Industry Skill Demands and Priority Competencies Required by Employers in Eastern Uganda

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ABSTRACT

Technical and Vocational Education and Training (TVET) is a key strategy to fill the skills gap and improve employability in Eastern Uganda. The study compared the skills and priority competencies demanded by the employers with the type and quality of training provided by the TVET institutions in the region, and the impact of the above was studied. A convergent parallel mixed methods research design was used, which comprised questionnaires and interviews with 476 respondents, comprising 326 trainees, 138 trainers, 6 principals, and 6 industrial partners, with a response rate of 98.4%. The results reveal that TVET curricula are seen as industry-oriented, but there are still gaps in the implementation of TVET curricula in practice, soft skills, and exposure to current technologies. The correlation between the industry skill requirements and marketable skills development was very high ($r = 0.645$). From the regression analysis, the variance in the marketable skill development ($R^2 = 0.416$) was explained by skill requirements in the industry. Based on the study, the researcher recommends that while theoretically TVET training is oriented towards the workplace, this is not always the case in terms of providing competencies for the workplace. It recommends a national framework for practical skills fidelity, adding industry-based problem-solving elements in training curricula; a national TVET technology modernization fund; a national innovation ecosystem; and using strategic foresight in training curricula to plug the skills gap between training and industry.

Key Words: *Industry Skill Demands, Priority Competencies, TVET, Marketable Skills Development, Employer Requirements.*

INTRODUCTION

Technical and Vocational Education and Training (TVET) is therefore a key factor in economic growth and development of workforces in order to respond to the changing needs of a dynamic labor market, as it enhances the skills of people to contribute to the economic growth of the country and its citizens (IAG-TVET, 2025). There is evidence that linking TVET outcomes with industry needs is still a challenge in Uganda, particularly in Eastern Uganda, partly brought about by poor institutional-industry linkages, lack of resources, and poor training curricula alignment with industry needs (Iddrisu & Edjigu, 2025). The mismatch has exacerbated youth unemployment and underemployment; as per recent surveys, about 30% of the youth population that is institutionally qualified cannot find employment (Yiga, 2022). The coordination of TVET between the institutions and industries is therefore critical in ensuring the graduates acquire skills that are marketable and required by industries to improve their employability and drive the development of the region (UNESCO-UNEVOC, 2021).

One of the key elements of this partnership is the precise identification and incorporation of industry skills requirements and priority skills in TVET programs. Various studies in different contexts indicated that TVET graduates' technical and soft skills are not in line with the skills required by the job market (Oluropo, 2022; Generalao et al., 2025; Jamaludin et al., 2023). In Eastern Uganda, despite having a number of industries, there

is a huge gap between TVET training and the demand of the industry, in that a preference is given to the informally trained apprentices as opposed to the formally trained apprentices from TVETs, thus creating a critical disconnect (Jones, 2020). Although the alignment of policy objectives is being enhanced through national policy initiatives such as the Skilling Uganda Strategy and TVET Policy of 2025, the region does not have all the TVETs improving; many of them have outdated equipment and poor industrial exposure (ACET, 2025; Nakawala et al., 2025).

In this context, the current study aimed to examine industry skills and the specific priority competencies that employers demand in Eastern Uganda. The research was based on the Human Capital Theory, which considers education and training as an investment that enhances individual productivity and employability (Sharipov, 2024), and tested a hypothesis on the fact that industry skill demands and priority competencies significantly influence the type and quality of training that TVET institutions in the region offer to learners. The study adopted a mixed-methods design approach that involved TVET institutions, trainees, and industry employers to elicit empirical evidence specific to the context in which TVET institutions worked to align the curriculum, to strengthen the partnerships between TVET trainers and industry employers, and finally, to enhance the marketability of the TVET graduates in Eastern Uganda.

SPECIFIC OBJECTIVE OF THE STUDY

Analyze industry skill demands and priority competencies required by employers in Eastern Uganda.

Research Hypothesis

H1: Industry skill demands and priority competencies have a significant influence on the type and quality of training provided by TVET institutions in Eastern Uganda.

