INTEGRATING TECHNOLOGY SKILLS WITH INTERPERSONAL COMPETENCIES TO ENHANCE GRADUATE EMPLOYABILITY MALAYSIAN TECHNICAL UNIVERSITY NETWORKS

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ARTICLE INFO	ABSTRACT
	The Fourth Industrial Revolution (4IR) has heightened the demand for graduates equipped with a balanced integration of technological skills and interpersonal competencies to meet the evolving needs of the workforce. This study adopts a quantitative research design, surveying 370 final-year students from Malaysian Technical University Network (MTUN) institutions. Using Partial Least Squares Structural Equation Modeling (PLS-SEM), the study examines the moderating role of technology skills in enhancing the impact of self-efficacy, soft skills, and personality traits on employability. The findings emphasize the necessity of curriculum reforms integrating technical and interpersonal training. This research contributes actionable insights for aligning higher education practices with the demands of 4IR industries, ultimately equipping graduates with holistic skill sets crucial for the global workforce
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1 Introduction

While technical expertise remains a crucial foundation for employability, it is increasingly evident that it alone is insufficient to meet the evolving demands of the modern workforce. Employers today prioritize graduates who demonstrate a blend of digital proficiency, self-efficacy, adaptability, communication, and teamwork—qualities essential for thriving in dynamic, technology-driven environments (Hasselaar & Lebel, 2024; Salas-Pilco, 2020; Yorke, M., & Knight, 2004). However, many graduates from the Malaysian Technical University Network (MTUN) continue to face significant challenges in meeting these expectations. Despite being renowned for their technical training, MTUN institutions often produce graduates who lack the interpersonal and technological skills

necessary to succeed in competitive, digitally integrated industries (Ismail & Mohammed, 2015).

In addressing these challenges, this study examines four key variables influencing graduate employability, emphasizing their relevance in the context of the Fourth Industrial Revolution (4IR). The first variable, self-efficacy, significantly shapes graduates' confidence and resilience, enabling them to tackle challenges in technology-intensive roles. Recent research underscores the critical role of self-efficacy in enhancing employability, particularly in dynamic environments where adaptability is paramount (Kamuzora, 2024; Obidile et al., 2023). The second variable, soft skills, encompasses essential competencies such as communication and teamwork, which are increasingly recognized as vital for effective collaboration in hybrid work settings where interpersonal interactions are pivotal (Hirudayaraj et al., 2021; Stewart & Preiksaitis, 2023). A study by Uwayezu highlights the high application of soft skills among graduates, underscoring their importance in achieving workplace success (Uwayezu, 2024).

In addition to interpersonal attributes, personality traits, including adaptability and emotional stability, are critical for enabling graduates to innovate and remain flexible in rapidly evolving industries. Literature suggests that these traits are increasingly significant in the 4IR era, where the ability to adapt to new technologies and work processes is a key determinant of employability (Adegbite & Govender, 2022; Arvanitis et al., 2022). Finally, technology skills serve as a moderating factor, amplifying the impact of interpersonal attributes on employability. Graduates with robust technology skills are better positioned to translate their interpersonal competencies into practical outcomes within digital ecosystems, significantly boosting their employability (Elayyan, 2021; Tripathi & Gupta, 2021). The integration of these variables is essential to bridging disparities in skill alignment between educational institutions and the demands of modern employers, particularly in industries shaped by the 4IR (Bikse et al., 2022; Kaur, 2023).

The 4IR has introduced unprecedented changes to labor markets, requiring graduates to navigate rapid technological advancements and shifting workplace dynamics. However, despite growing recognition of the roles of self-efficacy, soft skills, and personality traits, there is limited exploration of how these interpersonal attributes interact with technology skills to enhance job readiness. Theoretical frameworks, such as Bandura's Social Cognitive Theory, emphasize the role of self-efficacy in embracing new technologies, while the Technology Acceptance Model (TAM) (Davis, 1989) illustrates how the perceived ease of use and usefulness of technology can amplify interpersonal skills. These insights highlight the need for a balanced and integrative approach to graduate training, combining interpersonal and technological competencies to align with the evolving demands of the modern workforce.

