

Vocational training on employability in various countries

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Abstract: This study explores the accessibility of vocational education and training (VET) programs, focusing on how financial barriers, industry alignment, and societal perceptions influence enrollment rates, employability, and career outcomes. By utilizing data mining techniques to analyze vast datasets from various countries, the research identifies key trends and challenges in improving access to VET, including financial constraints, societal stigmas, and misalignment between training programs and industry needs. The study emphasizes the need for coordinated efforts to enhance the quality, accessibility, and relevance of vocational training to ensure its role in addressing workforce demand and improving long-term employment opportunities for marginalized groups.

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INTRODUCTION

Vocational education and training (VET) plays a critical role in preparing individuals for employment, but its accessibility and effectiveness vary significantly across countries. Factors such as financial barriers, societal perceptions, and the alignment of VET programs with industry needs shape the participation rates and success of these programs (Tukundane et al., 2015; Schmees et al., 2024). In many regions, vocational training is seen as a secondary choice compared to academic education, which often discourages enrollment, especially among marginalized groups (Di Stasio, 2017; Zeleke, 2018). Additionally, the mismatch between vocational curricula and industry requirements leads to skills gaps, resulting in high levels of underemployment among graduates (Eichhorst et al., 2015).

This research investigates the barriers to accessing vocational training, explores strategies to overcome these barriers, and highlights the importance of aligning VET with labor market demands. Using data mining techniques, the study analyzes large datasets to uncover patterns and trends that can inform policy and decision-making regarding VET systems across different international contexts.

Statement of the problem

This research aims to explore the key factors influencing access to vocational education and training (VET) and its impact on employability, career outcomes, and workforce development. The objectives of this research are to: Analyze the barriers to accessing vocational education and training: This objective explores the financial, social, and institutional challenges that prevent marginalized groups from enrolling in VET programs.

Examine the alignment between VET and industry demands: This objective focuses on how well vocational training programs meet labor market needs and the role of industry partnerships in improving employability outcomes.

Evaluate the impact of societal perceptions on vocational education: This objective investigates how societal attitudes toward VET influence enrollment rates, career aspirations, and long-term employment opportunities for graduates.

Assess the quality of VET programs and their effectiveness: This objective examines the extent to which VET programs provide relevant skills, integrate hands-on experience, and align with workforce demands, especially in developing economies.

METHODOLOGY

Research design

This study employs a data mining approach to analyze large-scale datasets related to vocational education and labor market outcomes. Data mining techniques such as clustering, classification, and association rule mining will be used to identify patterns and trends in VET participation, employment outcomes, and policy effectiveness. By mining data from government reports, educational databases, industry employment statistics, and labor market surveys, the research will uncover hidden insights and correlations that may not be readily apparent through traditional methods.

Data analyses procedure

To analyze the data, the study will employ a range of data mining techniques. First, clustering will be used to group countries or regions that share similar characteristics regarding VET accessibility, quality, and employability outcomes. This will help identify patterns across different contexts and determine the factors that contribute to VET success. Next, classification will be applied to categorize regions or specific VET programs based on their success in aligning educational outcomes with labor market needs.

By examining these classifications, the study will highlight best practices and areas for improvement. The third technique, association rule mining, will be employed to uncover relationships between key factors such as financial constraints, societal perceptions, industry demands, and VET enrollment rates. This will help identify the most influential factors affecting access to vocational education. Finally, predictive analysis will be used to forecast the potential impact of various policy interventions on VET access and employability outcomes, utilizing historical data to anticipate future trends and inform policy decisions.

FINDINGS AND DISCUSSIONS

Access to vocational training programs

Access to vocational education and training (VET) plays a crucial role in equipping individuals with the skills needed for employment and career advancement. However, accessibility varies across countries due to factors such as financial barriers, social perceptions, and institutional challenges. While some nations have well-developed vocational training pathways integrated

with industry partnerships, others struggle with limited funding, negative societal attitudes, and inadequate infrastructure. Understanding these differences helps in identifying key strategies to improve VET accessibility and ensure that more individuals, particularly marginalized groups, can benefit from vocational training opportunities.

Access to vocational education and training (VET) is a crucial factor in ensuring that individuals acquire the necessary skills for employment. However, across different countries, barriers such as socioeconomic status, financial constraints, and limited industry partnerships continue to restrict participation in vocational training programs. In Uganda, high training costs and negative social perceptions prevent marginalized youth from enrolling in VET programs (Tukundane et al., 2015). Similarly, in Norway, students from lower socioeconomic backgrounds face difficulties transitioning from VET to higher education, limiting their career advancement (Schmees et al., 2024).

