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Systematic Literature Review: Perspectives of Employer's on TVET Graduates' Competencies

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Abstract

The role of Technical and Vocational Education and Training (TVET) in equipping individuals with the essential skills and knowledge for the workforce is essential. TVET graduates are expected to integrate both technical skills and soft skills that meet industry requirements. As labor markets continue to change, it is crucial to identify the competencies that employers value to ensure that TVET curricula are effectively aligned with industry demands. This review systematically analyze the competencies of TVET graduates from the perspective of employers, guided by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. A comprehensive search across SCOPUS and Web of Science databases, focusing on literature from 2016 to 2024, a period significantly influenced by Industry 4.0. The analysis identified 14 key competency domains, including communication skills, teamwork skills, critical thinking and problem solving. These competencies were further categorized into two primary skill sets: soft skills and technical skills. The discussion explores the implications of these findings for curriculum alignment and stakeholder engagement. This review provides critical insights that can guide the refinement of TVET programs to better meet the dynamic needs of the workforce.

Keywords: Technical and Vocational Education and Training (TVET), Graduate Competencies, Soft Skills, Technical Skills, Employer Expectations

1. Introduction

Technical and Vocational Education and Training (TVET) aims to provide individuals with the practical and technical skills needed to succeed in various professions. According to the UNESCO Strategy for 2022-2029, the aim of Technical and Vocational Education and Training (TVET) is to equip both skilled and unskilled individuals with the hands-on abilities required to perform specialized tasks in the workplace, fulfilling the demands of businesses and industries (UNESCO, 2022). In light of recent global challenges, the importance of TVET has grown significantly. The labor market is expected to undergo substantial changes by 2025, driven by the rapid adoption of automation and the lingering effects of the COVID-19 pandemic. The World Economic Forum (2020) predicts that 97 million new jobs will be created, underscoring the urgent need for reskilling and upskilling to help workers adapt to these shifts. In this evolving job market, developing 21st-century skills such as critical thinking, problem-solving, and digital literacy is essential for graduates to remain competitive. By 2025, the global labor market is expected to experience a "double disruption," driven by the widespread adoption of automation and the ongoing economic repercussions of the COVID-19 pandemic. The connection between TVET providers and industry is essential for bridging skill gaps, improving training outcomes, and providing learners with practical, real-world experiences. This vital partnership is a fundamental component of the curriculum for vocational skills development training programs across all TVET institutions. Employers have consistently voiced concerns regarding the preparedness of graduates, particularly highlighting a notable deficiency in essential soft skills and practical experience. This gap is critical, as soft skills such as communication, teamwork, and leadership are increasingly recognized as vital for effective workplace performance. The study indicates that despite the technical competencies that graduates may possess, their inability to demonstrate these interpersonal skills can hinder their employability (Wafi et al., 2022). Furthermore, the lack of practical experience exacerbates this issue, as employers often seek candidates who can seamlessly transition into the workforce and adapt to real-world challenges.

Many studies have highlighted a significant gap between the employability skills of graduates and the requirements of the industry. Research by Mustafa et al. (2011), and Makhbul and Yussof (2015) has revealed deficiencies in employability skills among graduates. Mengistu and Negasie (2022) found that TVET graduates were perceived to have notably low employability skills, especially in the area of soft skills. Employers expressed significant dissatisfaction with the job-related experiences of these graduates, highlighting a clear gap between the skills they acquired and what employers actually expect. These studies indicate that industries are seeking TVET graduates who possess strong communication skills, interpersonal abilities, critical thinking, problem-solving capabilities, and entrepreneurial skills. Specifically, Makhbul and Yussof (2015) found that employers perceived a considerable skills gap in areas such as ethics and values, cognitive skills, leadership, decision-making, and problem-solving. Additionally, the research conducted by Samad et al. (2017) proposed that enhancing TVET curriculum planning could significantly improve the employability skills of graduates, aligning them more closely with industry needs. Research

by Sinha et al. (2019) identify critical challenge in the Indian engineering education landscape, where the skills imparted to graduates do not meet the expectations of employers, resulting in a high rate of unemployability among fresh engineering graduates. Addressing this issue requires collaboration between educational institutions and industry to ensure that curricula are aligned with the skills needed in the workforce.

2. Literature Review

The term competencies refer to a blend of skills, abilities, knowledge, and personal traits that are crucial for effective job performance. Researchers like McClelland (1973), Klemp (1980), and Boyatzis (1982) emphasize that these competencies are fundamental characteristics directly linked to achieving superior work outcomes. A common thread in many definitions is the idea that competencies encompass both measurable skills and personal behaviors that contribute to success in specific roles. However, there are differences in how researchers conceptualize these traits. Some, like Campbell et al. (1993) and Hoffmann (1999), focus on competencies as observable behaviors and actions that can be measured, while others, such as Dubois (1993) and Woodall and Winstanley (1998), include underlying attributes like mindsets and attitudes that may not be as easily observed. Additionally, while some definitions, such as those by Page and Wilson (1994), consider both explicit skills and implicit personal characteristics, others, like Jacobs (1989) and Chung and Lo (2007), focus more on the practical skills and knowledge needed to perform tasks effectively. Despite these variations, the consensus remains that competencies play a critical role in determining effective performance in the workplace. In summary, although some discrepancies exist, key elements such as knowledge, skills, abilities, and other qualities are commonly identified. Competencies are defined as a combination of individual characteristics that enable organizational members to achieve excellent performance. These competencies serve as measures of whether an individual is suitable for a job and help to distinguish varying levels of performance.

