



Contents lists available at JVSAR website

# Journal of Vocational Studies on Applied Research

Journal homepage: <https://ejournal2.undip.ac.id/index.php/jvsar>



Review Article

## Skills Mismatch in Rwanda's TVET: Factors and Workforce Development Impacts

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### Abstract

Technical and Vocational Education and Training (TVET) is central to Rwanda's strategy for workforce development. However, evidence from policy documents, peer-reviewed literature, and international reports indicates a persistent skills mismatch between what TVET graduates offer and what employers need. This study synthesizes secondary data from 39 sources using a qualitative document analysis. The analysis identifies nine contributing factors to skills mismatch in Rwanda's TVET sector, including outdated curricula, weak industry-institution collaboration, insufficient trainer competence, technological and infrastructure gaps, shortage of work-based learning, poor labor market information systems, limited entrepreneurial and soft skills training, funding and policy constraints, and socio-cultural barriers. These mismatches result in graduate unemployment, reduced organizational productivity, and constrained national growth. Based on the evidence, the study recommends modernizing the curriculum, expanding work-based learning, enhancing trainer development, strengthening industry partnerships, and improving labor market data systems. Due to the lack of primary data, findings are exploratory and should be validated through future tracer studies and employer surveys.

### Article history:

Received: 4<sup>th</sup> February 2026

Revised: 28<sup>th</sup> April 2026

Accepted: 28<sup>th</sup> April 2026

Available online: 6<sup>th</sup> July 2026

Published: 30<sup>th</sup> October 2026

### Keywords:

Technical and Vocational Education and Training (TVET); Skills Mismatch; Workforce Development; Employability; Labor Market Alignment; Rwanda



Permalink/DOI: <http://doi.org/10.14710/jvsar.31259>

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### 1. Introduction

Technical and vocational education and training have become a key part of Rwanda's strategy for economic transformation. In line with national frameworks such as Vision 2050 and the National Strategy for Transformation (NST1), the Rwandan government aims to build a middle-income, knowledge-based economy with a skilled workforce (Gahigi, 2023). Human capital development drives productivity and growth (World Bank, ILO & UNESCO, 2023). TVET is positioned as a tool to provide market-relevant skills, not merely as an alternative to general education.

The government has invested in institutional reforms. Rwanda Polytechnic (RP) and the Rwanda TVET Board (RTB) coordinate technical education, including curriculum development, accreditation, quality assurance, and trainer training (RTB, 2021). The

Competency-Based Curriculum (CBC) emphasizes learner-centered pedagogy, hands-on training, and entrepreneurship. Similar reforms have been implemented elsewhere to improve TVET responsiveness (Rathelot et al., 2023).

Despite these efforts, skills mismatch persists. A skills mismatch occurs when a person's skills and qualifications do not match the needs of the labor market (International Labor Organization, 2023). It includes underemployment, skill deficits, and qualification disparities. Many TVET graduates cannot find jobs in their field, and employers report difficulty hiring skilled technicians (Nkoana & Stemele, 2025; Kalisa & Mugiraneza, 2024). Beyond individual outcomes, a mismatch raises business training costs, reduces productivity, and slows technology adoption (Brudevold-Newman & Ubfal, 2024). At the macro level, it hinders labor market efficiency and economic diversification.

The problem also reflects systemic weaknesses, including outdated curricula, weak industry-

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institution links, lack of modern equipment, underfunding, and limited teacher development (Hakizayezu & Maniraho, 2022; RTB, 2021). Poor labor market information systems prevent evidence-based planning. Thus, Rwanda's TVET sector faces a double burden, as graduates lack workplace skills, while priority sectors face shortages (Gahigi, 2023).

This study has three main objectives. The first is to identify the key factors that contribute to skills mismatch between TVET graduates and labor market demands in Rwanda. The second is to analyze the impacts of this mismatch on individual employability, organizational productivity, and national economic development. The third is to propose evidence-based strategies that can improve alignment between TVET outputs and labor market needs. In line with these objectives, the study explores three central questions. What are the factors that cause skills mismatch in Rwanda's TVET sector? How does this mismatch affect individual, organizational, and national outcomes, and what evidence-based strategies can better align TVET outcomes with labor market demands?

## 2. Literature Review

This literature review focuses on Technical and Vocational Education and Training (TVET) studies and their alignment with the labor market demands, specifically in Rwanda. It draws lessons from worldwide and regional experiences as it examines the notion of skills mismatch, its causes, and consequences. The review synthesizes available research to highlight the gaps in current practice and lays the groundwork for comprehending how TVET may improve graduate preparation for jobs and economic growth.

