INDUSTRY LABOUR FORCE SKILLS GAP INVESTIGATION

A Focus on the Automotive, Electrical Engineering, and ICT Industries in Swaziland

FINAL REPORT

Prepared for:

TAIWAN TECHNICAL MISSION

TVET ENHANCEMENT PROJECT

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30th January 2018

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EXECUTIVE SUMMARY

Introduction

Sluggish economic growth coupled with high unemployment rates have become synonymous with the economy in Swaziland. In particular, youth unemployment, which stood at 51.6% in 2014, the last year for which reliable data is available, has skyrocketed amidst limited opportunities for young people in the economy. Put differently, these figures suggest that one in every two young people in Swaziland is unemployed. Moreover, the 'youth bulge' – a situation in which the population share of the 15-24 year-olds exceeds 20% and the share of the 0-14 year-olds (often also referred to as the "children bulge" and a good predictor of future youth bulges) is higher than 30% –, means the country's population is also growing faster than jobs are created.

This calls for urgent strategies and public policies that can transform the economy, reignite economic growth, and capitalise on Swaziland's youthful population. Technical Vocational Education and Training (TVET) has emerged as a credible route for the production of the necessary skills and knowledge that will feed directly into industry in a bid to enhance the employability of young people and create employment. Indeed, the talent, know-how, skills and capabilities of human capital can provide the relevant stock of competencies needed to increase efficiency and overall productivity in industry.

However, at the present moment, there is very little information on whether or not the skills produced by the TVET sector in Swaziland are meeting the needs of industry. Conceivably, this has compromised efforts aimed at increasing the contribution of TVET in human capital development in Swaziland.

In an attempt to make TVET education more relevant in Swaziland, His Majesty's government has partnered with the government of the Republic of China on Taiwan, which has agreed to provide assistance in upgrading technical skills in Swaziland with a focus on the automotive, electrical engineering, and information and communications technology (ICT) industries.

This Report presents the results of a TVET-industry skills gap analysis in the automotive, electrical engineering, and information and communications technology (ICT) industries in Swaziland. It investigates the relevancy of the skills supplied by the TVET institutions against the skills demanded/required by the three industries considered in this study. Closing the skills gap in the technical and vocational labour force could directly impact the productivity of local companies, create new enterprises, and enable the economy to grow through both formal and informal employment.

The study focuses on four objectives: (i) to ascertain the development trends in each of the three industries and specify the existing challenges and opportunities; (ii) to assess the capacity and quality of Swaziland's TVET system and its position to serve the skills required by industry; (iii) to identify the gaps between the skills supplied by TVET training institutions in Swaziland, (particularly, SCOT, and Gwamile VOCTIM) versus the skills demanded by the automotive, electrical, and ICT industries; and (iv) to recommend strategies for reducing the labour force skills gap within the three focus industries.

Key Findings

i. Development trends in each of the three industries and existing challenges and opportunities

Starting with the automotive industry, the study finds that Swaziland does not have an automotive manufacturing industry, but a growing industry in auto-repairs, auto-spares, and used car dealerships. The major development challenge within the automotive industry is a struggle to keep up with technology advancements as newer car models demand specialised skill-sets in vehicle computer systems, and associated functionalities. Adding to the issue is the influx of imported Japanese used vehicles creating an opportunity for more specialised auto-spare dealerships, advanced skills in auto mechanics beyond the usual brands such Toyota, Nissan, Ford, Mazda, Opel, Isuzu, Chevrolet, Kia, and Hyundai.

The electrical engineering industry in Swaziland is diverse and includes sectors such as energy, communications, manufacturing, construction, and electronics. The most common business activities within the electrical engineering arena in Swaziland includes general installations, electrical repairs and maintenance, electricity production, sale of electrical appliances, air conditioning, wiring, electronics, and home and industrial electrical support. However, the current skills supply in this industry is not enough: the majority of electrical training courses provide skills on basic electrical engineering only useful for ordinary jobs such as house wiring to the detriment of advanced low-voltage and high-voltage industry electrical needs and advanced control electrical engineers.

ICT development in the country has been relatively slow, only picking up after the establishment of the ICT industry regulator in 2013. Though growing at a snail's pace, the ICT industry spans throughout the economy characterised by diverse products and services. These include computer sales and repairs, network installations and management, banking and retail, graphic designing and printing, hardware and machinery, programming, office support, and systems development and management. The biggest challenge facing this industry is the lack of access to technology, and low infrastructure development. The country suffers from high internet costs, slow internet, and limited ICT infrastructure in the four regions of the country.

ii. The capacity and quality of Swaziland's TVET system and its position to serve the skills required by industry

The National Development Strategy (NDS) (2014), the Education Policy 2011, and the National Technical and Vocational and Skills Development (TVETSD) Policy (2010) form the key national legislative framework that supports TVET development and implementation in Swaziland. In terms of its implementation, the Ministry of Education and Training (MoET) is responsible for TVET system in the country. The Ministry of Labour and Social Security, and the Ministry of Commerce, Industry and Trade are also custodians of TVET implementation in Swaziland.