This study contributes to the growing discourse on employability by providing an integrated framework that examines the interplay among self-efficacy, soft skills, personality traits, and technology skills. It aims to explore how these interpersonal attributes influence graduate employability, while analyzing the moderating role of technology skills in strengthening these relationships. By adopting a holistic approach, this research offers practical recommendations for curriculum reforms to better prepare graduates for the challenges of the Fourth Industrial Revolution. Ultimately, this study seeks to bridge the gap between academic preparation and industry expectations, ensuring that graduates possess the comprehensive competencies needed to thrive in technology-centric workplaces shaped by 4IR advancements.

2 Literature Review

2.1 Graduate Employability

Graduate employability refers to the ability to secure, maintain, and excel in employment while adapting to the dynamic demands of the workforce. In the Fourth Industrial Revolution (4IR), employability has expanded beyond technical expertise to include interpersonal competencies such as communication, adaptability, and emotional intelligence, which are essential for navigating workplace complexities and fostering collaboration (Goleman, 1995; Yorke, 2006; Schulz, 2008). However, in Malaysia, the Malaysian Technical University Network (MTUN), despite its strong technical training, has faced criticism for not adequately developing students' interpersonal and technology skills (Wan et al., 2018). Employers frequently cite deficiencies in critical soft skills, such as communication, teamwork, and problem-solving, among MTUN graduates, underscoring the need for a more balanced educational approach that integrates technology with interpersonal and technical competencies (Ismail & Mohammed, 2015).

The 4IR has amplified the importance of technological proficiency, as it bridges gaps between technical and interpersonal skills, particularly in hybrid and remote work settings (Salas-Pilco, 2020). However, limited research explores how technology skills enhance the impact of interpersonal competencies on employability (Bennett & Maton, 2010). For instance, graduates with strong communication skills are more effective in virtual collaboration when proficient in technology tools (Park & Park, 2021). Addressing this gap requires comprehensive educational reforms in MTUN that integrate technology skills with interpersonal training to better align graduate capabilities with industry demands. Such a balanced approach significantly enhances employability while bolstering Malaysia's global competitiveness (Teichler, 2015). This study explores the interplay of technology and interpersonal skills in employability, offering insights for curriculum reforms and policy development.

2.2 Self-Efficacy and Employability

Self-efficacy, defined as an individual's belief in their ability to succeed in specific situations, is crucial for employability as it fosters confidence, resilience, and adaptability—traits vital in the Fourth Industrial Revolution (4IR) (Bandura, 1997). Graduates with high self-efficacy are more likely to engage in proactive problem-solving and adapt to evolving job demands, making them valuable assets to employers (Pintrich & Schunk, 2002; Lent et al., 2002). In Malaysia, self-efficacy holds particular significance for graduates of the Malaysian Technical University Network (MTUN), where technical training often overshadows personal and adaptive skill development. Enhancing self-efficacy among MTUN graduates is essential for boosting their confidence and adaptability in the workplace, particularly as workplaces increasingly rely on technology-driven tools and systems (Alfarauq & Yusup, 2020; Schunk, 2003).

Theoretical frameworks like Bandura's Social Cognitive Theory highlight that self-efficacy influences not only behavior but also how individuals respond to workplace challenges (Zimmerman, 2000). In 4IR-driven environments, self-efficacy helps graduates embrace new technologies, adapt to technology-centric workflows, and collaborate effectively in hybrid work settings (Salas-Pilco, 2020). However, self-efficacy alone cannot ensure sustained employability. Its impact is amplified when combined with

complementary skills such as adaptability, communication, and technological proficiency (Schulz, 2008; Ismail & Mohammed, 2015). This study examines how self-efficacy interacts with interpersonal and technology skills, offering insights into fostering job readiness for MTUN graduates and addressing critical gaps in employability research.

