The Effectiveness of Existing TVET–Industry Linkages in Enhancing Trainees' Marketable Skills

Wenani Francis Mwisaka[1], Kisilu Kitainge[2], Ronoh Richard[3]

[1,2] Department of Technology Education, University of Eldoret, P.O. Box 1125-30100 Eldoret, Kenya

[3] Department of Computer Science, Kibabii University, Bungoma, Kenya P.O. Box 1125-30100 Eldoret, Kenya

DOI: https://doi.org/10.47772/IJRISS.2026.100700473

Received: 16 July 2026; Accepted: 21 July 2026; Published: 05 August 2026

ABSTRACT

This study evaluates the effectiveness of existing TVET–industry linkages in enhancing trainees' marketable skills in Eastern Uganda. Both quantitative and qualitative data were gathered using a convergent parallel mixed-methods design with a total response rate of 98.4%, including 326 trainees, 138 trainers, 6 institutional principals, and 6 industrial partners. Results reveal that industrial attachments are organized and beneficial, although the duration of some attachments was found to be too short for deep skill acquisition, and mentorship was found not to be consistent. The modules are seen as relevant, but most are hampered by the need for updating resources and slow integration of feedback. Joint training and industry involvement activities are not consistent, resulting in inconsistent trainee exposure. TVET–industry linkages were highly correlated with marketable skills development with $r = 0.659$. These linkages accounted for 43.4% of the variance in the marketable skills development ($R^2 = 0.434$) by regression analysis. The study concludes that although linkages do exist, they are hampered by lack of consistency in implementation, brief attachment periods, and ad hoc collaboration. Suggested solutions include industry attachment durations based on competency, formalizing mentoring relationships between the industry and training units, having standardized protocols for agile curriculum updates, expert-in-residence programs funded by the industry, mandatory industry immersion for trainers on a cyclical basis, and structured industry immersion as a component of the training curriculum.

Keywords: TVET–Industry Linkages, Marketable Skills, Industrial Attachments, Curriculum Alignment, Employability, Skills Development.

INTRODUCTION

Effective collaboration between Technical and Vocational Education and Training (TVET) institutions and industry is widely recognized as a critical mechanism for aligning educational outcomes with labor market needs and enhancing the development of marketable skills among graduates (Chepkwony et al., 2025). However, in Eastern Uganda, the persistent high levels of youth unemployment and underemployment suggest that collaborative linkages that exist are not fully leveraged to their potential (Dungey & Ansell, 2020). Although the industry engagement policy has been institutionalized through industrial attachments at colleges and industrial curriculum co-development in the TVET Act of 2019, tracer studies show that out of the 38% of graduates from the eastern colleges who are not employed/cannot be employed six months after graduation, the main reasons for this are curricula that "privilege theory" and minimal industrial exposure (UBTEB, cited in Nakawala et al., 2025; Yiga, 2022).

The success of a TVET–industry linkage depends on the quality and modalities of the key collaborative activities such as industrial attachments, matching of the curriculum, joint activities, and incorporating industry experts into the training process. Similar studies in other settings highlight systemic issues that can hinder such connections, such as limited duration of attachment, poor supervision, mismatched curricula, and the lack of frequent industry expert participation (Uwilingiyimana et al., 2026; Kebede et al., 2024; Siddiky & Uh, 2020).

However, East Uganda's operational challenges, including outdated tools, funding limitations, and communication gaps, hinder the depth and frequency of these collaborative efforts, further reducing their influence on practical skill acquisition (Niwamanya et al., 2025; Oluwatoyin, 2025).

In this context, the study assesses the effectiveness of current linkages between TVET and industry in improving the marketable skills of trainees in Eastern Uganda. The research takes place in a series of practical, mixed-methodology tests of the hypothesis that the effectiveness of these linkages is of great value in developing marketable skills of the trainees. Using the TVET institutions, and industry partners' data, the investigation provides empirical evidence for the effectiveness of existing collaborative models, highlights strengths and critical gaps, and suggests evidence-based recommendations to strengthen these important partnerships for enhanced employability of graduates and regional socio-economic transformation.

Specific objective of the study

Evaluate the effectiveness of existing TVET–industry linkages in enhancing trainees' marketable skills.

Research Hypothesis

H1: The effectiveness of existing TVET–industry linkages significantly enhance the development of marketable skills among trainees in Eastern Uganda.

LITERATURE REVIEW

Industrial attachments have been consistently identified in the literature as a key linkage between theory and practice in TVET and have been found to have a positive effect on the employability, technological competence, creativity, confidence and innovation of the trainees; preparedness for work; and the technical, pedagogical and industry-relevant skills of trainers (Mwaura et al., 2022; Muthoka et al., 2025; Issa & Muya, 2025). But many of the attachments are not always effective because of a range of systemic challenges such as lack of standardised frameworks, mismatching attachments, inadequate supervision, outdated curricula, limited access to machinery, and reliance on trainees as unskilled labour, which all contribute to poor skill acquisition and weak job readiness of the graduates (Uwilingiyimana et al., 2026; Sarpong-Nyantakyi & Mensah, 2025; Mwaura et al., 2022). The duration is also another key factor that shapes attachment quality, in those short attachments (typically three months or less) are viewed as inadequate for deep learning, and longer attachments are statistically linked to 1) the attainment of training goals and 2) the comprehensive learning of skills by students and trainers (Mwaura et al., 2022; Sarpong-Nyantakyi & Mensah, 2025; Issa & Muya, 2025). The results highlight the importance of both the quality and length of the industrial attachment and emphasise that if the industrial attachment is not well structured, supervised, trained or equipped and if there is not enough time, the industrial attachments may not provide the significant experiential learning outcomes that they are intended to provide.

