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Leveraging Technological Advancements in Technical and Vocational Education and Training (TVET) Institutions in Zimbabwe: Addressing Skills Mismatch in the Technology-driven Era

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ABSTRACT

This study focuses on leveraging technology in TVET institutions in Zimbabwe to bridge the gap between the skills taught and those required by the labor market. Adopting a pragmatic research philosophy and mixed research approach, this investigation employed questionnaires, interview guides, and observational checklists as data collection instruments. SPSSv26 was used to analyse quantitative data and thematic analysis for qualitative data. The research findings showed that the current state of technology adoption in TVET institutions revealed a low uptake, despite the presence of Internet of Things elements such as WIFI, computer labs, and assistive devices for individuals with disabilities. Challenges identified included limited funding, curriculum misalignment, resistance from staff members, limited technical support, and a lack of technological infrastructure. To overcome these challenges, the study recommends aligning the curriculum technological advances and industry needs, establishing innovation hubs for creativity and collaboration, utilizing vernacular language in science education, and incorporating assistive devices and technologies for inclusivity. Implementing these recommendations will help Zimbabwean TVET institutions overcome obstacles, bridge the technological gap, and create a more inclusive and technologically advanced education system, preparing students for the demands of the future workforce.

Keywords: curriculum, skills, technology, TVET.

INTRODUCTION

Technical and Vocational Education and Training (TVET) is vital in equipping Zimbabweans, especially the youth, to meet the demands of the labor market in the country. In Zimbabwe, the TVET sector has been recognized as a key driver of economic development. In today's technology-driven age, rapid technological advancements are reshaping industries and transforming the skills required in the market. Characterized by high unemployment rates, the Zimbabwean labor market has been competitive with employers considering several factors such as soft skills, interpersonal skills, problemsolving skills, leadership qualities,

knowledge of technological advances, and flexibility among other factors. TVET graduates must possess these employability skills to increase their chances of employment. TVET institutions have, however, been accused of focusing on the theoretical aspect of the courses and often lack the practical technology needed for students to be employable in the market [1]. In this technology-driven era, it is essential to examine how technology is leveraged within the TVET system to bridge the skill gap. Like most African countries, Zimbabwe faces a plethora of challenges in ensuring that TVET programs align with the demands of the ever-evolving technological world. Globally, there has been an increase in digital skills such as data analytics, cybersecurity, software development, automation, and digital marketing, necessitating the integration of technology in TVET curricula. Introducing this to the TVET sector can effectively address skill mismatches and enhance graduates' employability in the digital job market.

This study aimed to assess the current state of skill mismatch in Zimbabwe's TVET sector in the context of the technology-driven era and explore the existing integration of technology in TVET programs. By examining the availability of technological infrastructure, pedagogical approaches, and the impact of technology integration, this study seeks to provide insights and recommendations for policymakers, educational institutions, and stakeholders to enhance the leveraging of technology in TVET and bridge the skill gap in Zimbabwe.

Many scholars have documented the potential of TVET institutions to transform many economies. For instance, the European Union (EU) considers (TVET) institutions as a tool for international competitiveness and a drive for economic development [2]. TVET is a tool for achieving sustainability and social justice [3]. Despite the consensus that TVETs are instrumental in the attainment of development, there is still a mismatch between the potential of TVETs and their performance [4]. Poor countries, such as African countries, remain unskilled, and developed countries are struggling to meet the demand for human capital [5]. Thus, this study recommends leveraging technology by TVETs in Zimbabwe.

Focusing on TVETs in Germany, they have sophisticated technology and the country has low youth unemployment rates, which is attributed to the effectiveness of TVETs [6]. In Switzerland, the country offers all the necessary technologies, and the government invests in TVET institutions [7]. Therefore, this technology facilitates the transformation of TVETs. In Western countries invest in technology that equips both learners and lecturers, enabling the students to be able to be competitive, even in the job market [8]. Through this technology, most TVETs in developed countries can offer distance learning and make use of practical lesson simulations [4]. TVETs in developed countries are wellequipped in terms of technology, and they also invest a lot in the practical aspects of lessons.