### 2.1 TVET and Labor Market Alignment

TVET is widely seen as essential for human capital development and inclusive growth. Tusiime et al. (2022) argue that TVET links formal education to the labor market by providing practical, job-relevant skills. Its success depends on responsiveness to market changes. Despite reforms such as the creation of Rwanda Polytechnic, Mbahongeriki & Muhayimana (2025) find that many graduates still struggle to find related employment.

Wealthy nations maintain TVET relevance through strong business-institution coordination. Germany's dual training model combines classroom learning with structured apprenticeships, reducing youth unemployment (Euler, 2013). In Rwanda, however, competence-based curricula have only partially improved practical skills; graduates often cannot apply theory in real workplaces (Tusiime et al., 2022).

Many low- and middle-income countries face similar mismatches. Oketch & Rolleston (2021) identify outdated facilities and limited industry exposure as

barriers. In Rwanda, Mbahongeriki & Muhayimana (2025) observe that graduates lack entrepreneurial and problem-solving abilities. Addressing this requires ongoing curriculum updates, structured internships, and ICT integration. Tusiime et al. (2022) show that even with policy reforms, implementation gaps persist.

### 2.2 The Concept of Skills Mismatch

Skills mismatch describes a situation where a person's abilities, experience, and credentials do not meet labor market demands (Cedefop, 2010; Kiss, 2016). This misalignment reduces economic competitiveness and raises unemployment. Literature distinguishes horizontal mismatch (working outside one's field) and vertical mismatch (over- or under-qualification). Increasingly, scholars focus on qualitative mismatches, lacking digital skills, occupational competencies, or transferable abilities (McGuinness et al., 2018; Maltseva, 2019; Bischof, 2024).

The OECD (2021) argues that automation and digitalization render many skills obsolete quickly, necessitating constant curriculum adjustments. Haasler (2020) adds that mismatch forces businesses to bear retraining costs. In Rwanda, employers describe TVET graduates as lacking practical skills, digital literacy, and workplace flexibility (Brudevold-Newman & Ubfal, 2024). Thus, qualitative inadequacies are the core problem.

### 2.3 International Perspectives on Skills Mismatch in TVET

International experiences offer valuable lessons on how to reduce skill mismatches through efficient TVET management and instructional design. The integration of institutional learning with formal apprenticeships in nations with strong alignment mechanisms, like Germany, guarantees that training content changes in accordance with industry demands. Maintaining graduate employability and occupational relevance has been demonstrated to depend on employer involvement in curriculum development and evaluation (Euler, 2013).

However, even in Germany, VET dropout rates are a persistent concern, with research showing that a lack of informed career choices contributes to students leaving their programs (Herrmann & Kühn, 2024). Similar to this, Asian nations like Malaysia, Singapore, and South Korea have demonstrated the importance of competency-based training, continuous curriculum evaluation, and reliable labor market information systems. According to Abdullah et al. (2024), Malaysia's shift towards industry-driven competency standards has greatly reduced graduate underemployment and improved employer satisfaction. Likely, Halik Bassah (2022) found that

Malaysian industry experts emphasize the need for continuous curriculum updates and stronger institutional-employer partnerships. These systems emphasize digital literacy, adaptability, and lifelong learning as critical components of workforce readiness.

Conversely, data from sub-Saharan Africa point to continuing structural impediments. Cloete et al. (2020) highlight that the restricted integration of ICT skills and soft skills still poses a barrier to graduate adaptability in South Africa. Oketch & Rolleston (2021) and Munene (2021) identify that inadequate private sector engagement, restricted trainer access to industry, and outmoded assessment strategies are principal contributors to the persistent skills gap in Kenya. The issues facing Rwanda’s TVET system are reflected in these regional trends. In general, global literature stresses that curriculum reform alone is insufficient to address skills misalignment.

Institutionalized employer involvement, ongoing professional development for trainers, cutting-edge training facilities, adaptable qualification frameworks, and efficient labor market information systems are all necessary for sustainable solutions. These lessons offer a useful resource for bolstering Rwanda’s current TVET changes.

**2.3.1 A critical comparison: Rwanda, Germany, and Singapore**

While Rwanda has borrowed elements from successful TVET systems such as Germany’s dual training model and Singapore’s competency-based frameworks, the transfer has been incomplete. Germany’s system succeeds because employers collectively fund and co-manage training through chambers of commerce, a level of private sector organization that Rwanda lacks. Singapore’s Skills Future initiative relies on real-time labor market data analytics and continuous curriculum updates every 18-24 months, a pace that Rwanda’s slower bureaucratic processes cannot yet match. This suggests that borrowing policy without equivalent institutional infrastructure is unlikely to produce similar outcomes. Rwanda may need to develop hybrid models adapted to its smaller formal economy and weaker employer coordination mechanisms.