The literature also identifies curriculum alignment with industry needs as fundamental to marketable skills development in TVET, yet documents a persistent mismatch characterised by outdated content, limited integration of digital and soft skills, and weak responsiveness to labour market demands, resulting in low graduate employability and costly employer retraining (Motsepe et al., 2026; Gani & Halim, 2024; Wahungu et al., 2023; Kebede et al., 2024). Robust industry participation in TVET curriculum design, standard setting, internships and practical training; transformational and collaborative institutional leadership; and regular review of the curriculum are all strongly associated with effective alignment (Chepkwony et al., 2025; Koba Formyuy, 2025; Moustafa et al., 2023). Some internal challenges, including lack of adequate infrastructure, outmoded equipment, and trainers' lack of industrial exposure, and some external challenges, such as weak public-private partnership frameworks, inadequate stakeholder consultation, poor feedback mechanisms, weak industrial incentives, and negative perception of TVET, stand as obstacles to the alignment efforts, and these collectively hinder sustained collaboration and contribute to skills mismatch (Wahungu et al., 2023; Mathur et al., 2022).

Joint training and skill exchange programmes between TVET institutions and industry, such as apprenticeship, work-based learning, on-the-job training and cooperative education, are widely recognised as important approaches in producing marketable skills, where frequent and structured collaboration programmes are found to be valuable in improving the relevance and practical competency of training (Omar & Kamaruzaman, 2024; Kebede et al., 2024; World Bank, 2023). Empirical research has shown that they can have a positive impact on students' practical skills, exposure to modern equipment and their preparation for work if they are well executed (Mulati et al., 2019). In many contexts in developing countries, however, the number and quality of these interactions are small, and they are not fully supported by industries, are superficial, and lack employer trust in TVET training, leading to a chronic lack of skills matching and insufficiently skilled graduates for jobs (Siddiky & Uh, 2020; Hoang & Nguyen, 2024; Kebede et al., 2024; Semali, 2024). Despite the presence of collaborations, however, qualitative shortcomings, including unstructured in-company training, repetitive tasks, insufficient supervision, communication barriers, and the lack of training in higher-level and supervisory skills, render the impact ineffective, and industries are forced to depend on in-house training or training from outside the labour force (World Bank, 2023; Mulati et al., 2019).

While a great deal has been written, there are still many areas of interest which this study will fill. Geographically, most of the studies are conducted in countries with socio-economic, policy and industrial environments, which are very different from Uganda's; hence, the results cannot be directly applied in the Ugandan context (Siddiky & Uh, 2020; Hoang & Nguyen, 2024; Gani & Halim, 2024; Mathur et al., 2022). In terms of methodology, a significant portion of literature consists of reviews, policy analyses, bibliometric studies, or single-method designs, with a lesser amount of primary empirical data being produced and limited triangulation with trainees, instructors, and employers from the industry (Formyuy, 2025; Omar & Kamaruzaman, 2024; Yusvana, 2025). Many studies tend to examine isolated variables, institutional processes, and large-scale models of alignment while neglecting to empirically investigate the specific demands of a given sector of the economy or the actual processes and challenges affecting TVET industry alignment in practice (Motsepe et al., 2026; Gani & Halim, 2024; Mathur et al., 2022). This current study aimed to fill these gaps by examining Eastern Uganda and using a mixed-methods design to provide new and context-specific evidence from TVET providers, trainees and industry employers regarding industry priority skills, the effectiveness of existing TVET-industry collaboration mechanisms and the barriers to effective TVET-industry collaboration for skills development of marketable skills.

CONCEPTUAL FRAMEWORK

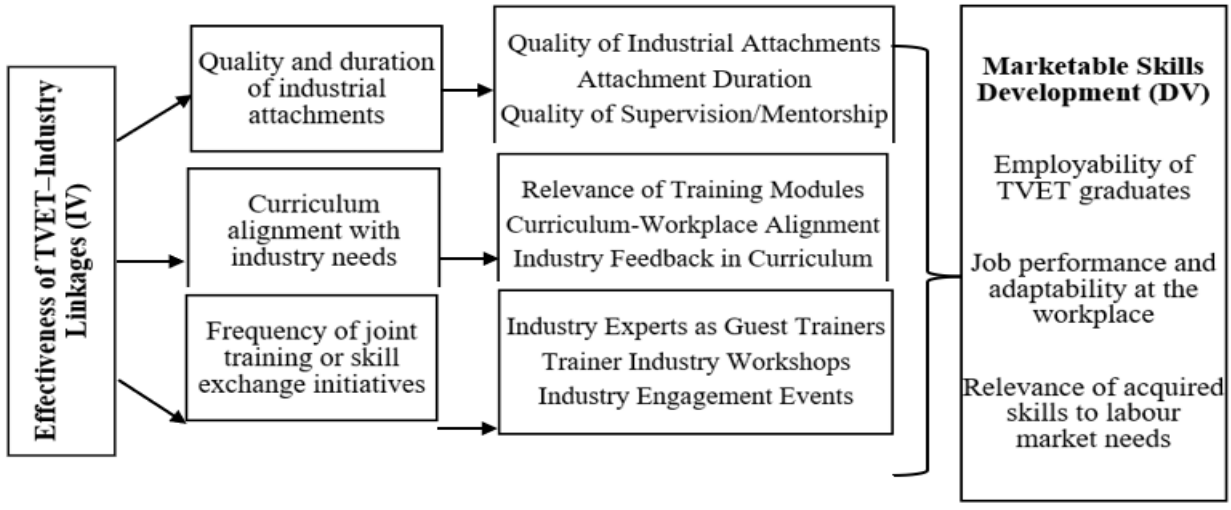

Figure 1: Conceptual framework showing the relationship between effectiveness of TVET-Industry linkages and marketable skills development