Developed countries have started using blended learning and online platforms, combined with face-to-face lectures. However, online platforms have proven to be effective for remote students, as they can easily interact with the rest of their peers. For instance, Indonesia implemented the National Digital Literacy Program, which aimed to educate the nation on the importance of digital instruments [9]. TVETs in developed countries have also adopted Virtual Simulations and Augmented Reality (AR) technologies to provide hands-on training safely and cost-effectively. For example, students studying automotive repair can diagnose and fix virtual

vehicles. AR can also be used to overlay digital information onto real-world environments, thereby enhancing learning experiences in fields such as construction and engineering.

Technologies such as 3D printing and rapid prototyping have also begun to be adopted, allowing learners to create physical models and prototypes of their designs. This can be adopted in the fields of industrial design, engineering, and architecture, where students can bring their concepts to life and iterate their designs quickly and cost-effectively. TVET students from developed countries also have an advantage in that they are exposed to the Internet of Things (IoT) and Industrial Automation. TVET institutions incorporate IoT technologies and industrial automation into their programs to prepare students for the digitalization of industries. At these institutions, students have access to smart devices, analyze data from sensors, and gain handson experience with automated manufacturing systems. Finally, mobile learning applications are also incorporated into the learning environment, and in most cases, they are tailor-made for specific programs. TVET are formal or informal education system that focuses on training and skills development for a wide range of occupations [10]. Most African countries have not invested technology in TVETs. For instance, in Sudan, the country relied on foreign technology because of a deficiency in industrial performance, despite having graduates from TVETs [11]. Most African countries such as Botswana, Egypt, Ghana, Senegal, Seychelles, Tunisia, and Zimbabwe, still lag when it comes to the implementation of technology as compared to developed countries. In Mozambique, TVET teachers use chalks to draw instruments or equipment with the aim of the student's familiarity with the instruments [12] . This is common in most parts of sub-Saharan Africa.

In the case of Zimbabwean, there are many TVET institutions in Zimbabwe, such as Bulawayo Polytechnic, Gweru Polytechnic, Harare Polytechnic, Kushinga P. Polytechnic, Kwekwe Polytechnic, Masvingo. Polytechnic, Mutare Polytechnic, School of Hospitality and Tourism, Joshua M. N. Polytechnic, Msasa Industrial College, Mupfure Industrial Training College, St. Peters Kubatana Technology Centre, and Westgate Industrial College. TVET institutions in Zimbabwe have a curriculum that aims to equip students with knowledge of tools and equipment for their different trades. Despite having these many TVET institutions and Universities in the country, there is still a deficit in skilled personnel as indicated by the National Critical Skills Audit Report of 2018 as shown below

Table 1: National Critical Skills Audit Report (2018)

Sector	Availability
Engineering and Technology	6.43%
Netural and Applied Sciences	3.09%
Business and Commerce	121%
Agriculture	12%
Medical and Health Sciences	5%
Applied Arts and Humanities	82%
Average	38.25%

Fig 1 shows the statistics for Engineering Technology (6.43%), Natural and Applied Sciences (3.09%), Business and Commerce (121%), agriculture (12%), Medical and Health Sciences

(5%), and Applied Arts and Humanities (82%) [13]. Of all these sectors, the Business and Commerce sector is the one with a surplus, and the Natural and Applied Sciences sector has the least skills in the country.

Although TVET institutions in Zimbabwe aim to equip students with technical skills, they often lack technological advances compared to other countries [14]. The high unemployment rates in the country have been attributed to the irrelevance of the curriculum in the job market [15]. Thus, adopting technology in Zimbabwean TVETs can help address issues related to skill mismatches. Thus, the reason why there are high unemployment rates in Zimbabwe is the lack of necessary skills rendering graduates useless in the job market and the economic situation in the country. However, there are also strides to equip students with the necessary skills, for instance, the fact that there is work-related learning where students go on attachment to learn more employability skills. The fact remains that the students still lack exposure to the technological infrastructure and instruments required for them to be effective. Although some TVET institutions in Zimbabwe have computer labs and equipment, they do not have up-to-date technologies that are being implemented in developed countries.

OBJECTIVES

This study was based on the following research objectives:

1. To assess the state of skill mismatch in Zimbabwean TVET institutions.
2. To investigate the extent to which technology is integrated into Zimbabwean TVET institutions.
3. To identify the challenges and barriers faced in integrating technology in TVET institutions in Zimbabwe.
4. To develop strategies for TVET institutions in Zimbabwe to bridge the skill mismatch in the technologically driven era.