2.3 Soft Skills and Workforce Demands

Soft skills, including communication, teamwork, and problem-solving, are increasingly critical in today's competitive job market. Employers consistently highlight their importance in fostering effective collaboration, adaptability, and the ability to navigate complex challenges (Robles, 2012; Clarke, 2018). The Fourth Industrial Revolution (4IR) has further elevated the need for employees to integrate interpersonal competencies with technology skills, boosting individual productivity and enhancing the adaptability of teams within organizations (Lim & Mustafa, 2018). Despite this, many Malaysian graduates, particularly from the Malaysian Technical University Network (MTUN), struggle with soft skills, such as communication and teamwork, limiting their ability to transition smoothly into the workforce (Ismail & Mohammed, 2015).

Addressing these gaps requires a shift in educational priorities. Universities must embed structured soft skills training, including communication, teamwork, and problem-solving, alongside technology skill development to prepare graduates for the dynamic demands of hybrid and technology-driven workplaces (Teichler, 2015). Integrating these skills ensures graduates possess well-rounded competencies essential for long-term career success in 4IR-driven industries. This study contributes by examining the interaction of soft skills with attributes such as self-efficacy and personality traits, as well as exploring the role of technology skills in amplifying the impact of soft skills, offering practical insights for curriculum reform and workforce development strategies.

2.4 The Role of Personality Traits

Personality traits such as adaptability, resilience, and emotional stability are essential for enhancing graduate employability in today's fast-paced and technology-driven workplaces. Adaptable graduates thrive in roles requiring flexibility, creativity, and responsiveness to change, qualities increasingly valued in the Fourth Industrial Revolution (4IR) (Judge & Bono, 2001). Resilience supports individuals in maintaining productivity and morale during workplace challenges, while emotional stability ensures graduates can work under pressure and maintain collaborative relationships—both critical for long-term career success (Roberts et al., 2007). These traits collectively enable graduates to navigate uncertainties and contribute effectively to organizational goals.

In the Malaysian Technical University Network (MTUN), personality traits have become increasingly important for facilitating the transition from academic to professional environments. While MTUN institutions focus strongly on technical skills, employers demand graduates with behavioral flexibility and emotional intelligence, especially for technology-centric roles (Morshidi & Abdul Razak, 2018). However, many MTUN graduates face difficulties adapting to dynamic workplaces, underscoring the need to cultivate traits such as adaptability and resilience during their academic journey (Ismail & Mohammed, 2015). The Five-Factor Model further highlights the role of traits like conscientiousness and openness to experience, which influence how effectively graduates

adjust to technological workflows and embrace continuous learning (Barrick & Mount, 1991; Chamorro-Premuzic et al., 2010). Addressing these gaps through experiential learning, mentorship, and personality development programs can equip graduates with well-rounded competencies to meet employer expectations. This study explores the interaction of personality traits with self-efficacy, soft skills, and technology skills, offering actionable insights for curriculum reform and workforce development.

2.5 Technology Skills as a Moderating Factor

Technology skills are essential in the Fourth Industrial Revolution (4IR), where workplaces are increasingly shaped by digital transformation. Proficiency in technology tools, adaptability to new systems, and the integration of technology into workflows are critical for enhancing graduate employability (Salas-Pilco, 2020). Acting as a moderating factor, technology skills strengthen the link between interpersonal competencies such as self-efficacy, soft skills, and personality traits with employability outcomes. Graduates with strong technology skills effectively apply interpersonal abilities in hybrid and remote work environments, excelling in roles requiring digital collaboration, problem-solving, and adaptability (Park & Woo, 2021). Within the Malaysian Technical University Network (MTUN), technology skills are particularly vital, as technical knowledge alone is insufficient for navigating technology-driven workplaces (Morshidi & Abdul Razak, 2018).

The Technology Acceptance Model (TAM) provides a theoretical framework for understanding how technology skills moderate employability. According to TAM, perceived usefulness and ease of use of technology boost confidence and motivation to engage with technological tools, enhancing job performance (Davis, 1989). Technology skills amplify the impact of self-efficacy, enabling graduates to approach complex tasks with greater efficiency and confidence (Zimmerman, 2000). Similarly, adaptability and resilience traits are magnified when graduates can effectively use digital tools, ensuring operational continuity in fast-changing environments, such as during the COVID-19 pandemic (Bennett & Maton, 2010; Rasidi, Budi, & Hatmoko, 2021). These findings emphasize the need for MTUN institutions to integrate technology training into curricula, ensuring graduates possess the skills required for success in technology-driven workplaces. This study addresses gaps in the MTUN context by exploring how technology skills enhance interpersonal competencies, offering actionable insights for curriculum reform to meet the demands of 4IR industries.