Among the publicly funded TVET training institutions in Swaziland, Gwamile Vocational and Commercial Training Institute of Matsapha (VOCTIM), and Swaziland College of Technology (SCOT), are the longest, and largest standing government funded TVET institutions in the country.

The study finds that the government of Swaziland established the Directorate of Industrial and Vocation Training (DIVT) to facilitate linkages between industry, government, and TVET training institutions in 1982. The DIVT has the responsibility

to monitor and evaluate TVET, skill upgrades and skill development. However, the role played by DIVT in facilitating the necessary linkages between TVET providers and industry remains minimal and compromised. Consequently, the DIVT has been unable to inform TVET curriculum development in Swaziland due to the lack of clear mechanisms of information sharing and liaison. The study finds that the DIVT tends to focus more on its trade testing and apprenticeship facilitation responsibilities to the detriment of all the other equally important responsibilities such as curriculum development and facilitating strong industry and TVET training institutions linkages.

The provision of both apprenticeships and grade testing services has been declining since 2010, with trade testing dropping from over 1,000 students in 2010 to about 700 students in 2016. The study reveals that though industry does provide internships and employment for TVET graduates, there are no formal agreements/partnerships enabling and safeguarding these engagements. The study finds that the lack of industry and TVET training institutions engagement in advice and research on current and future TVET skills needed by industry is a major impediment of the TVET system in Swaziland contributing to the inability of TVET graduates to secure employment opportunities within industry.

The TVET system in the country lacks quality assurance and an effective coordination mechanism. Training institutions such as SCOT and Gwamile VOCTIM often work on a City and Guilds curriculum framework based on the South African and United Kingdom industry developments, and is proving to be a major stumbling block in the development of local industry relevant skills. However, SCOT pulled out from the City and Guilds curriculum and currently provides a localised National Diploma. Training institutions carry out their own certifications apart from the grade testing provided by the DIVT.

The resulting situation is that there is now a lack of vertical education pathways between the TVET training institutions within the TVET sector and in other non-TVET tertiary institutions. By and large, TVET training institutions in the country mostly offer certificates and national diploma level qualifications.

The investigation also finds that generally, the demand for tertiary education institutions in the country is much higher than the number of students the training institutions can accommodate. There are over 16,000 young people that graduate from high school each year. In 2015, the University of Swaziland (UNISWA) absorbed 2,144 of these high school graduates, while Limkokwing University of Creative Technology and the Southern African Nazarene University both enrolled 2,000 students each. Therefore, less than 40% of the graduates are able to secure a space in the tertiary institutions, leaving a large number of graduates (60%) to fill most of the TVET institutions in the country. Yet, SCOT and Gwamile VOCTIM enrolled a total of 917 and 139 students, respectively from 1st year to final year in 2015 (MoET, 2016). These numbers demonstrate that regardless of the quality of the education, or certification process, graduates are willing to enrol in any of the available training institutions to develop their skills and knowledge.

With the limited TVET training spaces in the country, the study finds that another barrier that affects TVET delivery in Swaziland is the lack of flexibility in the TVET system, particularly on the side of the training providers. Flexibility in the TVET system relates to a shift from a rigid/fixed time for learning (8A.M. to 5P.M.), to the introduction of internet or online learning, where students can learn in their own time and pace. To illustrate, ***a greater part of SCOT and Gwamile VOCTIM could be dedicated to the provision of state-of-art workshops to allow students***

to apply the online-based theory into practical skills. By so doing, both SCOT and Gwamile VOCTIM can increase their capacity to service a greater proportion of the population within each trade rather than the 25-30 students they enrol on average each year. This type of 'learn on your own online and practice in the workshops' can easily accommodate even full-time employed technicians and artisans to allocate time for late afternoon or evening classes for practice in the workshops.

The study finds that TVET is a skill intensive field requiring substantial investments in equipment and machinery. A key challenge in acquiring up-to-date machinery is the dynamic nature of technological change and advancement among industries. In Swaziland, there is currently no national body that monitors and evaluates the delivery and assessment of TVET and so delivery and assessment tend to vary with each TVET provider. From the quality and relevance of the equipment used, to the structure of the curriculum and modules, to the level of qualifications required for trainers and instructors and the types and levels of certificates offered; TVET delivery varies according to the specific training institution.

Nonetheless, training institutions face similar challenges when it comes to the lack of financial and physical resources. The lack of suitable and up-to-date equipment and materials significantly affects the quality of TVET delivery across all the TVET training institutions. The study finds that public TVET institutions are by in large underfunded, and mostly lack resources to procure equipment and material for practice in the different training workshops and laboratories. For instance, SCOT and Gwamile VOCTIM are public entities funded by the government, under its laws and regulations. But, while government funding takes care of the staff salaries it does not completely cover operational costs which would support the procurement of up-to-date equipment and machinery for the practical work that students need in order to practice and apply the skills learned.

iii. The gaps between the skills supplied by TVET training institutions in Swaziland versus the skills demanded by the automotive, electrical, and ICT industries;

The study reveals that of the sampled companies, an estimated 30.8% of the labour force within the automotive industry are technicians, 18.9% in the ICT industry, and 10.8% in the electrical engineering industry. Male technicians dominate all three industries: about 90.9% of the technician positions available in the electrical engineering industry, 78.1% in the automotive industry, and 56.2% in the ICT industry are male. Furthermore, a majority of the employees in the three industries are young, falling between the ages 18-44. The electrical engineering industry boast of the youngest human capital with 60.9% of the employees aged 18-34 years followed by the automotive industry with just above half (53.5%) of the employees aged 18-34 years. The analysis highlights the fact that all three industries have a generally young labour force. This is an opportunity for growth and industrialisation in Swaziland since young people have a higher propensity to upgrade and upskill themselves in line with developments in each of the three industries considered in this Report.