**2.4 Conceptual Framework**

Based on the literature reviewed, this study proposes a conceptual framework for understanding skills mismatch in Rwanda’s TVET sector. The framework draws on key insights from existing literature, including the typology of mismatch forms developed by McGuinness et al. (2018), as well as contributions from Cedefop (2010), the ILO (2023), and the World Bank (2023). It organizes the causes, mediating processes, and consequences of skills mismatch into a coherent structure. Figure 1 presents the framework.

The framework posits that skills mismatch arises from interactions among five factor categories. Supply-side factors include outdated curricula, low trainer competence, weak ICT and language integration, and limited soft skills and entrepreneurship training. Demand-side factors include inadequate labor market information systems, limited private sector participation, and quick technology development. Institutional factors cover weak industry collaboration, infrastructure gaps, and a shortage of work-based learning. Socio-cultural factors include negative TVET perceptions, regional disparities, and gender disparities. Policy factors include funding limits and slow curriculum reviews. These factors influence three mediating processes, such as curriculum delivery quality, work-based learning effectiveness, and career

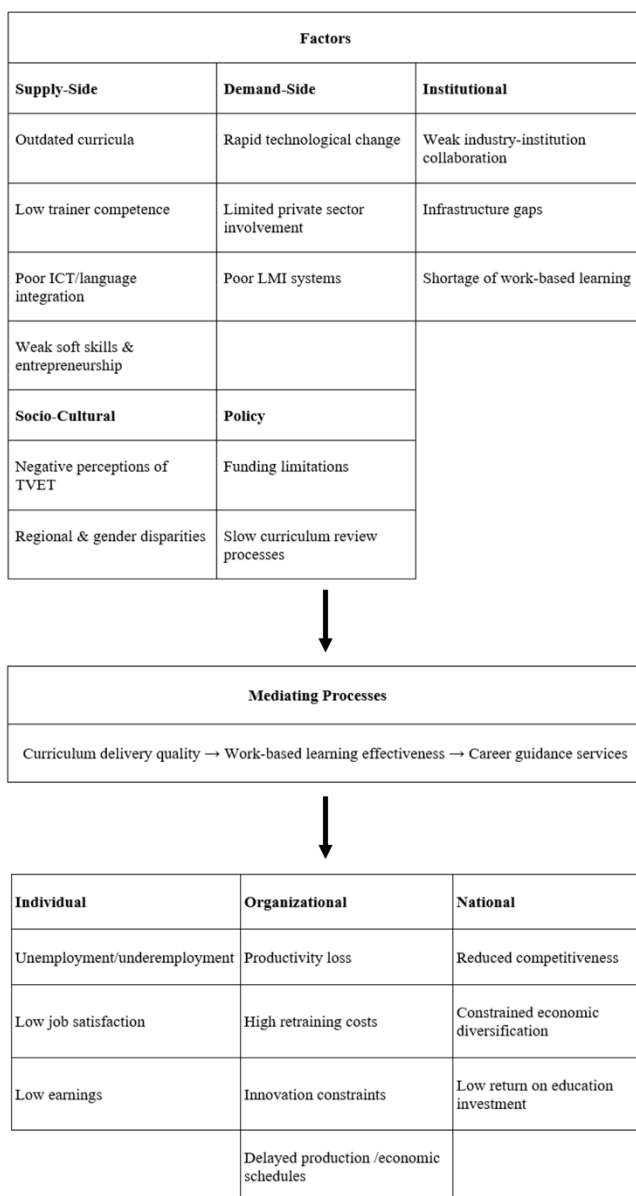


Figure 1. Conceptual framework for skills mismatch in Rwanda’s TVET system.

guidance services. In turn, these affect outcomes at three levels. Individual outcomes include unemployment, underemployment, and job dissatisfaction. Moreover, productivity loss, excessive retraining expenses, and restrictions on innovation are among the organizational effects. National outcomes include reduced competitiveness, constrained diversification, and low return on education investment. This framework guides the analysis of findings.

### 2.5 Synthesis and Research Gap

Looking across the 39 reviewed sources, several patterns are evident. First, weak industry collaboration is the most frequently cited cause of skills mismatch in Rwanda. Second, graduates lack practical soft skills more than formal credentials. Third, successful TVET systems such as those in Germany, Singapore, and Malaysia avoid these problems by embedding employer input throughout curriculum design, delivery, and assessment. Malaysia's shift toward industry-driven competency standards, for example, has been associated with improved employer satisfaction and better graduate outcomes (Abdullah et al., 2024). However, almost no existing research examines how curriculum implementation, teaching methods, and industry cooperation interact to create a mismatch. Most studies treat these factors separately or focus on policy intentions rather than on classroom realities. This lack of interaction analysis leaves policymakers guessing whether to invest in new equipment, teacher retraining, or internships. This study addresses the gap by synthesizing evidence into a conceptual framework (Section 2.4) that maps how supply, demand, institutional, socio-cultural, and policy factors connect a starting point for future primary research.