Competencies are widely recognized as encompassing a range of essential elements, including technical, personal, social, and cognitive skills, which are critical for effective performance in various roles. Previous researchers, such as Katz and Kahn (1986), Prahalad and Hamel (1994), and Raju et al. (2014), emphasize technical and functional competencies, focusing on the specific skills and knowledge needed to perform tasks effectively. Additionally, Le Deist and Winterton (2005), Hecklau et al. (2016), and Müller-Frommeyer et al. (2017) consistently highlight personal and social competencies, including emotional intelligence, communication, and teamwork, as crucial. Cognitive abilities like critical thinking, problem-solving, and decision-making are also widely recognized, as noted by Cheetam and Chivers (1996), Boyatzis and Saatcioglu (2008), and Demartini and Benussi (2017).

However, researchers diverge in their emphasis on certain elements. For example, Cheetam and Chivers (1996) stress the importance of ethical and value-based competencies, focusing on values, ethics, and personal integrity in the workplace—an area less emphasized by others. Leadership and strategic competencies are also highlighted by Carroll and McCrackin (2008)

and Ulrich et al. (2012), who focus on the ability to lead, manage, and align organizational goals. In contrast, others concentrate more on technical or functional skills. Additionally, meta-competencies, which involve adaptability and the ability to learn across different situations, are emphasized by Le Deist and Winterton (2005) and Kuijpers et al. (2009), reflecting a broader perspective on the capacity to acquire new skills in ever-changing environments. Overall, while there is consensus on the core elements of competencies, the differences in emphasis reflect the diverse perspectives on what constitutes essential competencies in various contexts

Education in engineering has evolved from a local to a global focus in the 21st century. Today, it plays a crucial role in connecting students to the global community and increasing awareness of international challenges. Globalization in the corporate sector demands engineers equipped with professional competencies that transcend borders. Consequently, industry leaders have prioritized identifying and assessing the competencies required to thrive in such environments. It is essential that the skills of engineering graduates align with industry expectations. In the context of Technical and Vocational Education and Training (TVET), industry is regarded as an external customer, while students are seen as internal customers. Understanding the competencies industry leaders expect from TVET graduates is key to ensuring that educational programs are aligned with workforce needs. Increasingly, industries emphasize the importance of practical, globally relevant skills for TVET graduates, ensuring they are equipped to meet the demands of an evolving and competitive labor market.

3. Methodology

The purpose of a Systematic Literature Review (SLR) is to enable researchers to assess and conclude what is currently known and unknown regarding the review questions, though this is done with varying degrees of certainty, consistency, and confidence (Briner & Denyer, 2012). The process starts by developing and validating a review protocol, which ensures that the review is conducted systematically, adheres to established procedures, and is both transparent and replicable (Briner & Denyer, 2012; Mohamed Shaffril et al., 2020). In this study, the SLR follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, established by Moher et al. (2009) and Liberati et al. (2009), as illustrated in Figure 1.

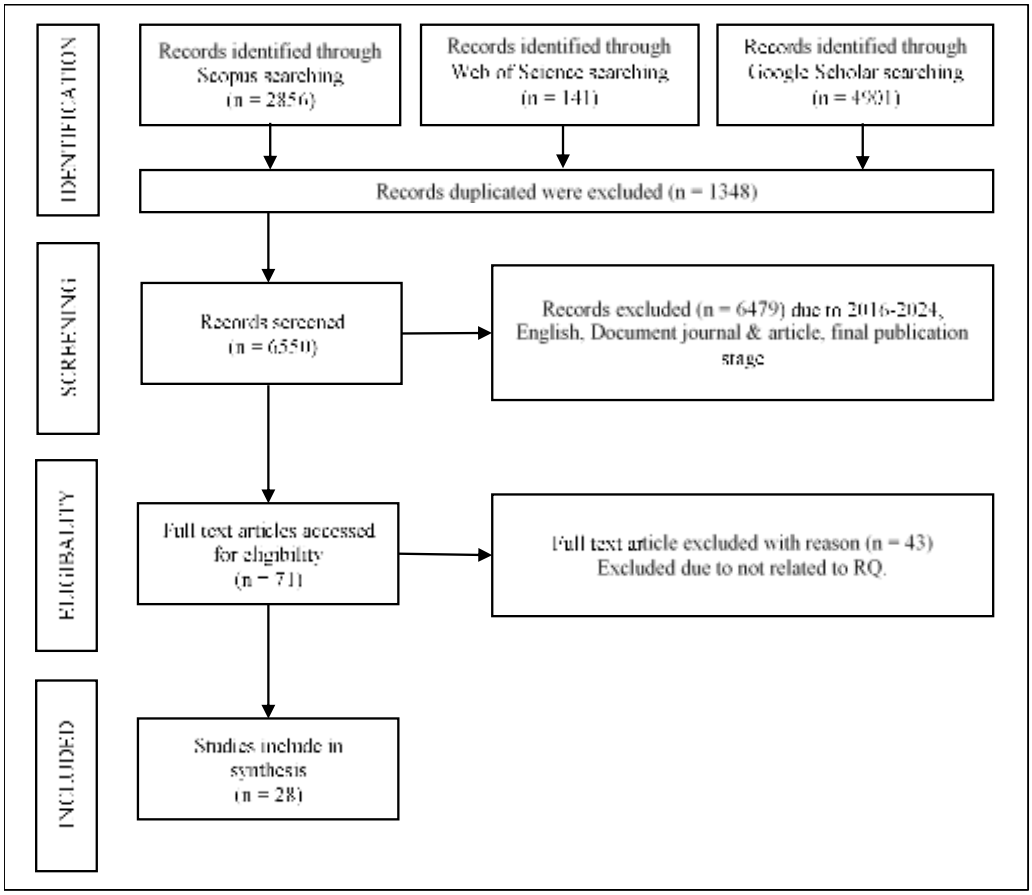

Figure 1. PRISMA flow diagram. Guided from Moher et al. (2009)