LITERATURE REVIEW

In the literature, there has been a constant report of a mismatch of TVET training with labor market demand as a consequence of obsolete training programs, inadequate practical training, and the rapid pace of technological change, which has a negative effect on the employability of TVET graduates and employers' lack of recognition of TVET qualifications despite the persistent skills shortage in industry (Oluropo, 2022; Generalao et al., 2025; Jamaludin et al., 2023; Tuenpusa et al., 2021). However, the employers' preference for TVET graduates with soft skills and with technical skills that can be applied in the digital era, like applied engineering-mathematics-physics, problem-solving, communication, teamwork, adaptability, and personal management, indicates that TVET graduates are not necessarily equipped with adequate soft skills and digital skills (Hasan et al., 2025; Nugraha et al., 2020; Shahbazi & Ahmady, 2022). To remedy this, it is recommended that TVET and industry public-private partnerships (PPPs), internships, enterprise-based TVET trainings, and TVET teachers' ongoing professional development in the use of digital tools and its integration into education be increased, as these have been proven to improve the employability of TVET participants (Abdullah & Masek, 2024; Generalao et al., 2025; Yusvana, 2025). The lack of sustainable partnerships, institutional constraints, and the rapid technological changes, however, hinder the extent of their implementation in practice, and key barriers to effective local implementation are not much explored (Jamaludin et al., 2023; Yusvana, 2025).

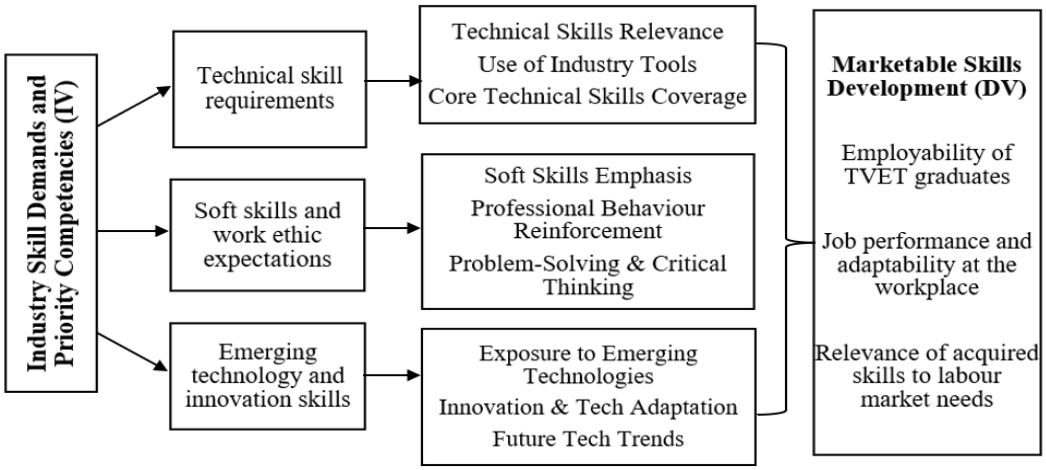
The literature also overwhelmingly confirms that soft skills and work ethic are key factors in the employability of TVET graduates, and in technologically advanced and automated workplaces, employers seem to appreciate these skills as much or more than technical skills (Poláková et al., 2023; Varma & Malik, 2023). Evidential data indicate that labor market success is inextricably tied to the essential skills such as problem-solving, critical and analytical thinking, communication, creativity, innovation, collaboration, networking, and self-marketing, which have a strong relationship with labor market success among the TVET graduates and postgraduate graduates (Oviawe, 2020; Hussein, 2024; Awodiji & Magogodi, 2023). This agreement has not yet been reflected in the curricula of TVET institutions, as soft skills are generally underrepresented and sometimes little understood; the integration of soft skills in practical training is limited, and technical skills are the predominant focus, leaving graduates with a lack of skills in communication, interpersonal interaction, decision-making, and problem-solving (Melesse et al., 2023; Massi et al., 2026)). Although innovative pedagogies such as problem-based learning, work-integrated learning, and internships have been noted as effective pedagogies, there is minimal

industry interaction with TVET and also minimal involvement of industry in developing the curriculum, leaving the trainers with minimal exposure to the latest industrial practices and thereby limiting the relevance and impact of soft skills training (Varma & Malik, 2023; Kasim et al., 2024; Massi et al., 2026)).

