*International Journal of Learning, Teaching and Educational Research*
*Vol. 24, No. 3, pp. 312-332, March 2025*
*https://doi.org/10.26803/ijlter.24.3.15*
*Received Jan 31, 2025; Revised Mar 14, 2025; Accepted Mar 19, 2025*

# Future Generic Skills for Technical Vocational Education Graduates

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**Abstract.** Global industries are changing rapidly due to technology, automation, and digital transformation, especially with the Fourth Industrial Revolution (4IR). This creates a growing demand for a workforce with adaptable and future-ready skills. In many countries, Technical and Vocational Education and Training (TVET) plays a key role in preparing graduates for industry needs. However, employers seek not only technical expertise but also essential generic skills. This study investigates the essential elements of future generic skills for TVET graduates using a Systematic Literature Review (SLR) method. By meticulously analysing existing research, the study identifies and synthesizes key trends and themes in developing future generic skills. The study highlights the critical role of these generic skills in preparing TVET graduates for future labor markets, stressing the need for innovative teaching methods and collaboration among educators, policymakers, and industry stakeholders. A thorough selection and evaluation process of scholarly articles published in the last decade yielded 11 relevant studies. The findings reveal three primary themes: Generic Skills and Employability, Digital and Technical Competencies, and Integration of Transversal Competences. Soft Skills and Employability include teamwork, communication, creativity, problem-solving, and adaptability, all crucial for job readiness and workplace effectiveness. Digital and Technical Competencies emphasize the growing need for digital literacy, technical skills, and proficiency in Industry 4.0 technologies, driven by technological advancements. Meanwhile, integration of Transversal Competences involves incorporating broad-based skills such as career adaptability, systematic thinking, and lifelong learning into TVET curricula to meet labor market demands. This research offers valuable insights for developing training

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programs that equip TVET graduates with the necessary skills to succeed in a rapidly evolving job landscape.

**Keywords:** Fourth Industrial Revolution; future skills; generic skills; technical vocational education graduates

## 1. Introduction

In the rapidly evolving landscape of education and employment, Technical and Vocational Education and Training (TVET) institutions play a pivotal role in equipping individuals with the practical skills and knowledge necessary to thrive in diverse professional environments (Calero López & Rodríguez-López, 2020; García-Pérez et al., 2021). However, as we stand at the precipice of profound technological advancements and socio-economic transformations, the traditional definition of employability is undergoing a fundamental shift. This paradigm shift necessitates a re-evaluation of the skill sets deemed essential for TVET graduates to succeed in the future workforce (Crespí & García-Ramos, 2023; Lunde, 2024). While technical proficiency remains indispensable, the contemporary employment landscape demands a holistic approach that encompasses a broader spectrum of competencies (Hyytinen et al., 2024; Tuononen et al., 2023). This is where the concept of generic skills comes into play.

As the world continues to evolve and adapt to new technologies and societal changes, the skills required for success in the workforce are also constantly evolving. Many industries are experiencing a shift towards automation and digitization, which has led to the emergence of new types of jobs that require a different skill set (Mohd Faishal et al., 2023). According to research, there is a growing need for TVET graduates to possess future generic skills to thrive in the changing job market. One of the main challenges faced by TVET graduates is the rapid advancement of technology (Reddy et al., 2020). Technology has the potential to transcend time and place, allowing individuals to learn and undergo assessment outside of formal environments at their own pace and convenience (Kanwar et al., 2019). However, the integration of technology into TVET systems in many developing countries is still minimal. This lack of technological integration poses a problem for TVET graduates as they may not have the necessary skills to excel in a technology-driven workplace. In a qualitative study conducted with 35 TVET teachers from 19 developing countries, concerns were raised about whether TVET graduates in these countries are acquiring the necessary future generic skills (Okolie et al., 2020). The study aimed to understand how TVET teachers are fostering employability skills among learners (Din Nugraha et al., 2020).

Generic skills, often referred to as transferable or soft skills, encapsulate a range of abilities that transcend specific job roles and industries (Fleming et al., 2024; Slisane et al., 2022). They are the foundational pillars upon which individuals build their professional capabilities, enabling them to adapt, innovate, and thrive in dynamic environments (Räisänen et al., 2022; Wei & Sotiriadou, 2023). While technical skills equip individuals with the know-how to perform specific tasks, generic skills empower them to navigate complexity, communicate effectively,

collaborate seamlessly, and continuously learn and evolve (Muukkonen et al., 2022). However, the definition and scope of generic skills for TVET graduates remain elusive, often obscured by varying interpretations and evolving socio-economic dynamics (Wahyudi et al., 2023; Yusof et al., 2021). Thus, the primary objective of this article is to elucidate the concept of generic skills in the context of TVET education. By delving into the intricacies of this multifaceted concept, we aim to provide clarity and direction for educators, policymakers, and industry stakeholders alike.