On a global scale, accessibility strategies are essential for promoting inclusivity in VET programs. Kibrit et al. (2022) highlight that addressing administrative challenges and financial barriers can significantly improve accessibility, particularly in digital education. In Indonesia, expanding industry partnerships has been identified as a key strategy to ensure hands-on training opportunities and enhance students' readiness for employment (Estriyanto, 2021). Similarly, in India, initiatives like the Skill India Mission and the National Skill Development Corporation (NSDC) aim to bridge skill gaps, but implementation challenges persist due to fragmented vocational ecosystems (Majumdar, 2024).

Efforts to improve access also include strengthening certification and accreditation processes. In Indonesia, the development of a vocational roadmap and enhanced collaboration between schools, industries, and local governments help create structured pathways for students (Haryoko & Jaya, 2017). Ensuring wider accessibility to vocational training requires coordinated efforts between governments, educational institutions, and industries to develop inclusive policies and enhance skill development opportunities for all learners.

There are varying degrees of accessibility to vocational education and training (VET) across different countries, with financial constraints, social perceptions, and institutional barriers playing a significant role in determining participation. In Uganda, high training costs and the negative perception of VET as a "second-class option" discourage many young people, particularly marginalized youth, from enrolling in vocational programs (Tukundane et al., 2015). Similarly, in Norway, while nearly half of all students pursue VET, those from lower socioeconomic backgrounds face difficulties accessing higher education pathways, reinforcing social inequalities and limiting career mobility (Schmees et al., 2024). These cases illustrate how economic and social factors influence the accessibility of vocational education, regardless of a country's overall economic status.

Despite these challenges, efforts to improve access to VET have been implemented in various contexts. In India, the Skill India Mission and the National Skill Development Corporation (NSDC) have been established to expand vocational education, particularly in underserved areas. However, the effectiveness of these initiatives has been hindered by fragmented vocational ecosystems and a shortage of qualified trainers, making it difficult to integrate vocational learning with general education (Majumdar, 2024). A similar approach can be seen in Indonesia, where expanding industry partnerships and implementing a development roadmap for vocational high schools (SMKs) aim to enhance students' hands-on training experiences and increase employability (Estriyanto, 2021; Haryoko & Jaya, 2017). On a broader scale, research suggests that addressing administrative barriers, financial difficulties, and teacher training deficiencies can improve VET accessibility, particularly in the context of digital education (Kibrit et al., 2022).

While countries differ in their approaches to increasing access to VET, some common advantages and disadvantages emerge. Countries with strong industry partnerships, such as

Indonesia, benefit from better hands-on training and employment alignment, whereas nations struggling with financial and social constraints, like Uganda, experience lower enrollment and limited job opportunities for VET graduates. On the other hand, even in developed nations like Norway, systemic barriers prevent vocational students from seamlessly transitioning into higher education, limiting their long-term career prospects.

In conclusion, access to vocational training programs remains a critical issue worldwide, with financial barriers, social stigma, and institutional limitations shaping participation rates. While some countries have implemented strategic policies to enhance VET accessibility, challenges persist, requiring coordinated efforts between governments, industries, and educational institutions. Expanding financial support, fostering industry partnerships, and improving societal perceptions of vocational training are essential steps toward ensuring that VET serves as a viable and respected pathway to employment and career growth.

Industry demand and skills alignment

The effectiveness of vocational education and training (VET) depends significantly on its alignment with industry demands. In various countries, the success of vocational training programs is determined by how well they prepare graduates with job-ready skills. The relationship between education and employment systems plays a crucial role in ensuring that vocational graduates meet labor market expectations (Rageth & Renold, 2020). While some countries have developed strong apprenticeship-based systems to bridge the gap between training and industry needs, others struggle with misalignment, resulting in underemployment and skills mismatches (Eichhorst, Rodríguez-Planas, Schmidl, & Zimmermann, 2015). The challenge of ensuring that vocational programs produce workforce-ready graduates remains a global concern, requiring strategic collaboration between educational institutions and employers.

