure the construct. According to Pallant (2020), the overall value of the variant should exceed 50%. Table 8 shows that the total variance is over 50% for the construct of TS (65.40%), IR4.0-GS (56.04%), CAS (73.42%), and TVET CAP (58.08%).

Table 8. Total variance explained finding for each construct

Constructs	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% Variance	Cumulative %	Total	% Variance	Cumulative %
TS	10.465	65.409	65.409	10.465	65.409	65.409
IR4.0-GS	34.750	56.049	56.049	34.750	56.049	56.049
CAS	14.684	73.422	73.422	14.684	73.422	73.422
TVET CAP	33.109	58.086	58.086	33.109	58.086	58.086

Then, factor loading values in the component matrix for each construct are carried out. The higher the factor loading value, the higher the level of reliability. Cronbach's alpha values above 0.7 and factor loading values between 0.6 and 0.7 are accepted (Nunnally & Bernstein, 1994). Cronbach's alpha value for each variable and construct is above 0.8, and factor loading is above 0.6. This finding shows that the level of internal consistency is high, and the items are reliable.

## 4. Finding

### 4.1. Descriptive Analysis

This study uses SPSS 27 software to conduct a descriptive analysis divided into two analyses: descriptive analysis of respondents and analysis of the variables.

#### 4.1.1. Descriptive Analysis of Respondents' Demographics

A descriptive demographic analysis of the respondents was conducted to obtain an overview of their demographic profiles. This section will report and discuss the profile of respondents who are senior teachers in Malaysian Vocational Colleges, including gender, state of service, descent, academic qualifications, length of service, period of teaching TVET subjects and TVET subjects taught.

The final analyzed data showed that 418 respondents from 5 states were involved in this study, representing their respective zones through stratified random sampling. A total of 24% of respondents

served in Perak, followed by 16% from Selangor, 19% of respondents served in Johor, and the rest served in other states. Most respondents, 77.0%, were female, while only 23.0% were male. In terms of ethnicity, the majority are Malay (95.9%). In addition, 4% of respondents have a Postgraduate Education Diploma, 92.1% have a bachelor's degree, and 6.7% have a master's degree. Based on length of service, 33.7% of respondents have served for 11-15 years, 27.8% have served for more than 20 years, 17.7% have served for 16-20 years, 11.7% have served for 6-10 years, and only 9.1% of respondents have served for less than six years.

#### **4.1.2. Descriptive Analysis of the Variables**

This section discusses and reports the descriptive analysis conducted on each variable in this study includes the mean and standard deviation. The instrument used is a five-point Likert scale that describes the level of agreement of the study participants to the questionnaire items, namely: 5 (strongly agree), 4 (agree), 3 (slightly agree), 2 (disagree), and 1 (strongly disagree). The variables involved are Technical Skills, Industry 4.0 Generic Skills, Career Adaptability Skills, and TVET CA Practices. Following that, the overall analysis of variables is also reported.

##### **(a) Technical Skills Construct**

A questionnaire consisting of 3 dimensions of Technical Skills, including method, process, and technique, was used to measure and evaluate Technical Skills. The findings of this study show that the teacher's agreement on the construct of Technical Skills is high based on the mean score ( $m$ )=4.10 and the standard deviation score ( $sd$ ), which is 0.577 according to the dimension. The method dimension obtained a score of ( $m$ =4.0.7,  $sd$ =0.682), the process dimension received a score of ( $m$ =4.18,  $sd$ =0.590), and the technique dimension with a score of ( $m$ =4.06,  $sd$ =0.666).

##### **(b) Industry 4.0 Generic Skill Constructs**

The findings of this study show that the respondent's level of agreement on Industry 4.0 Generic Skill is at a moderate level based on the mean score value ( $m$ ), which is 3.84, and 0.514 for the standard deviation score ( $sd$ ) according to the dimension. The dimension of entrepreneurial skills obtained a score ( $m$ =3.68,  $sd$ =0.686), the dimension of interpersonal skills obtained a score ( $m$ =3.97,  $sd$ =0.605), the dimension of technology use skills obtained a score ( $m$ =3.77,  $sd$ =0.651), the dimension of teamwork skills received a score ( $m$ =3.97,  $sd$ =0.606), the dimension of leadership skills obtained a score ( $m$ =3.92,  $sd$ =0.609), the dimension of communication skills obtained a score ( $m$ =3.86,  $sd$ =0.583), the dimension of complex problem-solving skills received a score ( $m$ =3.64,  $sd$ =0.707), the dimension of technical competence and ICT knowledge obtained a score ( $m$ =3.85,  $sd$ =0.654), the dimension of communication skills and the ability to work with data obtained a score ( $m$ =3.74,  $sd$ =0.688) and the dimension of emotional intelligence and self-skills obtained a score ( $m$ =3.93, 0.591).

##### **(c) Career Adaptability Skill Constructs**

The findings of this study show that the respondent's level of agreement on Career Adaptability Skills is moderate based on the mean score of 3.76 and 0.630 for the standard deviation score according to the dimension. The dimension of concern obtained a score ( $m$ =3.67,  $sd$ =0.685), the dimension of curiosity obtained a score ( $m$ =3.71,  $sd$ =0.694), the dimension of control obtained a score ( $m$ =3.85,  $sd$ =0.661), and the dimension of confidence received a score ( $m$ =3.81,  $sd$ =0.666).

##### **(d) TVET CA Practices Construct**

The findings of this study show that the level of respondents' agreement with TEVT CA Practices is high based on the mean score of 4.14 and 0.476 for the standard deviation score according to the

dimension. The assessment concept dimension obtained a score ( $m=4.10$ ,  $sd=0.498$ ), the assessment approach dimension obtained a score ( $m=4.20$ ,  $sd=0.517$ ), and the Proficiency dimension obtained a score ( $m=4.13$ ,  $sd=0.544$ ).

#### **4.2. Analysis of Initial Model**

This study employed Partial Least Squares Structural Equation Modelling (PLS-SEM) using SmartPLS 4 to assess the reliability and validity of the measurement model prior to testing structural relationships. Given the multidimensional nature of the constructs, a two-stage higher-order construct approach (HOC) modelling was adopted, following the recommendations of Hair et al. (2019) and Henseler et al. (2016). Figure 2 illustrates the model for the first-order construct, which involves the analysis among the sub-constructs or dimensions of each construct.

In this model, Technical Skills (TS), Industry 4.0 Generic Skills (IR4.0 GS), Career Adaptability Skills (CAS), and Classroom Assessment Practices (CAP) were specified as second-order reflective–reflective constructs, each measured by several first-order dimensions. In the first stage, the latent variable scores of the first-order constructs were estimated. In the second stage, these scores were used as indicators to form the higher-order constructs.