MATERIALS AND METHODS

The following materials and methods were adopted in this study:

Research Methodology

This study adopted a pragmatic research philosophy. A pragmatic approach to research philosophy focuses on the practicability of knowledge, as its findings address real-time challenges [16]. Therefore, a pragmatic research philosophy was used, as it allowed the researcher to select a research methodology that is suitable for gaining the experiences of the people at TVET institutions. For this study, a pragmatic research philosophy was adopted because of its flexibility which allows the researcher to make use of multiple methods to address the objectives under study.

This study employed a mixed research approach that used both qualitative and quantitative data. The mixed research approach allowed the researcher to compare the views and perceptions of the respondents using quantitative data. A mixed research approach was adopted because it allowed the researcher to gain a broad, in-depth understanding and corroboration of both qualitative and quantitative views from the research participants towards the adoption of technology in TVET institutions in Zimbabwe. A multicase study design was used in this study. The adoption of a multi-case study research design allowed the

researcher to compare the results obtained from different institutions. Thus, in this study, 10 TVET institutions (Harare Polytechnic, Danhiko, Mupfure Industrial College, Kaguvi Technical College, Kwekwe Polytechnic, Bulawayo Polytechnic, Masvingo Polytechnic, Mutare Polytechnic, Ruwa Training Center, and Mashayamombe Vocational Training Center) were used as case studies. The researcher also involved HEXCO, which is the governing board for TVET institutions in Zimbabwe. This multiple-case design was used because it allowed the researcher to generalize the situation of TVET institutions in Zimbabwe.

Target Population

The target population for this study was individuals from HEXCO, TVET institutions in Zimbabwe including Principals, Vice Principals, Heads of Departments, Lecturers, and students.

Sampling and Sample Size

The study used a random sampling technique to select the research participants. A total of 188 participants were chosen from this study. From the students, lecturers, principals, and vice principals that were available, those who were conveniently available to participate in the study were used. This allowed the researchers to save time and be able to conduct the research in all 10 TVET institutions.

Research Instruments

Structured questionnaires, semi-structured interview guides, and observational checklists were used as the qualitative data research instruments in this study. Questionnaires were used to obtain quantitative data and the interview guides and observational checklist were used to collect. Online questionnaires were sent out through Google Forms. About the interviews, face-to-face interviews were conducted. The respondents were allowed to use vernacular language for the interviews and the data was then transcribed into English in those cases.

Data Analysis

Thematic data analysis was used for qualitative data and they were based on the research objectives. For qualitative data, SPSS Version 26 was used to analyse the data.

Limitations

Getting access to the research participants was a challenge, as it took time for some of the institutions to approve. The researcher had to attach the permission granted from the relevant authorities as well as the questionnaire to show the nature of questions that were going to be asked. Financial constraints were also a impediment and the researchers had to rely on personal funds.

RESULTS

Response Rate

This paper presented the response rate first to assess the feasibility of this study. Of the 140 questionnaires that were administered, 125 responses were obtained making a response rate of 89%. 48 interview respondents were also targeted for the TVET in Zimbabwe and 36 interviews were conducted making a response rate of 75%. The average response rate for this

paper was 87.5%, making this study feasible and the results to be generalized to the population in Zimbabwe.

Demographic Information

The study also sought to analyze the gender of the research participants in this study. The findings indicated that the majority of the respondents in this study were males constituting 75.2%, females constituting 21.6% and lastly 3.2% of the respondents preferred not to mention their gender.

Academic Qualifications of the Respondent

The study's findings also sought to understand the academic qualifications of the research participants. The figure below shows the results