The analysis finds that less than 20% of the TVET graduates produced by the TVET system in Swaziland will have the acceptable skill level demanded by industry. Half of the TVET graduates will have the basic skills required in their trades but require additional training or upskilling to meet industry needs, and about one third of the TVET graduates can easily be absorbed by industry without needing any major additional training. This means that even though the local TVET institutions produce graduates, the graduates will have a hard time finding employment opportunities

within the automotive, electrical engineering, and ICT industries. For the automotive industry, the biggest skill deficiencies include challenges with technological applications and computer skills, automatic gearbox repairs, poor hydraulics knowledge, lack of knowledge on newer engines and car models, on top of poor quality control and technical documentation. Scarce technicians within the automotive industry include: Grade 1 mechanics and workshop managers; heavy duty mechanics; vehicle programmers and diagnostic specialists; car electricians and wiring specialists, as well as computer box specialists.

For the electrical engineering industry, graduates face the greatest challenge maintaining quality control and applying their knowledge on standards, work methods and procedures within the industry. Generally, the TVET graduates usually lack the practical experience and safety judgement to carry out work procedures to a level that is deemed acceptable by the employers. Scarce technicians in this industry include: millwrights; broiler makers; technicians that have both electrician and mechanical fitter skills; maintenance engineers; instrumentation technicians; and air conditioning and refrigerator technicians.

On the other hand, the ICT industry faces two major skill deficiencies: hand working, machinery, materials; and problems with practical skills/aptitudes to carry out work assignments. Within the ICT industry, the study finds that the graduates have limited practical exposure in working with the various ICT hardware and infrastructure, and installing complete computer systems. The major scarce technicians in this industry include: network engineers and operators; programmers; and software and system developers/engineers.

While there may be gaps in the skills required by industry, there are also select abundant skills in the TVET labour force. In the automotive industry the study finds that the abundant skills supplied are basic car servicing and repairs, panel beating and spray painting. In the electrical engineering industry technicians can easily read and interpret electrical circuits, and are competent in basic wiring and in basic electrical appliance repairs. In the ICT industry the abundant skills are basic installation and assembling of computers, theoretical knowledge, and basic hardware and software support.

Despite the shortcomings of the TVET graduates skills, the good news is that (91.5%) of the sampled companies reported that they hire technicians trained within the local TVET institutions such as SCOT, Gwamile VOCTIM, Ngwane Park Youth Training Centre among others. Specifically, among the mechanics, electricians, and ICT technicians produced by the local TVET system, the study also finds that SCOT supplies a greatest number of all three types of technicians: 17.38%; 9.15%; and 7.93% respectively. Gwamile VOCTIM tends to supply a significant number of automotive (13.41%) and electrical engineering technicians (7.32%).

Conclusion

Effective TVET delivery is impossible without a nationally dedicated TVET coordinating agency and without the involvement of the industries that absorb the TVET throughputs. Overall, there are more weaknesses in the TVET system than there are strengths in all the industries considered in this study. There is a significant mismatch between the skills supplied by the TVET training institutions in the country versus the skills demanded by industry. The study underscores six (6) main factors that impact skills development in TVET in Swaziland. These are:

(i) Lack of or weak collaborations between the TVET training institutions and industry;
(ii) Inadequate physical resources, which include facilities, equipment, and machinery;
(iii) A weak and fragmented institutional environment supporting TVET;
(iv) Lack of adequate funding for TVET institutions;
(v) Outdated curricula and training modules, and
(vi) Inadequate capacity amongst TVET instructors.

In concert, these factors affect the ability of TVET to meet industry skills needs and requirements thus impacting job creation and employment in Swaziland.

Recommendations

I. TVET Governance

1. Establish the Directorate of TVET in the Ministry of Education and Training to coordinate the TVET sector in collaboration with the Ministry of Commerce, Industry and Trade;

2. The Ministry of Education and Training should develop a national curriculum framework for TVET and provide a qualifications and grading or certification system that is based on competency standards.