The researchers formulate a research question based on the PICo method. According to Mohamed Shaffril et al. (2020), the researchers used the PICo method to develop the research question. This method serves as a tool for crafting suitable questions for the review and includes three essential components: the population (P), the area of interest (I), and the context (Co). Hence, the researchers have included three main components in formulating a research question, which are TVET graduates (Population), competencies (Interest), and employers' perspective (Context). By combining those three main elements, the research question formulated is:

RQ1: What are the key competencies that employers seek in Technical and Vocational Education and Training (TVET) graduates by the journal article reviewed?

3.1 Identification

SLR process needs to align with a developed research question. In the first process, known as identification, the researchers identified three main keywords from the research question, which are "employers' perspective", "TVET graduates" and "competencies". To ensure a comprehensive search, Scopus, Web of Science, and ScienceDirect were chosen as the main databases, since using multiple sources helps reduce publication bias, balances out the limitations of any single database, and maintains transparency in the process (Kraus et al., 2020; Xiao & Watson, 2019). Google Scholar and ResearchGate were also included as useful

additional resources. For a more thorough and effective search, enriching keywords was necessary, with Gazendam et al. (2010) suggesting the use of online thesauruses to find synonyms and expand the search terms. Keeping in view the purpose of the study, researcher created different search strings to minimize the risk of missing out a potential article. To ensure that a broad spectrum of studies in all the search string, the researcher developed a full search string using Boolean operator, phrase searching, truncation, wildcard, and field code functions. Table 1 shows how the researchers developed search strings on Scopus.

Table 1. The search string for SCOPUS

DATABASE	SEARCH STRING
SCOPUS	TITLE-ABS-KEY (TVET OR “technical and vocational” OR engineering) AND (graduate* OR undergraduate* OR postgraduate* OR student*) AND (competency OR aptitude OR capability OR expertise OR proficiency OR skill) AND ("employer* perspective*" OR "manager* perspective*" OR "industr* perspective*" OR "employer* perception*" OR "manager* perception*" OR "industr* perception*" OR "employer* interpretation*" OR "manager* interpretation*" OR "industr* interpretation*" OR "employer* expectation*" OR "manager* expectation*" OR "industr* expectation*" OR "employer* view*" OR "manager* view*" OR "industr* view*" OR "employer* viewpoint*" OR "manager* viewpoint*" OR "industr* viewpoint*" OR "employer* point of view*" OR "manager* point of view*" OR "industr* point of view*")

3.2 Screening

The second stage of the PRISMA protocol in this study involves screening. During this screening process, researchers decide which articles to include or exclude for the review. This step is facilitated by an automated filter system within the database. The benefit of this screening process is that it helps researchers ensure that the selection criteria are appropriately balanced, neither too narrow nor too broad (Moher et al., 2009; Liberati et al., 2009). To avoid duplicate reviews, the researchers removed articles that appeared in both the SCOPUS, Web of Science, Science Direct, ResearchGate and Google Scholar databases. This step is crucial to maintain the integrity of the review, resulting in the identification and removal of 1348 duplicate records. A depicted in Table 2, several inclusion and exclusion criterion are determined. The researchers set exclusion criteria based on the study's timeline, spanning from 2016 to 2024, as the Fourth Industrial Revolution (4IR), also known as Industry 4.0, began gaining significant momentum in 2016. This rise followed its introduction by Klaus Schwab, founder and executive chairman of the World Economic Forum, who emphasized the transformative impact of this era on industries. Schwab noted that the convergence of advanced technologies was signaling a major shift in industrial practices and economic structures worldwide. Secondly, with regard to literature type, only article journal are selected, which means review article, book, book series, chapter in book, conference proceeding and reports are all excluded. Thirdly, to article language (English). The authors have chosen to review only articles published in English, following the advice of Linares-Espinos et al. (2018), who highlighted the importance of selecting publications in languages they understand. Articles in foreign languages can lead to additional confusion, increase the review's costs, and consume more time. Consequently, 6479 articles were

excluded for not meeting these criteria.

3.3 Eligibility

The third process in PRISMA protocol is eligibility. This process is challenging because it is a manual process, apart from identification and screening (Mohamed Shaffril et al., 2020). Therefore it is a thorough process conducted by the researchers. There are 71 articles available for the eligibility process. The researcher applied the suggestion by Kraus et al. (2020), whereby the researchers start reading the articles through the title and abstract. Then, the researchers can reveal whether the article is eligible and match the research question in this study. As a result, 43 articles are not eligible because they do not match the desired research question. After the eligibility process, the researchers can perform the following process called inclusion.

3.4 Inclusion and Data Extraction

After the eligibility process is completed, the researchers agreed to take 28 articles to be reviewed. Then, the researchers performed data extraction by preparing an extraction sheet at the beginning. Thus, data extraction helps assist the researchers in answering the research question. In addition, the matrix table is a helpful support tool to create transparency and enlighten the process of ongoing synthesis (Kraus et al., 2020; Mohamed Shaffril et al., 2020).

4. Finding

4.1 Background on the Selected Articles

The researcher reviewed a total of 28 articles. Among them, two were published in 2024, four in 2023, seven in 2022, three in 2021, four in 2020, two in 2019, four in 2018, and one each in 2017 and 2016. In terms of region, Malaysia contributed the most articles with 12 studies, followed by India with three studies. There were two articles each from the USA and Thailand, and one each from Brunei, South Africa, Saudi Arabia, Hong Kong, New Zealand, Poland, Indonesia, Portugal, and Palestine. The research design shows a mix of approaches, with 15 quantitative articles, 10 qualitative articles, and three mixed-method article.