Subsequently, after evaluating the first-order measurement model, several items/indicators were removed from the model due to indicator loading values of less than 0.7. The items/indicators removed were PRS23 and PUP1 under the assessment concept dimension. In addition, item KKKBD52 under the communication and data processing ability dimension was also excluded to achieve discriminant validity. Figure 3 illustrates the second-order measurement model involving all constructs in the study. The findings for both the first-order and second-order measurement models are discussed in the following section.

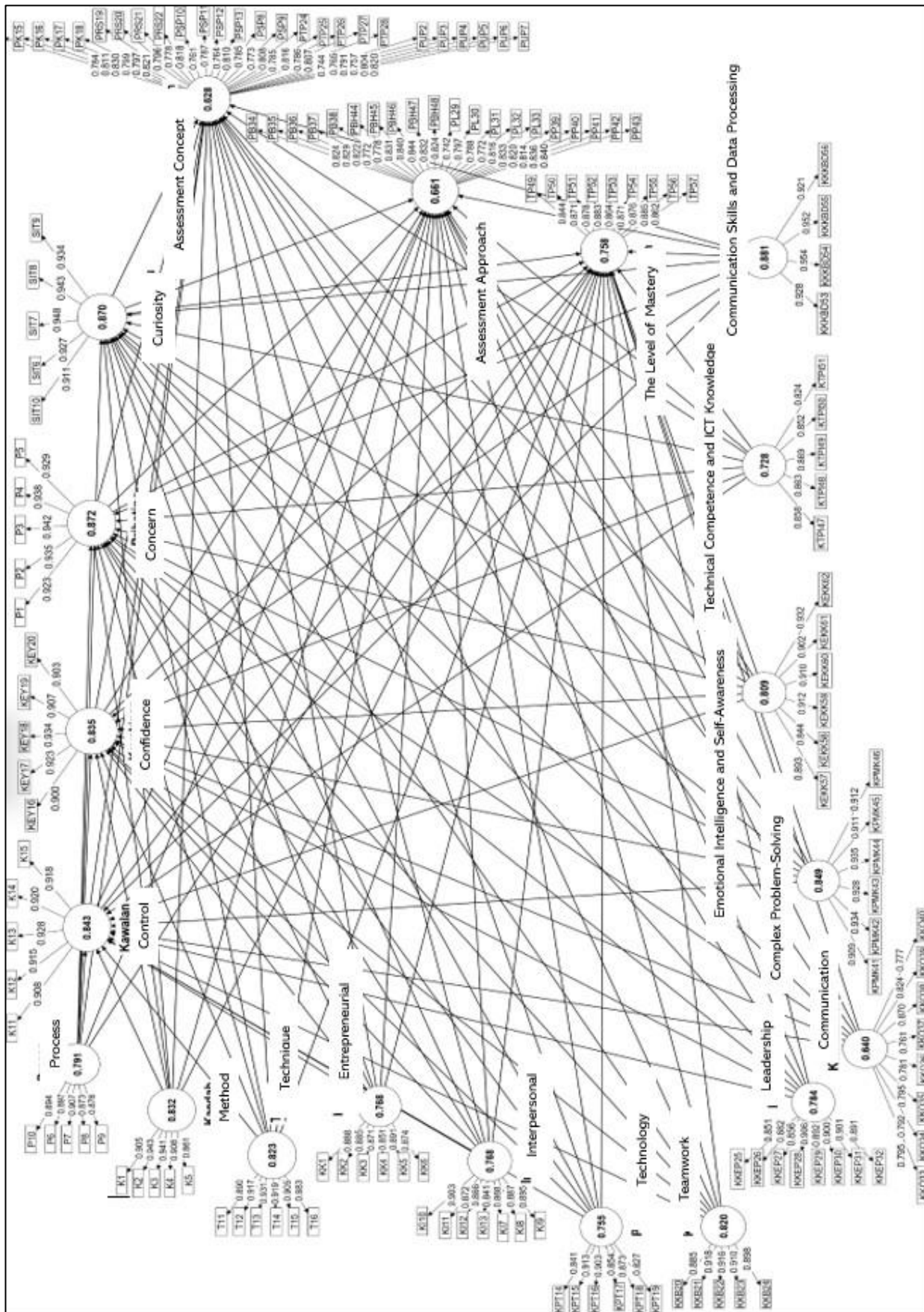


Figure 2. Model for the First-Order Construct

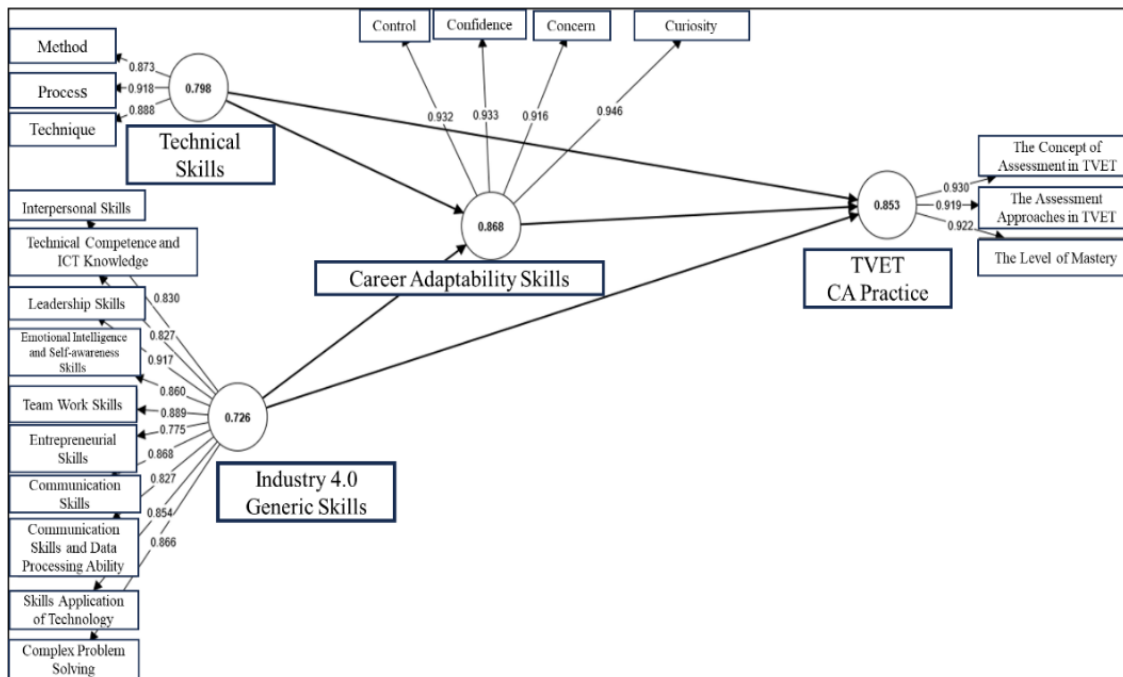


Figure 3. Second Order Measurement Model

#### 4.2.1. Indicator Reliability

Indicator reliability was evaluated based on the outer loadings of each indicator on its respective construct. According to Hair et al. (2019), outer loadings should exceed 0.70, although values above 0.60 are acceptable in exploratory research. During the first-order measurement model assessment, three indicators—PRS2, PUP1, and KKKBD52—were found to have loadings below the acceptable threshold and were therefore removed from further analysis. After deletion, all remaining indicators exhibited loadings above 0.70, indicating satisfactory indicator reliability.