### 3. Methods

This study employs a qualitative document analysis approach to synthesize existing knowledge on skills mismatch in Rwanda's TVET sector. Document analysis is a well-established method for identifying patterns across published sources and generating evidence-informed recommendations without primary data (Bowen, 2009). Following Bowen's principles, this study applies a replicable search, screening, and thematic synthesis procedure to the specific context of Rwanda's TVET system. Unlike a systematic literature review, which requires exhaustive searches and quality appraisals, document analysis offers a flexible yet rigorous method for interpreting selected documents, including peer-reviewed articles, government reports, and publications from international organizations.

#### 3.1 Data Sources

The study relies exclusively on secondary data, including peer-reviewed journal articles (n=24), government policy documents (n=2), international organization reports (n=9), books and book chapters (n=3), and media/technical reports (n=1) = 39 sources total. Inclusion criteria were (a) focus on TVET, skills mismatch, or workforce development in Rwanda or comparable contexts; (b) publication between 2015 and 2025; (c) English language; (d) credible provenance (peer-reviewed journals, official government bodies, international organizations, established news outlets). Table 1 provides a full breakdown.

#### 3.2 Analytical Procedure

The study followed a systematic five-step process. First, the author read and retrieved sources using Google Scholar, Scopus, and various institutional websites. Keywords included TVET Rwanda, skills mismatch, vocational education, labor market

Table 1. Summary of data sources (39 total).

Source type	Number	Analyzed Document
Peer-reviewed journal articles	24	Tusiime et al. (2022); Kalisa & Mugiraneza (2024); Mbahongeriki & Muhayimana (2025); Hakizayezu & Maniraho (2022); Adams et al. (2024); Abdullah et al. (2024); Nkunya & Mwila (2024); Nakayiso (2025); Brudevold-Newman & Ubfal (2024); Rukundo & Sikubwabo (2021); McGuinness et al. (2018); Maltseva (2019); Bischof (2024); Herrmann & Kühn (2024); Munene (2021); Haasler (2020); Bowen (2009); Okoye, Hui & David (2025); Nkundimana et al. (2023); Nkoana & Stemele (2025); Mugabirwe, Mugabe & Muhumuza (2025); Gekara & Snell (2017); Rathelot et al. (2023)
Government policy documents	2	Rwanda TVET Board (2021); Gahigi (2023).
International organization reports	9	ILO (2023); World Bank (2023, 2024); UNESCO (2024a, 2024b); OECD (2021); Cedefop (2010); Kiss (2016); World Bank, ILO & UNESCO (2023)
Books and book chapters	3	Cloete et al. (2020); Oketch & Rolleston (2021); Euler (2013)
Media and technical reports	1	Ulandssekretariatet (2024).
Total	39	

alignment, and workforce development in Rwanda.

Second, each source was screened for relevance. For those that met the inclusion criteria, basic metadata (author, year, country focus, and methodology for empirical studies) were extracted and recorded in a spreadsheet. Third, open coding was conducted. The author read each source line by line, highlighting any passage that discussed causes, consequences, or solutions for skills mismatch. Initial codes were kept descriptive, such as outdated equipment, no employer input, or low digital literacy.

Fourth, axial and thematic coding brought these descriptive codes together. Similar codes were grouped into broader categories. For example, outdated equipment, obsolete software, and a lack of ICT infrastructure were combined into a category called technological and infrastructure gaps. To avoid overgeneralizing from a single source, a category was promoted to a full theme only if it appeared in at least three independent sources from at least two different source types, for example, a peer-reviewed article and a government report. This triangulation criterion helped reduce the risk of single-source bias.

Fifth and finally, the author synthesized and cross-validated the findings. Themes were compared across different source types, such as peer-reviewed papers, government documents, international reports, and media, to identify convergence, divergence, or gaps in the evidence. When peer-reviewed evidence was limited, such as for the factor of rapid technological change in Rwanda, this limitation was noted explicitly in the findings.

### 3.3 Limitations

This study has several important limitations. First, without primary data such as employer surveys, graduate tracer studies, and classroom observations, the claims found in existing sources cannot be independently verified. Second, document analysis may over-represent problems that are more likely to be published and under-represent successes. Third, some factors, particularly rapid technological change, have not been extensively studied in Rwanda specifically, requiring cautious interpretation. Fourth, media reports lack the rigor of peer-reviewed research. Thus, findings are exploratory and should be treated as a synthesis of current knowledge, not definitive conclusions.