As from the Table 2 below, the review resulted in 14 major domains related to graduates' competencies. The 14 major domains are communication skills (CS), problem-solving skills (PS), teamwork and and collaboration skills (TC), critical thinking skills (CT), technological skills (TeS), interpersonal skills (IS), technical skills (TcS), leadership skills (LS), adaptability skills (AS), management skills (MS), personal quality skills (PQS), analytical thinking skills (AT), lifelong learning (LL) and self-motivation skills (SM).

Table 2. The Systematic Literature Review Findings

Author	CS	PS	TC	CT	TeS	IS	TcS	LS	AS	MS	PQS	AT	LL	SM
Salleh et al. (2016)	√							√						
Ravichandran and Abirami (2017)	√	√					√		√					
Azmi et al. (2018)	√	√	√	√	√		√		√	√				
Chan et al. (2018)	√	√	√		√	√		√	√	√				
Khan, S. (2018)	√	√		√				√				√		
Pang et al. (2018)			√			√					√	√	√	
Sinha et al. (2019)	√	√				√	√							
Dean and East (2019)	√	√	√			√								√
McGunagle and Zizka (2020)	√	√	√	√									√	√
Khoo et al. (2020)	√	√	√	√	√	√								
Bansal, Aggarwal, and Gopal (2020)	√	√	√				√				√			
Musa and Idris (2020)	√							√			√			
Rawboon et al. (2021)	√		√		√		√							
Ramamuruthy et al. (2021)	√	√	√		√	√	√	√						
Aliu and Aigbavboa (2021)		√		√				√				√		
Irdayanti Mat Nashir et al. (2022)					√		√							
Murrar et al., (2022)	√				√									
Grebski et al., (2022)	√	√	√	√	√		√					√		
Halik Bassah (2022)	√		√		√			√						
Wafi et al. (2022)	√		√	√				√		√				
Ong et al. (2022)	√	√	√		√								√	
Chaengpromma & Pattanapairoj, 2022)				√	√		√		√	√				
Yong and Ling (2023)	√	√	√		√							√		
Wagiran et al., (2023)	√	√	√	√	√	√	√				√			
Holidi and Abu Seman (2023)	√	√		√	√	√	√		√	√	√			
Teoh et al. (2023)	√	√	√	√	√	√	√		√	√	√			√
Gupta and Mahajan (2024)	√	√	√	√	√					√				
Ferreira et al. (2024)	√	√	√	√	√	√	√		√				√	
	24	**19**	**18**	**13**	**11**	**10**	**10**	**8**	**7**	**7**	**6**	**5**	**4**	**3**

4.2 The Themes

Scholars have broadly classified competencies into two main categories: ‘hard’ skills and

'soft' skills (Stewart et al., 2016; Pang et al., 2018; Grebski et al., 2022; Wagiran et al., 2023; Ferreira et al., 2024). Hard skills refer to the technical knowledge and expertise required to perform specific tasks, emphasizing mastery in a particular field. These skills are considered fundamental, particularly for vocational graduates, where technical proficiency is often the highest priority (Wagiran et al., 2023). In contrast, soft skills pertain to personal interactions and behavioral traits, which are essential for managing relationships and fostering collaboration. Based on the analysis of 28 selected articles, 14 key competency themes were identified from an employer's perspective. These competencies were classified into the two primary categories of hard skills and soft skills. Wisshak and Hochholdinger (2020) similarly distinguished recruitment skills into these two groups: hard skills, which focus on specific technical knowledge and training, and soft skills, which include personality traits such as leadership, self-management, problem-solving, communication, and time management (Dubey & Tiwari, 2020).

4.2.1 Communication Skills

Communication skills are widely acknowledged as a key competency in today's competitive job market, with 24 out of 28 studies highlighting their importance. These skills, which include both verbal and written communication, are essential for fostering teamwork, reducing misunderstandings, and boosting overall productivity in the workplace (Salleh et al., 2016). Active listening is a crucial skill, particularly in remote work environments. The ability to comprehend arguments and effectively convey one's perspective, both verbally and in writing, to various stakeholders, including supervisors, clients, and colleagues, is essential. This skill not only facilitates navigating the workplace but also fosters relationship building and contributes to shaping the organization's culture in virtual settings. Mastering these communication skills is key to achieving success and advancing in one's role. Being able to communicate clearly allows employees to share their ideas effectively and engage meaningfully with colleagues, clients, and stakeholders. Employers, particularly in industries like technology, healthcare, and management, are always on the lookout for graduates who can express their thoughts clearly and work well with diverse teams (Murrar et al., 2022).

Drawing from Social Cognitive Theory (Bandura, 1986), communication self-efficacy can greatly influence how actively they engage and contribute in the workplace. Researchers often divide communication into oral and written forms, both of which are critical for professional success (Ravichandran & Abirami, 2017; Wagiran et al., 2023). This division highlights the need for accuracy and clarity in how information is shared across different formats. Additionally, studies by Khoo et al. (2020) emphasize how communication is central to workplace dynamics, while Chan et al. (2018) argue that it is the most essential employability skill, particularly when working with people from diverse backgrounds. Being proficient in multiple languages, especially English, adds another valuable layer to communication skills, as it helps professionals navigate cross-cultural interactions more effectively, particularly in industries that operate on a global scale (Rawboon et al., 2021; Teoh et al., 2023). In many globalized workplaces, English proficiency is seen as essential. Furthermore, technical communication is crucial in industries where complex information needs to be simplified and made accessible, such as in engineering, healthcare, and IT.