The literature indicates that emerging technologies such as artificial intelligence (AI), virtual reality (VR) and augmented reality (AR), Internet of Things (IoT), digital simulators, and adaptive learning platforms have great potential for enhancing marketable skills development in TVET, such as increasing engagement, offering safe and economical hands-on learning experiences, customizing learning experiences, and enhancing technical and soft skills development (Kuwanta et al., 2023; Ghosh & Ravichandran, 2024; Tonui et al., 2025). These, however, are yet to be adopted due to related systemic challenges like limited internet connectivity, substandard infrastructure, funding issues, lack of up-to-date teachers' training, lack of digital competencies, resistance to change, and lack of training personnel with recent industry experience, which all contribute to the irrelevance of the training and poor employability outcomes (Akamobi & Grace, 2022; Nanjala et al., 2025; Tonui et al., 2025). The challenges stem from the broader and deep-going mismatch between TVET and industry, evidenced by the lack of access to the latest equipment, industrial support, work-based TVET, and continuous professional development for teachers, as well as poor ability to create marketable digital and innovative skills (Niwamanya et al., 2025). Yet literature and evidence indicate that a good partnership between the TVET providers and enterprises is essential for a meaningful transformation of TVET, provision of relevant curricula, employer alignment, and a level of work-based training to be relevant to the industries in which TVET learners are working (Abu et al., 2025; Niwamanya et al., 2025); although it is possible to use technology, there is a lack of collaboration between enterprises and TVET providers, outdated curricula, a low level of work-based training, and minimal industry specificity in TVET research and practice.

Despite extensive global literature on TVET skills development, clear research gaps persist that justify the current study. Most of the existing literature is geographically limited to outside Sub-Saharan Africa or is very general global reviews, which are less relevant to Uganda's specific industrial structure, policy context, and labor market requirements (Oluropo, 2022; Poláková et al., 2023; Ghosh & Ravichandran, 2024). Furthermore, most of the literature is mainly concerned with the problems facing TVET, technological tools, or gaps in generic skills, with little empirical attention given to the demand of the local industries, the effectiveness of the TVET industry collaboration mechanism, and actual challenges that hinder industry collaboration in localized environments (Melesse et al., 2023; Akamobi & Grace, 2022). Methodologically, most studies adopted a conceptual framework/or literature review/or policy analysis, or a single-method design, failing to seek input from the employer and thus lacking the depth to explain the rationale for the failure of collaboration (Varma & Malik, 2023; Niwamanya et al., 2025). The present study set out to address these gaps by studying the empirical context of Eastern Uganda and applied a mixed-methods approach to collect primary data from TVET trainees, industry trainers, and industry employers with the specific objective of identifying locally relevant marketable skills, exploring how industry and TVET are currently working together, and identifying context-specific barriers to successful collaboration between industry and TVET.

CONCEPTUAL FRAMEWORK



Source: Adopted from NGU and Teneng (2020) and modified by the researcher

Figure 1 illustrates a conceptual model of the relationship between industry skill demands, priority competencies, and the development of marketable skills among TVET graduates. The independent construct is comprised of 3 related dimensions: Technical Skill Requirements (relevance of technical skills, effective use of industry-specific tools, and core technical content); Soft Skills and Work Ethic Expectations (professional conduct, strong work ethic, and problem-solving and critical thinking skills); and Emerging Technology and Innovation Skills (exposure to contemporary technologies, ability to innovate and adapt with technology, and awareness of emerging trends in technology). Timiras et al. (2024) argue that the industry-driven competencies are hypothesized to affect the dependent construct, marketable skills development, which is operationalized through graduates' employment, working performance, adaptability to the work environment, and fit with the labor market. The framework confirms the notion that the conscious and strategic integration of TVET training with industry's multi-dimensional competencies is an important avenue to mitigate skills gaps and make workforces and economic productivity relevant.

METHODOLOGY

The research employed a convergent parallel mixed-methods design and descriptive research approach to thoroughly explore the phenomenon of TVET-industry partnerships and its implications for the development of marketable skills in Eastern Uganda. The descriptive design was used to describe the current scenarios and practices, while the mixed-methods design (pragmatist paradigm) enabled the collection of both quantitative and qualitative data for comprehensive analysis and triangulation (Schoonenboom & Johnson, 2017).

The study involved a total of 476 participants from six purposively selected TVET institutions and their associated industries in Eastern Uganda. 326 trainees, 138 trainers, 6 institutional principals, and 6 industrial partners have been identified as key stakeholder groups that are crucial to understanding the supply and demand side of skills training and were included in this sample. This composition enabled the needs outlined in the table below to be addressed in the institutional reality, as well as the experiences and expectations of the learners.