For the second-order constructs, all dimensions loaded strongly on their respective higher-order constructs. For example, Technical Skills was reflected by Method (0.911), Process (0.908), and Technique (0.922). Similarly, Generic Skills was represented by ten dimensions, including Communication (0.918), Leadership (0.904), Teamwork (0.899), and Problem Solving (0.897), all exceeding the recommended thresholds. Career Adaptability Skills was well represented by Concern (0.949), Curiosity (0.932), Control (0.920), and Confidence (0.946). Classroom Assessment Practices was reflected by Assessment Concept (0.950), Assessment Approach (0.945), and Assessment Mastery (0.957). These results confirm the adequacy of the higher-order measurement structure.

#### 4.2.2. Internal Consistency Reliability

Internal consistency reliability was assessed using Cronbach’s Alpha (CA) and Composite Reliability (CR). Values exceeding 0.70 indicate satisfactory reliability (Hair et al., 2019). All first-order constructs recorded CA and CR values above the threshold, indicating strong internal consistency. At the second-order level, Technical Skills (CR = 0.931), Generic Skills (CR = 0.948), Career Adaptability Skills (CR = 0.961), and Classroom Assessment Practices (CR = 0.963) all demonstrated excellent reliability. These results confirm that the constructs consistently measure their intended latent variables.

#### 4.2.3. Convergent Validity

Convergent validity was evaluated using the Average Variance Extracted (AVE). An AVE value of 0.50 or higher indicates that the construct explains more than half of the variance of its indicators (Bagozzi & Yi, 2012). All first-order and second-order constructs achieved AVE values above 0.50. At the higher-order level, Technical Skills (AVE = 0.818), Generic Skills (AVE = 0.645), Career Adaptability Skills (AVE = 0.860), and Classroom Assessment Practices (AVE = 0.898) demonstrated strong convergent validity.

#### 4.2.4. Discriminant Validity

Discriminant validity was assessed using the Heterotrait–Monotrait Ratio (HTMT). According to Henseler et al. (2016), HTMT values below 0.90 (or below 1.00 for conceptually related higher-order constructs) indicate acceptable discriminant validity. The HTMT values among the higher-order constructs ranged from 0.626 to 0.920 as shown at Table 9. Although the HTMT value between IR 4.0 Generic Skills and Career Adaptability Skills reached 0.920, this is considered acceptable given their conceptual proximity and higher-order nature. Importantly, no HTMT value exceeded 1.00, confirming that all constructs are empirically distinct.

Table 9. Heterotrait-Monotrait Ratio (HTMT) values of first-order constructs

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1																				
2	0.645																			
3	0.749	0.601																		
4	0.609	0.457	0.711																	
5	0.818	0.633	0.826	0.734																
6	0.733	0.573	0.806	0.722	0.812															
7	0.798	0.590	0.764	0.727	0.883	0.774														
8	0.745	0.600	0.673	0.557	0.741	0.671	0.695													
9	0.700	0.551	0.884	0.713	0.818	0.811	0.775	0.634												
10	0.700	0.543	0.780	0.806	0.828	0.769	0.784	0.648	0.756											
11	0.581	0.421	0.694	0.877	0.725	0.699	0.691	0.598	0.698	0.742										
12	0.573	0.588	0.692	0.573	0.636	0.607	0.620	0.480	0.660	0.573	0.500									
13	0.482	0.477	0.565	0.509	0.560	0.520	0.526	0.360	0.539	0.525	0.434	0.812								
14	0.746	0.559	0.722	0.747	0.786	0.705	0.804	0.690	0.704	0.750	0.708	0.580	0.517							
15	0.663	0.511	0.704	0.748	0.799	0.750	0.775	0.655	0.765	0.777	0.780	0.512	0.428	0.739						
16	0.666	0.515	0.815	0.694	0.767	0.754	0.717	0.630	0.832	0.717	0.714	0.539	0.462	0.715	0.762					
17	0.667	0.747	0.619	0.514	0.647	0.593	0.621	0.600	0.570	0.592	0.470	0.565	0.492	0.608	0.525	0.560				
18	0.711	0.576	0.878	0.715	0.789	0.769	0.747	0.641	0.874	0.724	0.721	0.638	0.526	0.725	0.783	0.882	0.556			
19	0.591	0.556	0.679	0.544	0.608	0.612	0.593	0.451	0.631	0.542	0.465	0.798	0.802	0.549	0.501	0.560	0.564	0.618		
20	0.689	0.662	0.610	0.521	0.671	0.585	0.605	0.639	0.578	0.617	0.465	0.512	0.439	0.682	0.558	0.589	0.795	0.572	0.496	

Note: 1. Interpersonal Skills 2. Method 3. Control 4. Technical Competence and ICT Knowledge 5. Leadership Skills 6. Emotional Intelligence and Self-Awareness Skills 7. Teamwork Skills 8. Entrepreneurial Skills 9. Confidence 10. Communication Skills 11. Communication Skills and Data Processing Ability 12. Concept of Assessment 13. Assessment Approaches 14. Skills in the Application of Technology 15. Complex Problem-Solving Skills 16. Concern 17. Process 18. Curiosity 19. Level of Mastery 20. Technique

Table 10 presents the discriminant validity values for the second-order constructs as measured by the Heterotrait-Monotrait Ratio (HTMT). The HTMT value assesses the mean correlation of indicators across constructs. According to Henseler et al. (2016), discriminant validity is established when the HTMT value is less than 0.90. However, for higher-order models, HTMT values approaching 1 are still acceptable (HTMT < 1). Based on Table 10, all HTMT values for the second-order constructs are below 1. Therefore, the discriminant validity criterion has been satisfactorily met.

