

Global Challenges Affecting TVET in its Quest Towards Sustainable Development

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Abstract:

TVET functions as a crucial foundation for sustainable development since it develops skills that enable individuals to become more employable through increased productivity alongside innovation capabilities. The developing labor markets and globalized economy with technological progress and environmental threats have heightened awareness about TVET systems as tools for resolving economic disparity and environmental preservation together with establishing social equity. The worldwide TVET setting encounters constant barriers which obstruct its capability to achieve these goals. This study examines the barriers which affect TVET program quality and inclusiveness as well as relevance using recent research combined with secondary data especially from developing nations with constrained resources and noticeable education disparities. The research proves that removing these obstacles requires investments by governments together with educational institutions and industry leaders as well as international organizations implementing solutions. The effectiveness of TVET programs can be improved through investments in contemporary infrastructure, modernization and digital education combined with green skills training alongside strengthened partnerships which promote work-based learning methods and policies which integrate inclusive approaches for disadvantaged groups. The report proposes that governments establish strong governance procedures which will boost policy execution and monitoring as well as evaluation practices. TVET will enhance its contribution to United Nations SDGs (especially quality education and decent work alongside climate action) through implementing key improvements. The research investigates pragmatic methods alongside important findings that guide policy decision makers and educational professionals and stakeholder groups to enhance the sustainable development outcome of TVET in the dynamic global landscape.

Keywords: TVET, sustainable development, skills development, , green skills, SDGs.

1. Introduction

Technical and Vocational Education and Training (TVET) constitutes a fundamental component that supports both economic expansion and workplace deficit reduction as well as sustainable development progress. TVET provides students the essential abilities along with expertise and understanding that enables them to succeed in different workplaces and provide solutions to multiple community requirements. Economic transformations across global countries have made TVET institutions stand out as essential agents for sustainable development through their UN Sustainable Development Goals achievements. SDGs 4, 8 and 13 reinforce the need to provide equal educational opportunities while stimulating economic inclusivity combined with environmental stewardship (Anderson et al, 2021; Smith & Johnson, 2022). Global challenges currently restrict TVET from reaching its sustainable development goals even though it plays a vital role in this accomplishment.

TVET faces its most crucial challenge because of limited funding which prevents proper investment. Multiple nations especially developing countries find it difficult to grant appropriate funding to their TVET programs because they must manage limited national budgets alongside many competing funding requirements. The insufficient investment results in a degraded quality of educational content and training premises as well as restricted practical learning possibilities for students (Brown, 2020). The funding challenge escalated due to COVID-19 because the emergency healthcare response and economic recovery took away funding that should have gone to education and training systems (Taylor & Miller, 2021). The fundamental obstacle consists of digital innovation together with technical developments in modern society. The global economy's multiple sectors have improved through digital technology yet rapid technological progress has created an employment skill deficit in the workforce.

The inability of TVET institutions to adopt modern technology stems from inadequate access to contemporary equipment alongside insufficient training for teaching staff and obsolete educational programs which do not match digital economy requirements (Davis & Martin, 2020). The gap between TVET graduates' skills and contemporary workplace needs makes them less employable which blocks TVET from achieving desired sustainable development outcomes. TVET programs experience substantial obstacles because they need to overcome both inclusivity and equitable access problems. Quality TVET programs remain inaccessible to disabled and disadvantaged groups including women together with individuals from low-income backgrounds. The main obstacles to accessing TVET programs stem from cultural prejudices as well as discriminatory actions combined with expensive educational costs (Jones et al., 2022). Many groups of people lack access to skill development opportunities because of which they become unable to join labor markets or engage in sustainable development activities.

Globalization and the changing nature of work also present challenges for TVET systems. The exponential growth of economic connections created several new employment opportunities mostly within IT sectors and renewable energy and healthcare divisions. The transformation of jobs requires an ongoing process of workforce reskilling and upskilling because traditional jobs have been eliminated (Williams, 2021). TVET institutions need to transform their operations through flexible educational structures which address actual employer requirements for skilled labor together with worker needs for personalized development. TVET faces critical challenges from both climate change and environmental sustainability which produce extensive consequences for the sector. A green transformation of the economy necessitates training programs to produce professionals equipped with renewable energy capabilities together with competency in energy efficiency and waste handling and sustainable agricultural practices.