Despite the recognized importance of TVET in equipping students with practical skills for the workforce, there exists a critical gap in understanding and defining the concept of generic skills specifically tailored for TVET graduates (Abdullah et al., 2019; Ngware et al., 2022). This gap poses a significant challenge for educators and policymakers, as they strive to ensure that TVET programs adequately prepare students for the evolving demands of the future workforce (Mohd Kamaruzaman et al., 2019). Without a clear definition and understanding of these essential generic skills, TVET graduates may find themselves ill-equipped to navigate the complexities of modern workplaces, hindering their ability to secure and retain employment in an increasingly competitive job market (Muschalla, 2021). Therefore, there is an urgent need to address this gap by systematically identifying and defining the future generic skills required for TVET graduates, thereby enabling educators to tailor curricula and pedagogical approaches to better meet the evolving needs of students and industry alike.

## 2. Definition and Concepts of Generic Skills

While definitions and interpretations of generic skills may differ, they are generally recognized as cross-disciplinary and cross-professional. These skills are commonly categorized into four groups: personal, ideas and object-related, interpersonal, and community-related skills (Zouaoui et al., 2024). Based on Carvalho (2024) study's suggested McClelland's theory further emphasizes that these generic skills significantly contribute to a worker's performance and overall excellence. In the context of TVET, generic skills encompass a wide array of foundational competencies that extend beyond specific occupations or industries (Corbett, 2023; Stigen et al., 2022; Thianthai & Sutamchai, 2022). These skills are crucial for TVET graduates to effectively navigate the complexities of the modern workplace and adapt to the ever-evolving demands of diverse professional environments.

Generic skills, also referred to as transferable or soft skills, encompass a range of abilities and attributes that individuals can apply across diverse contexts to enhance their performance and adaptability in various situations (Mansor & Che Rus, 2021). These skills are not confined to a specific profession or field but are fundamental for success in both professional and personal domains. According to Salleh et al., generic skills are essential competencies that individuals must possess to function effectively in their work alongside their specialized skills. Similarly, Mohd Amiruddin et al. (2017) emphasize that generic skills include cognitive abilities and non-academic competencies such as leadership, teamwork, communication, and problem-solving. Thus, generic skills are integral to an

individual's ability to perform tasks efficiently, complementing their technical expertise while fostering adaptability and effectiveness in the workplace.

**2.1 The Elements for Future Generic Skills**

Future generic skills refer to a set of competencies that individuals must develop to successfully navigate the evolving and dynamic job market (Connor et al., 2014). These skills are not confined to a specific industry but are transferable across various fields and sectors. As highlighted by Kowalewski and Halasz (2019), "[t]he skills employees need to be successful in the workplace are different than 20 years ago, and they will be different 10 years from today." With rapid technological advancements, new job roles are emerging while others are becoming obsolete (Figliè et al., 2022).

Among the critical future generic skills, effective communication has become increasingly vital. Strong communication skills are essential in the workplace as they enable individuals to articulate ideas clearly, collaborate with team members, and establish meaningful relationships with clients and stakeholders (Pandey & Shukla, 2020). Additionally, adaptability and problem-solving abilities are crucial competencies for future employment. These skills involve the capacity to learn new technologies, adapt to evolving work processes, and engage in critical thinking to develop innovative solutions for complex challenges.

Future generic skills in TVET are essential competencies that graduates need to possess to adapt to the evolving job market influenced by technological advancements and societal changes. These skills are not specific to a particular job but are applicable across various industries and positions. Skills such as digital literacy, the ability to learn continuously, problem-solving, critical thinking, and adaptability are becoming increasingly important. As new jobs emerge, particularly in areas that are becoming more automated and digitized, TVET graduates must be equipped with these competencies to thrive in diverse workplace settings. The rapid progression of technology is a significant factor influencing these skills, as it allows individuals to transcend traditional learning and assessment spaces, learning at their pace and convenience. However, the challenge arises in integrating technology within TVET systems, especially in developing countries where this integration is minimal. Without the necessary technological emphasis in their education, TVET graduates may find themselves unprepared for a tech-centric workplace.