Table 10. Heterotrait-Monotrait Ratio (HTMT) value for second-order construct

	TVET CA Practices	IR 4.0-GS	CAS	TS
TVET CA Practices				
IR 4.0-GS	0.693			
CAS	0.713	0.920		
TS	0.679	0.790	0.723	

### 4.3. Analysis of Measurement Model

According to Hair et al., (2014), it can generally be said that the evaluation of the measurement model can be explained based on the assessment of the reliability and validity of items/constructs and constructs. Table 11 shows the findings of the reliability and validity assessment. Figure 4 provides a summary of the initial measurement model for second order constructs.

Table 11. The Assessment of the Initial Measurement Model

	Item	Outer loading	Alpha Cronbach	CR
Technical Skills	Method	0.873	0.949	0.961
	Process	0.918	0.934	0.950
	Technique	0.888	0.957	0.965
Industry 4.0 Generic Skills	Entrepreneurial Skills	0.775	0.940	0.952
	Interpersonal Skills	0.830	0.949	0.959
	Skills Application of Technology	0.854	0.935	0.949
	Teamwork Skills	0.889	0.945	0.958
	Leadership Skills	0.917	0.960	0.967
	Communication Skills	0.868	0.919	0.934
	Complex Problem Solving	0.866	0.964	0.971
	Technical Competence and ICT Knowledge	0.827	0.907	0.930
	Communication Skills and Data Processing Ability	0.827	0.943	0.967
	Emotional Intelligence and Self-awareness Skills.	0.860	0.952	0.962
Career Adaptability Skills	Concern	0.916	0.963	0.971
	Curiosity	0.946	0.963	0.971
	Control	0.932	0.953	0.964
	Confidence	0.933	0.950	0.962
TVET CA	The Concept of Assessment in TVET	0.930	0.977	0.978
Practices	The Assessment Approaches in TVET	0.919	0.973	0.975
	The Level of Mastery	0.922	0.960	0.966

#### 4.3.1. Analysis of the Significance Affect between the Variables

RQ1: To what extent do teachers perceive students' Technical Skills as influencing their Career Adaptability Skills?

The finding shows the path coefficient value of the structural model to give an overview of the hypothetical relationship between the constructs in the structural model. Hair et al. (2014) suggest a significant level that can be accepted is at least at a significant level of 10%. Based on the findings shows that Technical Skills significantly positively affect Career Adaptability skills ( $p < 0.10$ ). The path value of the coefficient ( $\beta = 0.050$ ,  $t = 1.339$ ) explains that each unit increase in Technical Skills will increase by about 0.050 Career Adaptability Skills. This shows that Technical Skills have a positive and significant relationship and subsequently influence Career Adaptability Skills in the TVET CA Practices. Respondents believe that students with a high level of Technical Skills will have a high level of Career Adaptability Skills, which are very suitable to be applied in the TVET CA practices.

RQ2: To what extent do teachers perceive students' Industry 4.0 Generic Skills as influencing their Career Adaptability Skills?

The finding shows Industry 4.0 Generic Skills significantly positively affect Career Adaptability skills ( $p < 0.05$ ). The path value of the coefficient ( $\beta = 0.843$ ,  $t = 29.115$ ) explains that each unit of increase in Industry 4.0 Generic Skills will increase 0.843 Career Adaptability Skills. This shows that Industry 4.0

Generic Skills have a positive and significant relationship and subsequently affect Career Adaptability Skills in the TVET CA Practices. The results show that students with a high level of Industry 4.0 Generic Skills will have a high level of Career Adaptability Skills, which are suitable to be applied in the TVET CA Practices.

RQ3: How do teachers perceive the influence of students' Career Adaptability Skills on TVET CA Practices?

The finding shows Career Adaptability Skills significantly positively affect the TVET CA Practices ( $p < 0.05$ ). The path value of the coefficient ( $\beta = 0.389$ ,  $t = 5.007$ ) explains that each unit of increase in career adaptability skills will increase 0.389 of TVET CA Practices. The finding shows that Career Adaptability Skills are positively and significantly related to the TVET CA Practices.

RQ4: How do teachers perceive the influence of students' Technical Skills on TVET CA Practices?

The path value of the coefficient ( $\beta = 0.268$ ,  $t = 5.039$ ) explains that each unit of increase in Technical Skills will increase 0.268 TVET CA Practices. It showed that positive relationship Technical Skills influence the TVET CA Practices significantly.

RQ5: How do teachers perceive the influence of students' Industry 4.0 Generic Skills on TVET CA Practices?

The finding shows that Technical Skills significantly positively affect the TVET CA Practices ( $p < 0.05$ ). Industry 4.0 Generic Skills marginally significant, indicating a relatively weak effect the TVET CA practices ( $p < 0.10$ ). The coefficient path value ( $\beta = 0.119$ ,  $t = 1.467$ ) explains that each unit increase in Industry 4.0 Generic Skills will increase 0.119 TVET CA Practices. The finding shows that Industry 4.0 Generic Skills have a relatively weak relationship to TVET CA Practices. Table 12 shows significance effect of each variable for the structural model.

Table 12. Significance Effect of Each Variable for the Structural Model

		Path Coefficient	t value	p-value	LCL	UCL
<b>H<sub>a1</sub></b>	Technical Skills → Career Adaptability Skills	0.050	1.339	0.090*	0.003	0.098
<b>H<sub>a2</sub></b>	Industry 4.0 Generic Skills → Career Adaptability Skills	0.843	29.115	0.000***	0.795	0.891
<b>H<sub>a3</sub></b>	Career Adaptability Skills → TVET CA Practices	0.389	5.007	0.000***	0.261	0.515
<b>H<sub>a4</sub></b>	Technical Skills → TVET CA Practices	0.268	5.039	0.000***	0.182	0.356
<b>H<sub>a5</sub></b>	Industry 4.0 Generic Skills → TVET CA Practices	0.119	1.467	0.071*	0.016	0.228

Note: \*\*\*Significant at 1%, \* Significant at 10%, LCL- lower confidence level, UCL- upper confidence level

#### 4.3.2. Analysis of Structural Model based on the Value of Predictive Accuracy (R<sup>2</sup>), Predictive Relevance (Q<sup>2</sup>) and Effect Size (f<sup>2</sup>)

The findings obtained are by making a summary of the relationships that exist between all the indicators and constructs involved. Once the model is developed, the next test will focus on the accuracy of prediction (R<sup>2</sup>), the actual effect (f<sup>2</sup>) and the relevant effect (Q<sup>2</sup>) of the model. Coefficient of determination (R<sup>2</sup>) is a coefficient of determination to measure the accuracy of model predictions and is calculated as a squared correlation between the actual value and the predicted value of the dependent variable. The R<sup>2</sup> explains the variation (change) in the dependent (endogenous) variable that is explained by the amount of change in the independent (exogenous) variable. In other words, it represents the sum of variations that are related to each other by systematically sharing the same pattern. The R<sup>2</sup> value is between 0 and 1 and the higher the R<sup>2</sup> value, the higher the expected accuracy level. According to Chin (1998), R<sup>2</sup> > 0.67 is strong, R<sup>2</sup> > 0.3 is moderate, and R<sup>2</sup> > 0.19 is weak. Table 12 shows the value of the R<sup>2</sup> for TVET CA Practices and Career Adaptability Skills. Based on the value

of R2, 50.1% of the total variation in TVET CA Practices is explained by Technical Skills, Industry 4.0 Generic Skills and Career Adaptability Skills, while for the total variation of Career Adaptability Skills is as much as 77.4%.