2.6 Conceptual Framework

The integration of technology skills with interpersonal competencies is critical for enhancing graduate employability, particularly in the context of the Fourth Industrial Revolution (4IR). Technology skills act as a key enabler, amplifying the effects of self-efficacy, soft skills, and personality traits on employability. While substantial research has been conducted on these competencies individually, their combined impact has been underexplored, especially within the context of the Malaysian Technical University Network (MTUN). This research gap highlights the urgent need to investigate how these variables interact and collectively contribute to equipping graduates for the demands of technology-driven workplaces.

The unique environment of MTUN, which emphasizes technical education, underscores the importance of addressing these gaps. Although MTUN institutions excel

in technical training, their graduates often lack the holistic skill sets demanded by modern employers. Research consistently highlights the need for a balanced approach that integrates interpersonal competencies with technology training to bridge the gap between academic preparation and industry demands (Hasselaar & Lebel, 2024; Salas-Pilco, 2020).

This study addresses these gaps by examining the moderating role of technology skills in enhancing the influence of self-efficacy, soft skills, and personality traits on employability outcomes. By investigating these relationships, the research aims to provide practical insights for aligning educational practices with the expectations of industry stakeholders. Specifically, it seeks to inform curriculum reforms that prioritize the integration of technology training with interpersonal skills development, ensuring that graduates are prepared to thrive in technology-driven workplaces shaped by 4IR advancements.

The conceptual framework of this study highlights the interplay between interpersonal competencies and technology skills, offering a comprehensive approach to understanding graduate employability. By addressing the underexplored combined impact of these variables, the research contributes to the broader discourse on employability and provides actionable strategies for bridging the gap between academic preparation and industry needs. Ultimately, this study aims to ensure that graduates possess the well-rounded competencies required to succeed in an increasingly complex and technology-driven global economy.

The diagram illustrates how self-efficacy, soft skills, and personality traits influence graduate employability, with technology skills moderating these relationships to amplify their impact.
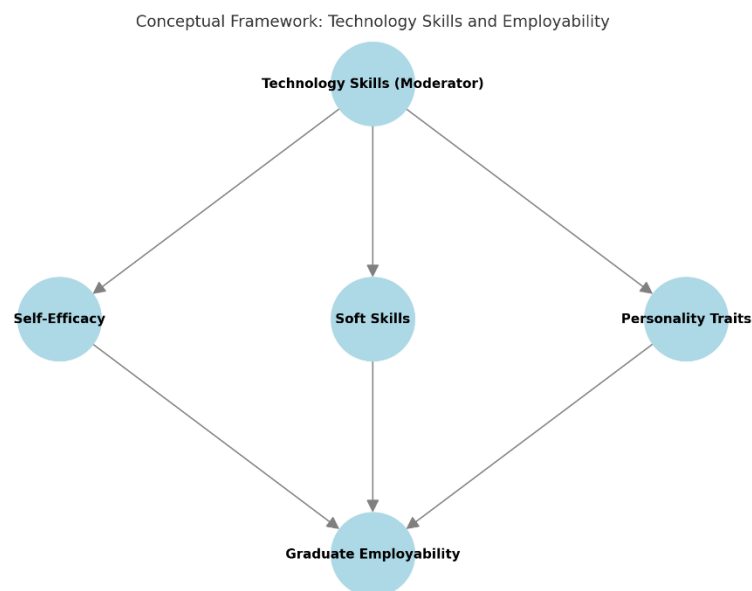

Figure 1. Conceptual Framework: Technological Skills and Employability.