In conclusion, TVET graduates must demonstrate adaptability, technological proficiency, and a diverse range of soft skills to effectively navigate the complexities of an evolving labor market. Previous studies have identified eight key elements that constitute generic skills: digital fluency, adaptability and resilience, creativity and innovation, collaboration and interdisciplinary teamwork, critical thinking and problem-solving, global and cultural competence, ethical leadership and social responsibility, and emotional intelligence. According to Saidi et al. (2019), communication and teamwork skills are among the most dominant soft skills required in the workplace. However, certain areas, such as

entrepreneurial skills, remain a challenge for students and are often identified as areas for improvement.

According to Mohd Kamaruzaman et al. (2019), the terminology used to describe future skills varies across different countries. As illustrated in Figure 1, various terms are employed to refer to Fourth Industrial Revolution (4IR) generic skills. In the United States, these competencies are known as "workforce skills", whereas in the United Kingdom, they are referred to as "future skills", "transversal skills", or "4IR skills". Similarly, Ireland also adopts the term "future skills". In Australia, these skills are labeled as "new skills" or "skills for a global future", while in Canada, they are referred to as "durable skills". German academics commonly use the term "skills 4.0" to describe 4IR generic skills, whereas in Switzerland, they are known as "top skills" or "IR 4.0 skills". Finland uses the term "future traits", while in North Africa, these competencies are referred to as "human skills". In Turkey, the term "futureproof skills" is commonly used.

Despite the variation in terminology, these concepts share a common definition, referring to the essential soft skills required for effective work performance. As highlighted in Figure 1, these skills are also identified as workforce skills, transversal skills, new skills, 4IR skills, skills for I4.0, future traits, skills 4.0, and durable skills. This conceptual framework serves as the foundation for the present study.

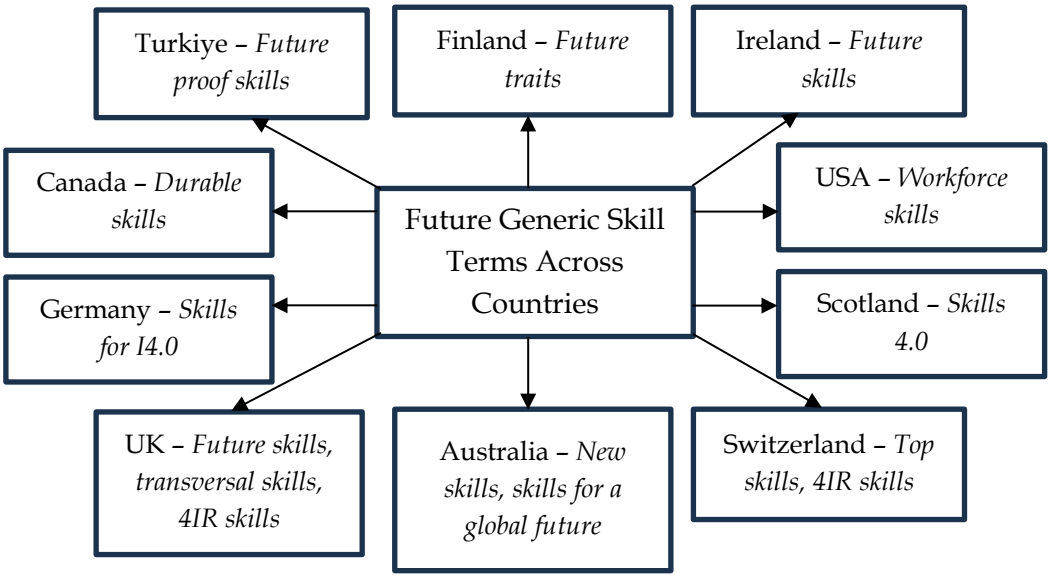


**Figure 1: Conceptual framework of future generic skills terms across countries**

## 3. Research Methods

The methodology employed in this study was a Systematic Literature Review (SLR), which was conducted to systematically analyze and synthesize research on generic skills, particularly for future TVET graduates. The SLR approach facilitates a structured analysis of information by employing rigorous and systematic inquiry and review techniques. This process involves formulating a research question, identifying relevant studies, extracting data, synthesizing findings, and interpreting results to generate new insights or theoretical

frameworks (Walsh & Downe, 2005). Specifically, this study adheres to the methodological recommendations outlined by Nik Othman et al. (2024). Additionally, the study follows the Reporting Standards for Systematic Evidence Syntheses (ROSES), which provide guidelines for transparent and structured reporting of systematic reviews or meta-analyses. These standards ensure methodological rigor, allowing for clarity, evaluation, and replication of the research findings.