Graduates who are skilled in conveying technical details in both written and verbal formats can ensure that specialized knowledge is accurately communicated to a wider audience (Ramamuruthy et al., 2021). As the world of work becomes more interconnected, the need for TVET graduates who can communicate effectively across languages, cultures, and technical fields will continue to increase. In today's dynamic and competitive environments, communication is more than just a soft skill—it's a critical element that shapes how well individuals and teams perform.

4.2.2 Problem-solving Skills

19 of the 28 studies focused specifically on problem-solving skills. Essentially, problem solving is about finding ways to overcome obstacles and challenges (Dean & East, 2019). Problem solving skill helps people pinpoint issues, figure out what's going on, and come up with workable solutions. McGunagle and Zizka (2018) highlight that employers are particularly keen on candidates who can think both critically and creatively because this ability is key to innovation and keeping things running smoothly. In a manufacturing environment, being able to tackle problems and find solutions quickly is especially important (Chan et al., 2018). According to Aliu and Aigbavboa (2021), problem-solving skills involve the ability to identify problems, analyze their root causes, and develop effective solutions. This includes both creative and logical approaches to addressing challenges. In the construction sector, unexpected issues often arise, and graduates who can quickly diagnose problems and propose viable solutions are highly valued by employers. This skill is essential for maintaining project timelines and budgets.

From a theoretical perspective, Bloom's Taxonomy supports the idea that higher-order thinking skills, such as analysis and evaluation, are essential for effective problem solving. These skills are necessary for breaking down complex issues into manageable components and devising solutions, which is vital in maintaining project timelines and budgets. Additionally, McGunagle and Zizka (2018) emphasize that employers value candidates who think critically and creatively, as this fosters innovation and operational efficiency. Therefore, developing problem-solving skills through structured learning environments can greatly enhance graduates' ability to meet industry demands.

4.2.3 Teamwork and Collaboration Skills

Teamwork skills are consistently highlighted as one of the most essential competencies for graduates, with 18 studies emphasizing their importance from the perspective of employers. McGunagle and Zizka (2018) define teamwork as the ability to collaborate effectively with others, a skill that is vital in modern workplaces because it not only enables individuals to contribute meaningfully in-group settings but also helps manage teams by resolving conflicts, motivating members, and fostering a positive, cooperative work environment. Employers value graduates who can demonstrate strong teamwork skills because they know that collaboration is fundamental to achieving organizational goals. As Khoo et al. (2020) point out, both employers and academic staff consider teamwork a critical competency for graduates entering the workforce. This is particularly important in sectors like mechanical and manufacturing engineering, where collaborative efforts are key to project success (Teoh

et al., 2023). In these industries, graduates must be able to share ideas, work cohesively with colleagues, and support team objectives to meet common goals.

Teamwork skills are not just about cooperating with others but also about actively contributing to the collective problem-solving process, handling different perspectives, and maintaining harmony within the group. TVET graduates with strong teamwork abilities are often better equipped to navigate the complexities of modern organizational structures, which are increasingly team-oriented and project-based. The importance of teamwork is highlighted by Tuckman (1965), who introduced the Tuckman Team Development Model, describing the stages of team progression: forming, storming, norming, and performing. Graduates with good teamwork skills can help a group move through these stages more efficiently, leading to high-performance outcomes. In conclusion, teamwork is an indispensable skill for graduates, particularly in fields that demand collaboration like engineering. It enables individuals to resolve conflicts, motivate others, and work toward shared goals, making it a competency highly sought after by employers.

4.2.4 Critical Thinking Skills

13 out of 28 studies focused on critical thinking skills. Critical thinking is more than just processing information—it involves the active, skillful conceptualization, application, analysis, synthesis, and evaluation of data to reach sound conclusions (Ravichandran & Abirami, 2017). As industries become more complex and dynamic, the ability to think critically is increasingly essential, especially in fields like construction. Academic staff consider critical and conceptual thinking as vital competencies for graduates, particularly in navigating complex problem-solving scenarios (Khoo et al., 2020). Critical thinking goes beyond basic analysis; it involves evaluating information, understanding underlying assumptions, and making reasoned judgments.

In line with Bloom's Taxonomy (Bloom, 1956), which emphasizes higher-order thinking, critical thinking requires individuals to not only understand and apply knowledge but also to evaluate and create new solutions. Analytical skills, closely tied to critical thinking, allow individuals to break down complex problems into manageable parts and assess information effectively (Aliu & Aigbavboa, 2021). In industries like manufacturing, where challenges can be unpredictable, critical thinkers are better equipped to question assumptions, seek innovative solutions, and make well-informed decisions. This ability to think creatively and critically helps graduates navigate industry complexities, identify potential risks, and drive project success, making them highly valuable to employers. By fostering critical thinking, individuals can adapt to the constant changes in their field, contributing to both their professional growth and the success of their organizations.

4.2.5 Technological Skills

Ten studies emphasize the crucial role of technological skills in graduates' competency. Holidi and Abu Seman (2023) describe these skills as the ability to use digital tools and technology effectively. Halik Bassah (2022) highlights the necessity for graduates to be proficient in basic computer skills and technological knowledge to meet the demands of

Industry 4.0. Similarly, Gupta and Mahajan (2024) note that technological proficiency is increasingly important in today's job market. As industries rapidly evolve, employers seek graduates who can efficiently utilize digital tools, driving both productivity and innovation (Teoh et al., 2023). In addition to familiarity with standard office software like Word, Excel, and Access, graduates should also master specialized tools such as SPSS for statistical analysis and AutoCAD for design work. Proficiency in these areas is no longer a competitive advantage but a basic requirement for employment in many fields (Khoo et al., 2020). Furthermore, Ramamuruthy et al. (2021) argue that these technology skills are essential for data analysis, reporting, and effective communication in the workplace.