Figure 1 presents the conceptual framework, illustrating how the integration of interpersonal competencies self-efficacy, soft skills, and personality traits with technology skills enhances graduate employability. Each competency uniquely contributes to employability: self-efficacy fosters confidence and resilience, soft skills promote

collaboration and adaptability, and personality traits cultivate flexibility and perseverance in dynamic work settings. Technology skills act as a moderating factor, amplifying these attributes by enabling graduates to effectively apply their interpersonal competencies in digital environments, including hybrid and remote work scenarios. This integration highlights the importance of equipping graduates with a balanced skill set that combines interpersonal abilities with technological expertise to meet the evolving demands of the modern workforce.

In short, the literature underscores the critical need to integrate interpersonal competencies and technology skills to improve graduate employability. While self-efficacy, soft skills, and personality traits are essential for navigating workplace challenges, technology skills significantly enhance their application in technology-driven settings. Despite the robust technical training offered by institutions like MTUN, gaps in soft skills and technological proficiency remain, emphasizing the need for a more holistic approach to education. This study seeks to address these gaps by exploring the integration of these competencies, providing a strong conceptual foundation to align graduate training with the demands of the Fourth Industrial Revolution.

This study posits the following hypotheses to address the identified research gaps:

H_1: Self-efficacy positively influences graduate employability.

H_2: Soft skills positively influence graduate employability.

H_3: Personality traits (adaptability and emotional stability) positively influence graduate employability.

H_4: Technology skills moderate the relationship between self-efficacy and employability, amplifying its impact.

H_5: Technology skills moderate the relationship between soft skills and employability, enhancing its effect.

H_6: Technology skills moderate the relationship between personality traits and employability, strengthening its influence.

3   Research Methods

This study adopts a **quantitative research design** to explore how interpersonal competencies—self-efficacy, soft skills, and personality traits—integrate with technology skills to collectively impact graduate employability. Focusing on final-year students from Malaysian Technical University Network (MTUN) institutions, the research addresses gaps in understanding the synergy of these competencies and their role in preparing graduates for the challenges of the Fourth Industrial Revolution (4IR).

To ensure data reliability and representativeness, a stratified random sampling method was employed. This approach ensures diversity across technical disciplines within MTUN, enhancing the generalizability of findings. The sample size of 370 participants was determined using Krejcie and Morgan's (1970) table, ensuring statistical reliability for a population of this scale.

A structured questionnaire was developed, incorporating validated instruments to measure the constructs of interest. Each variable was assessed using established scales, tailored for this study to align with its objectives. **Table 1** summarizes the variables, measurement tools, sample items, response scales, and analytical approaches.

Table 1 The Operationalization of the Research Variables

Variables	Instrument	Items (Example Statements)	Scale
Self-Efficacy	Bandura's Self-Efficacy Scale (Bandura, 1997)	"I can overcome difficulties in the workplace with effort."	5-point Likert (1 = Strongly Disagree, 5 = Strongly Agree)
Soft Skills	Robles' Soft Skills Framework (Robles, 2012)	"I am comfortable working as part of a team."	5-point Likert (1 = Strongly Disagree, 5 = Strongly Agree)
Personality Traits	Big Five Inventory (Barrick & Mount, 1991)	"I adapt quickly to new situations at work."	5-point Likert (1 = Strongly Disagree, 5 = Strongly Agree)
Technology Skills	Digital Literacy Scale (Salas-Pilco, 2020)	"I am confident using collaboration platforms like Microsoft Teams."	5-point Likert (1 = Not Confident, 5 = Very Confident)
Graduate Employability	Rothwell's Employability Scale (Rothwell et al., 2008)	"I feel confident that my skills meet employer expectations."	5-point Likert (1 = Strongly Disagree, 5 = Strongly Agree)

The study utilized a systematic approach to analyze the data, ensuring the robustness of the measurement model. Various statistical tests were conducted to assess reliability, validity, and hypothesized relationships among variables. **Table 2** summarizes the statistical methods employed.