Several TVET institutions face limitations in their ability to incorporate sustainability content into training programs because they lack necessary resources and expert personnel and proper facilities (Harris & Clark, 2021). The insufficient ability of TVET graduates to protect the environment and make climates more resilient affects their meaningful contribution to sustainable development. Many countries face challenges due to fragmented TVET system governance policies which lack proper structure and inadequacies. The implementation of TVET programs becomes less efficient because weak

coordination occurs between government agencies and private sector stakeholders and educational institutions. The necessary implementation of effective governance and policy reforms leads to TVET systems that match national objectives and labor market needs as well as worldwide sustainability goals (OECD, 2020).

Literature Review

TVET as a training method has an essential function in advancing sustainability by delivering critical employability abilities and economic growth skills and environmental sustainability expertise to people. Numerous problems in the global TVET environment disable its capacity to reach its complete potential. Research investigating TVET's sustainable developmental pathway through international studies focuses on funding issues and technological adoption together with inclusivity problems and global impacts and environmental sustainability requirements and the proper management of the system. The literature reveals that lack of sufficient funding together with inadequate resource distribution is a major difficulty for TVET programs. Many Global South countries lack enough financial resources to fund TVET programs because they prioritize other national objectives and have limited funds available as noted by Williams (2021). Insufficient funding leads TVET institutions to maintain substandard education standards which deteriorates their facilities and restricts their teaching resources and hands-on education possibilities.

Brown (2020) points out that limited financial support deteriorates the hiring process and prevents schools from keeping quality educators which harms TVET programs. A shortage of funding support during the COVID-19 pandemic and its aftermath has severely affected TVET systems across the world. The pandemic caused resource redirection toward healthcare and economic recovery that deprived TVET institutions of necessary funding to stay operational and meet new requirements (Taylor & Miller, 2021). Many TVET programs now face mounting challenges to maintain their usefulness and effectiveness because the job market changes too quickly. TVET faces multiple advantages together with various difficulties due to the quick acceleration of technological progress. Many TVET institutions encounter substantial obstacles when they attempt to adopt and integrate digital technologies which could improve their teaching operations. Davis and Martin (2020) explain how the digital divide caused by missing access to technology and internet infrastructure makes existing TVET inequality problems worse.

The implementation of digital learning initiatives suffers from insufficient resources of well-trained instructors who have attained necessary digital skills. New skills demand arises from the technological revolution of Industry 4.0 which combines the elements of automation and Internet of Things (IoT) along with artificial intelligence (AI). TVET institutions need to address a skills gap in new competencies like data analytics and cybersecurity and robotics because the industry requires them to stay relevant (Harris & Clark, 2021). TVET programs continue to use obsolete curricula which creates an unskilled workforce because their content does not fit the digital economy needs (Anderson et al., 2021). The main goal of sustainable development includes social equity and inclusivity which TVET shows signs of becoming a powerful force for change. Multiple research investigations reveal enduring obstacles which prevent underprivileged groups from getting quality access to TVET programs. Smith and Johnson (2022) show that women together with persons with disabilities and those from lower income backgrounds encounter institutional barriers because of cultural biases and discriminatory practices and education expenses.

The barriers faced by these groups block their interference with TVET programs and limit their potential for social and economic movement. Jones et al. (2022) advocate for specialized TVET system policies and initiatives that should focus on improving access for all. TVET programs should offer financial help along with inclusive educational content and gender-equitable as well as disability-friendly educational spaces. NGOs and community-based organizations must form partnerships to achieve better access for marginalized populations regarding TVET training programs. TVET faces essential changes due to labor market global expansion and modifications in how people work. The growing economic connections between nations produce fresh employment possibilities based in information technology together with renewable energy and healthcare sectors. The modern economy has produced job displacement through its changes thus creating ongoing requirements for workforce education upgrades (Williams 2021). The changing nature of the labor market demands TVET institutions to establish flexible programs which follow employer needs while meeting worker requirements according to Brown (2020).