Table 1: Study Population, Sample Size, and Sampling Techniques

Category	Population	Sample size	Sampling Techniques
Principals	6	6	Purposive
Industrial Partners	6	6	Purposive
TVET Trainers	215	138	Stratified Random
Trainees	2,121	326	Stratified Random
Total	**2,348**	**476**	

Source: *MoES, TVET Department (2025)*

A combination of probability and non-probability sampling techniques was utilized. All 6 principals and 6 industry partners were purposively selected due to their key role in coordinating partnerships and institutional leadership (Palinkas et al., 2013). The multi-level stratified random sampling technique was used for the trainers and trainees. The population was first split into the six institutions and then further split into role (trainer/trainee) and course programs to ensure proportional representation and minimize sampling bias (Blair & Blair, 2015).

There were two main instruments used for data collection. Structured questionnaires in Google format were used to obtain quantitative data from the trainers and trainees on the industry skill requirements, effectiveness of linkage, barriers, and outcomes of skills development on a 5-point Likert scale. Separate semi-structured interview guides were also used to collect qualitative data with principals and industry partners to provide insight on the same themes. Both the expert review and pilot testing at Uganda Technical College Elgon confirmed the instrument's validity, as all the items had factor loadings exceeding 0.5 in the exploratory factor analysis. Reliability was assessed by conducting a pilot; all the items in each section of the questionnaire had Cronbach's alpha values greater than 0.70, thus confirming the reliability of the questionnaire.

Data obtained from questionnaires are quantitative and were processed in Excel and then analyzed in SPSS version 27. Data were summarized using descriptive statistics and tested for relationships between variables using inferential statistics (Pearson correlation and linear regression). The qualitative data gathered from the 12 interviews was transcribed and analyzed thematically using NVivo version 15 (Flick, 2013), and a hybrid inductive/deductive coding approach was used to show the patterns in relation to the research objectives.

Ethical clearance and permits were issued by the Busitema University Research Ethics Committee (BUREC) and the Uganda National Council for Science and Technology (UNCST). The Ministry of Education and Sports also gave its approval. Informed consent was obtained from all participants, and data were anonymized and kept in a secure place.

The study had high return rates and increased the representativeness of the data. The returned questionnaires from the quantitative part were 449 from a total of 464 questionnaires (96.8%). 100% of the 12 key informant interviews were completed. The overall response rate of 98.4% helps minimize the non-response bias and sets a good baseline for the results of this study on 'TVET-industry collaboration in Eastern Uganda' (Schoonenboom & Johnson, 2017).

RESULTS

Table 2: Descriptive statistics on industry skill demands and priority competencies required by employers

	Statements	***SD (%)***	***D (%)***	***NS (%)***	***A (%)***	***SA (%)***	***Mean***	***σ***
1	The technical skills I am taught/teaching are up-to-date with current industry practices.	0 (0)	26 (5.8)	30 (6.7)	219 (48.8)	174 (38.8)	4.20	.803
2	I am confident in using the tools and equipment that are standard in my industry.	0 (0)	11 (2.4)	41 (9.1)	256 (57.0)	141 (31.4)	4.17	.689
3	The training program adequately covers the core technical skills required for employment in my field.	6 (1.3)	16 (3.6)	35 (7.8)	279 (62.1)	113 (25.2)	4.06	.768
4	My training program emphasizes soft skills (e.g., communication, teamwork) as much as technical skills.	17 (3.8)	0 (0)	40 (8.9)	227 (50.6)	165 (36.7)	4.16	.879
5	I believe that punctuality, professionalism, and a strong work ethic are regularly reinforced in this institution.	5 (1.1)	15 (3.3)	55 (12.2)	255 (56.8)	119 (26.5)	4.04	.788
6	Problem-solving and critical thinking skills are regularly practiced in the training sessions.	0 (0)	15 (3.3)	30 (6.7)	254 (56.6)	150 (33.4)	4.20	.704
7	The curriculum includes exposure to emerging technologies (e.g., automation, digital tools) in my field.	10 (2.2)	31 (6.9)	56 (12.5)	212 (47.2)	140 (31.2)	3.98	.956
8	I am encouraged to learn about new innovations and adapt to technological changes.	0 (0)	5 (1.1)	37 (8.2)	259 (57.7)	148 (33.0)	4.22	.638
9	The training prepares me for future technological trends in the industry.	0 (0)	15 (3.3)	30 (6.7)	265 (59.0)	139 (31.0)	4.18	.693

Source: *Primary Data, 2025*

The results indicate that the technical curriculum was perceived by the respondents as somewhat congruent with the industry standards, but with certain variations. Of those that responded, the mean was 4.20 (moderate range, SD = 0.803), with a majority in agreement (48.8%) or strong agreement (38.8%) that skills taught are current and a minority undecided (6.7%) or disagreed (5.8%) with minor uncertainty across institutions. Also, there was a high level of confidence in their use of these industry-standard tools (57.0% agree and 31.4% strongly agree, mean=4.17, SD=0.689); 9.1% were undecided and 2.4% disagreed. The core technical skill coverage was also considered well answered, with a mean rating of 4.06 and SD of 0.768, 7.8% 'undecided' and 4.9% 'disagree' to some extent. The findings show that the curriculum is well established and effective in terms of the technical skills and competency in using practical tools; however, the experiences of the programs, as reflected in the results, show some inconsistencies and variations, which could be improved by regular updating of the curriculum and consistency of resources.