### 3.4 Ethical Considerations

Since this study used only published documents and did not involve interviews or surveys, ethical approval for human subjects was not required. Academic honesty was taken seriously as every source was properly credited, and care was taken to represent each author's ideas fairly without selective reporting.

As a Rwandan researcher examining the country's own TVET system, the author brings both insider knowledge and potential bias to this work.

## 4. Research Findings and Discussion

The main results of the study on skills mismatch in Rwanda's TVET industry are presented and discussed in this chapter. It emphasizes the elements that lead to the mismatch between vocational training and labor market needs, analyzes how this misalignment affects graduates, companies, and the overall economy, and investigates ways to improve the relevance and efficiency of TVET programs. This chapter offers a thorough analysis of the causes, effects, and possible remedies for the skills mismatch in Rwanda by synthesizing empirical data with current research.

### 4.1 Factors Contributing to the Mismatch in Rwanda

The analysis identified nine recurring factors contributing to skills mismatch in Rwanda's TVET sector. Each factor appeared consistently across multiple sources, including peer-reviewed articles, government reports, and international organization publications. The following subsections describe each factor.

#### 4.1.1 Outdated Curricula

Outdated curricula that ignore emerging industry trends are a major factor in Rwanda's skills gap. Ulandssekretariatet (2024) notes that many courses still deliver static content, failing to address automation and digital transformation. The World Bank (2023) reports that Rwandan TVET curricula lag technological changes by three to five years. Tusiime et al. (2022) found similar gaps at Rwanda Polytechnic, and the RTB (2021) strategic plan admits that curriculum review is too slow. This problem is not unique to Rwanda; studies from Tanzania (Nkunya & Mwila, 2024) and Uganda (Nakayiso, 2025) report identical issues. As a result, graduates finish with expertise that is no longer fully applicable to the workforce. This misalignment restricts job prospects and reduces vocational education's contribution to economic progress. The situation calls for constant curriculum updates to ensure graduates possess market-relevant competencies.

#### 4.1.2 Industry-Institution Gaps and Private Sector Disengagement

Weak cooperation between TVET colleges and employers is a major cause of skills mismatch. Nkunya & Mwila (2024) argue that limited collaboration prevents cocreated curricula and proper internships.

The Rwanda TVET Board (2021) notes that formal channels for employer input remain underdeveloped. Kalisa & Mugiraneza (2024) found that fewer than 30% of Rwandan TVET institutions have active industry advisory boards. The World Bank (2024) adds that limited private sector involvement restricts internship quality. Consequently, training stays theoretical, and students gain little exposure to workplace technologies.

Three underlying reasons emerge from the sources. First, many Rwandan firms are small and informal, lacking the capacity to supervise trainees. Second, collaboration costs fall on employers, while benefits are shared across firms a collective action problem. Third, TVET funding is tied to enrollment numbers, not graduate employment outcomes. Until funding models reward job placement, institutions will lack motivation to pursue demanding industry partnerships.

#### 4.1.3 Insufficient Trainer Competence

Deficiencies in trainer competence perpetuate skills mismatch. Kiss (2016) argues that learners cannot meet labor market needs if trainers lack current industry knowledge or modern teaching methods. Okoye et al. (2025) state that many TVET educators struggle to implement Competency-Based Training effectively. Hakizayezu & Maniraho (2022) add that the absence of ongoing professional development prevents trainers from keeping pace with industry changes. As a result, graduates may have a theoretical understanding but lack practical skills and problem-solving abilities. This gap widens further when trainers cannot update their own skills. Without continuous upskilling, even well-designed curricula fail to produce competent graduates. Investing in regular, structured professional development for TVET trainers is essential. Such programs ensure that trainers can teach current industry practices and use effective competency-based methods.

#### 4.1.4 Technological and Infrastructure Gaps

Technological and infrastructural constraints greatly exacerbate skills mismatch. Nkundimana et al. (2023) report that many TVET schools have inadequate ICT infrastructure, poorly maintained labs, and obsolete equipment. Mugabirwe et al. (2025) document equipment shortages across multiple institutions. The World Bank (2024) notes insufficient investment in digital learning resources, such as simulations and smart workshops. Rapid technological changes in automation and AI are transforming labor markets, creating a gap between graduates' skills and employers' expectations (Kiss, 2016). Ulandssekretariatet (2024) adds that the lack of access to modern technologies amplifies this problem.

Students trained in outdated machinery are ill-prepared for modern manufacturing. To close these gaps, infrastructure and technology must be updated to match vocational training with contemporary industrial demands. This includes making investments in ICT, cutting-edge workshop equipment, and digital learning resources.