In addition to evaluating R2 for all dependent variables, changes in R2 values when certain independent variables are excluded from the model can be used to evaluate whether the predictor construct has a substantive (real) effect on the dependent variable. This method is called effect size (f2). Table 13 shows finding of effect size (f2). The finding showed that 77.4% of the total variance of Career Adaptability Skills is explained by Technical Skills and Industry 4.0 Generic Skills. Based on the effect size value, there is no effect between Industry 4.0 Generic Skills on TVET CA Practices, while there is a small relationship between Career Adaptability Skills and Technical Skills on TVET CA Practices. Next, by using the PLSpredict procedure, the predictive relevance is obtained to determine the strengthening of the model (Q2). According to Henseler et al., (2009, 2016) a Q2 value less than 0 means that the model has less predictive relevance. Based on the Q2 value, this model is proven to have predictive relevance. Therefore, the Figure 4 is Structural Model based on the value of predictive accuracy (R2), predictive relevance (Q2) and effect size (f2).

Table 13. Effect Size (f2)

Constructs	TVET CA Practices	
	f <sup>2</sup>	Size
Industry 4.0 Generic Skills	0.005	No effect
Career Adaptability Skills	0.069	Small
Technical Skills	0.068	Small

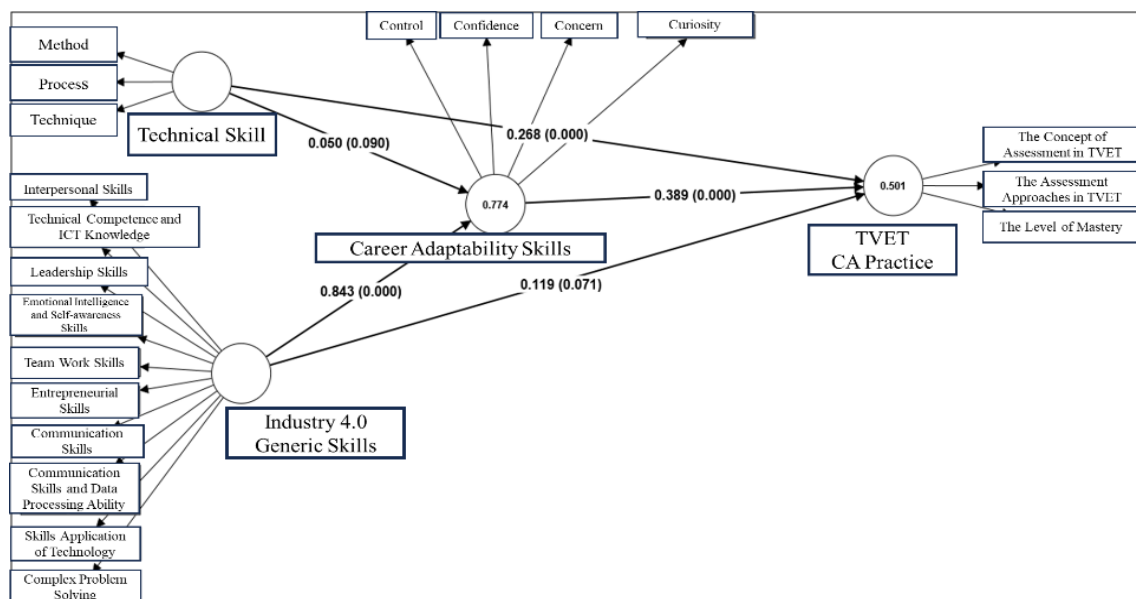


Figure 4. Structural Model

RQ6: According to teachers' perceptions, do Career Adaptability Skills mediate the relationship between Technical Skills and CA Practices?

RQ7: According to teachers' perceptions, do Career Adaptability Skills mediate the relationship between Industry 4.0 Generic Skills and CA Practices?

The structural model path coefficient in Table 14 shows that Career Adaptability Skills are not significant mediators in the relationship between Technical Skills and TVET CA Practices [(p>0.05), β=0.019, t= 1.275]. The findings show that Career Adaptability Skills do not play an essential role in

increasing the effect of Industry 4.0 Generic Skills on TVET CA Practices. Therefore, this alternative hypothesis statement is not supported. The findings of the study prove that Career Adaptability Skills are a significant mediator in the relationship between Industry 4.0 Generic Skills and TVET CA Practices [( $p < 0.01$ ),  $\beta = 0.328$ ,  $t = 4.934$ ]. Based on Table 14, the increase in the value of the coefficient path,  $\beta = 0.328$ , also shows that Career Adaptability Skills are essential to increase the effect of Industry 4.0 Generic Skills in the TVET CA Practices. Respondents define that Industry 4.0 Generic Skills and Career Adaptability Skills influence each other, and applying these skills is essential in the TVET CA Practices.

Table 14. Mediation Analysis Result

		Path Coefficient	t value	p-value	LCL
H <sub>a6</sub>	Technical Skills → Career Adaptability Skills → TVET CA Practices	0.019	1.275	0.101	-0.003
H <sub>a7</sub>	Industry 4.0 Generic Skills → Career Adaptability Skills → TVET CA Practices	0.328	4.934	0.000***	0.222

Note: \*\*\*Significant at 1% level

## 5. Discussion

### 5.1. Technical Skills and Career Adaptability Skills (Ha1)

RQ1: To what extent do teachers perceive students' Technical Skills as influencing their Career Adaptability Skills?

The findings indicate that the relationship between Technical Skills and Career Adaptability Skills is marginally significant, suggesting a relatively weak association between these constructs. From the perspective of TVET teachers, students who demonstrate stronger technical competencies may exhibit slightly higher levels of adaptability; however, technical skills alone may not be sufficient to fully explain variations in career adaptability. This finding suggests that while technical competencies remain important in vocational education, they may not directly translate into adaptability-related attributes such as confidence, curiosity and flexibility. This is consistent with previous studies which emphasise that adaptability is influenced by a broader set of competencies beyond technical expertise. Therefore, the role of technical skills in shaping career adaptability should be interpreted with caution.