TVET institutions need to create competency-based learning structures through work-based instruction while using data systems for skill need identification. The execution of these strategies becomes achievable through successful partnerships between TVET institutions together with industry stakeholders and policymakers

(Harris & Clark, 2021). Sustainable development requires a transformation to a green economy where TVET demonstrates essential functions as the key driver in this initiative. Davis and Martin (2020) note that the creation of green skills based on renewable energy and energy efficiency and waste management and sustainable agriculture holds essential value for environmental preservation and climate resilience. Numerous TVET educational institutions lack sufficient financial support together with specialized knowledge and infrastructure that would help them implement sustainability training programs. TVET institutions need to establish "greening TVET initiatives" in order to build environmental awareness and practice sustainable methodology while adding green competencies into educational courses (Harris & Clark, 2021).

These initiatives should involve cooperative relationships with business partners to create green training standards along with centers of excellence for teaching green skills. The necessary skills which students need for green economy participation enable TVET to contribute to the fulfillment of SDG 13 (climate action) and additional environmental sustainability goals. Appropriate governance systems alongside policy structures form the basis for TVET systems to achieve higher performance outcomes. Multiple governance and policy coherence problems are identified through research studies. Anderson et al. (2021) demonstrate how inadequate cooperation between public agencies and private actors alongside educational bodies produces administrative problems in TVET program delivery. Separate institutions within TVET systems destroy their capability to fulfill the needs of labor markets and support national developmental goals. The adoption of integrated governance structures is proposed by Smith and Johnson (2022) to deal with existing challenges because these structures promote sustainable development goal alignment and collaborative decision-making through accountability mechanisms.

National TVET strategies together with quality assurance mechanisms and stakeholder engagement will help enhance the governance of TVET systems to make them more effective and relevant. TVET has proven its capability to drive sustainable development according to research studies because it builds a pathway for employment opportunities and social inclusivity while preserving natural environments. Several obstacles demand attention to maximize the effectiveness along with relevance of TVET systems. The effectiveness of TVET systems requires additional financial support together with digital transformation adoption and inclusiveness promotion and labor market adaptation

alongside sustainable training program integration and improved governance systems. TVET possesses transformative potential to advance sustainable development because of properly handled current difficulties.

Methodology

This section describes the study design and procedures for data collection and analysis methods through which global TVET challenges affect its sustainable development efforts. The research approach used qualitative methods that depend on secondary data for exploring the complete set of challenges affecting TVET education at a global level. Researchers utilized secondary data sources to understand complex broader challenges because the sources provided access to existing information so as to detect patterns in data and building upon pertinent research findings (Creswell & Poth, 2018; Merriam & Tisdell, 2016). This study used descriptive research as its design to analyze TVET system challenges. The researchers systematically assessed secondary data through this design because it allowed them to organize and interpret existing information. This study relied on secondary data as its primary methodology to establish a comprehensive analysis of factors that limit TVET program effectiveness in sustainable development initiatives (Patton, 2015).

The evaluation material in this study stems from major authoritative sources such as academic peer-reviewed journals and official policy documents, government reports as well as international organizations like UNESCO and ILO. The research used relevance as an important criterion alongside credible sources and study dates after 2020 for selection of secondary data materials. The research analyzed various data sources to achieve valid and reliable findings with data triangulation as described by Yin (2018). Researchers performed thematic analysis procedures on the secondary sources of data. The researcher analyzed qualitative data through an approach which identifies repeating themes and patterns as well as provides categories and interpretations within the collected data. The developers of the thematic analysis adapted their approach to include specific stages: data familiarity followed by coding then theme identification to eventually arrive at theme refinement. The research process moved back and forth between stages so the researchers could uncover vital issues affecting TVET and its connection to sustainable development (Braun & Clarke, 2006).