II. Funding and Resource Mobilisation

3. Develop multiple and sustainable funding sources to support TVET training and practice in Swaziland;

4. The Government of Swaziland should develop sustainability strategies and continuation plans for TVET projects that are funded by development partners;

5. Provide a special fund for updating machinery, equipment, and materials in TVET training workshops also ensuring proper management and continuous monitoring and upgrading of the equipment;

III. Structures and Systems

6. Establish mechanisms for monitoring and assessing TVET delivery and quality assurance;

7. Establish training centres where TVET instructors, students and industry employees can continually upgrade their skills and knowledge, such as continuing education centres;

8. Establish a system for the formal engagement, and increased participation of industry on the development, design and reviewing or upgrading of TVET curriculum;

IV. Curriculum and Internships

9. Review and update TVET curriculum periodically, to meet industry technological developments;

10. Establish a formal or structured system for internship/apprenticeship provision between industry and TVET training institutions;

11. Introduce more self-development programmes for TVET students to provide career guidance and entrepreneurial or management skills, regarding the different fields of TVET and specialisation opportunities;

V. Capacity Building in TVET

12. Currently the highest level of qualifications offered by TVET in the country are diplomas. There is need to improve the capacity and quality of the TVET institutions to a level where they can also offer degrees;

13. Provide special training to lecturers at SCOT and VOCTIM to update their skills and knowledge in line with the latest technology developments in the ICT, electrical engineering and automotive industries;

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1. Introduction

Sluggish economic growth and high unemployment are currently best descriptors of the economy in Swaziland. To illustrate, the Central Bank Report in 2015/16 reports that real GDP growth slowed to 1.7% in 2015 from 2.7% in 2014 and to -0.6% in 2016 (Central Bank of Swaziland, 2016). This is characterised by low productivity in some sectors of the economy and high unemployment rates. Unemployment currently stands at 28.1% with youth unemployment at a high 51.6% (Integrated Labour Force Survey (ILFS), 2014). According to the World Bank (2014) the "youth bulge" – a situation in which the population share of the 15-24 year-olds exceeds 20% and the share of the 0-14 year-olds (often also referred to as the "children bulge" and a good predictor of future youth bulges) is higher than 30% -, means the country's population is also growing at a faster pace than the creation of industrial development and employment opportunities. Currently, Swaziland has a significantly young population: about 79% of the population below the age of 34 years (Ministry of Sports, Culture, and Youth Affairs – MoSCYA, 2015). Therefore, there is a need for the country to devise strategies that could be used to curb youth unemployment and come up with practical solutions to reignite economic growth and gross domestic production (GDP) in the different sectors of the economy.

According to the World Economic Forum, the key to economic growth lies in the talent, know-how, skills and capabilities of human capital. Therefore, it is necessary to ensure that the skills provided by the education system, including the provision of technical and vocational training are relevant to the labour market. Through education, countries are able to produce the relevant stock of skills, and competencies needed to increase labour productivity and efficiency (Schwab and Sala-i-Martin, 2015). Likewise, the revised National Development Strategy (NDS) (Government of Swaziland (GoS), 2014) emphasises human capital as the foundational pillar for driving social and economic development in Swaziland. Hence, His Majesty's government has partnered with the government of the Republic of China (Taiwan), which has agreed to provide assistance in upgrading technical skills in Swaziland in an attempt to make TVET education more relevant to industrial development and reigniting economic growth in the country. Technical vocational education and training (TVET) has emerged as a credible route for the production of the necessary skill and knowledge that feeds directly into industry; enhancing the employability of individuals and creating employment. Regional and national efforts have emphasised skills development to curb high levels of unemployment and to open opportunities for job creation. These include strategies in the African Union, Southern African Development Community (SADC), and development partners that support TVET.

Information communications technology (ICT) is one of the areas that the Taiwan Technical Mission TVET Enhancement Project identified as key potential driver of economic growth and development in Swaziland. ICT is a foundational component of all sectors of a country's economy. ICT is a key component of communications, medicine, production, manufacturing, and even public service. The automotive and electrical engineering fields are also key areas of interest within the TVET Enhancement Project due to the lack of advanced skills in these sectors in the country. Thus, the report investigates the industry skill gap with a focus on these three industries: automotive, electrical engineering, and ICT. The challenge with education and training institutions has been the production of an inadequately skilled workforce not informed by industry needs. This has meant that, while education and training institutions continue to produce graduates, these graduates remain largely unemployed. For instance, Swaziland's Labour Market Profile in 2013 projected that of the 10,000 school leavers that enter the labour market each year, only 2,000 (20%) are absorbed by the labour market each

year. It points to the need to develop an industry relevant labour force, with a clear articulation of the skills required by industry and the existing deficiencies in skills supplied by the training institutions, particularly the TVET training institutions.

This report, therefore investigates the skills gap focusing on the skills supplied by the TVET institutions in Swaziland versus the skills demanded/required by the automotive, electrical engineering and ICT industries. The purpose of this investigation is to ascertain and highlight the key skills needed that can induce growth in the three specified industries. In the following sections, the report ascertains the development trends in each of the three industries, and specifies the challenges faced. It also assesses the capacity and quality of Swaziland's TVET system to serve the automotive, electrical engineering, and ICT industries, and identifies the labour force requirement skills gap between industry and the TVET training system in Swaziland. Lastly, the report provides some recommended strategies for reducing the labour force skills gap within these three industries of interest.

The structure of the report is such that Section 2 discusses the purpose of the study and associated specific objectives. Section 3 presents the study methods and analytical framework. Section 4 discusses the structure, capacity, and quality of the TVET system in Swaziland. This is followed by Section 5 which gives an overview the labour market analysis of the automotive, electrical engineering, and ICT industries in Swaziland; while Section 6 presents the analysis of the identified skills gap including a summary of the factors that contribute to the observed skill gap. The report on Section 7 concludes with recommendations for aligning TVET training with the skills required by industry.