The qualitative findings show that the TVET institutions continuously look out for collaboration with the industry to ensure the relevance of the curriculum, there are feedback mechanisms, TVET modules are competency-based, and the TVET trainers are engaged in professional development regularly. The institutions emphasize practical training, simulation training, and industrial attachment, where the ultimate objective is to provide the students with the four elements of competence, but there is a lack of readiness for real-life scenarios due to limited exposure to state-of-the-art equipment and technology. Industry partner findings indicate that graduates have a reasonable knowledge of theory and basic skills, but need more training to be put into practice at work. These findings explain the high quantitative ratings for the curriculum relevance and the skill areas' coverage, as it reflects the differences in learners' experiences. As one institutional informant said,

> *"We keep our technical skills aligned with industry by encouraging our trainers to periodically return to industries to learn new technologies in their respective disciplines. We also invite experts from industries to participate directly in our institutional processes, such as assessing learners during their industrial training and contributing to curricula development and reviews. This two-way exchange ensures that practical, current knowledge flows into our programs"* (KII I4, 2025).

An industrial partner emphasized the ongoing gap, stating,

> *"Given the lack of familiarity with some tools and equipment, graduates still require training on how to use these tools and equipment; this indicates that the tools that are available at the TVETs may have some differences or less adequate for through training on hands-on learning" (KII I9, 2025).*

The results also show that the respondents have a positive perception of the high level of integration of soft skills, professional behaviors, and problem-solving skills in the training program, with some differences in perceptions. The mean of 4.16 with a variation rate of moderate (SD=0.879) was 68.4% of respondents who strongly agreed that soft skills (communication and teamwork) are placed emphasis on. A mean of moderate 4.16, with a moderate variation rate (SD=0.879), was 68.4% of respondents who strongly agreed that soft skills (communication and teamwork) are given emphasis. Punctuality and work ethic were positively rated with a mean of 4.04, with 56.8% agreeing and 26.5% strongly agreeing; 12.2% were undecided, and 4.4% disagreed to some degree. The skills of problem-solving and critical thinking were also accepted, with 56.6% agreeing and 33.4% strongly agreeing, for a mean of 4.20 and low variation (SD=0.704), while 6.7% were undecided and 3.3% disagreed. Overall, the results suggest that the program is an effective blend of technical instruction and development of interpersonal, professional, and analytical skills, although there are some discrepancies in its implementation by courses and instructors, suggesting a need for some additional standardization.

The qualitative findings indicate that pedagogies in TVET schools are planned and carefully designed to include soft skills, professional behavior, and problem-solving in the technical learning, with a pedagogical approach that is structured and competency- and student-centered. Group projects, presentations, and collaborative activities are an integral part of these soft skills, and clear policies, role modeling, and work expectations are an integral part of these professional behaviors. Problem-solving and critical thinking skills are developed through real-world projects and simulations, as well as open-ended scenarios. This institutional work is very good, as it

sets a firm tone for the learners; as seen from the quantitative perceptions, there is high confidence. Feedback from industry does indicate some areas that require additional workplace induction as well; however, in order to achieve the highest level of operation, professional consistency, and higher-order thinking, gaps were identified in the implementation of the foundational competence. As one of the institutional informants said,

> *"We integrate soft skills like teamwork, communication, problem-solving, and leadership directly into all of our technical training modules. This is operationalized through mandatory group projects, presentations, and community service activities. These methods ensure that soft skills are not taught in isolation but are reinforced alongside technical learning"* (KII I1, 2025).

An industrial partner noted,

> *"Graduates are typically competent in troubleshooting common, well-documented problems. However, they often lack the analytical depth and creativity for complex problem-solving and critical analysis, limiting their capacity for innovation and advanced roles"* (KII I12, 2025).