The dual apprenticeship system in European countries and other advanced economies has been identified as one of the most effective models for industry alignment. This approach integrates classroom learning with real-world job experience, ensuring that graduates possess both theoretical knowledge and practical skills (Eichhorst et al., 2015). Similarly, in Indonesia, the "link and match" policy aims to synchronize vocational curricula with industry competency needs, transforming vocational schools into miniature industries to provide hands-on experience (Haryoko & Jaya, 2017). Despite these efforts, many vocational graduates still face employment challenges due to the imbalance between the number of trained workers and actual industry demand (Estriyanto, 2021). This highlights the necessity for demand-driven enrollment strategies and continuous industry engagement to refine vocational training programs.

South Africa, China, and India provide insights into the challenges of skills misalignment. In South Africa, the National Certificate (Vocational) in Building and Civil Engineering (NCV: BCE) program has been criticized for focusing too much on theoretical knowledge while lacking hands-on training, making it difficult for graduates to transition into the workforce (Nkwanyane, 2023). Similarly, in China, vocational programs must be structured around enterprise needs to ensure graduates meet employer expectations and integrate smoothly into the labor market (Shi, 2021). Meanwhile, India's implementation of the National Occupational Standards (NOS) and Qualification Packs (QPs) under the National Skills Qualification Framework (NSQF) aims to align training with industry requirements. However, many employers remain reluctant to adopt these frameworks, leading to persistent gaps between education and workforce needs (Majumdar, 2024). This misalignment contributes to high unemployment rates among vocational graduates despite their specialized training.

International perspectives further underscore the need for industry-education collaboration. Research highlights that industry engagement is crucial for ensuring that vocational graduates possess the competencies required by employers (Somantri & Pramudita, 2024). Internships and work placements have been identified as effective mechanisms for bridging the skills gap and providing students with practical experience before entering the workforce (Tong, 2024). In Indonesia, efforts such as the Indonesian National Qualifications Framework (IQF) and the Rapid Assessment Process (RAP) aim to systematically map occupational needs, ensuring that vocational education remains relevant to industry demands (Suroño & Anggraini, 2024). Despite these efforts, the country still faces high unemployment rates among vocational school graduates (Rahayu, Meirawan, Muktiarni, Ghinaya, & Sabitri, 2024). Additionally, studies suggest that transferable skills are essential for adaptability in the job market, yet many vocational programs still struggle to adequately develop these competencies (Mahmudah & Santosa, 2021).

In conclusion, the alignment between vocational education and industry needs is a key factor in improving employability outcomes. Countries with strong apprenticeship-based systems and industry collaborations tend to produce more job-ready graduates. However, challenges such as theoretical-heavy curricula, employer resistance to standardized frameworks, and skills mismatches continue to hinder the effectiveness of vocational training in many regions. To address these issues, vocational programs must be continuously updated based on labor market trends, and stronger partnerships between vocational institutions and industries should be fostered. By refining curricula and integrating more practical learning opportunities, vocational education can play a more significant role in addressing workforce demands globally.

Social perception of vocational training

The social perception of vocational education and training (VET) varies across countries, influenced by cultural, economic, and institutional factors. In some nations, VET is seen as a valuable and practical alternative to academic education, while in others, it is often viewed as a secondary choice for students who do not pursue higher education. Public attitudes toward vocational education shape enrollment rates, career choices, and policy decisions, ultimately affecting the employability of VET graduates. Across different regions, perceptions of vocational training are influenced by factors such as occupational prestige, labor market structures, and societal biases favoring academic pathways. Studies indicate that while vocational education provides essential skills for the workforce, its reputation often suffers due to lingering stereotypes and structural barriers (Abrassart & Wolter, 2020; Di Stasio, 2017; Rehman et al., 2024; Zeleke, 2018; Pantea, 2020; Avis, 2019; Bettencourt et al., 2023). Understanding these perceptions is crucial for addressing the challenges faced by VET programs and improving their role in workforce development.

Vocational education faces significant perception challenges in many countries, often being viewed as a lesser alternative to traditional academic pathways. In Switzerland, despite a strong vocational training system, social prestige considerations lead many students and parents to favor university education over VET programs, reinforcing the notion that higher education is associated with better career prospects (Abrassart & Wolter, 2020). Similarly, in European countries, VET is often seen as a safety net rather than a preferred career path. While it provides a direct transition into employment, it is still regarded as a second-choice option due to concerns about limited opportunities for social mobility (Di Stasio, 2017).