Referred to as information and communications technology (ICT) skills, these competencies encompass the ability to use computers and IT to manage information, solve problems, and facilitate communication. In Malaysia, as industries transition toward Industry 4.0, the reliance on technology in the workplace has grown, making digital proficiency a key requirement for future employment. The importance of technological skills in the workforce can be linked to technological determinism, which suggests that technological development drives societal and workforce changes. As digital tools become integral to almost every industry, possessing strong technology skills is essential for graduates to remain adaptable and competitive. The growing relevance of these skills is also supported by the Human Capital Theory, which asserts that individuals' skills and knowledge, especially in technology, increase their value in the job market (Strober, 1990).

4.2.6 Interpersonal Skills

Interpersonal skills featured the most often in the studies on TVET graduates' soft skills from the perspective of employers with 10 studies. Spencer and Spencer (1993) describe interpersonal skills as the ability to empathize, listen actively, be sensitive to others, and understand both emotions and situations. Khan (2018) broadens this concept by defining interpersonal competencies (IPCs) as the skills needed to effectively communicate, work in teams, and build relationships—critical for fostering a collaborative and positive work environment. Chan et al. (2018) also highlight the importance of these skills for enhancing teamwork and cooperation among employees. Khoo et al. (2020) reinforce the idea that being able to develop and maintain strong interpersonal relationships is highly valued by employers. Additionally, Ramamuruthy et al. (2021) point out that social and interpersonal skill, particularly empathy and offering helpful suggestions, are key to building relationships and ensuring customer satisfaction. The set of abilities enabling a person to interact positively and work effectively with others. In the business domain, the term refers to an employee's ability to get along with others while getting the job done (Ravichandran & Abirami, 2017).

Interpersonal skills are essential for graduates entering the workforce, especially in industries where collaboration and communication are critical for success. Graduates who excel in working within teams, resolving conflicts, and building strong professional relationships are often better positioned to succeed in today's highly interconnected and dynamic workplace. These skills go beyond just technical knowledge. It help to create a productive, supportive, and inclusive work environment, which is highly valued by employers. This aligns with

Bandura's Social Learning Theory (1977), which emphasizes that much of our behavior is learned through observing others and interacting socially. Graduates with strong interpersonal skills can better integrate into various organizational cultures and collaborate with diverse teams. In conclusion, interpersonal skills are a critical competency for graduates, enabling them to work well in teams, build positive relationships, and create an inclusive work environment—all of which are highly valued by employers today.

4.2.7 Technical Skills

Ten studies indicate that technical skills are vital for graduates. Ferreira et al. (2024) argue that, despite a demand for a more varied curriculum, the strength of engineering education lies in its rigorous grounding in mathematics, physics, and chemistry. This foundation prepares Technical and Vocational Education and Training (TVET) graduates with the necessary knowledge and practical abilities. It is crucial for graduates to understand key theories and concepts and to engage in continuous learning to keep pace with changing industries and new technologies. In addition to technical skills, graduates must also cultivate soft skills such as communication, teamwork, and problem solving to succeed in various work environments. Training programs should align with employer needs, including practical experiences like internships and real-world projects.

Understanding fundamental engineering concepts is crucial for applying knowledge in real-world situations. Ravichandran and Abirami (2017) note a gap between what employers expect and the skills engineering graduates possess, stressing the importance of proficiency in specialized tasks. Wagiran et al. (2023) highlight that vocational graduates must prioritize technical skills, while Teoh et al. (2023) observe that employers generally have confidence in graduates' technical foundations, suggesting that educational institutions adequately prepare students for careers in fields like engineering, IT, and manufacturing. Research conducted by Rawboon et al. (2021) points out that major Thai and multinational companies are looking for engineering graduates who possess not only essential technical skills but also global competencies, highlighting the need for engineering education to align with industry requirements. Bansal, Aggarwal, and Gopal (2020) reveal that engineering students often concentrate primarily on honing their technical skills, influenced by an educational system that traditionally emphasizes technical knowledge and problem solving; leading them to believe that excelling in these areas will secure employment. Promoting creativity and adaptability is essential, as emphasized by Irdayanti Mat Nashir et al. (2022), especially in a rapidly evolving job market. A skilled workforce contributes to competitiveness, productivity, and economic growth, allowing individuals to create new opportunities through entrepreneurship or innovation.

4.2.8 Leadership Skills

Eight articles underscore the crucial role of leadership skills in enhancing organizational performance and effectiveness. Theoretical frameworks assert that soft skills are integral to effective leadership. These skills facilitate the identification and development of individuals' latent potential, enabling organizations to optimize operational effectiveness. Despite many graduates, lacking confidence in leadership roles, the ability to lead and take initiative is

highly valued (Halik Bassah, 2022). Effective leaders guide, motivate, and influence others towards shared goals while managing teams and fostering innovation in dynamic environments. Employers prioritize graduates who can lead projects, as strong leadership directly affects organizational success (Salleh et al., 2016). Proactive leadership is essential for workforce development, encompassing functions such as goal achievement, vision articulation, strategic planning, organization, control, resource mobilization, and motivation. Leaders who excel in these areas are instrumental in driving organizational progress.