#### 4.1.5 Shortage of Work-Based Learning Opportunities

A lack of well-organized work-based learning worsens skills mismatch. Industrial apprenticeships are frequently short, unmonitored, or ill-suited to the sector's demands. The ILO (2023) reports that fewer than 40% of TVET students in Rwanda complete a supervised internship longer than two months. Comparative studies from Uganda (Nakayiso, 2025) and Tanzania (Nkunya & Mwila, 2024) demonstrate that structured internships greatly enhance job outcomes. Students can apply classroom topics, build professional networks, and understand workplace norms through work-based learning. Without sufficient exposure, graduates remain ill-prepared for real work environments. To address this shortage, industry-TVET collaboration must be strengthened to offer well-planned, supervised work experiences. Extended internships, proper supervision, and integration of workplace learning into formal assessment are essential strategies.

#### 4.1.6 Poor Labor Market Information Systems

The scarcity of reliable labor market data hinders evidence-based decision-making in the TVET sector. Without current labor market information, institutions cannot align curricula with demand or steer students toward viable careers (Ulandssekretariatet, 2024). This disparity leads to a scarcity of skills in high-growth fields like ICT, renewable energy, and sophisticated manufacturing, as well as an excess of graduates in low-demand industries. While developing sectors struggle to locate competent personnel, TVET institutions may continue to provide graduates for the fading industry. The lack of real-time data also prevents informed policy decisions on resource allocation and program funding. A strong labor market information system needs regular tracer investigations, yearly employer surveys, and sector-level skill evaluations. Such systems enable proactive curriculum adjustments and improve the responsiveness of vocational education to economic changes.

#### 4.1.7 Limited Entrepreneurial and Soft Skills

Most TVET graduates possess technical abilities but lack entrepreneurial and soft skills needed for workplace flexibility. Brudevold-Newman & Ubfal (2024) highlight deficiencies in communication,

teamwork, problem-solving, and business management. Consequently, graduates often resort to formal employment and struggle to innovate or work independently. Brudevold-Newman & Ubfal (2024) add that soft skills deficits reduce employability, as employers report difficulties finding graduates with appropriate interpersonal and problem-solving abilities. In Rwanda's evolving economy, self-employment and small business creation are increasingly important pathways to work. Without entrepreneurial skills, TVET graduates miss opportunities to generate their own income. To address this gap, TVET programs must integrate entrepreneurial education and soft skills development into their curricula. This includes project-based learning, communication workshops, team assignments, and basic business management training.

#### 4.1.8 Funding and Policy Limitations

Funding and policy disadvantages significantly exacerbate skills mismatch. Kiss (2016) highlights that insufficient public funding impedes curriculum updates, reskilling initiatives, and professional development. Staff training, technology adoption, and infrastructure development are challenging in Rwanda due to a lack of funding (Gahigi, 2023). Without adequate funding, institutions cannot maintain modern learning environments or invest in innovative teaching practices. Additionally, slow curriculum review processes represent a critical policy limitation. Tusiime et al. (2022) note that bureaucratic procedures delay responses to industry changes, allowing curricula to become outdated before revisions are approved. The combination of funding shortages and policy inertia creates a cycle where TVET institutions cannot keep pace with labor market demands. To break this cycle, TVET institutions require increased government and private investment, alongside streamlined curriculum review procedures that enable faster, more responsive updates.

#### 4.1.9 Socio-Cultural Factors: Perceptions, Disparities, and Language Gaps

Societal attitudes significantly affect TVET enrolment and outcomes. The perception that vocational education is for weaker students discourages high-achieving students from enrolling (World Bank, 2024). Adams et al. (2024) report similar challenges in Ghana. Regional disparities also matter as rural TVET colleges face infrastructure and resource limitations (Nkundimana et al., 2023). Gender disparities show underrepresentation of females in engineering and construction, leading to economic inequalities. Furthermore, limited proficiency in English hinders graduates' ability to engage with modern technologies and cross-border trade

(Ulandssekretariatet, 2024). These socio-cultural factors interact to undermine employability. Addressing them requires national campaigns to raise TVET prestige, targeted infrastructure investment for rural institutions, scholarships and mentorship for female participation, and integration of language training across all TVET programs.

#### 4.2 Impacts of Skills Mismatch in Rwanda's TVET Sector

After looking at the factors of skills mismatch in Rwanda's TVET system, it is critical to investigate its wider effects on individuals, businesses, and the country's economy. Having the wrong set of skills has a significant negative impact on one's professional development, the output of an organization, and its overall financial results.