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

This conceptual framework (as depicted in Figure 1) posits that the effectiveness of TVET-industry linkages positively and directly influences the marketable skills development among TVET graduates. Each of the three dimensions in the independent construct focused on three aspects: Quality and Duration of Industrial Attachments: length of attachment and quality of supervision/mentorship provided in attachment; Curriculum Alignment with Industry Needs: degree of alignment of training modules with industry requirements and systematic incorporation of industry feedback into the curriculum design; and Frequency of Joint Training or Skill Exchange Initiatives: inclusion of industry experts as guest trainers, industry workshops, or engagement arrangements. The hypothesised linkages with these robust and multifaceted industry connections are hypothesised to influence the dependent construct 'Marketable Skills Development', assessed as graduate employability, job performance and adaptability to the workplace and the relevance of the skills acquired to evolving labour market needs. The framework thus builds on the premise that robust, deliberate, and active TVET-industry partnerships are the key mechanism for making skills relevant, bridging the skills gap, and elevating the economic productivity of TVET graduates.

METHODOLOGY

The convergent parallel mixed methods research design and descriptive research approach were used to collect data, and thus to adequately examine the TVET-industry partnership phenomenon and its impact on producing marketable skills in Eastern Uganda. The descriptive design was used to collect the data in order to capture the present situation and practices without experimentation, and for the mixed methods design, a pragmatist paradigm was used to collect both quantitative and qualitative data for analysis and triangulation (Tenuche, 2018).

The study engaged a total of 476 participants selected from six purposively chosen TVET institutions in Eastern Uganda and their linked industries. The sample consisted of key stakeholder groups who are crucial in the understanding of the supply and demand sides of skills training, namely 326 trainees, 138 trainers, 6 institutional principals and 6 industrial partners. This arrangement allowed the institutional realities, learner experiences and industry expectations to be properly represented, as shown in the table below.

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. The 6 principals and 6 industry partners were selected purposively because of their role in coordinating the partnership and as institutional leaders (Palinkas et al., 2013). A multi-level stratified random sampling technique was used for the trainers and trainees. To ensure proportional representation and minimize sampling bias, the population was first stratified by the six institutions and then by role (trainer/trainee) and course programs (Blair & Blair, 2015).

There were two primary research tools used. The trainers and trainees were given structured questionnaires using Google docs, where the quantitative data that were collected regarding industry skill demands, linkage effectiveness, barriers and skills development outcomes were collected, were in the format of a 5-point Likert scale. Qualitative data was collected by administering separate semi-structured interview guides to principals and industry partners about the same themes. The instrument was validated with the help of experts as well as a pilot study conducted at Uganda Technical College Elgon, where all the items had factor loadings greater than

0.5. The pilot was successful and the Cronbach's Alpha for each section of the questionnaire was above 0.70 indicating good reliability. Quantitative data from questionnaires were cleaned in Excel and analysed using SPSS version 27. Data were described by descriptive statistics and relationship between variables were tested by inferential statistics (Pearson correlation, linear regression). Qualitative data from 12 interviews were transcribed and analyzed thematically using NVivo version 15, employing a hybrid inductive-deductive coding approach to identify patterns aligned with the research objectives (Palmer & Coe, 2020). Ethical clearance was obtained from the Busitema University Research Ethics Committee (BUREC) and Uganda National Council for Science and Technology (UNCST) permit was also obtained. The Ministry of Education and Sports also gave its permission. All of the participants signed an informed consent and the data were anonymized and kept securely.

The study had high response rates with an improvement in data representativeness. For the quantitative component, 449 of 464 questionnaires were returned (96.8%). Ten of the 12 key informant interviews (100%) were completed. The high overall 98.4% response rate helps to minimize non-response bias and contributes to the robustness of the findings of the study on TVET-industry collaboration in Eastern Uganda (Taherdoost & Madanchian, 2024).

RESULTS

Table 2: Descriptive statistics on the effectiveness of existing TVET–industry linkages in enhancing trainees' marketable skills

		SD (%)	*D (%)*	*NS (%)*	*A (%)*	*SA (%)*	*Mean*	*σ*
1	The industrial attachment/ internship program is well-organized and provides valuable hands-on experience.	0(0)	10(2.2)	25(5.6)	254(56.6)	160(33.6)	4.26	.661
2	The duration of the industrial attachment is sufficient to develop meaningful practical skills.	0(0)	80(17.8)	51(11.4)	214(47.7)	104(23.2)	3.76	1.002
3	I receive (or my trainees receive) adequate supervision and mentorship from industry staff during attachments.	0(0)	15 (3.3)	123 (27.4)	224 (49.9)	87 (19.4)	3.85	.762
4	The training modules are directly relevant to the tasks performed in real work environments.	5(1.1)	15 (3.3)	36 (8.0)	239 (53.2)	154(34.3)	4.16	.795
5	There is a clear connection between what is taught in the classroom and what is required during industrial attachment.	0(0)	15 (3.3)	41 (9.1)	263 (58.6)	114(25.4)	4.18	.728
6	Industry feedback is used to update and improve the TVET curriculum.	5(1.1)	26(5.8)	41 (9.1)	263 (58.6)	114(25.4)	4.01	.824