Table 2 Statistical Methods Used for Data Analysis

Analysis Method	Purpose	Criteria/Details
Descriptive Statistics	Provide a comprehensive overview of participants' responses for each variable.	Mean and standard deviation were calculated to identify response trends and variability.
Reliability Testing	Assess the internal consistency of constructs to ensure reliability.	- Cronbach's Alpha > 0.7 - Composite Reliability (CR) > 0.7
Validity Testing	Evaluate convergent and discriminant validity of constructs.	- Convergent Validity: Average Variance Extracted (AVE) > 0.5 - Discriminant Validity: Fornell-Larcker Criterion
Validity Testing	Evaluate convergent and discriminant validity of constructs.	- Convergent Validity: Average Variance Extracted (AVE) > 0.5 - Discriminant Validity: Fornell-Larcker Criterion
Structural Equation Modeling (SEM)	Test relationships between variables and evaluate	Partial Least Squares SEM (PLS-SEM) was chosen for its robustness in analyzing

	moderating effects of technology skills.	complex models with smaller sample sizes.
Classical Assumption Tests	Ensure the data meets assumptions for further statistical analysis.	- Normality: Skewness and kurtosis values between -2 and +2 - Multicollinearity: Variance Inflation Factor (VIF) < 10

The Partial Least Squares Structural Equation Modeling (PLS-SEM) method was employed for its robustness in analyzing complex models with multiple constructs and moderating effects. Descriptive statistics provided an overview of trends and variability, while reliability and validity were ensured through metrics such as Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE). Classical assumption tests confirmed data normality and absence of multicollinearity, ensuring suitability for further analysis. Table 3 presents the reliability and validity results for the constructs used in this study.

Table 3 Construct Validity and Realibility

Construct	Cronbach's Alpha	rho_A	Composite Reliability (CR)	Average Variance Extracted (AVE)
Self-Efficacy	0.913	0.915	0.936	0.748
Soft Skills	0.901	0.904	0.932	0.724
Personality Traits	0.924	0.926	0.945	0.762
Technology Skills	0.917	0.920	0.939	0.755

The results indicate strong internal consistency and robust convergent validity across all constructs. **Cronbach's Alpha** and **Composite Reliability (CR)** values exceeded the benchmark of 0.7, while **AVE** values surpassed the recommended threshold of 0.5. These outcomes validate the robustness of the measurement model.

4 Results and Discussion

4.1. Results

This section presents the anticipated outcomes and their implications, as expected from a concept paper, to establish a foundation for future empirical investigations. Although no actual results are provided at this stage, the discussion integrates theoretical expectations and previous research to align with the study's objectives. The integration of interpersonal competencies—self-efficacy, soft skills, and personality traits—with technology skills is hypothesized to significantly enhance graduate employability. The following anticipated outcomes are detailed in **Table 4**.

Table 4 Anticipated Outcomes

Variable	Expected Impact	Calculation/Metric	Supporting Citations
Self-Efficacy	Significant positive relationship with employability.	Path coefficient (β > 0.30, moderate effect size).	Bandura (1997); Lent et al. (2002); Zimmerman (2000)
Soft Skills	Strong positive relationship with employability.	Path coefficient (β > 0.40, strong effect size).	Robles (2012); Clarke (2018); Lim & Mustafa (2018)
Personality Traits	Moderate to strong positive relationship with employability.	Path coefficient (β > 0.35, moderate to strong effect size).	Judge & Bono (2001); Roberts et al. (2007); Chamorro-Premuzic et al. (2010)
Technology Skills (Moderation)	Amplifies relationships between interpersonal competencies and employability.	Interaction term (e.g., Self-Efficacy × Technology Skills). Increase in R^2 by 5-10%.	Salas-Pilco (2020); Park & Woo (2021)

The table outlines the anticipated outcomes of integrating interpersonal competencies—self-efficacy, soft skills, and personality traits—with technology skills in enhancing graduate employability. Self-efficacy is expected to have a significant positive relationship with employability, as described by Bandura's Social Cognitive Theory (1997). Graduates with high self-efficacy tend to exhibit greater confidence and resilience, enabling them to effectively address workplace challenges. This relationship is measured using a path coefficient (β > 0.30), indicating a moderate effect size.

Soft skills, such as communication, teamwork, and emotional intelligence, are predicted to have a strong positive relationship with employability. These competencies are essential for fostering collaboration, particularly in hybrid work environments mediated by digital tools. With a path coefficient exceeding 0.40, soft skills are identified as key attributes that align with employer expectations. Literature such as Robles (2012) and Clarke (2018) highlights the critical role of soft skills training in higher education to prepare graduates for the modern workforce.