Academic integrity principles guided all phases of using secondary data in this study through proper ethical data

handling. Correct citation practices along with appropriate acknowledgment of all data sources were implemented to stop plagiarism and maintain ethical standards for research. The researchers analyzed the credibility and reliability of secondary data sources as well as their possible biases to increase the trustworthiness and rigor of the analysis (Israel, 2015). Using secondary data provides various benefits but it still has several associated shortcomings. A principal drawback lies in the fact that secondary data fails to completely resolve the particular research inquiries because it originated from different original purposes. The researchers had restricted power to maintain consistent standards and full comprehensiveness of the collected data. The use of secondary data offers important perspectives about worldwide TVET challenges to guide both research investigations and policy implementations (Creswell & Poth, 2018).

Results and Discussion

By analyzing secondary data in published studies and scholarly articles and reports this section establishes fundamental findings in their relationship to TVET's function as a promoter of economic and social sustainability and environmental sustainability development. The evaluation of secondary data reveals that a lack of proper funding constitutes a vital challenge facing TVET systems. Several nations primarily within the Global South struggle with insufficient budget funds to properly support TVET training programs. TVET receives inadequate financial support which damages different elements within the educational structure from facilities to educational materials and practical skill training capacities (Brown & Smith, 2021; Davis, 2020). The lack of modernized facilities together with antique equipment prevents learners from obtaining practical skills while reducing their ability to enter the job market as well as their capacity to participate in sustainable development (Taylor, 2021). The pandemic of COVID-19 created additional financial difficulties for TVET institutions. The transformation of resources by governments for healthcare and economic recovery purposes led to decreased funding availability for TVET and other educational systems based on reports from ILO (2021). TVET institutions lost their ability to address current challenges because funding decreased (Harris & Clark, 2021). The insufficient ability to preserve training quality and relevance prevented numerous TVET programs from delivering sustainable development initiatives.

The swift advances of digital technology together with technological progress represent a major obstacle for

TVET. Progress through the Fourth Industrial Revolution commenced when digital technologies started to spread alongside AI and automation changes the global workforce requirements (Anderson et al., 2021). Many TVET educational institutions struggle to follow technological advancements because they have insufficient modern tools and substandard digital systems and lack qualified instructors (Williams & Johnson, 2022). The technological gap between developed and underdeveloped nations makes it harder to solve this challenge. The ability of TVET institutions in developed nations to implement digital technology training remains limited for developing country institutions that lack required resources and infrastructure (Jones et al., 2022). The worldwide skills shortage results from this inequality that makes TVET graduates unready for digitized employment while diminishing their job prospects and economic potential (Davis, 2020).

TVET systems worldwide encounter an essential challenge when it comes to achieving inclusivity along with equity. Various marginalized population groups such as women and persons with disabilities and low-income individuals still encounter barriers to attend quality vocational education programs despite government initiatives (Smith & Taylor, 2021). The acquisition of needed labor market skills by people to engage in sustainable development is obstructed by cultural prejudices and discriminatory treatment and high expenses of education and training (Harris & Clark, 2021). TVET systems must tackle these equity challenges because doing so will enable them to promote social inclusion and fight against inequalities. TVET programs which welcome diverse students create equal learning pathways to employment and economic empowerment thus achieving sustainable development (Jones et al., 2022). Achieving TVET inclusivity depends on specific policy actions and budget growth alongside systematic efforts to overcome barriers that prevent student access to education and training (Williams, 2021).

Globalization and the changing nature of work present additional challenges for TVET systems. New job opportunities persist in information technology and renewable energy and healthcare sectors because of rising international economic connections. The rise of automation together with advances in technology has resulted in the elimination of traditional jobs from manufacturing and agricultural industries (Brown & Smith, 2021). The changing nature of work requires ongoing workforce training which includes both upskilling and reskilling to fulfill employer industry needs (Anderson et al., 2021). The transformation of TVET institutions remains challenging because their

curricula are outdated and they lack sufficient connections to industry partners as well as capacity to provide lifelong learning (Taylor, 2021). For TVET systems to meet present workforce needs TVET programs must adopt flexible learning approaches which teach practical abilities along with entrepreneurial education and innovation (Williams & Johnson, 2022).