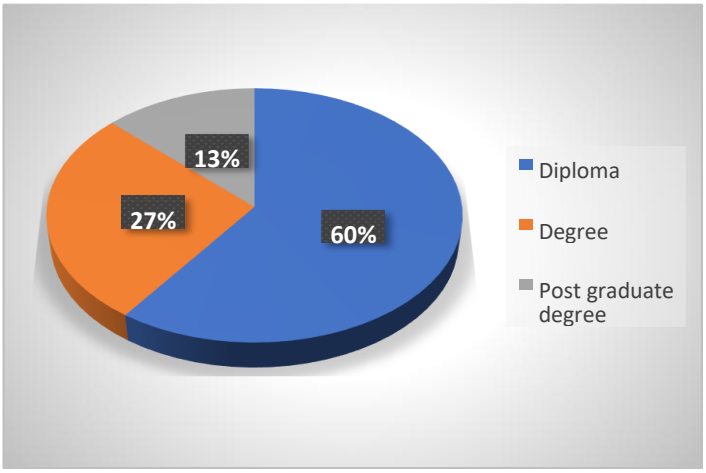

Fig 1: Academic qualifications of the respondents

Fig 2 shows that of the 125 respondents, the majority of the respondents had Diplomas 75 participants (60%), 34 (27%) and 16 (13%) represented those with Degrees or equivalent and also postgraduates respectively.

The State of Skills Mismatch in Zimbabwean TVET

The paper sought to evaluate the existing skills gap and mismatch in TVET institutions in Zimbabwe about the demands of the technology-driven era. The study sought to understand the perspectives of the respondents regarding the skills mismatch between what is being provided in TVET institutions and what was being demanded in the market regarding knowledge and application of technology

Table 2: skills mismatch in Zimbabwe

		Frequency	Percent
Valid	Yes	76	60.8
	Partially	35	28.0
	No	14	11.2
	Total	125	100.0

The research findings indicated that the majority of the participants (60.8%) believed that there is a skills mismatch between what is being offered in the TVET institutions in Zimbabwe and what is needed in the companies. For instance, Harare Lecturer 1 (2024) noted that there was a skills mismatch because the institutions did not have any machinery and they had to rely on equipment from the 1980s. He further alluded that the automotive department for instance rely on donations from other companies. Supporting this, the research findings noted that even those from the Midlands Province also rely on donations from Mimosa, Sable Chemicals and other companies in the area (Midlands Lecturer 2, 2024).

However, 28% of the respondents noted that they partially believed that there are skills mismatches between what is being offered and what is required in the market. For instance, a lecturer from Masvingo Province highlighted that they do not have advanced machinery, but they rely on the students getting exposure from the industrial attachment. She also acknowledged that they are some students who still get attached at the institution for their work-related learning. In cases like these, she noted that that is when there is a mismatch (Masvingo Lecturer, 2024).

11.2% of the participants indicated that there is no skills mismatch. One Principal noted that the reason why the country has a few technical people was that Zimbabwe produces competent students who are in demand across the globe (Harare Principal 1, 2024). The study's findings indicated that industrial attachment exposes the students to the technology in the industry thus meaning there is no skills mismatch.

Technological Integration in TVET Institutions in Zimbabwe

This paper also sought to understand the current state of technological integration in TVET institutions in Zimbabwe. The researchers sought to understand the knowledge of the respondents on what is being implemented in the institutions at the moment. The Figure below shows the responses.

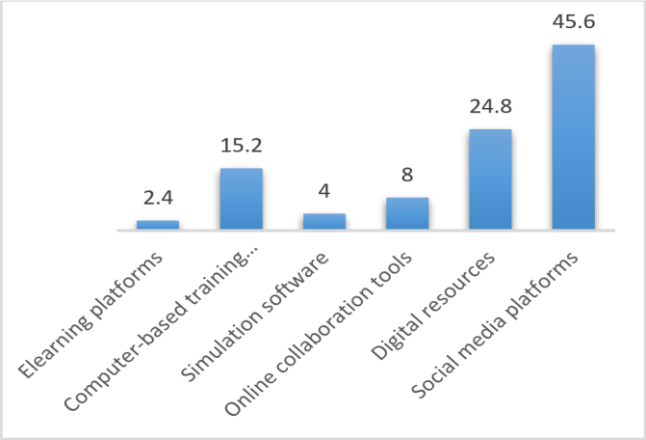

Fig 3: Adoption of technology in TVET

45.6% of the respondents noted that they are making use of social media platforms such as WhatsApp to communicate and teach the students. 24.8% noted that they make use of digital resources such as eBooks and journals. 8%, 4%, 15.2%, and 2.4% of the respondents noted

that they make use of online collaboration tools, simulation software, computer-based training software, and eLearning platforms.