In TVET, developing Technical Skills is essential to prepare students to enter the world of work. However, Technical Skills alone are not enough to be successful in their career choices. Career Adaptability Skills such as concern, curiosity, control, and confidence are also needed to face changes and career development (Savickas & Porfeli, 2012; Zool Hilmi Mohamed Ashari, 2016). The findings of this study differ from those conducted by (Ebenehi et al., 2016); that is, students with Technical and Vocational skills do not significantly affect career adaptability skills with a finding of  $\beta = .02$ ,  $p = .653$ . However, Technical Skills in the VET sector can help students acquire the career adaptability skills needed to face the needs of the ever-evolving world of work (de Guzman & Choi, 2013).

TVET CA Practices plays a vital role in forming and developing students' Career adaptability skills. This is because the TVET CA practices involve assessing the students' Technical Skills. Pupils are tested based on their performance in tasks and practical work related to the vocational field studied. This assessment process helps determine the students' Technical Skill levels and provides feedback for improvements that stakeholders can implement, especially trainers and the school. The TVET CA Practices, according to Lahn & Nore (2019) and Rauner et al. (2013) also provides an opportunity to cultivate students' Career Adaptability Skills through several methods and findings, such as continuous learning and self-management.

### 5.2. Industry 4.0 Generic Skills and Career Adaptability Skills (Ha2)

RQ2: To what extent do teachers perceive students' Industry 4.0 Generic Skills as influencing their Career Adaptability Skills?

The results show that Industry 4.0 Generic Skills have a strong and significant relationship with Career Adaptability Skills, indicating that this is the most influential predictor in the model. Based on teachers' observations, students who demonstrate higher levels of critical thinking, problem-solving and adaptability are more likely to exhibit stronger career adaptability. This finding highlights the importance of transferable competencies in preparing students for dynamic and uncertain work environments. Unlike technical skills, Industry 4.0 generic skills appear to play a central role in enabling students to manage career transitions and respond to evolving job demands. This supports existing literature which emphasises the importance of soft and generic skills in the context of Industry 4.0.

In line with the findings of the multivariate test conducted by de Guzman & Choi (2013), there is a positive relationship between Career Adaptability Skills and Industry 4.0 Generic Skills through communication skills with values ( $r=.48$ ,  $pb.001$ ) and problem-solving skills with values ( $r=.44$ ,  $pb.001$ ). This study also shows that Career Adaptability Skills correlate significantly with teamwork ( $r=.67$ ,  $pb.001$ ). The findings of de Guzman & Choi (2013) showed that the four elements of Career Adaptability Skills positively correlate with Industry 4.0 Generic Skills such as communication, problem-solving, and teamwork. The study by Ebere & Onuoha (2022) showed that there is a significant and positive relationship between leadership skills and Career Adaptability Skills with values ( $p= 0.000 <0.05$   $r= 0.700$ ). This study also found that problem-solving skills have a significant and positive relationship with value ( $p=0.000 <0.05$ ) and  $r= 0.778$ ).

This finding shows that Industry 4.0 Generic Skills are critical in forming Career Adaptability Skills in the TVET assessment curriculum, especially for the TVET CA practices. Industry 4.0 Generic Skills and Career Adaptability Skills enable students to adapt to changing job demands and improve their efficiency at work when venturing into a career field. Students with high Industry 4.0 Generic Skills are seen as more capable of adapting to job demands, solving problems, and collaborating well with friends. Following the statement Acerbi et al., (2022), the development of Industry 4.0 Generic Skills in today's world of education is increasing towards digitization, networking, significant life changes, and even changes in the world of work today also shift the paradigm in education.

### 5.3. Career Adaptability Skills and Classroom Assessment Practices (Ha3)

RQ3: How do teachers perceive the influence of students' Career Adaptability Skills on TVET CA Practices?

The findings indicate that Career Adaptability Skills have a significant positive relationship with Classroom Assessment Practices. From teachers' perspectives, students who demonstrate higher levels of adaptability are more likely to perform effectively in assessment activities. This suggests that adaptable students are better able to engage with assessment tasks, respond to feedback and demonstrate their competencies in various learning contexts. As classroom assessment in TVET involves performance-based evaluation, students' ability to adapt to different tasks and expectations plays an important role in determining their performance outcomes.

In TVET, CA Practices is essential in developing and measuring Career Adaptability Skills. For example, the Human Resources Development (HRD) model by McLagan (1989) is an evaluation framework that measures human resource competence, especially skills involving Technical Skills and Industry 4.0 Generic Skills. Then, the findings from the evaluation help provide appropriate development programs for career advancement (Muhd Khaizer Omar et al., 2021). The practices of TVET Classroom Assessment can support the development of Career Adaptability Skills in the field of TVET as suggested by the Competence Assessment and Development Model (COMET) Rauner et al.

(2013), i.e., skills and competencies should be assessed with accurate assessment methods to support the development of human resource competencies.

CA Practices can be implemented through (1) An assessment concept allowing students to use their Career Adaptability Skills in the real world. For example, outcome-based assessment and observation-based approaches where students are required to solve real-world problems can help them develop their problem-solving skills, teamwork, and adaptability. (2) Formative assessment provides continuous feedback on student progress, enabling them to identify areas for improvement and make appropriate judgments. Students can improve their abilities and confidence by receiving feedback on their Career Adaptability Skills. (3) Self-assessment: Self-assessment and reflection can help students develop self-awareness and identify their strengths and weaknesses. By considering their skills, interests, and values, pupils can make important decisions about their career paths and develop strategies to adapt to an ever-changing learning and career environment. In addition, career assessment tests can also be conducted to help students explore different career options and identify their interests and strengths. These tests can include personality tests, interest inventory tests, and student skills assessments.

#### **5.4. Technical Skills and Classroom Assessment Practices (Ha4)**

RQ4: How do teachers perceive the influence of students' Technical Skills on TVET CA Practices?

The results show that Technical Skills have a significant positive relationship with Classroom Assessment Practices. This finding is expected, as technical competencies are directly evaluated in TVET assessment activities. Teachers assess students' ability to perform practical tasks, apply technical knowledge and demonstrate job-related competencies. Therefore, students who exhibit stronger technical skills are more likely to perform well in classroom assessment practices. This finding reinforces the importance of competency-based assessment approaches in TVET education.