1.1. Study Objectives

The overall objective of the investigation is to generate information on the industry labour force requirements in automotive, electrical engineering, and ICT industries that employ TVET graduates in Swaziland. The specific objectives of the study are to:

I. Ascertain development trends in each of the three industries and specify the challenges faced;
II. Assess the capacity and quality of Swaziland's TVET system to serve the automotive, electrical engineering, and ICT industries;
III. Identify the labour force requirement skills gap between industry and the TVET training system in Swaziland;
IV. Recommend strategies for reducing the labour force skills gap within the three specified industries.

Answering the above objectives requires an understanding of the interplay between TVET and economic growth. The simplest way to look at this is to understand the contribution of TVET in human capital formation and skills development and employability, which is considered next.

1.2. The Role of TVET in Driving Economic Growth and Development

Human capital is a fundamental component of economic development. Pelinescu (2015) shows that investment in human capital is important for economic growth. This implies that skills and knowledge are a major contributing factor to development. Hind and Moss (2011) emphasise that employability depends on the knowledge, skills, and abilities that individuals possess. Having the right skills and competences required by industry is a fundamental ingredient for industrial growth, as well as improves employee productivity in the work place. Evidence from South Korea, Taiwan, and China shows that these countries were able to successfully develop their industries through investment in human capital. They invested in

the development of future industry skill needs which drew foreign direct investment (FDI) and grew local industries. This suggests that countries can channel industrial growth through the production of relevant skills and knowledge for national and international companies. In this way, TVET increases a country's readiness for technological change, adoption, and adaptation, which contributes to its openness to new forms of work organisation and industry investments (Department for International Development (DFID), 2015).

With a rapidly changing business environment and technological development, TVET is also continuously changing. A growth in industry resulting from changes in products and processes also requires a change in skills and competences to deal with the changes. For instance, the automotive industry moved from manual cars, to automatic cars, electrical cars, and now to self-driving cars with advanced artificial intelligence systems. These developments require different skill sets to cope with the introduction of these new technologies and adapt to the changes in industry. This is one of the key reasons why developed and developing countries have a hard time keeping their TVET training systems up-to-date with the latest industry developments. Álvarez-Galván, (2015) shows that both institutional and implementation level challenges are persistent in the TVET system. For instance, TVET coordination and industry engagement is a huge challenge in most developing countries. Thus, Weller and Gontero (2016) contend that managing TVET is a continuous process of monitoring and tracking a moving target.

However, TVET literature shows that TVET in itself ranks high in the development discourse (Marope, Chakroun, and Holmes, 2015). It is emphasised in the Africa Union's agenda for development as a priority for youth development, and at different regional economic communities such as the European Union, Organisation for Economic Co-operation and Development (OECD) countries, and Caribbean community. TVET is considered a source of the necessary skill and knowledge that feeds directly into the industry, enhancing the employability of individuals and creating employment. This increases overall industrial productivity, employment, competitiveness and contributes to economic development. Mozambique, is one example where formal job growth has been sustained in recent years through both national and foreign direct investment harnessing the TVET skills developed locally (DFID, 2015). Nonetheless, people still view skills acquired through the TVET system as a second best option, or a last resort.

The challenge with TVET, apart from a negative perception, is that the TVET training systems is marred by huge implementation costs in providing the technical expertise, and equipment necessary to perform the technical and vocational jobs. Lecturers have to be continually trained and engaged in professional development activities at a substantial cost while the equipment, and materials required for training also come at a significant cost. Thus, the Commonwealth (2013) argues that for countries to have an effective TVET system, policies should be aligned with funding mechanisms, developing positive attitudes and enhancing management. In Egypt, for instance, the organisation of social partners in their technical cluster's initiative enhances the production of high quality skills, ensures the integration of resources and tackles labour needs more effectively (Álvarez-Galván, 2015). This model can be emulated by other countries to strengthen their own TVET systems. A number of factors explain skills gaps within different countries. The African Union (2007) proposes that a supply driven (rather than a demand driven) education system tends to produce graduates that are not absorbed by industry due to the lack of adequate industry relevant skills. Marope (2010) further discusses the lack of education pathways between the different education levels in a country, while Álvarez-Galván, (2015) emphasises the lack of coordination in the TVET system and low engagement of industry as some of the key problems that lead to observed gaps between industry and TVET systems. Industrial evolution, and the failure of education systems to evolve with industry is another factor that results in a skills gap.

The most common problem that developing countries face is an oversupply of low-level skills and an undersupply of high-level industry skills. But to sustain the TVET system, both the education system and educators need to keep up with industry needs (Ridzwan et al., 2017). Thus, a weak education or TVET training system results in adverse skills gaps that intensify unemployment, which in turn, affects the productivity and development of each country's economy. The World Bank (2014) states that with the high population of unemployed youth in Swaziland, in addition to the current low level of economic growth, TVET has a fundamental role to play in creating the much needed employment and relevant skills to industries to spur the much needed industrial growth.