Supporting these statistics, Harare Lecturer 2 (2024), noted that in the civil engineering department, they acquired a drone and were in the process of developing a visual simulation application. Thus, he believed that as an institution, their college was supportive of any technological advances and all of the resources needed. Furthermore, one of the institutions in Harare Province relied on donations from Jesuits in Germany and they regarded their institution as one of the best in the country because of the machinery they obtained (Harare Principal 1, 2024).

In support of this, the researchers also observed that one of the institutions in Harare Province has a CNC machine, which most TVET institutions in the country do not have. The figure below shows the CNC available.

Fig 4: CNC machine at an institution in Harare Province

Despite not being the latest model, the CNC machine available at the TVET institution in Harare province holds significant importance. While newer models may offer advanced features, the existing machine serves as a valuable tool for skill development. Students can gain hands-on experience in programming, operating, and troubleshooting CNC systems, which are essential competencies in the machining and engineering fields. The accessibility of any CNC machine, regardless of its age, provides a platform for students to learn the basics of CNC technology and its applications. Furthermore, the core principles of CNC machining remain consistent across different models, allowing students to grasp fundamental concepts that can be applied to more advanced machines in the future. However, the majority of the respondents noted that they do not have many of the advanced technologies that are needed. The researchers noted the following issues related to technology.

Access to Internet

In regards to access to the internet, all of the institutions noted that they have access to the internet at the institution. However, one of the challenges faced by the TVET institution in

Zimbabwe is the issue of limited bandwidth or insufficient WIFI to accommodate everyone which affects the access to the internet for both students and lecturers. One of the institutions in Masvingo Province noted that they provide the students with 2 gig of WIFI per day on the pretext that the students had paid for fees (Vice Principal, 2024). This means those who would not have paid for fees would not be able to access internet on the institution. This challenge of limited WIFI access was not a challenge in Masvingo Province alone but to also other institutions in other provinces. The study showed that the TVET institutions in Zimbabwe struggle to provide a strong and stable internet connection that can accommodate the needs of all users simultaneously.

Access to Computers

In terms of computer availability, a significant number of lecturers at the TVET institution in Zimbabwe rely on their laptops for teaching purposes. While they may bring their laptops to the classrooms, it highlights a potential gap in the availability of dedicated computers for instructional use. Additionally, the computer labs within the TVET institution were not sufficient to accommodate all the students, creating challenges in accessing computers for educational activities. This situation is further compounded by the fact that some students did not have personal laptops of their own, limiting their ability to engage fully in computer-based learning and assignments. The figure below shows one of the computer laboratories within one of the TVET institutions in Harare Province

Fig 5: Computer lab at an institution in Harare Province

At this institution, they have 28 computers, and not all of them are functional enough to accommodate an estimated 300 students. Therefore, the student-tocomputer ratio was not sufficient.

Access to Assistive Devices

Assistive devices play a crucial role in supporting individuals living with disabilities, enabling them to overcome barriers and actively participate in educational settings. At one institution, they have recognized the importance of assisting students with disabilities and have provided some forms of support. For instance, they offer prescribed spectacles for students with visual impairments to improve their vision and hearing aids for students with hearing impairments to enhance their auditory experience (Vice Principal, Masvingo Province, 2024).

However, it is worth noting that not all institutions have the necessary capacity to cater to the needs of students with disabilities. In such cases, the study shows that the majority of the institutions would refer the students to specialized organizations like Danhiko or Emerald Hill, which are known for their expertise in providing support for individuals with disabilities. These organizations can offer a range of services, including assistive devices tailored to specific disabilities, specialized training, and additional resources to help students succeed in their educational pursuits.

Challenges and Barriers to the Adoption of Technology in TVET Institutions in Zimbabwe

The following table provides the responses that were provided by the research participants.

Table 4: Challenges to the adoption of technology

	Frequency	Percent
Limited access to technological infrastructure	51	40.8
Insufficient training and professional development	12	9.6
Lack of financial resources	26	20.8
Resistance to change among faculty members	4	3.2
Limited technical support	3	2.4
Lack of curriculum development	29	23.2
Total	125	100

40.8% of the respondents noted that there was limited infrastructure and 20.8% noted that there was a lack of financial resources. 23.2% indicated that a lack of curriculum development was a major impediment and 9.6% indicated a lack of human capacity building. 3.2% noted resistance from staff members and 2.4% indicated a lack of technical support.