Results indicate a high level of integration of emerging technologies, innovation, and future-readiness in training, but this varies by training program. In terms of technological exposure, 47.2% agreed and 31.2% strongly agreed, 12.5% were undecided, 6.9% disagreed and 2.2% strongly disagreed, with a mean score of 3.98 and a high level of variance (SD=0.956), meaning that there is an inequitable distribution of tools and practical labs. Support for encouragement to explore innovation and adapt to change was high, with 57.7% agreeing and 33.0% strongly agreeing, 8.2% undecided, and only 1.1% disagreeing, with a mean of 4.22 and low variation (SD=0.638), indicating that institutions consistently promote proactive learning. Learners had positive perceptions of a forward-looking and industry-relevant curriculum (mean = 4.18, SD = 0.693); 59.0% agreed and 31.0% strongly agreed. Results show a good level of technological awareness, adaptability, and future-readiness of institutions, but there is a need for more uniformity in the exposure to emerging tools and technologies by investing in and standardizing them.

The qualitative findings reveal that there is a structured, multi-faceted approach undertaken by the TVET institutions in relation to the use of emerging technologies, including the incorporation of emerging technologies in the curriculum, industrial demonstration, industrial tour, and expert lecture. Learning is reinforced through innovation clubs, competitions, and attachments that encourage pupils to be innovative, flexible, and proactive. Industry partners highlight a lack of ready access to some technologies in the workplace, the need for new equipment, and lack of exposure to some modern technologies, while institutional strategies highlight inquiry and lifelong learning. Overall, students are very receptive and flexible, but trends are not always ready; rather, they are reactive in preparing students. As one institutional informant said,

> *"Our curriculum exposes students to emerging technologies in several ways. We incorporate topics and practical sessions related to Artificial Intelligence and Machine Learning, Virtual and Augmented Reality, Data Analytics, Robotics and Coding, Online and Blended Learning platforms, and Gamification and Game-Based Learning techniques"* (KII I1, 2025).

An industrial partner noted,

> *"The current curriculum is obsolete to some extent. The emerging technologies are only exposed to students who are doing the courses like mechatronics that is new with few students. The use of computer numerical control (CNC) is one of the current technologies but the machines are few for students to practice"* (KII I8, 2025).

Table 3: Correlation analysis between Industry Skill Demands and Marketable Skills Development

Correlations			
		Industry Skill Demands	Marketable Skills Development
Industry Skill Demands	Pearson Correlation	1	.645**

	Sig. (2-tailed)		.000
	N	449	449
Marketable Skills Development	Pearson Correlation	.645**	1
	Sig. (2-tailed)	.000	
	N	449	449
**. Correlation is significant at the 0.01 level (2-tailed).			

Source: *Primary Data, 2025*

The findings of the Eastern Uganda trainees show that the development of marketable skills is correlated with the industry skill demand, and there is a positive relationship with a high level of significance. The Pearson correlation coefficient is 0.645; with an increase in the industry's expectations and required competencies, there is a corresponding increase in the students' development of marketable competencies. This association is statistically significant (p value 0.000), with a much lower value than the standard value of 0.05, and therefore not a chance occurrence. Hence, the study finds that the hypothesis of this study is accepted when the type and quality of skill development in TVETs is significantly influenced by industry skill demands. The findings showed that greater alignment with the needs of the industry may result in improvements in the job readiness of trainees and the job relevance of the training product in the region.

Table 4: Regression analysis between Industry Skill Demands and Marketable Skills Development

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.050	.171		6.155	.000
	Industry Skill Demands	.729	.041	.645	17.826	.000
a. Dependent Variable: Marketable Skills Development						

R	R Square	Adjusted R Square	Std. Error	F Statistic	Sig.
.645a	.416	.414	.45162	317.767	.000[b]

Source: *Primary Data, 2025*

The results of the regression analysis presented in Table 4 indicate that there is a relatively strong and statistically significant relationship between industry skill demands and the development of marketable skills with an R-squared of 0.416, which explains that 41.6 percent of the variation in the development of marketable skills is accounted for by industry skill demands. The model is statistically significant ($F = 317.767$; $p = 0.000$), which indicates that the skill demands of the industry are able to predict the marketable skills outcomes reliably. The beta of 0.729, which is unstandardized, means that every one-unit increase in industry skill will result in a 0.729-unit increase in marketable skills development, and the beta of 0.645, which is standardized, means that there is strong predictive power. The relationship is further indicated by the high value of $t = 17.826$ and p-value = 0.000. The findings of the study support the hypothesis that skills requirements of the industry have a significant influence on marketable skills, and the other factors such as institutional capacity, resources, pedagogical methods, policy support, and students' motivation also have a significant role, as 58.4 percent of the variance remains unexplained by these factors.