7	Industry experts are regularly invited as guest lecturers or trainers in my program.	31(6.9)	72 (16.0)	82 (18.3)	185(41.2)	79(17.6)	3.47	1.157
8	TVET trainers get opportunities to participate in industry-led workshops or training programs.	20(4.5)	52(11.6)	61 (13.6)	218 (48.6)	98(21.8)	3.72	1.068
9	There are enough structured events (e.g., industry tours, career days) that connect trainees with companies.	28(6.2)	60 (13.4)	92 (20.5)	182(40.5)	87 (19.4)	3.53	1.132

Source: Primary Data (2025)

The results indicate that there is a high level of overall support for the industrial attachment programme, although there are differences in perceptions of different aspects of the programme. On organisation and hands-on experience, 56.6% agreed and 33.6% strongly agreed, 5.6% were neutral, and 2.2% disagreed, with a mean score of 4.26 and a relatively low standard deviation (SD=0.661), meaning that the value of the programme in linking theory and practice was recognised by the participants in a consistent manner. Options for duration of attachment were less certain, with 47.7% agreeing and 23.2% strongly agreeing, 11.4% neutral, and 17.8% disagreeing, with an average score of 3.76 and high variability (SD=1.002), indicating this duration may be too short to achieve mastery of skills. Supervision and mentorship (49.9%, 19.4%, 27.4%, and 3.3% strongly agree, agree, are neutral, and disagree, respectively) were rated very well with a mean rating of 3.85 and moderate variation (SD = 0.762), indicating overall satisfaction but some differences in the quality of supervision and mentorship. The overall results indicated that industrial attachments contribute to the development of practical skills and workplace readiness for the trainees, while duration of attachment, supervision, and quality of industrial attachments need to be reviewed for all trainees to improve the outcomes of the attachment.

The qualitative results suggest that industrial attachments provide a formal and reflective link between learning and working in the workplace and are facilitated through a specific liaison office as well as industry connections. The programme effectively addresses equipment and institutional capacity gaps, technical competence, networks, and adaptability in the workplace and has gained recognition for its value. Typically, this takes 6-10 weeks, which is viewed as not being enough time to achieve high levels of skills, though it may be determined by the resources available in the industry, the number of trainees and the complexity of the project. Supervision and mentorship are formalised in logbooks, supervisors are assigned, and follow-up visits are conducted, but inconsistencies and limited developmental guidance minimise effectiveness. There is moderate quantitative variation due to differences in the depth of experience and mentorship that is gained by students. As one institutional informant explained,

"The current duration of 6-10 weeks is beneficial but often insufficient for deep skill acquisition. Longer placements would allow students to become more familiar with industrial workflows and complex processes. A short period only offers an introduction rather than mastery of practical tasks" (KII I1, 2025).

An industrial partner noted,

"Generally, the duration is considered too short by most partners. It allows for orientation and basic task execution but falls short of providing deep, comprehensive practical experience on complex or long-cycle projects" (KII I12, 2025).

The findings suggest good overall perceptions of relevance of the curriculum and alignment with industry, with some differences between aspects. In terms of the relevance of the modules, 53.2% agreed and 34.3% strongly

agreed, 8.0% neither nor nor, 3.3% disagreed and 1.1% strongly disagreed, with a mean score of 4.16 and a moderate variation (SD=0.795), indicating that most learners feel classroom instruction is relevant to workplace tasks. The perceived linkage between classroom learning and industrial attachments was also high, and its mean value of 4.18 (SD=0.728) with 58.6% agreeing, 25.4% strongly agreeing, 9.1% neutral and 3.3% disagreeing suggests that this linkage is mostly supported but with variations in placement quality. Feedback from industry was accepted well, with 58.6% agreeing and 25.4% strongly agreeing, 9.1% neutral, 5.8% disagreeing and 1.1% strongly disagreeing, for an average of 4.01 (SD = 0.824), showing that curriculum updates are largely based on industry feedback, but there are some areas of concern regarding awareness and implementation. In general, the research indicates that theory-to-practice integration and industry feedback are integrated into the training curriculum, but this could be deepened and reinforced by maintaining consistency and transparency within the curriculum and programmes.

The findings of the qualitative analysis reflect the importance of industry linkage and relevance of modules in TVET programmes and show that these are well supported by proactive and multifaceted approaches, such as active industry partnerships, connecting to the national occupational standards and structuring module components, including safety and professionalism, to be part of the workplace. Industrial attachments help to validate the learning that happens in class and give a solid foundation of learning theory to reinforce the practical experience of the industrial placement. However, there is structured feedback from industry to inform curriculum revisions, but employers report that this is often infrequent and that it does not provide real-time feedback. Industry responses emphasise practical issues like brief attachment times, limited resources, and long feedback cycles, which partly account for the moderate variation and neutral quantitative responses. The quantitative responses show varying degrees of relevance and connection with institutional efforts, but industry partners emphasise practical issues such as brief attachment durations, limited resources, and slow feedback cycles, which partly explain the moderate variation and neutral responses. An institutional informant stated,

"Our training modules are directly aligned with national occupational standards and are verified by employers to ensure relevance. However, we acknowledge that rapid technological changes in industry can sometimes create minor, temporary gaps. We strive to minimize these through our continuous feedback and curriculum review processes" (KII I1, 2025).

An industrial partner noted,

"There is a connection, though time is a limiting factor in applying all the taught concepts during the short attachment period. The theoretical knowledge is present, but practical mastery requires more time" (KII I7, 2025).