Limited Access to Technology:

Limited access to technology poses a significant challenge for TVET institutions. One aspect of this challenge is the outdated machinery being used, some of which dates back to the 1980s. The figure below shows some of the machinery used at one of the

Fig 6: Machinery from the 1980s at an institution in Midlands Province

While donations from other companies can provide temporary relief, relying solely on outdated machinery is not sustainable in the long run. As technological advances continue to progress rapidly, the gap between the available machinery and the latest industry standards widens. The research indicated that in as much as the institutions rely on private partnerships, the companies donate obsolete technologies (Midlands Province Lecturer, 2024).

This hampers the ability of TVET institutions to keep pace with emerging technologies and provide students with the necessary hands-on experience and training on modern equipment. The figure below shows some of the machines that are being used in the TVETs in Zimbabwe. To address this challenge, institutions must explore avenues for acquiring updated machinery and invest in the necessary resources to provide students with access to current technology, ensuring they are equipped with the skills and knowledge required in today's evolving industries.

Insufficient Training and Professional Development for Educators:

Insufficient training of lecturers, particularly those who were trained in the 1980s, poses a challenge when it comes to effectively utilizing technology in the educational setting. The study indicated that there were some lecturers who were trained in the 1980s and did not further their education hence the need for them to be retrained on the contemporary technology (Midlands Principal, 2024). Lecturers who received their training during a time when technology played a minimal role in education may not have had the opportunity to develop the necessary skills and familiarity with modern digital tools. As a result, they may struggle to leverage technology effectively to enhance instruction, engage students, and facilitate interactive learning experiences.

Financial Resources:

The absence of resources from the Zimbabwe Manpower Development Fund (ZIMDEF) for institutions to acquire the necessary machinery poses a significant challenge. ZIMDEF plays a crucial role in supporting the development of vocational training by providing financial assistance for the procurement of equipment and resources. ZIMDEF has the mandate to provide the funds, but in some instances might provide $ 3 million ZWL which is not sufficient to buy a CNC machine (Masvingo Lecturer, 2024). Without adequate resources, institutions may struggle to keep up with technological advancements and provide students with hands-on experience with modern equipment. The lack of funding limits the ability of TVET institutions to purchase the machinery required to offer quality training that aligns with industry standards.

Resistance to Change Among Faculty Members:

Resistance to change among faculty members and administrators, particularly those from the older generation, can hinder the integration of technology and modern educational practices. Some individuals may be hesitant to adopt new approaches due to their familiarity with traditional teaching methods. The study noted that not all of the participants believed that using advanced technologies in TVET institutions is important. There is still a general belief from some of the participants that TVET institutions only have to teach the students the basics and they do not have to adopt new technologies as the students will eventually get

exposure in the industry (Harare Principal 1, 2024). This resistance from the principals can also even affect how an institution is managed. They also tend to deny requests for the purchasing of CNC machines or other advanced technologies that are required to teach the students citing that they are not in the curriculum (Harare Lecturer 3, 2024). This shows that there is still a resistance, from the administration in terms of the adoption of technology.

Curriculum Development:

One of the challenges in TVET institutions is that the curriculum often fails to incorporate technological advances. This is particularly evident in departments such as automotive departments. Those in the automotive department are still being taught about manual cars when there are now automatic and hybrid cars (Bulawayo Lecturer, 2024). As the automotive industry rapidly evolves with the introduction of electric and hybrid vehicles, advanced driver-assistance systems, and other emerging technologies, the curriculum must reflect these changes. The challenge related to the lack of curriculum development is not only peculiar to the automotive department but also to those who are studying boilermaking courses. Those studying boiler making have the same challenge as their curriculum does not cover how a boiler maker is made or anything related to steam yet their program is hinged on that (Midlands Lecturer, 2024). Showing the need for a curriculum review.

Furthermore, the study showed that the general curriculum in the TVET institutions focuses on theoretical work rather than practical aspects. The curriculum in Polytechnics and Vocational training Schools might be different as those in the Vocational training schools noted that their students spend 99% of their time doing practical and by the end of the month the students would have mastered using some of the machinery. The curriculum in polytechnics requires that they focus on much theory as compared to in vocational centers (Midlands Principal, 2024). However, the respondents from HEXCO (which is the governing board for TVET institutions in regards to curriculum) indicated that the curriculum for 2023 curriculum was formulated through a consultative process that involved the TVET institutions, companies in the industry and many experts (HEXCO Respondent, 2024). By updating the curriculum to include the latest advancements, TVET institutions can ensure that students are equipped with the skills and knowledge required to meet the demands of the modern industry.