At the individual level, many graduates enter the workforce without the skills employers expect, leading to underemployment or outright unemployment. These graduates often end up in jobs unrelated to their training or below their qualification level, which results in dissatisfaction, low motivation, and poor job satisfaction. National labor surveys confirm that a considerable proportion of TVET graduates remain jobless or work in low-paying informal sectors (Ulandssekretariatet, 2024). This situation diminishes the perceived value of vocational education, discouraging prospective students from enrolling in TVET programs and potentially shrinking the talent pipeline for critical industries. Similarly, the International Labor Organization (2023) points out that insufficient practical experience and mismatched qualifications are major drivers of youth unemployment in Rwanda, further eroding graduates' employability.

At the organizational level, businesses find it difficult to hire workers with the necessary skills, especially in the construction, ICT, and technical sectors that have been designated as priority areas for Rwanda's economic development. As a result, businesses frequently must spend more money retraining workers to meet workplace standards, which raises operating expenses and reduces productivity (Tusiime et al., 2022). Production schedules can be delayed, innovation can be hampered, and a firm's ability to adapt to changing market demands can be diminished when training outcomes and workplace expectations are not well aligned. In addition to burdening specific organizations, this disconnect impedes sector-wide development in vital industries. Gahigi (2023) reports that skills shortages delay production schedules, constrain innovation, and limit firms' ability to adapt to changing market demands.

At the national level, the effects affect broader socioeconomic development in addition to individuals

and organizations. Rwanda's pursuit of sustainable industrialization, technological development, and job creation, as set out in Vision 2050 and the National Strategy for Transformation (NST1), is hindered by a shortage of appropriate skills. When industries cannot find workers with the necessary competencies, economic diversification slows, import dependency rises, and national productivity declines. Moreover, persistent mismatches between labor market demands and educational outcomes weaken Rwanda's competitiveness in regional and global markets (World Bank, 2023). This situation also limits the country's ability to benefit from emerging sectors such as digital services, advanced manufacturing, and renewable energy, where highly skilled workers are essential for innovation and long-term growth.

A mismatch in skills also indicates ineffective resource use. According to Hakizayezu & Maniraho (2022), significant public and private investments in TVET infrastructure, curriculum modernization, and capacity building yield limited returns when graduates are unable to successfully transition into productive employment. Furthermore, the lack of industry-relevant skills hinders entrepreneurship, innovation, and the development of high-value competencies that are necessary for Rwanda to shift to a knowledge-driven economy (UNESCO, 2024a). Economic diversification and competitiveness are thus limited because the growth of startups, small businesses, and domestic technological solutions is impeded. Additionally, the discrepancy is particularly apparent in emerging sectors such as IT, advanced manufacturing, Automobile, Construction Technology, and global value chains.

The current TVET system finds it difficult to keep up with changing industry and technological standards, despite the growing need for professionals who are digitally literate, adaptable, and skilled (Ulandssekretariatet, 2024). If this gap is not closed, structural bottlenecks may form, jeopardizing Rwanda's long-term development goals as outlined in Vision 2050. In summary, the skills gap in Rwanda's TVET industry goes beyond personal unemployment; it also hurts organizational productivity, lowers return on investments in human capital, and stifles innovation and economic change. To create a skilled, flexible, and competitive workforce in the global market, this gap must be closed by curriculum reform, improved collaboration between industry and institutions, enhanced work-based learning, and ongoing labor market monitoring.

### 4.3 Strategies for Workforce Development

The ongoing skills gap in Rwanda's TVET industry requires integrated, multifaceted policies that align vocational training with labor market needs. Interventions must cover curriculum reform, hands-on

training, infrastructure improvements, teacher capacity development, and meaningful business engagement.

Strengthening industry-TVET partnerships is essential. Kiss (2016) highlights that international cooperation and credential recognition keep educational systems aligned with labor market demands. Vocational schools can improve curriculum relevance and graduate employability by promoting industry partnerships and aligning programs with regional standards. Effective collaboration requires formal channels for employer participation in curriculum development and evaluation (Tusiime et al., 2022). Dual training models, apprenticeships, and internships ensure students develop both hard and soft skills. Employer forums or sector skills councils provide ongoing input, helping institutions anticipate technological and industry trends.

Curriculum modernization is also crucial. TVET programs need routine evaluation and improvement to keep up with technological advancements. In addition to collaborations with industry and lawmakers, there should be more practical learning possibilities like project-based activities, internships, and apprenticeships. Regular labor market analysis and forecasting enable schools to prepare for skill shortages. Beyond technical proficiency, employability skills like teamwork, communication, problem-solving, entrepreneurship, and critical thinking must be embedded (Rukundo & Sikubwabo, 2021).