Furthermore, building and maintaining collaborative relationships with various stakeholders enhances workplace networks and efficiency (Aliu & Aigbavboa, 2021). In industries like construction, strong leadership is vital for effective project and team management. The Social Learning Theory (Bandura, 1977) supports this approach, suggesting that individuals learn behaviors through observation and imitation. By incorporating experiential learning opportunities, such as mentorship and project-based learning, TVET institute can better prepare graduates for leadership roles. Strong leadership also requires adaptability, interpersonal skills, and the ability to influence decision-making, encouraging employees to extend beyond their usual tasks and enhance overall performance (Succi & Canovi, 2020).

4.2.9 Adaptability Skills

Adaptability is widely recognized as a crucial skill for employability, especially in today's fast-changing industries. Halik Bassah (2022) describes it as the ability to adjust to new situations and challenges, which is increasingly valued by employers. Chan et al. (2018) similarly emphasize that adaptability is highly regarded in the workplace, as it allows individuals to navigate change effectively. In the engineering field, Ramamuruthy et al. (2021) argue that being able to adapt to evolving technologies and industry demands is essential for long-term success. Yong and Ling (2023) further highlight that adaptability enhances job prospects for engineering graduates by enabling them to learn new tools, work across diverse teams, and thrive in global settings. As industries continue to evolve with rapid technological advancements, graduates who demonstrate adaptability are better positioned to succeed and maintain relevance in their careers. This concept aligns with Bandura's Social Cognitive Theory (1986), which emphasizes learning through environmental interaction and behavioral adjustment. Graduates who are adaptable are better equipped to integrate into new workplace cultures and adjust to technological shifts, making them more resilient in their careers. In today's fast-paced industries, particularly in engineering, the ability to adapt is essential for innovation and long-term career success. Employers need individuals who can not only react to changes but also anticipate and integrate new knowledge and skills effectively into their work routines.

4.2.10 Management Skills

Seven studies underscore the critical role of management skills as a key element of graduates' soft skills, which employers, particularly in the manufacturing sector, consider valuable investments in their human capital. Skills such as planning and organizing enable graduates

to efficiently manage tasks and meet deadlines, contributing not only to the immediate operational success of the organization but also to the long-term value they bring as adaptable, high-potential employees (Chan et al., 2018). According to Human Capital Theory (Backer, 2009), these management competencies are viewed as forms of investment that enhance a graduate's economic productivity, benefiting both the individual and the organization by increasing future employability and leadership capacity. Teoh et al. (2023) further highlight that work-planning skills, appreciated by employers, optimize workplace efficiency and ensure timely task completion, aligning with Human Capital Theory's emphasis on skills as a source of organizational growth and individual career advancement.

4.2.11 Personal Quality Skills

Six studies state the importance of personal quality skills competency. Personal quality skills refer to the attributes, behaviors, and characteristics that influence how individuals interact with others and manage themselves in professional and personal contexts. Holidi and Abu Seman (2023) define personal quality skills as attributes such as self-awareness, productivity, competitiveness, determination, creativity, and innovation. Employers appreciate graduates who can plan and organize their work effectively. This skill ensures that tasks are completed efficiently and deadlines are met, which is crucial in a fast-paced work environment. According to Teoh et al. (2023), employers' value self-motivated individuals who take initiative and responsibility for their own learning and development. This trait is important for personal growth and contributes to a proactive work environment.

From a Behavioral Skills Theory perspective, personal quality skills are often seen as essential non-cognitive traits that complement technical skills (Fisher et al., 2009). Employers recognize that while technical abilities are important for specific job tasks, personal quality skills are necessary for managing work relationships, adapting to change, and demonstrating professionalism. In the modern job market, employers are increasingly looking for a combination of technical and personal quality skills. While technical expertise may help a candidate secure a job, personal qualities are often what enable long-term success and growth within an organization. As industries continue to place greater emphasis on collaboration, leadership, and emotional intelligence, personal quality skills are becoming indispensable for career advancement and workplace satisfaction.

4.2.12 Analytical Thinking Skills

Analytical thinking is defined as the skill to dissect intricate information, identify recurring themes, and effectively resolve issues through logical reasoning (Aliu & Aigbavboa, 2021). This capability involves not just the comprehension of data, but also its critical evaluation to lead to actionable outcomes. Scholars have emphasized that analytical thinking encompasses a methodical approach to problem-solving, requiring individuals to assess information thoroughly and make judgments grounded in evidence. In the contemporary job market, employers place a high premium on graduates who exhibit robust analytical thinking abilities. These individuals can navigate complex problems and play a vital role in both operational tasks and strategic decision-making (Pang et al., 2018). The ability to consider different viewpoints, make choices based on data, and adapt to changing circumstances makes

analytical thinkers valuable assets in various fields. For example, sectors like engineering, finance, and information technology particularly rely on these skills for effective problem resolution and process optimization. Moreover, the significance of analytical thinking goes beyond individual responsibilities; it affects an organization's capacity to innovate and maintain its competitive edge. Research indicates that professionals with strong analytical skills are better equipped to anticipate potential challenges and opportunities, thus significantly enhancing organizational decision-making and growth (Grebski et al., 2022). Consequently, developing analytical thinking is crucial for graduates who wish to align with employer expectations and excel in diverse industries.

4.2.13 Lifelong Learning

The ability to adapt to changing technologies and industry demands, along with a commitment to continuous learning, is vital for long-term success in the engineering field (Ramamuruthy et al., 2021). According to Khan (2018), lifelong learning is emphasized as a critical component for graduates to enhance their employability and work performance in a dynamic job market. It involves the continuous pursuit of knowledge and skills beyond formal education, encouraging individuals to engage in self-directed learning, adaptability, and personal development to meet evolving industry demands. The study highlights the necessity for graduates to cultivate competencies such as self-efficacy and self-evaluation, which are essential for navigating various work environments and aligning their skills with market needs.