This study identified relevant publications using the flowchart of suggested reporting items for systematic reviews, as outlined by Moher et al. (2009) and Page et al. (2020). Accordingly, the SLR approach employed in this study encompassed key stages, including the identification of relevant literature, application of screening criteria, determination of eligibility, data acquisition, and data analysis. To compile data, Scopus and Web of Science were utilized as primary databases. While both are widely recognized and predominantly provide access to scholarly articles in English, certain limitations must be acknowledged. One potential limitation pertains to database coverage, as neither database encompasses all research domains equally, potentially leading to an underrepresentation of specific disciplines. Furthermore, both databases prioritize articles from high-impact journals, which may result in the overrepresentation of studies published in well-established outlets.

The screening process was conducted using selected keywords, namely "future skills", "generic skills", and "vocational education". The inclusion criteria for this review were restricted to publications from 2020 to 2024, with English as the required language of publication. This selection process was essential to ensure that only studies directly relevant to the research focus—specifically, the generic skills of engineering graduates in the context of the 4IR—were incorporated into the analysis. Studies deemed outdated, irrelevant, or lacking direct reference to 4IR and labor market demands were excluded from consideration.

**3.1 Identification**

The process of selecting relevant papers for this study followed a systematic review approach consisting of three main phases. The initial phase involved identifying appropriate keywords and searching for related or synonymous terms using thesauri, dictionaries, encyclopaedias, and previous studies. Once the relevant keywords were determined, search strings were formulated for use in the Scopus and Web of Science databases (see Table 1). In this first phase of the systematic review, a total of 436 papers were successfully retrieved from both databases.

**Table 1: The search string**

| | |
|---|---|
| Scopus | **TITLE-ABS-KEY**( "Generic Skills" OR "Future Skills" OR "Soft Skills" **AND** "Vocational Educat*" ) **AND ( LIMIT-TO ( PUBYEAR , 2022 ) OR LIMIT-TO ( PUBYEAR , 2023 ) OR LIMIT-TO ( PUBYEAR , 2024 ) ) AND ( LIMIT-TO ( SUBJAREA , "SOCI" ) ) AND ( LIMIT-TO ( DOCTYPE ,** "ar" ) ) **AND ( LIMIT-TO ( LANGUAGE ,** "English" ) ) **AND ( LIMIT-TO ( SRCTYPE ,** "j" ) ) **AND ( LIMIT-TO ( PUBSTAGE** , "final" ) ) **AND ( LIMIT-TO ( OA** , "all" ) ) |
| WOS | "Generic Skills" OR "Future Skills" OR "Soft Skills" AND "Vocational Educat*" **(All Fields) and** Open Access **and** 2024 **or** 2023 **or** 2021 **or** 2022 **or** 2020 **(Publication Years) and** Article **(DocumentTypes) and** English **(Languages) and** All Open Access **(Open Access)** |

### 3.2 Screening

The second steps are the screening process whereby all the articles have been screening accordingly to the preferences of the authors. In this article, authors limit the screening for only articles which publish between 2020 until 2024. Besides, authors also stated the articles should be only in English and opened access. The document types are restricted for an article only. After the screening process, total of 401 articles has been removed from both databased. According to WOS databased only 16 articles left. Meanwhile for Scopus databased, 19 articles found after the screening process. Total article found from both of databased is only 35 articles. Next, the articles have been refined through eligibility process.

### 3.3 Eligibility

For the third step, known as eligibility, a total of 35 articles have been prepared. All articles' titles and key content were thoroughly reviewed at this stage to ensure that the inclusion requirements were fulfilled and fit into the present study with the current research aims. Therefore, 24 articles were omitted because they were out of field, title is not significant, no open access and do not provide full text (see Table 2).

**Table 2: The selection criteria**

| Criterion | Inclusion | Exclusion |
|---|---|---|
| Language | English | Non-English |
| Timeline | 2020-2024 | < 2019 |
| Literature type | Journal (Article) | Conference, Book, Review |
| Publication Stage | Final | In Press |
| Subject Area | Vocational Educational | Besides Vocational Education |

Each of the 24 omitted articles was excluded based on the following criteria: (i) irrelevant scope, some articles did not focus on TVET context, studies related to other academic disciplined were removed, articles that discussed skills development outside of 4IR context were not included, (ii) title not significant, articles that were too broad or vague making them unsuitable for the study and (iii) no open access, some articles were paywalled or required subscription access, making it difficult to retrieve and analyze the full content, only open access were prioritized to ensure transparency and replicability of the research findings.

### 3.4 Data Abstraction and Analysis

A total of 11 journal articles were identified from the SCOPUS and Web of Science (WOS) databases for data collection (see Figure 2).