The findings reveal moderate levels of perceptions on the structured industry engagement along several dimensions, albeit with significant variations in experiences. A mean score of 3.47 and an SD of 1.157 showed that 41.2% agreed and 17.6% strongly agreed that the industry experts were invited as guest lecturers, while 18.3% were neutral, 16.0% disagreed and 6.9% strongly disagreed, which means that there was a recognition of the value of having industry experts as guest lecturers, but there was not a consistent implementation. The opportunities for trainers to participate in the workshops arranged by industry were perceived moderately positively, with 48.6% agreeing, 21.8% strongly agreeing, 13.6% neutral, 11.6% disagreeing and 4.5% strongly disagreeing, giving a mean of 3.72 and an SD of 1.068, showing unequal opportunities and inconsistent institutional support. Structured events, including industry tours and career days, were moderately available (40.5% agreed, 20.5% neither agreed nor disagreed, 13.4% disagreed, and 6.2% strongly disagreed; mean = 3.53; SD = 1.132), and there was some variability in trainee exposures. Overall, the results indicate engagement of the industry, however not in a uniform way, and a need to strengthen industry structures to ensure benefits for all trainees and trainers are realised through greater formality, regularity and access.

Qualitative results indicate that the participation of industry in TVET programmes is well received and seen as an effective method to motivate students and impart practical knowledge and relevance to the curriculum, yet there is a lack of consistency, and industry involvement is rarely used. Guest speakers from the industry,

knowledge transfer sessions for trainers and organised events (career days, visits, etc.) are integrated into the programme in an ad hoc manner and not in a systematic way to reach a specific goal. Although these interactions have many benefits – real-world experiences, networking, skill updating, etc. – they are sporadic, which means there tends to be a lot of variance in the experiences of the students and trainers. Industry partners attest to low-level, ad hoc participation with support (not necessarily regular or structured). An institutional informant noted,

"Industry experts are invited as guest lecturers or trainers as deemed necessary, depending on the specific needs and goals of our programs. Their involvement has a significant impact, providing students with practical insights, enhancing curriculum relevance, offering career guidance, creating networking opportunities, and serving as a source of inspiration and motivation" (KII I1, 2025).

An industrial partner emphasized,

"Invitations for industry experts to lecture or train at TVET institutions occur rarely or on an annual basis at best. In some cases, there has been no contact at all from TVET institutions to involve industry professionals in teaching" (KII I7, 2025).

Table 3: Correlation analysis between TVET–Industry Linkages and Marketable Skills Development

Correlations			
		TVET–Industry Linkages	Marketable Skills Development
TVET–Industry Linkages	Pearson Correlation	1	.659**
	Sig. (2-tailed)		.000
	N	449	449
Marketable Skills Development	Pearson Correlation	.659**	1
	Sig. (2-tailed)	.000	
	N	449	449
**. Correlation is significant at the 0.01 level (2-tailed).			

Source: Primary Data, 2025

The correlation analysis in Table 3 shows a strong and statistically significant positive relationship between TVET–industry linkages and marketable skills development among trainees. The Pearson correlation coefficient of 0.659 shows that as institutions begin to work together and collaborate with industry partners, employability skills are likely to be strengthened and more relevant to the industry. This relationship is significant at the 0.01 level because the p-value is 0.000, which is much lower than the common p-value of 0.05, and thus the result is reliable. The results indicate that active and regular cooperation between the TVET institutions and industries positively affects the practical and competitive skills of graduates, which leads to better preparedness for the labour market, thus supporting the hypothesis.

Table 4: Regression analysis between TVET–Industry Linkages and Marketable Skills Development

Coefficients[a]					
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.743	.127		13.699	.000
Effectiveness of TVET–industry linkages	.598	.032	.659	18.500	.000
a. Dependent Variable: Marketable Skills Development					

R	R Square	Adjusted R Square	Std. Error	F Statistic	Sig.
.659a	.434	.432	.44456	342.256	.000[b]

Source: Primary data (2025)

Table 4 also presents the regression results, where it is found that TVET–industry linkages are significantly positively correlated with marketable skills with an R-squared value of 0.434, which means that 43.4 per cent of the variance in skill development can be accounted for by the TVET-industry linkages. The model shows a high F statistic of 342.256 and a p value of 0.000, which indicates that the model is statistically significant and able to predict the outcomes of employability of TVET–industry linkages. The unstandardized coefficient is 0.598, which means that the effect of TVET–industry collaboration on the development of marketable skills is significant, and the beta coefficient is 0.659, suggesting a strong effect size. A high t value (18.500) and p value of 0.000 confirms this relationship. The results generally indicate that TVET–industry linkages have a significant effect on the development of marketable skills, but the remaining 56.6 per cent of the unexplained variance suggests that other factors like funding, facilities, quality of instruction, student engagement, and policy support are also playing an important role.

DISCUSSION

The results confirm the overall positive perception that well-organised industrial attachments are valued and effective, which is consistent with the literature that structured workplace learning during training is effective for increasing skills acquisition and quality assurance when it is guided by clear institutional and industry roles as presented by Vernon et al. (2020) and Reinsch & Nyangweta (2023). The high degree of 'attachment' those trainees and industry present, in particular towards collaborative management and institutional equipment gaps, mitigates dominant criticisms of poor attachment quality identified by Uwilingiyimana et al. (2026) and Sarpong-Nyantakyi and Mensah (2025), indicating that formalised liaison, advance planning, and industry-led assessment can achieve effective outcomes. Nevertheless, perceptions about attachment duration do suggest a systemic weakness, as noted by Sarpong-Nyantakyi and Mensah (2025), with both institutions and employers suggesting that placements of 6-10 weeks would only offer basic orientation and not deep competence, thus limiting the duration in the attachments across the various trades. Furthermore, supervision is generally seen less in a transformative mentorship, as emphasised by Muthoka et al. (2025), compared to its role in developing the learners, as indicated by Reinsch and Nyangweta (2023), and continues the concern of the preparedness of the supervisors raised by Uwilingiyimana et al. (2026). In summary, the effectiveness of industrial attachments relies as much on their being available as it does on institutionalised collaboration, duration models that are flexible and based on competency, and the formalisation and incentivisation of mentorship roles in the partnership between industry and education.