2. Research Methods

2.1. Study Design

The study employed both quantitative and qualitative research methods and proceeded in four (4) parts; (i) document and literature review; (ii) key informant interviews (KII); (iii) employer survey, and (iv) a focus group discussion (FGD).

2.2. Data Collection

Data used in the study was collected from Gwamile VOCTIM and SCOT. These two colleges represent the main TVET training institutions in Swaziland. Other data were collected from private and public companies that operate in the automotive, electrical engineering, and ICT industries. Part of the research process included document analysis and literature review which provided information on the policy environment and structure of the TVET system in Swaziland. This was based on the general understating of the components of a TVET system as proposed by the Commonwealth (2013). To describe a TVET system the Commonwealth (2013) suggests six (6) major descriptors, shown on Figure 2.2.1 below. These are:

I. governance;
II. industry engagement;
III. competency-based standards;
IV. qualifications framework;
V. quality standards for providers, and;
VI. delivery and assessment.

Secondary data from government reports, education census, legal frameworks, and TVET training institutions were collected on these fore mentioned components of the TVET system. Primary data were also collected through semi-structured key informant interviews to provide a context of the TVET system in Swaziland. In total 16 interviews were conducted with key informants from the Ministry of Education, Ministry of ICT, the Directorate of Industry and Vocational Training (DIVT), and the Higher Education Council. The principals of the TVET training institutions and head of departments (HODs) also formed part of the key informant interviews. The last of the key informant interviews were conducted with key stakeholders and industry captains in the ICT, automotive and electrical engineering industries. The key informant interviews were corroborated with the results from the document analysis to ensure validity of the information.

Table 2.2.1: Features of a Well-Structured TVET System

Governance	Industry Engagement	Competency-Based Standards	Qualifications Framework	Quality Provider Standards	Delivery and Assessment
National TVET policy National agencies Nationally coordinated funding Nationally developed pathways between education sectors	National skills councils Advisory boards Research component Workplace training & placements	Nationally endorsed Skills aligned to specific occupations Skills aligned to level of competence	Nationally endorsed Competencies aligned to levels of qualifications Pathways to and between school, vocational and higher education	Nationally endorsed Registration standards for providers Standards for regulators Audit process & schedule Standards for course development Standards for data capture & analysis	Qualified teachers & trainers Recognition of prior learning Flexible learning options Moderated and validated assessments

Source: Commonwealth (2013)

A major part of the study included an employer survey with 172 companies (n = 172): 92 in automotive; 40 in electrical engineering; and 40 in the ICT industry. The researchers purposefully selected companies from key industry clusters representing the four regions of Swaziland: (Hhohho: Mbabane, Sidwashini, and Pigg's Peak; Manzini: Matsapha and Manzini; Lubombo: Siteki, Big-Bend, Simunye, and Mhlume, and Shiselweni: Nhlangano). These include 40 companies from the ICT industry, another 40 from the electrical engineering industry, and 92 from the automotive industry. In total the employer response rate was 97% (166 complete questionnaires out of the 172 target). Some companies represented more than one industry, hence were interviewed twice or three times depending on the nature of work they do under the three industries considered in this study.

The employer survey used for data collection included a self-administered questionnaire under the supervision of the data collection team. The questionnaire collected information on the following thematic areas; company core business activities and labour force structure; TVET skills inventory including scarce and abundant technicians and key competencies and skill deficiencies; general nature of skill shortage including strategies for dealing with the shortage; satisfaction of employers on TVET graduates skill-set; collaborations between industry and TVET training institutions; and SWOT (Strengths, Weaknesses, Opportunities, Threat) of the industry and TVET system in Swaziland. The focus group discussions were conducted with representatives from the industry (automotive, electrical engineering, and ICT), government, the TVET providers, and the TVET graduates themselves. The data were used to further describe the skills gap and corroborate information from the employer survey to ensure credibility and validity of the responses. A SWOT analysis was also conducted using

the focus group discussion data. However, of note is that, since the TVET Enhancement Project focuses on the Swaziland College of Technology (SCOT) and Gwamile Vocational and Commercial Training Institute (VOCTIM), the study paid attention to these institutions more than the other TVET institutions in the country.

2.3. Data Analysis

To analyse the different sets of data, the study employed the following analytical framework consisting of three (3) key elements;

A. Relevancy:

Involved assessing the relationship between the TVET skills outputs (types of technicians, quantity, quality of skills and qualifications and grade tests) in relation to the skills required by the three focus industries and the economy at large. In this component of the analysis, the study also interrogated the extent the TVET systems is aligned with current industry developments, and future prospects for growth in the next three (3) to five (5) years.