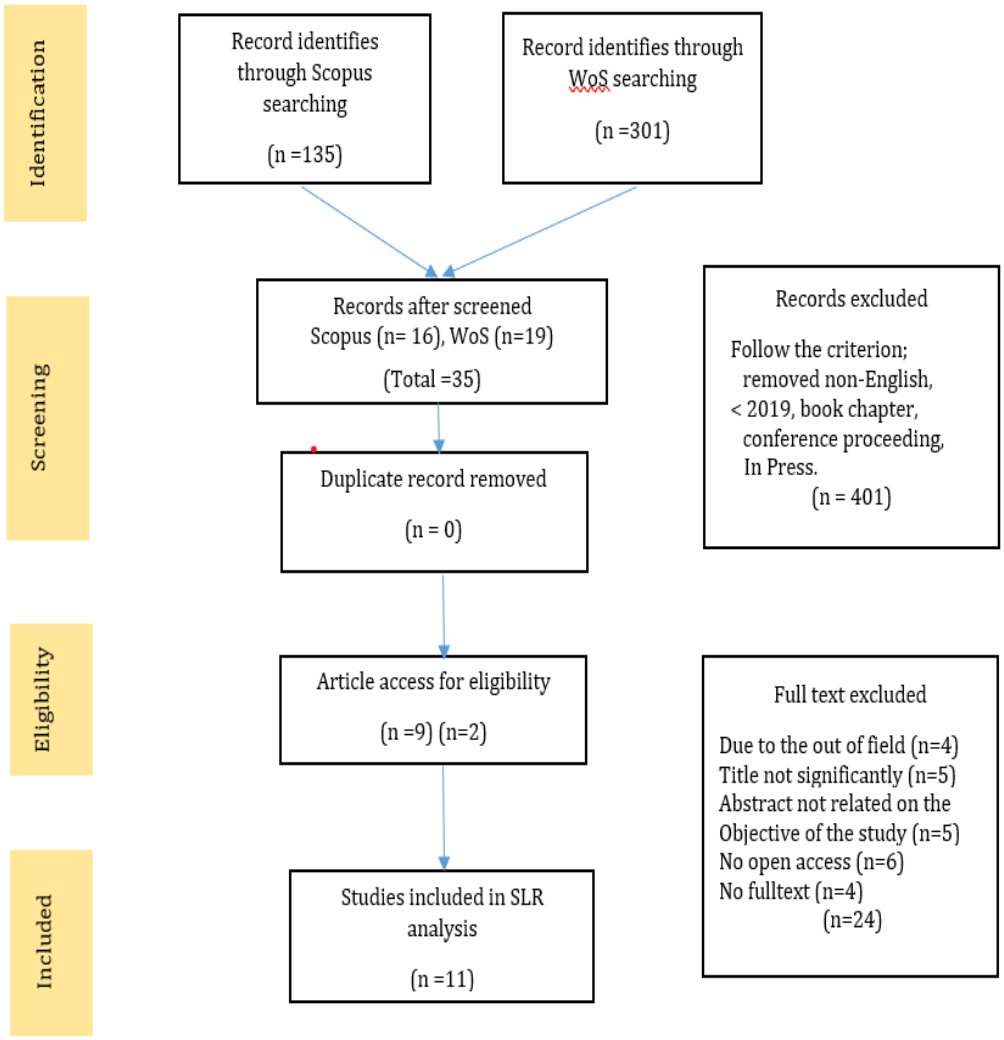


**Figure 2: Flow diagram of the proposed searching study**

All selected articles met the predefined inclusion and exclusion criteria. For this SLR, key details such as the article title, author(s), publication year, discussion on generic skills, and relevance to the TVET field were considered. The selection of

these 11 articles was guided by the following exclusion criteria: (i) studies that did not align with the predefined relevance criteria based on keywords, research scope, and study objectives; (ii) articles categorized as "out of field", referring to research unrelated to engineering education and labor market demands in the context of the 4IR; and (iii) articles excluded due to restricted access to full-text versions, which were verified through institutional access requests before removal. To mitigate potential bias, two independent reviewers from the research team assessed the selected articles.

## 4. Results

These are the 11 articles selected from both databases presented in Table 3. The main information regarding these articles such as the authors, year of publication, journal of publication, title and the key points of each study. These are the main information from the article reviewed in the table.