The finding also suggests that competency-based training modules are generally seen as relevant to work tasks, supporting the foundational principle of CBC and in line with the principles outlined by Bhandari (2025) and the industry-based '1+X' competency certification model outlined by Formyuy (2025), although when implemented by themselves, the modules do not provide the same level of theoretical background. The overall positive perception contradicts findings by Wahungu et al. (2023) and Motsepe et al. (2026) that relevance is not possible when there is no structured collaboration between the industry and the school. However, it suggests that relevance can be achieved if there is structured industry collaboration, but such a case can be interpreted as a form of cover-up of the lack of applied relevance due to outdated equipment and limited exposure to current technologies. Likewise, the lack of coherence between classroom learning and industrial needs is another integrated partnership ideal as raised by Kebede et al. (2024), but industry feedback shows that there are still gaps in implementation related to the duration of attachments and the complexity of the industrial work, which aligns with Moustafa et al.'s (2023) concerns. Lastly, the high internal confidence in curriculum updates based on feedback is largely inconsistent with industry perceptions of slow and ad hoc curriculum change, as highlighted by Mathur et al. (2022) and Wahungu et al. (2023), and in contrast to the proposed dynamic collaboration models by Chepkwony et al. (2025). In summary, the results indicate that the curricular design and intent are good, but maintaining relevance depends on flexible, binding, industry-controlled review systems and ongoing investment in practical resources to ensure alignment between the curricular theory and the practical, current competencies needed in the workplace.

The findings also highlight the consistent industry-embedded instructional practices that are broadly recommended in TVET literature but not well implemented. The moderate and highly variable presence of industry experts in teaching confirms issues raised by Siddiky and Uh (2020) and contrasts markedly with the highly structured and frequent partnerships noted in successful systems like Germany's dual model and the school-enterprise cooperation noted by Kebede et al. (2024), as revealed by qualitative evidence of sporadic, institution-led partnerships and lack of communication structures. Likewise, limited engagement of trainers in the industry-related workshops is in line with what Semali (2024) and Dennebo & Harikrishnan (2023) found and is also less than the continuous dual training as described in World Bank (2023), which is heavily dependent on ad hoc arrangements and personal networks instead of institutionalised training. Beyond that, the lack of access to industry tours and engagement events highlights equity issues, with exposure based on departmental efforts and not necessarily on the design of the system, as is the case with the VTC in Jordan and the UNESCO Model Skill Centres. The results overall suggest that poor incentives, lack of resources and a lack of a mandatory component of industry engagement (rather than optional) are hampering consistency and that formalised co-teaching arrangements, mandatory industry immersion for trainers and credit-bearing and centrally coordinated industry modules are needed to shift from sporadic collaboration to an accountable and equitable part of TVET delivery.

CONCLUSIONS

The effectiveness of industrial attachments for linking theory and practice in TVET relies on the formal organization, collaborative management and assessment of the industrial attachment. Short, standardised durations restrict mastery of skills and offer only basic orientation, not independent competence, with a need for tiered engagement, competency-based learning, and relation to trade complexity. Supervision may be necessary to keep things safe and orderly, but there is no mentored supervision, meaning that these things are done out of goodwill rather than training. Co-designed mentoring and recognition initiatives can help to make learning happen at work by moving monitoring into learning.

TVET learning materials are, in theory, in tune with industry tasks; however, the practical relevance is not optimized, as they are out of date with technology and are not sufficiently agile in teaching resources. The complexity of real work environments disrupts classroom-industry connections, and too much attachment does not adequately simulate the real work environments. Insufficient timely and binding industry feedback makes the process of making curricular changes slow. This means resources need to be continually updated in an agile way; realistic problems need to be presented in the workplace to support training, and a short-cycle, industry-led forum for the review of curricula needs to be established in order to keep curricula relevant and ready for use.

Industry involvement in teaching is ad hoc and patchy, with few formalized channels and opportunities for industry involvement in training, and trainer access to industry-led professional development is uneven and project-dependent, resulting in gaps in instructional currency. Similarly, engagement activities (e.g., tours and exhibitions), which are not always requested and not always compulsory, can lead to variations for the student experience. The following challenges can be addressed by the presence of experts-in-residence, the introduction of mandatory industry immersion for trainers, and by providing the necessary resources, with an emphasis on making experiential learning events mandatory, centralised and supported to ensure consistent, equitable and integrated practice-based learning.

RECOMMENDATIONS

Implement Competency-based attachment durations: National TVET authorities need to adopt a competency-centric period of attachment, with the length of attachment based on a sequence of competencies pre-defined and validated by industry. This involves collaborating with employers to create sector-specific competency checklists and to develop flexible academic calendars to allow for flexible placement lengths. This means that attachments are sufficiently long to reach an independent operational level and not only orientation.

Formalize and incentivize industry mentorship programs: Ensure industry mentorship programmes are co-created with industry partners, including mentorship of industry supervisors in pedagogical coaching and competency assessment. Companies should be rewarded for mentor hours dedicated, either with tax credits or recognition awards, publicly. It turns supervision into active, rewarding professional development and quality assurance.