Enhancing trainer capacity is another priority. Ongoing professional development programs are necessary to provide instructors with current industry knowledge and competency-based teaching methods (Hakizayezu & Maniraho, 2022). Modern laboratories, workshops, and simulated work environments are equally crucial (Mugabirwe et al., 2025). Thus, expanding work-based learning through extended, supervised internships and entrepreneurship training prepares students for self-employment.

Implementing robust labor market information systems enables evidence-based decision-making. Employer surveys, sector skills evaluations, and tracer studies help identify skill shortages and inform curriculum changes (Ulandssekretariatet, 2024). This helps policymakers plan workforce development strategically. Finally, promoting equal access and addressing infrastructure disparities is essential. Rural institutions need improved electricity, internet, and training facilities. Policies encouraging female participation in technical trades help address gender disparities, building a diverse, skilled labor force for Rwanda's economic progress.

## 5. Recommendations for Implementation

Several practical steps can better align TVET

outcomes with labor market demands. First, TVET institutions should establish formal industry advisory boards. These boards can identify future skills, specify necessary skills, and make recommendations for curriculum development, establishing a feedback loop between employers and instructors.

Second, dual training programs and structured apprenticeships need expansion. Students should alternate between classroom learning and on-the-job experience. This helps them apply theory, learn workplace norms, and build technical and professional skills. Joint evaluations by teachers and company supervisors ensure quality (Tusiime et al., 2022).

Third, curricula require regular updating so that students develop not only technical competencies but also essential employability skills such as communication, teamwork, problem-solving, entrepreneurship, and digital literacy. Complementing these with language training in English, French, and Kiswahili further enhances graduates' competitiveness in both domestic and international labor markets. Gekara & Snell (2017) remind us that a training system too focused on immediate employer demands risks weakening the breadth of transferable skills, ultimately reducing graduates' long-term job mobility and adaptability. To make this work, teachers need ongoing professional development in current teaching methods, industry practices, and ICT tools (Hakizayezu & Maniraho, 2022).

Fourth, investment in modern infrastructure is essential, such as workshops, labs, ICT facilities, and simulated work environments. Regular maintenance and upgrades ensure students train on equipment that meets industry standards (Mugabirwe et al., 2025). Work-based learning opportunities, internships, industrial attachments, mentorship, and entrepreneurship training should also be expanded. These prepare students to create jobs, not just seek them (Rukundo & Sikubwabo, 2021).

Fifth, a strong labor market information system allows evidence-based decisions on curriculum design, enrollment planning, and career advising (Ulandssekretariatet, 2024). Sixth, policies that promote gender equality and regional integration, such as scholarships, mentorship, awareness campaigns, and rural infrastructure development, help ensure equitable access to quality TVET.

Therefore, implementing all six recommendations at once is neither feasible nor wise given Rwanda's limited resources. Policymakers need to prioritize which interventions to pursue first. Based on the frequency analysis in Section 4.1, the most urgent factors are technological infrastructure and industry collaboration. Infrastructure upgrades are expensive and slow. Strengthening industry advisory boards and employer feedback loops, by contrast, can be done at low cost within six to twelve months.

A sequenced approach, therefore, makes sense.

First, formalize industry advisory boards and conduct rapid curriculum reviews for high-priority sectors (ICT, renewable energy, construction). Second, channel donor funding toward targeted infrastructure upgrades. Third, reform TVET funding so that a portion of allocations depends on graduate employment rates. This last change costs little but shifts incentives dramatically.

## 6. Conclusion

This study examined the reasons behind the skills gap in Rwanda's Technical and Vocational Education and Training (TVET) system and suggested ways to better match it with the demands of the labor market. According to the study, skills mismatch is a systemic problem that arises from the interaction between curriculum relevance, institutional capacity, industry engagement, and labor market information systems, rather than from specific training deficiencies. Through an integrated analytical lens, the study adds to current understanding by demonstrating how mismatches restrict graduate employability, labor force productivity, and innovation, especially in expanding industries like ICT, manufacturing, and services. The results make a strong argument for reorienting TVET as a demand-driven and industry-responsive system via curriculum modernization, better work-based learning, and continuous industry collaborations. These insights offer direct value to TVET colleges, companies striving to strengthen workforce preparedness, and policymakers committed to fostering inclusive economic growth. Future research should empirically assess the efficacy of these interventions through longitudinal graduate tracer studies, employer-based competency assessments, and experimental investigations of industry-led training models, in the context of ongoing TVET reforms in Rwanda.

## Acknowledgment

The author received no specific funding for this research and declares no conflict of interest.

## CRedit Author Statement

F. Ndikubwimana: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Resources; Supervision; Validation; Visualization; Writing original draft; Writing review & editing. The Author has read and agreed to the published version of the manuscript.

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