DISCUSSION

The study shows that TVET curricula are purposely designed to meet the demands of industry and that students and institutions believe that relevance, comprehensiveness, and competency are the cornerstones of curricula, but there is a disconnect between the intent of the curricula and their implementation. The findings were in line with those of Nugraha et al. (2020), which also emphasized that employability involves technical proficiency, core skills coverage, and tool usage. Also, Abdullah and Masek (2024) emphasized that employability is achieved through aligned technical proficiency, core skills coverage, and the use of tools. It is not seamless integration as in the study findings as summarized below: But there is some qualitative evidence from the employers that dampens this sense of success, which is that they found that alignment is not at all levels; to a certain extent, the level of technical exposure in the practical program is limited, and graduates had to undergo orientation after the completion of their training program, which incurs a significant cost, contrary to what Yuswana (2025) and Tuenpusa et al. (2021) purport. This aligns with the skills mismatch reported in the world by Jamaludin et al. (2023), Generalao et al. (2025), and Oluropo (2022), which stated that basic knowledge is not enough to equip workers with the desired skills needed in the workplace. Shahbazi and Ahmady (2022) describe how industry recognizes graduate skill in administering tools as adaptive potential, suggesting that the graduates' skill is dependent on attachments of varying qualities found in industry and resource constraints in institutions. The results from the study confirm the theoretical linkage of the curricula of TVET institutions but offer a need to strengthen the linkage of the curricula to the industry itself by providing direct investment in industry equipment, simulating industry workplaces, and providing intensive industrial training to create true employability.

The results also show that soft skills, professional behaviours, and problem-solving skills are purposefully embedded in the curricula and pedagogy of TVET institutions, but a common gap still exists between what they do and what the industry expects. Internally, communication, teamwork, professionalism, and critical thinking are very well perceived and consistent with the findings of Varma and Malik (2023), Poláková et al. (2023), and Oviawe (2020) and are reflected in the policy framework, role modeling, group work, and student-centered learning approaches. Employers, however, have a much narrower view of the above, with concerns of graduates lacking soft skills, which are too theoretical and are not observed in practice, further echoing concerns from Massi et al. (2026) and Kasim et al. (2024) about the persistent graduates' deficit and inconsistency in professional conduct in line with the concerns of Melesse et al. (2023) and Hussein (2024). Similarly, problem-solving is claimed to be developed, but industry reports suggest that only cyclical problems are solved, and thus, there is still a lack of creativity, independence, and higher-order problem-solving (Kasim et al., 2024). The overall results indicate that these competencies are more likely to be internalized if the training is conducted in a controlled, low-stakes learning environment, even if it is an authentic open-ended problem setting, or if the learning activities are predictable and if the competencies are simulated in a training setting that is rigorous enough to represent a real workplace and is industry-validated.

The findings indicate that the adoption of new technology is a topic to be discussed in TVET institutions, as is the promotion of innovation and preparation for future technological developments, but perception is not yet accurate (Letseka & Kahn, 2024). The moderate-to-high level of exposure to digital tools is consistent with the literature that highlights the importance of the use of AI, VR, AR, and robotics in the delivery of TVET, with curriculum changes and demonstrations, as reported by Kuwanta et al. (2023) and Ghosh and Ravichandran (2024). However, the feedback from the employers is also important and shows outdated technology, limited practical experience, and training skills of trainers, which builds on the results of Nanjala et al. (2025) and differs from the successful models of integration indicated by Tonui et al. (2025). However, there is much to be learned from the positive aspect of institutional and industry alignment in relation to developing adaptive and innovative learners, as highlighted by employer feedback on learners' curiosity and engagement during attachments, which contrasts with the concerns raised by Bernard et al. (2019) about resistance. But future readiness is about confidence and not anticipatory preparedness from industry perspectives, as brought out by Akamobi & Grace (2022) and highlighted in the alerts made by the Abu et al. (2025 and Ghosh and Ravichandran (2024) about situating exposure gaps. The findings show that real technological readiness in TVET is not just about the intention to use technology in the education program and building the corresponding mindset in students, but

about continuous utilization of modern equipment, the ongoing learning to do in industry, and collaboration for foresight and prototyping, which makes flexibility a competence for the future.