**Table 3: The information of article findings**

| No | Author, Year | Title | Key points | Generic skills | Journal |
|---|---|---|---|---|---|
| 1 | Calero López et al. (2024) | Are Creativity, L2 Motivation and Soft Skills Related? A Study in VET Students | Emphasizes the relationship between motivation, teamwork skills, and creativity among VET students. | Motivation, teamwork skills, and creativity. | Education Sciences |
| 2 | Rafiq et al. (2023) | The Integration of Inquiry and Problem-Based Learning and Its Impact on Increasing the Vocational Student Involvement | Explores student-centered learning (SCL) strategies like problem-based learning (PBL) and inquiry-based learning (IBL) in VET. | Systematic thinking skills and problem-solving skills. | International Journal of Instruction |

| | | | | | |
|---|---|---|---|---|---|
| 3 | Alam and Sharmin (2023) | Skills Development for Graduate Employability in Bangladesh: Japanese Language in TVET Program | Investigates the impact of a Japanese language skills program on TVET students in Bangladesh, emphasizing both hard and soft skills. | Development of both hard and soft skills | Journal of Technical Education and Training |
| 4 | Wahyudi et al. (2023) | Evaluate the Vocational School Graduate's Work-readiness in Indonesia from the Perspectives of Soft skills, Roles of Teacher, and Roles of Employer | Highlights the increasing importance of soft skills for job readiness in vocational education, based on a survey of Indonesian students. | Soft skills for job readiness | Journal of Curriculum and Teaching |
| 5 | Thianthai and Sutamchai (2022) | Skills That Matter: Qualitative Study Focusing on the Transfer of Training Through the Experience of Thai Vocational Students | Explores essential skills for vocational mechatronics and robotics students in Thailand, emphasizing the importance of soft skills. | Language and communicat-ion, Adaptability, interpersonal skills, willingness to learn, and innovative thinking. | Frontiers in Education |

| | | | | | |
|---|---|---|---|---|---|
| 6 | Kovalchuk et al. (2022) | Vocational Education in the Context of Modern Problems and Challenges | Analyzes the impact of COVID-19 and martial law on vocational education in Ukraine, highlighting the importance of lifelong learning and digital skills. | Enhancing digital skills and lifelong learning skills | Journal of Curriculum and Teaching |
| 7 | McGrath (2022) | Skills futures in Africa | Reflects on the need for skills development that benefits both people and the planet, emphasizing sustainable development goals. | Skills for engaging in Industry 4.0 and skills systems to support sustainable development goals. | Prospects |
| 8 | Fertig et al. (2022) | Who they are versus what they want: How dominance, influence, steadiness, and compliance profiles can aid in developing employability | Discusses the use of the DISC profile to train and develop soft skills valued by employers, highlighting gender and experience differences. | Developed soft skills | Industry and Higher Education |

| | | | | | |
|---|---|---|---|---|---|
| 9 | Calero López and Rodríguez-López (2020) | The relevance of transversal competences in vocational education and training: a bibliometric analysis | Stresses the importance of transversal competences and the need for collaboration among policymakers, industry, and educators. | Transversal competences and collaborative skills. | Empirical Research in Vocational Education and Training |
| 10 | Burns et al. (2020) | Supporting the development of digitally competent vet teachers in Serbia and Russia | Examines the digital competencies required for VET teachers in Serbia and Russia, aligning with European frameworks. | Digital competencies required for VET teachers | Obrazovanie i Nauka |
| 11 | Yusop et al. (2023). | Identifying and Validating Vocational Skills Domains and Indicators in Classroom Assessment Practices in TVET | Emphasize the need to integrate industrial revolution (IR) 4.0 generic skills, career adaptability skills, and technical skills into TVET assessments, covering cognitive, psychomotor, and affective aspects. | Industrial revolution (IR) 4.0 generic skills, career adaptability skills, and technical skills | Sustainability |

## 5. Discussions

From 11 articles the findings can be themed by three main elements of future generic skills. There are, (1) soft skills and employability, (2) digital and technical competencies and (3) integration of transversal competencies. As mentioned, generic skills importance for enhancing employability. These themes have significant to the elements of generic skills towards TVET graduates. That is

because most of the workforce in the industry required the integration of these skills. Graduates with combinations of generic skills, digital skills, technical skills will have great chances to enter the workforce nowadays.

**5.1 Generic Skills and Employability**

Generic skills refer to a set of personal attributes that enable individuals to interact effectively and harmoniously with others, encompassing competencies such as communication, teamwork, problem-solving, and adaptability (Achmad Rifa et al., 2023). Unlike technical or "hard" skills, which focus on an individual's ability to perform specific tasks, soft skills pertain to how work is conducted, including collaboration, time management, and conflict resolution. Employability, on the other hand, is defined as an individual's ability to secure and sustain employment (Suryani et al., 2023). It is influenced by a combination of knowledge, skills, and abilities, as well as how these attributes are presented to potential employers and the broader labor market context (Neetha, 2023).