Technical skills are essential applied in TVET CA Practices, specifically for TVET subjects, because they allow students to master the skills needed to carry out tasks and responsibilities in the field they are studying. TVET aims to equip students with the Technical Skills required to become a potential workforce (Fah, 2018). TVET CA Practices are an essential aspect of the TVET curriculum because the right CA Practices can help trainers assess student progress and ensure that they have acquired the necessary Technical Skills per the TVET field (Ridzwan Che Rus et al., 2017). Here are some TVET CA Practices that can apply Technical Skills in the field of TVET, as suggested by Sutarto & Jaedun (2018): (1) outcome-based assessment, which measures students' ability to use their Technical Skills in practical situations. This assessment can include building structures, solving technical problems, or handling equipment and materials. Assessment in practical training or 'hands-on' gives students practical experience in using their Technical Skills (Knight & Sweet, 2010). This assessment can include tasks such as cooking, sewing, assembling electronic equipment, welding two pieces of metal together, or doing laboratory experiments related to TVET, and (2) the concept of assessment through formative and summative assessment can provide continuous feedback to students and allow them to identify areas for improvement according to their potential.

By receiving feedback on students' Technical Skills, they can improve their abilities and build their confidence. CA Practices is essential in supporting the development of Technical Skills in the TVET curriculum (McSweeney, 2014). The variety of assessment concepts in the TVET field, such as competency-based assessment, performance-based assessment, practical assessment, and formative assessment, are effective methods to measure and support the development of Technical Skills in the TVET field (Niar Rosmaliana Rusalam et al., 2019). However, classroom assessment that adapts formative assessment and summative assessment is also an assessment that can measure the domain of student learning outcomes from the aspects of knowledge, skills, and attitudes as well as based on the actual situation of the work environment (Sephokgole & Makgato, 2019). By adopting TVET CA Practices, trainers can ensure that their students are prepared to learn and subsequently succeed in the job sector they are engaged in.

### **5.5. Industry 4.0 Generic Skills and Classroom Assessment Practices (Ha5)**

RQ5: How do teachers perceive the influence of students' Industry 4.0 Generic Skills on TVET CA Practices?

The relationship between Industry 4.0 Generic Skills and Classroom Assessment Practices was found to be marginally significant, indicating a relatively weak effect. While students who demonstrate stronger generic skills may show better engagement in assessment activities, the direct influence of these skills on assessment outcomes appears to be limited. This suggests that Industry 4.0 generic skills may not be directly reflected in assessment performance unless they are explicitly integrated into assessment design. Therefore, the role of generic skills in classroom assessment should be further strengthened through more holistic and integrated assessment approaches.

Assessment practices in implementing the TVET program aim to equip students with the skills and knowledge needed to succeed in the world of work. Technical skills are a critical requirement in TVET, but there is also a growing need for Industry 4.0 Generic Skills. These elements of Industry 4.0 Generic Skills are seen as transferable requirements across different industries and job types, such as communication, problem-solving, teamwork, and leadership skills. CA practices are essential in developing and measuring these Industry 4.0 Generic Skills, especially in the TVET curriculum.

The concept of assessment in the form of summative assessment allows students to use their skills and knowledge in a real-world context (McSweeney, 2014). For example, implementing assessments in the form of group projects and presenting project results where students are required to work together to solve real problems can help them develop teamwork, interpersonal, problem-solving, and leadership skills and further develop communication skills. According to Sandal et al. (2014), the practical aspect of the assessment in the field differs from the theoretical assessment students learn in the classroom. Their exposure to practical activities helps build communication skills, responsibility, and proper work ethics. In addition, implementing assessment through oral assessment or demonstration can help students develop communication skills. This assessment can also help students build confidence, measure their abilities, and increase their added value.

### **5.6. Mediating Role of Career Adaptability Skills (Ha6 & Ha7)**

RQ6: According to teachers' perceptions, do Career Adaptability Skills mediate the relationship between Technical Skills and CA Practices?

RQ7: According to teachers' perceptions, do Career Adaptability Skills mediate the relationship between Industry 4.0 Generic Skills and CA Practices?

The mediation analysis indicates that Career Adaptability Skills play a mediating role in the relationships between competency domains and Classroom Assessment Practices. Specifically, Career Adaptability Skills partially mediate the relationship between Industry 4.0 Generic Skills and Classroom Assessment Practices. This finding suggests that Industry 4.0 generic skills contribute to assessment outcomes indirectly by enhancing students' adaptability. Students who possess strong generic competencies are more likely to develop adaptability, which in turn supports their performance in assessment activities.

However, the mediating effect between Technical Skills and Classroom Assessment Practices is relatively weak, indicating that technical skills may influence assessment outcomes more directly rather than through adaptability. Overall, these findings highlight the importance of considering both direct and indirect pathways in understanding competency development in TVET.

The findings of this study show that Career Adaptability Skills mediate the relationship between generic skill constructs and TVET CA Practices. However, Career Adaptability Skills are not intermediate

between Technical Skills, and Career Adaptability Skills refer to an individual's ability to adapt to the ever-changing needs of the job market. Industry 4.0 Generic Skills constructs can help students acquire Career Adaptability Skills. The study of Cortellazzo et al. (2020) proved a positive relationship between Career Adaptability Skills and Industry 4.0 Generic Skills with value ( $\beta = .46, p < .01$ ). The findings of this study also demonstrate that students who have Industry 4.0 Generic Skills and high Career Adaptability Skills have the potential to get suitable jobs and succeed in entering the field of employment. Constructs of Industry 4.0 Generic Skills such as communication, teamwork, and complex problem-solving skills help students improve the skills needed in jobs involving other people and solving complex problems. Recognizing childhood as the beginning of the development of vocational skills and the basis for Career Adaptability, Hartung et al. (2008) assert that Career Adaptability Skills can be developed as early as childhood.

The development of technology and society is always linked to continuous changes in the environment and the role and structure of work. An individual's identity is usually formed from childhood and will continue to develop in their community and environment. Therefore, in this situation, the school environment can prepare students to face the world of work (Savickas & Porfeli, 2012). CA Practices for TVET subjects can also improve students' Career Adaptability Skills. Classroom assessment in the field of TVET allows trainers to assess a student's knowledge and skills involving authentic teaching and learning situations. In this process, students will experience challenges, face problems, and learn to make decisions by considering various factors. Therefore, through applying Industry 4.0 Generic Skill constructs in classroom assessment practices, students successfully acquire the Career Adaptability Skills needed to succeed in the work they are engaged in. Career Adaptability Skills mediate this relationship, as they play an essential role in linking Industry 4.0 Generic Skills and helping to equip students to meet the challenges of learning and thus improve their competence in the ever-changing real world of work.