Strategies for TVET Institutions to Bridge the Skill Mismatch

The study sought to explore the various recommendations and strategies that can be adopted to bridge the skills mismatch

Curriculum Review:

Firstly, the study showed that it is crucial to review the curriculum to align with technological advances and industry needs, ensuring that students acquire relevant and up-to-date skills. The research findings indicated that there is a need for the curriculum to be reviewed as some of the institutions are failing to acquire the machinery and technologies needed citing that they are not covered in the curriculum. Furthermore, there is a need for the curriculum to carter for vernacular language as the participants indicated that students tend to excel better when taught in their first language as the Chinese and even Russians do. Utilizing vernacular language in science education can enhance comprehension and engagement among students.

Most of those students fail to grasp skills and concepts of lectures not because they are not competent in the said skills, but because they fail to understand the language used not the skill being taught. This should also be the case for the students who have impairments for instance those who use sign language, the curriculum should also have provisions to test them in sign language if it is recognized as an official language in Zimbabwe.

Establishing Innovation Hubs:

The study also indicated that it is imperative for the government to establish innovation hubs for TVET institutions. Establishing innovation hubs within TVET institutions can foster a culture of creativity, collaboration, and technological exploration. The study findings also indicated that there should be 'wild' funding for the innovation hubs so that the students with any ideas can have adequate resources to come up with innovative ideas.

Incorporating Assistive Devices and Technologies:

There is a need for TVET institutions to promote inclusivity and access for individuals living with disabilities. The study indicated that the majority of students living with disabilities were being referred to Danhiko or Emerald Hill because the majority of the TVET institutions cannot accommodate those with impairments. Therefore, TVET institutions should invest in assistive devices so that those living with disabilities can be incorporated into mainstream TVET institutions.

Virtual Learning and Examinations:

TVET institutions cannot be in every corner of the country and those in remote areas are being left behind. Therefore, software programmers should work on creating applications that can be used to enable virtual learning and examinations in technical and vocational education to try and reach everyone. Technical and vocational colleges are the ones still lagging when it comes to virtual learning. The government of Zimbabwe must also work on subsiding data for technical education to make it affordable to all students. Zimbabwe has the most expensive data charges in the African region hence the need for subsidies.

Mandatory Skills Development for Lecturing Staff:

The government must facilitate for lectures to go for regular train the trainer courses so as to keep the lecturers abreast with this ever-evolving technology. There should also be structures that will enable the lecturers to be withdrawn from the system if they do not go for the set regular training courses. This will force those who are rigid on curriculum change to adopt to technology in TVET.

Motivation for Lecturers:

The study noted that the lecturers were not motivated to work nor enhance their knowledge due to low wages, insufficient resources at the institutions and general economic meltdown being experienced in the country. In comparison to other countries in the region, Zimbabwean TVET lecturing staff also get eroded pensions when they retire because of the high inflation rates in the country. This demoralizes the TVET staff as such they do not seem to have a zeal or eagerness to develop themselves technologically or come up with new innovative ideas. Therefore, the government should introduce motivational packages for lecturing staff to keep the sector revived and jovial.