As the employment landscape evolves, employers increasingly prioritize candidates with well-developed soft skills. These competencies are considered essential for employability as they enable individuals to navigate dynamic work environments, collaborate effectively, adapt to change, and engage in lifelong learning. Research indicates that soft skills often contribute more significantly to job performance than technical skills, making them a key differentiating factor among candidates with similar qualifications (Balcar, 2016; Thi Van Pham & Thi Thu Dao, 2020). Furthermore, given the rapid pace of technological advancements, technical skills may become obsolete over time, whereas soft skills remain relevant, facilitating continuous learning and adaptability (Putra, 2021). Consequently, employers place high value on these competencies, frequently incorporating them into hiring and career development decisions (Zheng et al., 2015).

Most elements of generic skills, particularly soft skills such as teamwork, creativity, communication, problem-solving, and adaptability, are fundamental for job readiness and effective workplace performance (Calero López et al., 2024; Wahyudi et al., 2023; Thianthai & Sutamchai, 2022). In alignment with this, one of the strategies to enhance students' generic skills is through active participation and collaboration with industries, providing them with opportunities to gain real-world experience, as emphasized by Kamaruzaman et al. (2017).

**5.2 Digital and Technical Competencies**

Technical Vocational Education and Training plays a crucial role in preparing individuals for the workforce by equipping them with practical skills and knowledge (Moses, 2016). In order to remain competitive in the vocational industries, TVET graduates need to possess a wide range of generic skills, with a particular emphasis on digital and technical competencies. These digital and technical competencies are of utmost importance in the vocational industries as they enable TVET graduates to effectively navigate and excel in the increasingly technology-driven workforce. Quality education is a strong foundation for preparing and improving the quality and competence of every nation's human resource development, which is an asset for global economic competition (World

Economic Forum, 2020). One of the elements in generic skills that is most important to the vocational industries is digital literacy. Digital literacy is the ability to use technology and information from digital devices effectively and efficiently in various contexts such as academics, careers, and everyday life (Zhang, 2016). The significant of using digital and technical competencies in the vocational industries cannot be overstated. In today's technology-driven world, employers seek candidates who are proficient in using digital tools and platforms to enhance productivity and efficiency (Andini, 2022; Hiller, 2021). Digital literacy enables TVET graduates to adapt to the rapidly evolving technological landscape, allowing them to stay relevant and competitive in the job market.

Additionally, technical competencies such as understanding and applying industry-specific software, equipment, and tools are essential for performing job tasks effectively. With the increasing integration of technology in vocational fields, TVET graduates with strong technical competencies are better positioned to contribute to the growth and innovation within their respective industries (Rahimah, 2020; Subramaniam & Abdul Aziz, 2023). Moreover, the use of digital and technical competencies enhances communication, collaboration, and problem-solving skills, which are vital for success in the modern workplace. As businesses continue to embrace digital transformation, individuals with these competencies will be better equipped to adapt and thrive in their roles, ultimately contributing to the overall productivity and success of their organizations (Ibrahim & Nashir, 2022). In conclusion, the adoption of digital and technical competencies in TVET programs is crucial for empowering graduates with the skills and knowledge needed to thrive in the digital era and meet the evolving demands of the workforce. Digital literacy is a key element in the generic skills that are important to the vocational industries (Maneschijn et al., 2013). This is supported by research that emphasizes the significance of digital literacy in today's job market (Nurhidayat et al., 2022). The ability to effectively use technology and digital devices is essential for success in various contexts, including academics, careers, and everyday life.

**5.3 Integration of Transversal Competencies**

The integration of transversal competences in Technical Vocational Education and Training is aimed at ensuring that graduates have not only the technical skills required for a particular vocation but also the breadth of skills necessary to navigate and be successful in the modern workforce. Transversal competences include problem-solving, critical thinking, teamwork, creativity, digital literacy, and intercultural communication. The most recent scholarly discussions emphasize the importance of such competences. For instance, studies suggest the value of encouraging collaboration between universities and enterprises to enhance the internationalization and applicability of education for engineering talents (Pan & Lin, 2023). Furthermore, the importance of quality education that enhances the competence of a nation's workforce is recognized as crucial for global economic competition, which transversal skills are undoubtedly a part of (Moses, 2016). The constant evolution of technology and globalization means that TVET programs need to dynamically adapt and continue to find innovative ways to embed these essential skills into their teaching and learning practices.