B. Efficiency:

Involved identifying the factors that facilitate the production of an industry demand-driven TVET skills including the factors that inhibit the supply of skills that can be absorbed by the automotive, electrical engineering, and ICT industries. These factors include;

- Mechanisms for funding TVET in Swaziland (students, government, industry, and development/donor partners).
- Quality of trainees (entry requirements and selection, level of informed career guidance related to industry needs, entrepreneurship, and key challenges and opportunities experienced by the students/trainees.
- Physical resources (teaching facilities, support facilities, and provision of equipment and consumable materials).
- Institutional environment supporting TVET (structure of the TVET system in Swaziland, quality and standards, government support, policies, and educational pathways and industry opportunities).
- Interrelations with industry (formal links and services between training institutions and industry, industry links of TVET instructors, training and apprenticeship opportunities, and level of engagement with industry to shape the production of the required type and calibre of technicians needed by industry).

C. Effectiveness:

Involved making judgements on whether the TVET system in Swaziland has the capacity and conducive environment to produce the quantity and quality of technicians in the three specified industries. It involved a holistic synthesis of the relevancy and efficiency elements to determine the overall key areas of skills gaps and the associated improvement that need to be effected. It provides feedback on the suitability of the TVET system given the industry needs and developments. It also identified the key areas for partnership to facilitate smooth absorption of TVET graduates into the automotive, electrical engineering, and ICT industries.

2.4. Limitations of the Study

The study employed a non-probability sampling technique for the survey which imposed limits to the generalisability of the results. However, the companies that were purposively sampled for the employer survey were representative of the four regions of the country, and were selected based on whether they had previously accepted TVET graduates for internship/apprenticeships, and or employment. The researchers chose this method because

there is no existing list of all such companies in the country. The second limitation is that the study focused on the two TVET training institutions (Gwamile VOCTIM and SCOT), which also means that the results cannot be generalised to the whole TVET system in Swaziland. However, the other TVET providers were consulted in the study during the interviews and focus group discussions.

3. The Structure, Capacity, and Quality of the TVET System in Swaziland

3.1. Introduction

Education is a fundamental component of the development of any country. It is a pillar for development and a driver of social and economic development. This is signified by its importance in the Sustainable Development Goals (SDGs), and also as an indicator for development in the Swaziland Development Index (SDI). Likewise, a skilled work-force is a vital component for driving the necessary development. It requires a high level of competency and learning in both general education and technical and vocational skills. Therefore, the extent a country is able to produce quality and competent TVET skills depends on the structure and coordination of the local TVET system.

Baraki and Kemende (2013) demonstrate that it is important to pay attention to: the TVET qualifications framework; occupational standards; occupational assessment and certification; accreditation of TVET institutions and testing centres; TVET research monitoring and evaluation; stakeholders' participation and partnerships; and other support/regulatory mechanisms for standard-based TVET delivery to improve the quality of TVET. As part of the analysis of the TVET-industry skill gap in this study, it is important to examine the different components of the TVET system to understand its capacity and the quality of graduates and skills it produces. In order to get a better understanding about the relevancy, efficiency, and effectiveness of the TVET system in Swaziland, the study employs the framework provided by the Commonwealth (2013) as the main assessment tool.

3.2. TVET Governance and Policy Environment in Swaziland

The Poverty Reduction Strategy and Action Plan (2005) states that access to education improves capacities and opportunities, as well as empowers people for greater social integration and equality. The NDS (GoS, 2014), the Education Policy 2011, and the National Technical and Vocational and Skills Development (TVETSD) Policy 2010 (Ministry of Education and Training (MOET), 2010) form the key national legislative framework that supports TVET development and implementation to meet the human capital needs necessary for resuscitating industrial and overall economic development.

However, the implementation of the National Technical and Vocational Skills Development Policy has been slow due to the absence of an implementation mechanism (MOET, 2015), and the general inadequate allocation of resources for implementation (World Bank, 2014). Weller and Gontero (2016) concur that the funding of TVET is a challenge in many countries, and as such it affects the ability to improve TVET coverage, efficiency, and effectiveness. To be sure, TVET only accounted for 2.12% of the national education budget while the education budget formed 4.89% of Swaziland's GDP in 2015 (Mgabhi and Mohammed, 2017). Confounding the situation, is that currently funding for TVET is not aligned to national policies and frameworks, and most of the education funds are directed towards primary education. Hence, the TVET training sector in Swaziland remains stagnant characterised by over-used old, out-of-date, and rusted equipment.

Furthermore, the lack of a national coordinating body for TVET in the Ministry of Education compromises the success of the TVET system. TVET is governed by the Chief Inspector of Tertiary Education at the Ministry of Education and Training. The inspector is also responsible for the National Curriculum Centre, in-service education, and teacher training education. As a result, TVET is for the most part, left uncoordinated since it requires a set of its own specific resources, time, and expertise. What usually happens as a result of this TVET neglect, is that

the interests of the TVET training sector are left unattended, to which in turn inhibits the potential growth of the national TVET portfolio. The TVET Draft Bill established alongside the TVET Policy in 2010 advocates for the establishment of a TVET directorate at the Ministry of Education to solely coordinate all TVET activities in the country, however it is yet to be presented in parliament.