## 6. Conclusion

This study examines the relationships between technical skills, Industry 4.0 generic skills, career adaptability skills and classroom assessment practices in Technical and Vocational Education and Training (TVET) based on teachers' perceptions of students' competencies. The findings provide empirical evidence on how different competency domains interact within TVET learning environments and influence classroom assessment practices.

The results indicate that both technical skills and career adaptability skills have significant positive relationships with classroom assessment practices, highlighting their direct importance in competency-based evaluation. In contrast, Industry 4.0 generic skills demonstrate a relatively weaker, marginally significant relationship with classroom assessment practices, suggesting that these competencies may not be fully captured in current assessment practices. In addition, Industry 4.0 generic skills show a strong and significant relationship with career adaptability skills, while technical skills exhibit a comparatively weaker association. These findings suggest that adaptability-related competencies are more strongly shaped by transferable and generic skills than by technical competencies alone.

Furthermore, the findings reveal that career adaptability skills partially mediate the relationship between Industry 4.0 generic skills and classroom assessment practices, indicating an indirect pathway through which generic competencies influence assessment outcomes. However, the mediating effect of career adaptability skills in the relationship between technical skills and classroom assessment practices is relatively weak, suggesting that technical competencies are more directly assessed within TVET classroom settings.

From a theoretical perspective, this study contributes to the literature by integrating multiple competency constructs into a unified structural model and highlighting the mediating role of career adaptability skills in competency development. The findings extend existing knowledge by

demonstrating that competency development in TVET is multidimensional and requires the integration of both technical and generic skill domains.

From a practical perspective, the findings suggest that TVET institutions should strengthen the integration of Industry 4.0 generic skills within teaching, learning and classroom assessment practices. While technical skills remain essential, current assessment approaches may need to be enhanced to better capture transferable competencies such as problem-solving, adaptability and communication. In addition, greater emphasis should be placed on developing career adaptability skills, as these competencies play a key role in supporting students' performance in assessment and their readiness for the workforce.

This study has several limitations. First, the findings are based on teachers' perceptions of students' competencies rather than direct measurement of students' abilities. Future studies may incorporate multiple data sources, including student self-assessment and industry evaluation, to provide a more comprehensive perspective. Second, the study is limited to a specific TVET context, which may affect the generalisability of the findings. Future research may also consider employing qualitative approaches to gain deeper insights into classroom assessment practices and competency development in TVET.

In conclusion, this study underscores the importance of aligning competency development with classroom assessment practices in TVET. By enhancing the integration of technical skills, Industry 4.0 generic skills and career adaptability skills, TVET institutions can better support the development of competent and adaptable graduates who are prepared to meet the evolving demands of the workforce.

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Not applicable.

## **Declaration**

The authors declare that minimal use of artificial intelligence tools was limited to language editing only. All scholarly content and interpretations are the authors' own. Ethical approval for this study was obtained from Technical Vocational Education and Training Division, Ministry of Education with the reference number KPM.600-3/2/3 Jld.2 (84)

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## Appendix

### Indicator Loading Values for First Level Construction

Dimension/sub-construct	Item	<i>Outer loading</i>
Method	K1	0.905
	K2	0.943
	K3	0.941
	K4	0.908
	K5	0.861
Process	P6	0.897
	P7	0.907
	P8	0.873
	P9	0.876
	P10	0.894
Technique	T11	0.890
	T12	0.917
	T13	0.931
	T14	0.919
	T15	0.905
	T16	0.883
Entrepreneurial Skills	KK1	0.888
	KK2	0.885
	KK3	0.871
	KK4	0.851
	KK5	0.891
	KK6	0.874
Interpersonal Skills	KI7	0.868
	KI8	0.887
	KI9	0.895
	KI10	0.903
	KI11	0.872
	KI12	0.866
	KI13	0.841
Skills Application of Technology	KPT14	0.841
	KPT15	0.913
	KPT16	0.903
	KPT17	0.854
	KPT18	0.873
	KPT19	0.827
Teamwork Skills	KKB20	0.885
	KKB21	0.918
	KKB22	0.916
	KKB23	0.910
	KKB24	0.898

<b>Dimension/sub-construct</b>	<b>Item</b>	<b><i>Outer loading</i></b>
Leadership Skills	KKEP25	0.851
	KKEP26	0.882
	KKEP27	0.856
	KKEP28	0.906
	KKEP29	0.892
	KKEP30	0.900
	KKEP31	0.901
Communication Skills	KKEP32	0.891
	KKO33	0.795
	KKO34	0.792
	KKO35	0.795
	KKO36	0.781
	KKO37	0.761
	KKO38	0.870
Technical Competence and ICT Knowledge	KKO39	0.824
	KKO40	0.777
	KPMK41	0.909
	KPMK42	0.934
	KPMK43	0.928
	KPMK44	0.935
Complex Problem Solving	KPMK45	0.911
	KPMK46	0.912
	KTPI47	0.858
	KTPI48	0.863
	KTPI49	0.869
Communication Skills and Data Processing Ability	KTPI50	0.852
	KTPI51	0.824
	KKKBD53	0.928
	KKKBD54	0.954
Emotional Intelligence and Self-awareness Skills.	KKKBD55	0.952
	KKKBD56	0.921
	KEKK57	0.893
	KEKK58	0.844
	KEKK59	0.912
Concern	KEKK60	0.910
	KEKK61	0.902
	KEKK62	0.932
	P1	0.923
	P2	0.935
Curiosity	P3	0.942
	P4	0.938
	P5	0.929
	SIT6	0.927

<b>Dimension/sub-construct</b>	<b>Item</b>	<b><i>Outer loading</i></b>
	SIT7	0.948
	SIT8	0.943
	SIT9	0.934
	SIT10	0.911
Control	K11	0.908
	K12	0.915
	K13	0.928
	K14	0.920
	K15	0.918
Confidence	KEY16	0.900
	KEY17	0.923
	KEY18	0.934
	KEY19	0.907
	KEY20	0.903
The Concept of Assessment in TVET	PUP2	0.744
	PUP3	0.765
	PUP4	0.791
	PUP5	0.757
	PUP6	0.804
	PUP7	0.820
	PSP8	0.785
	PSP9	0.773
	PSP10	0.761
	PSP11	0.787
	PSP12	0.764
	PSP13	0.810
	PK14	0.784
	PK15	0.811
	PK16	0.830
	PK17	0.799
	PK18	0.797
	PRS19	0.821
	PRS20	0.796
	PRS21	0.778
	PRS22	0.818
	PTP24	0.808
	PTP25	0.785
PTP26	0.816	
PTP27	0.786	
PTP28	0.807	
Assessment Approaches in TVET	PL29	0.742
	PL30	0.797
	PL31	0.788