To conclude, we identify three key themes: (i) soft skills and employability, (ii) digital and technical competencies, and (iii) integration of transversal competencies. There is an emerging consensus across the studies that combining soft skills with digital and technical competencies, along with the integration of transversal skills, creates a well-rounded graduate who is adaptable, innovative, and prepared for a wide range of work scenarios. For instance, graduates who possess strong digital literacy and technical competencies can better apply problem solving and creativity in real-world settings, which are key elements of transversal skills (Andini, 2022; Rahimah, 2020). The findings across the studies reinforce the idea that a combination of soft skills, digital/technical competencies, and transversal competencies is crucial for TVET graduates' employability. This is not just a matter of possessing individual skills, but rather an integrated approach that ensures graduates can thrive in a technologically advanced, interconnected, and dynamic work environment. By synthesizing these findings, the conclusion that TVET graduates with a holistic skill set have a competitive advantage in the workforce is strengthened. The emphasis on industry collaboration further supports this, as it helps bridge the gap between academic learning and real-world job requirements.

In sum, the integration of these skills: soft, digital, technical, and transversal equips TVET graduates with a comprehensive skill set that enhances their adaptability, job readiness, and long-term employability in the evolving job market. The integration of these skills not only helps graduates adapt to technological changes but also prepares them for the broader challenges they might face, such as intercultural communication or critical thinking, which are becoming increasingly important in globalized industries. Although this paper is based on a review of existing studies, these themes reflect a growing recognition in the literature that the TVET workforce requires a combination of these skills to excel and adapt to modern industry demands. These valuable insights will contribute to existing findings and serve as a reference for further research, especially in relation to future skills.

## 6. Conclusion

The rapid advancement of technology and globalization has significantly increased the demand for adaptable and forward-thinking skills among graduates of TVET programs. As industries and sectors continue to evolve, there is a growing need for a workforce that not only possesses technical expertise but also demonstrates transversal competencies. Integrating skills such as digital literacy, critical thinking, problem-solving, and adaptability into TVET curricula is crucial for ensuring that graduates are well-prepared for both current job markets and future career opportunities. Contemporary studies highlight that high-quality education plays a vital role in producing a skilled workforce capable of successfully navigating the challenges of global economic competition (Moses, 2016).

TVET institutions have a crucial role in incorporating these essential skills into their curriculum, teaching methods, and evaluation techniques, with a specific

emphasis on matching educational achievements with industry requirements. TVET institutions should ensure that the curriculum is regularly updated to reflect the latest technological advancements in relevant industries. This includes teaching new digital tools, software, and technologies that are widely used in the workplace. For example, training in industry-specific software, coding, robotics, or machine learning could be included in programs where these are becoming standard. On the other hand, TVET institutions can collaborate with tech companies or industry bodies to offer certification programs in digital tools or software, such as Microsoft Office, Adobe, AutoCAD, or industry-specific software. These certifications would enhance graduates' credibility and employability. By doing this, they will develop a workforce that is capable of creativity, competent to address growing issues, and ready to take advantage of possibilities in a constantly changing economic environment.

In order to ensure that TVET programs remain relevant to technical advancements and changes in the market, it is imperative for educators, policymakers, and industry stakeholders to work together and constantly improve these programs. By cultivating a setting that prioritizes ongoing education and the enhancement of skills, graduates of TVET may ensure their continued relevance in their fields and make substantial contributions to both economic progress and societal progression. The combination of these distinct abilities will enable individuals to take charge in their specific fields and have a significant impact on defining a strong and environmentally friendly global economy (Moses, 2016). Thus, to maintain competitiveness in a globally networked environment, TVET graduates are required to acquire not just the practical skills specific to their trade, but also the digital and technical abilities necessary for success in the future job market. One policy recommendation based on this finding is for the government to invest in smart classrooms, digital labs, and AI-driven learning platforms to enhance skill acquisition. This investment would make 4IR skills more accessible to all learners.

As this study is an intensive SLR, it may not directly offer new insights. However, its findings can help stakeholders prepare graduates with relevant future skills, facilitating a smoother transition into the workforce. Since this study serves as a preliminary investigation, it can contribute to future research by the authors on the framework of 4IR skills for TVET graduates. The findings will be valuable as a foundation for exploring relevant future skills, especially for TVET graduates.

## 7. Acknowledgement

We would like to express our sincere gratitude to Universiti Kebangsaan Malaysia for their financial support through the University Research Grant (GGPM-2022-016), which facilitated the publication of this article.

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