DISCUSSIONS OF FINDINGS

The response rate for the study conducted was deemed sufficient as it exceeded 75%. If a study has a response rate above 60%, it is deemed feasible, as such, the findings of this study can therefore be generalized to the rest of the TVET institutions in Zimbabwe [17]. Although the study may have dominated male participants, it is important to note that the gender composition does not necessarily invalidate the findings. The gendered perspective might not always be relevant in a study and this was the case for this study [18]. The qualifications of the individuals involved in the study indicate that they possessed the necessary expertise and understanding of the subject matter. Using participants who are knowledgeable about the area under study enabled the study to provide valuable insights and perspectives on the issues under study [19]. This ensures the credibility and relevance of the findings. Thus, despite the gender imbalance, the qualifications of the participants contribute to the robustness and reliability of the study's outcomes. A significant challenge in Zimbabwe is the skills mismatch between what is being taught in schools and the technological needs of the industry. Many TVET institutions in the country continue to face resource limitations, relying on outdated machinery from the 1980s. Zimbabwe produces a lot of graduates but lacks 'students trained for work' because of a lack of exposure to current technologies [20]. This lack of access to modern technology creates a gap between theoretical knowledge and practical skills, as students do not have hands-on experience with contemporary technologies. TVET institutions in the country are ill-equipped to deal with the needs of the industry[21]. However, the industrial attachment programs provide a valuable opportunity for students to bridge this gap. During these attachments, students have the chance to learn about and work with the latest technologies in realworld industrial settings. Industrial attachment exposes students to hands-on experience allowing them to acquire the necessary skills and adapt to the technological advancements demanded by the industry [22]. The Private Public Partnerships have also been an important aspect in providing contemporary machines to students. There are workshops where students are invited to companies such as Sable Chemicals, Delta, Mimosa, or Unki Mines. There is a need for both public and private investments in TVET institutions for the elevation of the social status of the institutions [23]. While industrial attachments serve as a valuable component of their education, addressing the resource constraints within institutions and ensure that students have access to up-to-date machinery and technology throughout their educational journey to better align their skills with industry requirements.

The study showed that the use of social media was common in the TVET institutions in Zimbabwe in comparison to other forms of technologies such as elearning, computer-based training, simulation software, online collaboration tools and digital resources. Online learning has become the buzzword in TVET institutions although the severity of implementation differs in each country [24]. The study showed that after the Covid-19 pandemic, the implementation of virtual lessons decreased.

About the challenges being faced in the adoption of technology in TEVT institutions limited access to technological infrastructure inhibits the integration of modern tools and equipment into the learning environment. Without the necessary resources, institutions struggle to provide students with hands-on experience using up-to-date technology, which is crucial for their future careers [3]. Another significant challenge is the insufficient training and

professional development opportunities for educators. In a study in Nigeria, noted that challenges as the case of Zimbabwe where the faculty members may lack the necessary digital literacy skills and knowledge to effectively incorporate technology into their teaching practices, can be disastrous for the education sector [10]. This can hinder the implementation of innovative teaching methods and prevent students from gaining the skills required in the digital era.

The lack of financial resources further compounds the challenges. Upgrading technological infrastructure, providing training programs, and maintaining technical support services require substantial investments. ZIMDEF has the mandate to provide TVET institutions with resources for training material and equipment, infrastructure improvement, and expansion [25]. These funds are obtained through the 1% training levy paid by employers for apprentices. However insufficient funding limits institutions' ability to procure modern equipment and provide ongoing support, hindering their capacity to keep pace with technological advancements.

Resistance to change among faculty members is another obstacle. Some educators, particularly those from older generations, may be hesitant to embrace new technologies due to their familiarity with traditional teaching methods or concerns about their adaptability. There is a need for technological competencies among the lecturers as well as the need for constant curriculum review in the digital era [26]. This resistance can hinder the effective integration of technology into the curriculum and limit the potential benefits for students. Thus Wagiran et.al, provided a competency framework for lecturers in the digital era [27]. Furthermore, limited technical support exacerbates the challenges associated with technology adoption. Inadequate technical assistance can result in prolonged downtime, unresolved technical issues, and teaching and learning activities disruptions.

CONCLUSION

In conclusion, the study showed that there is a skills mismatch between what is being offered in TVET institutions and what is demanded in the industry. The adoption of technology in TVET institutions in Zimbabwe is still lagging, despite the need to make significant progress as a country. This is evidenced with the low uptake of other technological advances in education such as online learning, computer-based training, simulation software and also other digital resources. Challenges such as resistance to change, limited funding, and a mismatched mentality within the education sector hinder the integration of technology for educational advancement. By implementing these recommendations such as curriculum review, establishing innovation hubs, incorporating assistive devices for students living with disabilities, virtual learning and examinations, mandatory skills audits and motivation for lecturers in Zimbabwe can bridge the technological gap in TVET institutions. This can also pave the way for a more inclusive and technologically advanced education system that prepares students for the demands of the future workforce.

Suggestions for Further Study

There is the need for a further study on the viability of online examinations for students including for the students living with disability to have specific applications made for them to be examined in disability friendly methods.

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