In developing countries, such as Pakistan and Ethiopia, societal and familial expectations strongly influence students' perceptions of vocational education. Rehman et al. (2024) found that in Pakistan, family attitudes play a crucial role in shaping students' decisions to pursue

VET programs under TEVTA. Likewise, in Ethiopia, vocational training is often perceived as a last resort for students who are unable to succeed in traditional academic pathways, leading to low enrollment and a lack of recognition for its value in the labor market (Zelege, 2018). These trends indicate that negative social perceptions hinder the effectiveness and attractiveness of vocational education, despite its potential to improve employability.

The situation in Romania reflects a similar pattern, where young people do not necessarily choose VET based on personal aspirations but rather due to external factors such as family pressure, institutional constraints, or a lack of alternative opportunities. Pantea (2020) argues that VET in Romania is not always an empowered choice but rather a pathway dictated by circumstance, limiting students' ability to see vocational training as a viable and respectable career option. Meanwhile, Nordic countries, despite their reputation for progressive education systems, also grapple with structural issues that shape how VET is perceived. Avis (2019) challenges the idealized view of Nordic VET systems, arguing that economic and political influences still contribute to social stratification, affecting how vocational education is valued within society.

In The Azores, Portugal, efforts are being made to improve the image of vocational education and enhance its recognition among students and employers. Bettencourt et al. (2023) emphasize the need for targeted policies that promote VET as a competitive and desirable alternative to academic education. By addressing social stigmas and increasing public awareness of the benefits of vocational training, policymakers can work toward improving enrollment rates and employment outcomes for VET graduates.

notable similarities in the challenges faced by vocational education systems worldwide. In both developed and developing countries, VET is often seen as a lower-status alternative to academic education, which impacts enrollment rates and career aspirations (Abrassart & Wolter, 2020; Di Stasio, 2017; Zelege, 2018; Pantea, 2020). However, the reasons behind these perceptions vary. In industrialized nations like Switzerland and many European countries, the preference for higher education is driven by social prestige and long-term career mobility concerns (Abrassart & Wolter, 2020; Di Stasio, 2017). In contrast, in developing countries such as Pakistan and Ethiopia, negative perceptions stem from societal and familial expectations, which discourage students from pursuing vocational training (Rehman et al., 2024; Zelege, 2018).

One of the key advantages of vocational education is its ability to provide job-ready skills and a smoother transition into the labor market. However, a major disadvantage is that social biases against VET often lead to lower enrollment and limited career progression opportunities. In some cases, vocational graduates may face barriers in advancing to higher education or securing high-status jobs, reinforcing the perception that VET is a less desirable option (Di Stasio, 2017; Pantea, 2020). Nonetheless, countries such as The Azores, Portugal, are actively working to shift these perceptions through policy reforms and awareness campaigns (Bettencourt et al., 2023).

The perception of vocational training plays a crucial role in shaping its effectiveness, enrollment rates, and employment outcomes. Across various countries, VET is often viewed as a secondary option compared to academic education, influenced by factors such as social prestige, labor market structures, and societal biases. While vocational education offers practical skills and employment opportunities, negative perceptions hinder its full potential. To enhance the status of VET programs, policymakers must implement targeted strategies that address social stigmas and highlight the long-term career benefits of vocational training. Countries such as The Azores, Portugal, have already taken steps to improve the image of vocational education, demonstrating that with the right policies, VET can be recognized as an equally valuable pathway to professional success (Bettencourt et al., 2023). Addressing these

perception challenges will be essential for ensuring that vocational training contributes meaningfully to workforce development and economic growth on a global scale.

Quality of vocational training

The effectiveness of vocational education and training (VET) largely depends on the quality of instruction, curriculum design, and alignment with labor market needs. Across different countries, the data highlights a recurring challenge: many VET programs remain supply-driven rather than demand-driven, meaning they are designed without sufficient employer input, leading to skill mismatches and underemployment (Tukundane et al., 2015; Mahmudah & Santosa, 2021). While some advanced economies, such as those in the European Union and Norway, have established structured apprenticeship and dual training systems that integrate both classroom learning and workplace experience, other regions, including Uganda and South Africa, struggle with outdated teaching methods, inadequate practical training, and insufficient industry collaboration (Eichhorst et al., 2015; Nkwanyane, 2023).