4.2.14 Self-Motivation Skills

Self-motivation refers to the ability to independently initiate and complete tasks without needing external encouragement. Individuals who exhibit high self-motivation are highly valued for their initiative, goal-setting, and strong work ethic, all of which are crucial in today’s fast-paced work environments. While only three out of twenty-eight studies emphasize the importance of self-motivation skills, employers greatly appreciate individuals who actively take charge of their learning and development. This trait not only promotes personal growth but also contributes to a more dynamic and proactive workplace (Teoh et al., 2023).

Although research on the significance of self-motivation from the employer's perspective is still limited, its importance became particularly clear during the pandemic, as remote work surged and shifted work styles across various industries (McGunagle & Zizka, 2018). The Self-Determination Theory supports this idea, indicating that individuals who are intrinsically motivated often perform better and experience higher job satisfaction, highlighting the necessity for self-motivated employees in the contemporary workforce (Deci & Ryan, 2012).

5. Discussion and Conclusion

The principal aim of this research is to systematically evaluate the competencies that employers value in graduates of Technical and Vocational Education and Training (TVET). This evaluation is based on a selection of 28 articles, following the PRISMA methodology. Fourteen significant competencies were identified, encompassing communication abilities,

problem-solving capabilities, teamwork and collaboration skills, critical thinking, technological proficiency, interpersonal skills, technical expertise, leadership qualities, adaptability, management abilities, personal attributes, analytical thinking, lifelong learning, and self-motivation. These results highlight the diverse skill set that is vital for achieving success in today's job market.

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The competencies identified in this study are consistent with existing literature that emphasizes the importance of a broad range of skills in TVET graduates. While previous research has often highlighted technical skills, this review illustrates that soft skills and personal attributes are equally essential for enhancing employability, particularly in the context of Industry 4.0. The recognition of competencies such as adaptability and lifelong learning is especially pertinent due to the rapid pace of technological advancements and changing workplace dynamics.

These findings provide significant insights for various stakeholders, including educational institutions, policymakers, and employers. By clarifying the competencies that employers prioritize, this review serves as a guiding framework for TVET institutions to align their educational programs with the evolving needs of the industry. Additionally, the insights may aid policymakers in developing educational strategies that address competency gaps within the labor market, ensuring that TVET graduates are adequately prepared for workforce demands.

Focusing on TVET in Malaysia, these findings are particularly relevant given the country's efforts to strengthen its technical and vocational education system. Malaysia's economic development strategy includes elevating the status of TVET as a means of producing a highly skilled workforce capable of meeting the demands of Industry 4.0. However, challenges persist in aligning TVET curricula with industry requirements, as evidenced by gaps in skills related to both technical and soft skills. For instance, communication, critical thinking, and leadership are areas where employers often report a mismatch between graduates' competencies and the skills required in the workplace.

The study makes noteworthy contributions in two primary areas. First, it provides an extensive overview of the competencies essential for TVET graduates within the context of Industry 4.0, thereby laying the groundwork for subsequent research in this field. Second, the suggested strategies aim to bridge the identified competency gaps, ensuring a better alignment between TVET institutions and employers' expectations regarding workforce

readiness. This is crucial for Malaysia as it seeks to boost the employability of its TVET graduates and meet the labor market's evolving demands.

While the review is comprehensive, it acknowledges certain limitations, such as potential biases in the selected articles and variations in research quality, which may affect the generalizability of the findings and necessitate careful consideration. To address these competencies effectively, it is recommended that Malaysian TVET programs incorporate both technical training and soft skills development into their curricula. This integration not only enhances graduates' employability but also aligns with the current workforce dynamics, which emphasize technological advancements and collaboration across sectors.

It is essential for educational institutions in Malaysia to adopt a comprehensive approach to curriculum design, ensuring that graduates possess not only technical expertise but also crucial soft skills for adaptability and effectiveness in the workplace. Collaborations between educational institutions and industry stakeholders are vital for keeping training programs relevant. Initiatives such as internships, collaborative projects, and industry partnerships can offer students practical experience and insights into employer expectations.

Moreover, Malaysian graduates should be encouraged to pursue continuous learning opportunities, such as workshops, online courses, and certifications, to keep their skills up-to-date. Educational institutions can support this by providing ongoing access to learning resources for their alumni, thereby promoting lifelong learning. Within the context of TVET in Malaysia, such support is vital for developing a skilled workforce that can adapt to the rapid technological advancements and fulfill the nation's economic and industrial goals.

6. Recommendations

Future research should investigate the longitudinal effects of competencies on career success among Technical and Vocational Education and Training (TVET) graduates, while also examining the specific competencies deemed essential across various industries. Such investigations are crucial for developing educational strategies and workforce development initiatives that align with industry needs. Given that this study primarily focuses on competencies from the employers' perspective, it is essential to conduct further review research aimed at identifying competency gaps as perceived by employers. This approach would enhance the understanding of discrepancies between educational outcomes and industry expectations. Additionally, while this study outlines several key competencies, future research should undertake a detailed examination of each competency across different levels, facilitating a more nuanced understanding of their contributions to employability and success in the workforce. Furthermore, existing studies on TVET graduates' competencies have primarily focused on only seven individual countries. This presents a significant opportunity for researchers to expand their investigations into additional countries, thereby enriching the global discourse on competency requirements and enhancing the generalizability of findings.

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