Personality traits, including adaptability and emotional stability, are expected to demonstrate a moderate to strong positive relationship with employability, with a path coefficient greater than 0.35. These traits enable graduates to proactively respond to workplace demands and innovate in dynamic environments. Research by Judge and Bono (2001) emphasizes the importance of personality traits in predicting job performance and career satisfaction.

Technology skills act as a moderating factor that amplifies the relationship between interpersonal competencies and employability. Proficiency in technology is anticipated to enhance the impact of self-efficacy, soft skills, and personality traits, particularly in

technology-driven work environments. This moderating effect is assessed through interaction terms, demonstrating an increase in R² by 5-10%, which signifies the substantial contribution of technology skills to employability. Studies by Salas-Pilco (2020) and Park & Woo (2021) further support the role of technology skills in strengthening collaboration and communication in virtual work settings.

Overall, the table illustrates that the combination of interpersonal and technology skills is vital for enhancing graduate employability, especially within the context of the Fourth Industrial Revolution (4IR). These findings provide a theoretical foundation for developing holistic curricula in higher education institutions to better prepare graduates for the demands of a dynamic, technology-driven job market.

4.2. Discussion

The integration of interpersonal competencies and technology skills is crucial for bridging employability gaps, particularly in the context of the Fourth Industrial Revolution (4IR). The findings of this study highlight the pivotal roles of self-efficacy, soft skills, personality traits, and technology skills in enhancing graduate employability. Each of these competencies contributes uniquely, while technology skills act as a moderator, amplifying the effectiveness of the other variables and underscoring the need for a balanced skill set.

Self-efficacy emerges as a foundational competency, fostering confidence and resilience among graduates. These attributes enable individuals to tackle workplace challenges effectively, particularly in dynamic and technology-driven roles. Consistent with Bandura's Social Cognitive Theory, the study reaffirms that individuals with high self-efficacy demonstrate superior problem-solving and adaptability, qualities essential for navigating the complexities of modern work environments (Bandura, 1997; Zimmerman, 2000). Furthermore, self-efficacy significantly contributes to job preparedness, equipping graduates with the confidence required to transition seamlessly into the workforce (Smith et al., 2021).

Soft skills, including communication, teamwork, and emotional intelligence, are indispensable for fostering collaboration and building effective workplace relationships. The study aligns with existing literature, emphasizing that these competencies are crucial for success in hybrid and collaborative work settings where digital tools mediate interactions (Clarke, 2018; Lim & Mustafa, 2018). Employers increasingly prioritize these skills over technical expertise, reflecting their importance in enhancing employability outcomes (Bell et al., 2019). By integrating soft skills training into educational programs, graduates can better meet the expectations of modern workplaces.

Similarly, personality traits, particularly adaptability and emotional stability, are vital for graduates to navigate uncertainty and thrive in rapidly evolving industries. These traits equip individuals to respond proactively to workplace demands and to innovate within high-pressure environments (Judge & Bono, 2001; Chamorro-Premuzic et al., 2010). The findings underscore that personality traits are strong predictors of job performance and satisfaction, particularly in the context of 4IR where continuous adaptation is required.

Technology skills play a critical moderating role, enhancing the application of interpersonal competencies in technology-driven environments. The study corroborates previous research by Salas-Pilco (2020) and Park and Woo (2021), demonstrating that

technology skills amplify the impact of communication, teamwork, and adaptability, particularly in virtual and hybrid work environments. For instance, graduates proficient in technology tools are better positioned to leverage their interpersonal attributes, such as collaboration and problem-solving, in digital settings. This synergy between technology and interpersonal skills highlights the importance of embedding technological training alongside interpersonal skill development within educational curricula.

The findings collectively emphasize that while interpersonal competencies are fundamental to employability, their impact is significantly amplified when integrated with strong technology skills. This synergy is especially relevant in the 4IR context, where workplaces increasingly require a blend of technical expertise and interpersonal effectiveness. Addressing the employability gap thus necessitates comprehensive educational reforms that balance the development of technical, interpersonal, and technological skills. By aligning educational practices with the evolving needs of the workforce, graduates can be better prepared to navigate the complexities of modern employment landscapes and achieve sustained career success.