The quality of vocational education and training (VET) significantly influences employability and workforce readiness. A recurring challenge across various countries is the misalignment between vocational training and labor market needs. In Uganda, for example, vocational training remains largely supply-driven, meaning that programs are designed without sufficient input from employers or industry experts, leading to high underemployment rates among graduates (Tukundane et al., 2015). Similarly, in South Africa, inadequate workshop time and limited practical exposure hinder students' ability to develop job-ready skills, necessitating urgent revisions to training models (Nkwanyane, 2023). Conversely, European Union countries emphasize the integration of classroom learning with hands-on work experience, which has been shown to improve employment outcomes (Sokolov, 2023). In Norway, concerns about the lack of clear progression pathways for vocational graduates highlight the need for stronger academic foundations within VET programs to support career advancement (Schmees et al., 2024).

There are key differences between developed and developing countries in their approach to vocational education. Advanced economies like those in the European Union and Norway benefit from structured learning pathways, dual apprenticeship systems, and continuous adaptation to technological advancements (Eichhorst et al., 2015; Rageth & Renold, 2020). In contrast, developing nations such as Uganda and Indonesia struggle with outdated teaching methods, weak employer engagement, and curriculum gaps that reduce the effectiveness of vocational training (Tukundane et al., 2015; Mahmudah & Santosa, 2021). Indonesia, for example, has been urged to improve teacher competency development and restructure vocational education management to align training with market demands (Haryoko & Jaya, 2017). Similarly, in China, improving the structure of skills training frameworks and fostering lifelong learning opportunities have been identified as key factors in enhancing VET outcomes (Shi, 2021).

Despite these differences, common challenges persist across regions. Many countries face difficulties in maintaining vocational program relevance due to outdated curricula, lack of hands-on training, and insufficient industry collaboration (Somantri & Pramudita, 2024; Kibrit et al., 2022). Studies highlight the importance of structured vocational education systems that integrate industry feedback into training, particularly in emerging fields like ICT, agribusiness, and sustainability (Tong, 2024). In Indonesia, research shows that while students develop transferable skills, there are still gaps that need to be addressed to strengthen job market integration (Rahayu et al., 2024). Moreover, in international studies, the role of industry-education partnerships is emphasized as a crucial factor in ensuring that vocational graduates

possess skills that align with employer expectations (Somantri & Pramudita, 2024; Tong, 2024).

The advantages of high-quality vocational training include increased employment rates, economic stability, and enhanced career progression opportunities. Countries that successfully implement dual-training models, such as those in the EU, tend to achieve higher employability outcomes (Eichhorst et al., 2015; Sokolov, 2023). However, where training quality is poor—such as in systems with limited practical application—graduates may struggle to secure stable jobs, leading to persistent unemployment and underemployment (Nkwanyane, 2023). Additionally, ineffective teacher training and inadequate institutional support hinder the development of high-quality VET systems, as observed in various international perspectives (Kibrit et al., 2022).

In conclusion, the quality of vocational education directly impacts employability and career sustainability. Effective vocational training requires ongoing curriculum updates, industry collaboration, competency-based assessment models, and investment in teacher development to bridge skill gaps. Countries that implement these improvements can ensure that vocational graduates are not only job-ready but also prepared for long-term career growth and adaptation to evolving industry demands.

CONCLUSIONS AND RECOMMENDATIONS

The study concludes that access to vocational training programs remains a global issue influenced by financial, social, and institutional factors. Despite efforts to enhance VET accessibility through policy initiatives and industry partnerships, significant barriers persist, particularly in developing countries. The alignment of vocational training with industry needs is crucial for improving employability outcomes. Countries with strong apprenticeship models and industry collaborations tend to produce more job-ready graduates, whereas those with theoretical-heavy curricula and weak industry ties struggle with high unemployment rates among VET graduates. Additionally, negative social perceptions of vocational training continue to limit its attractiveness as a career pathway, reinforcing enrollment disparities and career progression challenges. The quality of VET programs is directly linked to employment outcomes, with structured learning pathways, industry engagement, and competency-based training models playing a key role in ensuring that vocational graduates are well-prepared for the labor market. However, challenges such as outdated teaching methods, lack of practical exposure, and insufficient institutional support hinder the development of high-quality VET systems in various countries.

To address the challenges identified, several recommendations are proposed to improve vocational education systems globally. First, expand financial support—such as scholarships and subsidies—for marginalized groups to boost access and participation. Second, strengthen industry partnerships through apprenticeships and workplace learning to align training with labor market needs. Third, combat negative perceptions of VET with awareness campaigns and employer engagement to elevate its status. Fourth, enhance training quality by updating curricula, investing in teacher development, and adopting competency-based assessments. Finally, create clear pathways from VET to higher education and career growth to ensure long-term professional development. These strategies will help position VET as a vital contributor to workforce and economic progress.

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