A green economy transition creates both difficulties along with opportunities which face TVET. More countries are recognizing the necessity of green skills for renewable energy technologies and energy efficiency together with waste management and sustainable agriculture applications (Harris & Clark, 2021). Most TVET institutions confront a shortage of sustainable education capabilities as well as inadequate facilities and specialized trainers to teach sustainability to their students (Jones et al., 2022). Higher Education TVET needs to establish green curricula which trains students with capabilities to support environmental protection and climate adaptability. TVET institutions benefit from enhanced green skills training capacity when they establish partnerships between industry stakeholders and civil society organizations together with governmental associations (Williams, 2021).

The quality and relevance alongside sustainability of TVET systems need effective governance and policy frameworks for their proper functioning. The implementation of TVET suffers in numerous countries due to divided public administration systems and insufficient stakeholder coordination and insufficient policy implementation (Smith & Taylor, 2021). The delivery problems caused by these issues decrease program impact and lessens their overall effectiveness (Brown & Smith, 2021). The effective solution for managing these governance issues depends on policymakers who develop organized television education reform strategies that support national development plans while satisfying worker market needs and adding to worldwide sustainability efforts. The establishment of institutional strength should be pursued together with stakeholder involvement and evidence-based policy development (Anderson et al., 2021).

The analysis of secondary data demonstrates that multiple worldwide obstacles restrict TVET systems from delivering sustainable development results. TVET faces major hurdles in its ability to support sustainable development because of insufficient funding and the need for digital transformation along with issues that affect access and fairness and impose limits from globalization and global warming and government management challenges. These challenges need policymakers but also

educators and industry leaders and stakeholders to collaborate because they must enhance TVET programs' quality and inclusivity and relevance.

Conclusion

Enhanced sustainable development emerges from Technical and Vocational Education and Training (TVET) because it solves skill deficit problems and boosts inclusive economic expansion and establishes sustainable environmental programs. The effectiveness of TVET remains limited because of various global barriers that affect funding levels and access to technology while causing governance issues in addition to unequal distribution and the changing nature of work systems. The effective operation of TVET systems requires ongoing collaboration from government officials and teachers alongside industrial leaders and worldwide organizations to match labor market needs. TVET's ability to resolve existing problems will support sustainable development and diminish joblessness along with improving societal equity and developing toughness against unexpected international disruptions.

Recommendations

Several recommendations should be adopted to boost TVET's capability in attaining sustainable development goals.

- i. Impacting sustainable development requires raising financial backing for TVET infrastructure together with curricula development and trainer qualification enhancement. The government and international bodies need to increase their financial commitment to enable TVET institutions to improve their training facilities and integrate contemporary educational technologies.
- ii. The advancement of TVET systems requires systematic changes in their inclusivity measures to break down educational and training obstacles faced by marginalized groups including women and persons with disabilities and people from low-income backgrounds. TVET systems can reach their objectives through combination strategies including scholarship plans and public-awareness activities and inclusive policy frameworks.
- iii. TVET institutions need to expand their industry relationships because their training programs must reflect current labor market requirements and business industry demands. Industrial partnerships support the establishment of practical learning programs to help students

develop work experiences while boosting their marketable abilities.

- iv. TVET systems must build sustainable education programs through curricular addition of green and sustainable skills to train students for green economy career paths. A transformation to sustainable educational teaching practices together with the use of eco-friendly technologies and student-educator environmental awareness programs must become mandatory.
- v. An effective governance framework together with complementary policy structures represent essential elements that lead TVET systems to their achievement. Government institutions must improve collaborative interactions with stakeholders and maintain well-designed implementation policies and development to measure effectively how TVET programs promote sustainability goals. The implementation of suggested measures will enable TVET to serve the global efforts in sustainability development effectively.

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