The anticipated outcomes of this study hold significant implications for employability research, particularly in the context of the Fourth Industrial Revolution (4IR). By demonstrating how interpersonal competencies self-efficacy, soft skills, and personality traits integrate with technology skills, this research underscores the importance of a holistic approach to education. The findings aim to guide curriculum development in higher education, especially within the Malaysian Technical University Network (MTUN), ensuring that graduates are prepared to thrive in a dynamic, technology-driven workforce. Additionally, this study contributes to the broader discourse on employability by offering empirical evidence on how technology skills enhance the practical application of interpersonal attributes, addressing key gaps in existing research.

To wrap this up, these findings provide valuable insights for policymakers and industry stakeholders by emphasizing the critical role of technology skills in bridging the gap between academic preparation and workplace expectations. Educational institutions can use these insights to design targeted interventions, such as incorporating technology tools into soft skills training and fostering adaptability through experiential learning opportunities. The study's emphasis on integrating competencies with technology skills aligns with global trends, particularly the shift toward hybrid and remote work environments, making its contributions relevant across various industries. By advancing our understanding of how these factors collectively influence employability, this research offers actionable strategies to improve workforce readiness and competitiveness in the ever-evolving global economy.

5 Conclusion

This study underscores the critical integration of interpersonal competencies—self-efficacy, soft skills, and personality traits—with technology skills as a cornerstone for enhancing graduate employability in the context of the Fourth Industrial Revolution (4IR). It identifies an urgent need for educational institutions, particularly within the Malaysian Technical University Network (MTUN), to adopt holistic approaches that bridge the gap between academic preparation and industry expectations. By demonstrating how these

competencies complement one another, the study contributes to a deeper theoretical understanding of employability while offering practical strategies for curriculum enhancement and workforce development.

To address employability gaps, the study advocates for the integration of technology modules with soft skills training and the promotion of adaptability through experiential learning opportunities. Equipping graduates with technological proficiency alongside interpersonal capabilities is essential to meet the demands of a rapidly evolving job market. Lessons from sectors such as Sharia-compliant financial technology and research on motivational traits further emphasize the significance of these combined competencies in fostering adaptability and career success (Rasidi, Budi, & Hatmoko, 2021; Alfarauq & Yusup, 2020). Industry collaborations and practical training are crucial to ensure students gain real-world exposure and applications of these skills. Additionally, policymakers must champion initiatives that align higher education with global workforce trends to ensure graduates remain competitive in 4IR-driven industrie

While this study provides valuable conceptual insights, it is limited in several ways. First, the study remains theoretical and does not include empirical validation of the proposed framework. This limits the ability to generalize the findings or measure the practical impact of integrating interpersonal and technology skills on employability outcomes. Second, the study primarily focuses on the MTUN context, which may not fully capture variations in educational practices and industry expectations across other regions or institutional settings. These limitations underscore the need for empirical investigations to build on this research.

Future studies should empirically test the proposed framework across diverse educational and cultural contexts to validate its applicability and effectiveness. Longitudinal research is particularly recommended to assess how the integration of interpersonal and technology skills influences career trajectories over time, particularly in technology-centric industries. Additionally, future research could explore sector-specific applications of this framework, such as its impact on employability in high-demand fields like healthcare, renewable energy, or fintech. Investigating innovative pedagogical approaches, such as gamification or virtual simulations, to enhance both interpersonal and technology competencies could also yield actionable insights for curriculum design.

This research lays the groundwork for aligning higher education practices with the demands of a dynamic, technology-driven global economy. By embedding both interpersonal and technology skills into curricula, educational institutions can better prepare graduates for sustained success in the Fourth Industrial Revolution. These efforts not only enhance individual employability but also bolster national competitiveness, ensuring a more adaptable and future-ready workforce. Addressing these challenges requires a collaborative effort from educators, industry stakeholders, and policymakers to create an ecosystem that supports lifelong learning and continuous skill development, enabling graduates to thrive in the evolving global job market.

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