Establish agile curriculum update protocols: Ensure industry mentorship programmes are co-created with industry partners, including mentorship of industry supervisors in pedagogical coaching and competency assessment. Companies should be rewarded for mentor hours dedicated, either with tax credits or recognition awards, publicly. It turns supervision into active, rewarding professional development and quality assurance.

Institute funded "Expert-in-Residence" programs: Policy should ensure that “Expert-in-Residence” positions are established, with industry partners signing contracts to co-teach specific technical units for an entire semester within TVET institutions. The funding may come from the institution, the industry partner and a national skills development levy. This incorporates experts into the core delivery of instruction rather than in isolated guest lectures.

Mandate cyclical industry immersion for trainers: National policy to require TVET trainers to be seconded to industry for a national "skills update sabbatical" of at least 1 month every 3 years, fully funded. Compliance should be correlated with trainer certification and institutional accreditation. It is a systematic method, which means that all teachers, not just a lucky few, keep in touch with the latest practice and technology in the work world.

Embed structured industry engagement as core curriculum: Embed a compulsory credit-bearing “Industry Immersion Module” into the TVET curriculum, which involves structured events such as technical tours, live project briefings, and simulations. It is important that centralised institutional liaison offices have funding to ensure that all students in a programme are able to access these events equally. This makes for standardised and assured learning moments out of valuable but occasional engagements.

Suggestions for further research

Future research should investigate how structured mentorship within the industry affects the extent of the skills learnt and transferred from an industrial attachment. In particular, research could be undertaken to look at the impact of mentorship models which are formalised and co-designed by TVET institutions and industry partners on the quality of supervision, competency development of the trainees and employability after their attachment. The findings of such research can be used to design incentive mechanisms to be implemented by TVET supervisors, have a standard mentorship protocol and have an assessment protocol that acknowledges the transfer of skills as a competency, above and beyond just finishing a task, to improve the efficacy of TVET-industry linkages in the practical implementation of TVET programmes in Eastern Uganda.

REFERENCES

1. Blair, E., & Blair, J. (2015). Stratified Sampling. In Stratified Sampling (pp. 113-128). SAGE Publications, Inc., https://doi.org/10.4135/9781483394022.n5
2. Chepkwony, E. K., Wanami, S., & Okari, F. (2025). Influence of Alignment of Interests on TVET–Industry Collaboration in Trans-Nzoia County, Kenya. Journal of Research Innovation and Implications in Education, 9(3), 750–760. https://doi.org/10.59765/qug529f
3. Chepkwony, K., Wanami, S., & Okari, F. (2025). Influence of Alignment of Interests on TVET Industry Collaboration in Trans-Nzoia County. Kenya. Journal of Research Innovation and Implications in Education, 9(3), 760–660. https://www.jriiejournal.com/wp-content/uploads/2025/08/JRIIE-9-3-064-.pdf

4. Dungey, C. E., & Ansell, N. (2020). 'I go to school to survive': Facing physical, moral and economic uncertainties in rural Lesotho. Children's Geographies, 18(6), 614–628. https://doi.org/10.1080/14733285.2020.1822514
5. Formyuy, N. (2025). Linking Technical and Vocational Education and Training (TVET) Curriculum to the Labour Market needs in China. International Journal of Innovative Science and Research Technology, 10(1), 1707–1714. https://doi.org/10.5281/zenodo.14808075
6. Gani, N. A. A., & Halim, F. A. (2024). Strategic Leadership and Effective Management: Bridging the Gap between TVET Curriculum and Industry Needs in Malaysia. Journal of TVET and Technology Review, 2(2), 62–69. https://doi.org/10.30880/jttr.2024.02.02.006
7. Hoang, V., & Nguyen, T. T. (2024). The Impact of Formal and Non-Formal Training Programs in Vietnam's Manufacturing Sector. 22(22), 1. https://www.researchgate.net/publication/378711553
8. Issa, R., & Muya, F. (2025). The Role of Industrial Attachment in Enhancing Technical, Soft, and Pedagogical Skills of TVET Teaching Staff in Tanzania. Journal of Research Innovation and Implications in Education, 9(1), 340–350. https://doi.org/10.59765/n582pr
9. Kebede, A., Asgedom, A., & Asfaw, A. (2024). Is Linking Technical and Vocational Training with Industry a Bridge to Employability? Lessons from a Literature Review for Ethiopia. Cogent Education, 11(1), 2406721. https://doi.org/10.1080/2331186X.2024.2406721
10. Mathur, A., Sharan, M., Chakraborty, S., & Mullick, S. (2022). Technical and Vocational Education and Training: Examining Changing Conditions in India. The 9Th International Conference on Sustainable Development, 31. https://doi.org/10.3390/environsciproc2022015031
11. Moses, K. M., & Liu, W.-T. (2023). The Role of TVET Skill Development in Transformation of Informal Sector in Developing Countries: The Case Study of Skilling Uganda Program in Kampala Urban Area Uganda. Icveast, 46. https://doi.org/10.3390/proceedings2022083046
12. Motsepe, H., Sethu, M. J., Sikhosana, S., & Dladlama, B. (2026). Aligning Technical and Vocational Education and Training Curricula with Labour Market Demands: An Assessment of Contemporary Relevance. International Journal of Applied Research in Business and Management, 7(2). https://www.researchgate.net/publication/401309360
13. Moustafa, Riungu, F.K. Phd, & Rintari, A. (2023). The impact of curriculum implementation strategies on graduate employability in TVET institutions in Kenya. A case of Nairobi metropolitan counties. Strategic Journal of Business & Change Management, 10(3). https://strategicjournals.com/index.php/journal/article/view/2691/2556
14. Mulati, T. W., Kyalo, N. M., & Dimo, H. (2019). Industry-TVET Collaboration on Students' Skill Acquisition: The Case of TVET Institutions in North Rift Region, Kenya. Africa Journal of Technical & Vocational Education & Training, 4(1), 44–55. http://41.89.164.27:8080/xmlui/handle/123456789/636?locale-attribute=sw
15. Muthoka, D., Wangila, E., & Ongeti, O. K. (2025). Effect of Industrial Induction Process on Acquisition of Vocational Skills during Industrial Attachment among TVET Trainees in Kakamega County, Kenya. African Journal of Empirical Research, 6(3), 639–653. https://doi.org/10.51867/ajernet.6.3.49
16. Mwaura, A. N., Mugwe, M., Edabu, P., & Thinguri, R. (2022). Effectiveness of Industrial Attachment Exposure in Developing Trainees' Employability Skills from TVET Institutions in Nairobi County. East African Journal of Education Studies, 5(2), 275–285. https://www.researchgate.net/publication/362320890
17. Nakawala, L., Muwumba, A. M., Ogwang, S. P., Nahamya, W. K., & Oyesigye, O. (2025). Tracer Study of Graduates of National Diploma in Water, Civil, Electrical, and Mechanical Engineering programmes 2016–2019. International Journal of Advanced Research, 8(1), 399–413. https://doi.org/10.37284/ijar.8.1.3372
18. Niwamanya, G., Zhong, Z., Matola, C. A., Eliachu, D., Ravindra, S., & Fahn, J. B. (2025). Bridging the Digital Divide through Enterprise-TVET Provider Partnerships: Strategic Insights on Digital