CONCLUSIONS

Theory-based technical curricula in TVET systems are well aligned to industry standards, but there is not a strong linkage between the theory and the workplace readiness, and a considerable amount of post-hire training is required. While trainees are confident using tools, this doesn't necessarily mean that they are fully in control of these tools, and tools that are not of good quality or with variable attachments from industry contribute to a systemic weakness. The technical skills, which are the most important skills, are taught in a systematic manner and provide a good basis for understanding the skills; however, in the current technologies, there is no application in the real world. The success of TVET in preparing graduates to enter the workforce relies on the integration of curricular alignment to practical training as close as possible to industry, timely resources, and simulated scenarios in industry.

The introduction of soft skills and professional behaviors into the TVET curriculum has been made formal but is not consistently and frequently applied in the workplace. Problem-solving occurs more often in a routine context, and training contexts do not have the accountability to foster internalization of professional conduct of the kind that exists in a high-stakes context. To address this challenge, teaching methods need to be more immersive and to involve students in scenarios that have real and meaningful consequences, and they should focus on real-world problems, sourced from industry, to enable students to build their higher-order analytical thinking, creativity, and readiness for work and the world.

The exposure to emerging technologies in TVET often remains theoretical or demonstration-based, while learners do not get sufficient opportunities to obtain skills that can be reproduced in the classroom due to the lack of devices and trainers' capacity. Experiential strategies are good for developing innovations, curiosity, and adaptability, but they are not sufficient and not enough for developing proactive and forward-looking skills. Technological readiness is a complex process and must include experiences with the application of technology with strong industry connections; systematic education programs and training in foresight and early prototyping; ongoing investments in modern infrastructure; and strategic partnerships that provide access to new technology.

RECOMMENDATIONS

Develop a national framework for practical skills fidelity: The Ministry of Education should develop and provide funding for a national system of a minimum percentage of contact hours for practical hands-on work in industry-standard settings. This framework must set "technological currency" thresholds for each piece of equipment and require that institutions conduct and document fidelity audits annually and share the outcomes. This policy will ensure that theory will always be backed by practice.

Establish mandatory immersive soft skills modules: The soft skills learning in TVET institutions must be transformed into compulsory immersive modules implemented by simulated professional scenarios with high stakes that are co-developed with the industry partners and evaluated. These should be created to provide student activities, not lectures, such as simulated client negotiations, crisis management exercises, or time-constrained cross-functional team projects. The success criteria should be clearly defined in terms of behavioral competencies, not merely knowledge, but as set out by local employers in their experiences and achievements.

Institutionalize industry-sourced complex problem solving: Curriculum developers should require a substantial component of project-based learning and final assessment to be based on authentic, ill-structured problems, problems that are given to the student directly by an industry partner. This includes the creation of an online platform or a formal annual conference for businesses to report actual and unsolved operational challenges and for students to address these challenges. This change will take pedagogy from a training model based on troubleshooting and problem-solving to fostering advanced analytical and innovative thinking in complex work situations.

Launch a national TVET technology modernization fund: The government can establish a ring-fenced fund for the cyclical upgrading of TVETs' equipment and software, assisted by development partners and champions. Funds should be channeled to the technology roadmaps co-developed with industry, prioritizing procurement to address skills gaps. It's a methodical way of replacing the random donation and is now being used as a systematic approach to bring technology into all the institutions.

Create a national TVET innovation and adaptation ecosystem: A national body such as the TVET Commission should design and promote a sustained calendar of applied, competitive events linked to the industry sponsors, e.g., skills hackathons, innovation challenges, adaptive technology fairs, etc. These should be accredited for student credit and seen as a key indicator of the performance of institutions. This ecosystem creates a culture of exploration and makes the learning curiosity directly manifest in industry-validated outcomes and results.

Integrate strategic foresight into curriculum development: TVET institutions need to create a "Future Skills" committee with leading innovation hubs and companies to hold exercises yearly on new technologies and processes. These committees should be directly connected with a rapid stream for the curriculum to update and introduce the new tools and methodologies in the form of micro-modules. This moves the focus of preparation away from being broadly based and towards anticipatory and proactive skill development.

Suggestions for further research

Future research should focus on understanding the role that industry-led competency frameworks can play in closing the gap between TVET curriculum design and readiness for employment. Specifically, research can explore the impact of competency models created in partnership with TVET institutions on the relevance of training, on the success of the jobs of graduates, and on the reduction of the induction periods. Based on the findings of this research, industry-relevant benchmarks can be developed across the industry to guide the industry, and an improvement in the fidelity of practical training can enhance the effectiveness of inter-agency coordination for updating industry curricula.

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