Transformation in TVET in Developing Nations. Vocation, Technology & Education, 2(11). https://doi.org/10.54844/vte.2025.0977

19. Oluwatoyin, K. G. (2025). Bridging the Gap Between TVET Academics and Industry: Strategies for Economic Growth and Development in Nigeria. International Journal of Science, Architecture, Technology and Environment, 328–340. https://doi.org/10.63680/ijsate0525158.26
20. Omar, M., & Kamaruzaman, F. M. (2024). Technical and Vocational Education Training and Industry Collaboration: A Bibliometric Review. Journal of Education and Learning (EduLearn), 18(4), 1582–1592. https://doi.org/10.11591/edulearn.v18i4.21120
21. Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2013). Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research. Administration and Policy in Mental Health and Mental Health Services Research, 42(5), 533–544. https://www.researchgate.net/publication/258315317
22. Palmer, V., & Coe, A. (2020). A Best Practice Guide to Qualitative Analysis of research to inform healthcare improvement, re-design, implementation and translation Guidance Document. https://aci.health.nsw.gov.au/__data/assets/pdf_file/0006/660867/ACI-qualitative-analysis-of-research.pdf
23. Sarpong-Nyantakyi, J., & Mensah, R. O. (2025). Industrial Attachment Programme as a Panacea for Graduate Unemployment: A Case of Higher National Diploma Graphic Design students at the Takoradi Technical University, Ghana. African Quarterly Social Science Review, *2*(2), 55–72. https://doi.org/10.51867/AQSSR.2.2.6
24. Semali, L. (2024). Leveraging Multistakeholder Partnerships in Technical, Vocational Education, and Training. Semail, 1(3). https://doi.org/10.54844/vte.2024.0558
25. Siddiky, M. R., & Uh, S. (2020). Linking TVET with Industries in Bangladesh: Need for Supportive Policies and an Approach to TVET. Journal of Technical Education and Training, *12*(3), 1–21. https://doi.org/10.30880/jtet.2020.12.03.001
26. Taherdoost, H., & Madanchian, M. (2024). The Impact of Survey Response Rates on Research Validity and Reliability. Advances in Library and Information Science, 177–206. https://doi.org/10.4018/979-8-3693-1135-6.ch009
27. Tenuche, B. (2018). A mixed-method approach to investigate individual behaviour in online health communities. https://bura.brunel.ac.uk/bitstream/2438/15810/1/FulltextThesis.pdf
28. Uwilingiyimana, C., Iradukunda, P., Izerimana, L., Hakizimana, J. V., & Yadufashije, C. (2026). Impact of Industrial Attachment Program and Collaboration between Rwandan Industry-Educational Institutions. Indian Journal of Science and Technology, 19(5), 313–321. https://www.researchgate.net/publication/401049687
29. Wahungu, D., Wawire, V., & Kirimi, F. (2023). Strategies for aligning institutional engineering technical vocational education and training practices with industry skills requirements in kenya. Reviewed Journal of Education Practice, 4(1), 96–116. https://ir-library.ku.ac.ke/server/api/core/bitstreams/6943c742-4a32-407f-9e4e-a07f69662a46/content
30. World Bank. (2023). BUILDING BETTER FORMAL TVET SYSTEMS PRINCIPLES AND PRACTICE IN LOW-AND MIDDLE-INCOME COUNTRIES Public Disclosure Authorized Public Disclosure Authorized Public Disclosure Authorized Public Disclosure Authorized. https://documents1.worldbank.org/curated/en/099071123130516870/pdf/P175566037a5e20650a657068b5152205bf.pdf
31. Yiga, S. (2022). Assessment methodologies and determinants of employability and skills level among Technical and Vocational Education Training (TVET) graduates in Central Uganda. International Journal of Vocational and Technical Education, 14(2), 40–47. https://journal-backups.lon1.digitaloceanspaces.com/uploads/main/article/5f148bd70050.pdf