According to the TVETSD policy of 2010, the Ministry of Labour and Social Security and the Ministry of Commerce, Industry and Trade are also custodians of TVET in the country. The TVET system in Swaziland constitutes the government, the TVET training institutions, and industry. There are currently seventy (70) TVET training institutions in the country, of which twenty-seven (27) are publicly funded and the remaining forty-three (43) are privately funded. Among the publicly funded TVET training institutions, Gwamile VOCTIM, and Swaziland College of Technology (SCOT), are the longest, and largest standing government funded TVET institutions in the country. However, TVET coordination between these institutions leaves room for improvement as there is still no TVET dedicated body to carry out this functions. The result is a fragmented TVET management system from the different government ministries down to industry (World Bank, 2014).

Whereas in other countries national training boards or agencies ensure communication between the different ministries and industry, Swaziland uses the Directorate of Industrial and Vocational Training (DIVT) advisory board - even though the responsibilities and operations of the board within the TVET system are not defined. Therefore, the country still has room for improvement in strengthening the coordination of TVET programmes among all the public and private TVET training institutions in the country.

3.3. Swaziland TVET Training Providers

TVET training can fall under three (3) categories in the country. The first is the high school prevocational learning which introduces young people to technical and vocational trades. However, this is still a pilot project offered only 16 schools in country. The problem with this set up is that presently, the vocational subjects are not recognised at tertiary level even in the local tertiary institutions; hence, students are discouraged towards prevocational education because the TVET system does not provide for continuity of the skills attained in high school through to tertiary qualifications later in their chosen careers.

The second category of TVET are the Swaziland Skills Centres (SSCs), and Rural Education Centres (RECs). These centres offer certificates in trade, and artisan level vocational training such as electrical engineering, sewing, plumbing and handicraft. There are both public and private skills development centres for which most of the public centres (Swaziland skills centres or community skills centres) are located across the different fifty-five (55) constituencies while most of the private ones tend to be in urban areas. The community centres cater for all individuals interested in skill development while the urban ones cater for both primary or secondary school dropouts, and those that completed high school. Lately, due to the high number of youth graduating from high school, these institutions have had an influx of Form 5 graduates (final year of high school) than school dropouts.

The third, and last category of TVET training institutions are the technical training institutions, such as SCOT, Gwamile VOCTIM, and Ngwane Park Youth and Training Centre. These are post high school TVET training institutions. They have set criteria for entry requirements with the most common being completion of high school with 3 credits or more. All these institutions only offer up to diploma level qualifications.

Prior to the establishment of the Higher Education Council in 2015, there was no clearly defined procedure for approving and registering training institutions and regulating their

performance in the country. According to the Commonwealth (2013), a national system of approving and registering TVET providers is a fundamental feature of the TVET sector. This system influences the quality of TVET providers and continuous revision of curriculum to meet industry needs. The Swaziland Qualifications Framework (SQF) was adopted in 2016 under the custodian of the Swaziland Higher Education Council (SHEC) (Dlamini, 2017: *Pers. Comm.*). SHEC is currently in the evaluation stage of registering private and public TVET institutions in the country. The evaluation exercise will also lead to the revision of curriculum to meet the requirements of the SQF.

3.4. Industry Engagement in Production of TVET Skills

In 1982, the Swaziland government established the Industrial and Vocational Training Board through an Act of Parliament. The DIVT and its structures were established in 1987. The Directorate was given the mandate to provide the links between industry-government, and TVET training providers. The board of the directorate is composed of representatives from the three (3) different sectors. However, the operations of the board towards informing curriculum development in TVET, and monitoring of industry skill needs and evolution are not clear. Consequently, no agency ensures continuous engagements between industry and TVET training providers in Swaziland.

DIVT provides a linkage between industry and the TVET providers, through the use of industry determined trade testing standards and administration of apprenticeships. Since 2010, however, the provision of both apprenticeships and grade testing services has been declining in Swaziland, with trade testing dropping from over 1,000 students in 2010 to about 700 students in 2016. In the same vein, the companies that offer apprenticeships under the DIVT consists of 50-60 companies of which the number has not changed significantly since 2005, yet these companies are now taking even fewer number of students for apprenticeships/internships.

For example, big companies like the Royal Swaziland Sugar Corporation (RSSC) and Ubombo Sugar Company used to take 77 and 40 trainees in 2005. However, currently the numbers have plummeted by more than half to only 30 and 12 students respectively as of 2017. The decline is attributable to the lack of financial resources and commitment to pay students during apprenticeships, and also due to extreme financial constraints in acquiring testing equipment and machinery, materials, and testing facilities at the DIVT. The DIVT uses SCOT facilities for testing which are only available for a limited period of time. The implication of this is that only a limited number of students can be tested in the limited period of time the testing facilities become available.

While monitoring and evaluation of TVET, skill upgrading, and skills development are some of the responsibilities of the DIVT, activity within this important role has remained minimal. The DIVT, has therefore, been unable to play a major role in informing curriculum development in Swaziland due to the lack of clear mechanisms of information sharing and liaison. As a result, the DIVT tends to focus more on the trade testing and facilitating apprenticeships while the other important functions are to a greater extent ignored. Interviews with Gwamile VOCTIM and SCOT revealed that even though industry provides internships and employment for students in these training institutions, currently there are no formal agreements enabling and safeguarding these partnerships.

The problem, the interviews revealed, is that the number of available internships/apprenticeships are not guaranteed each year. Even those companies that are currently engaging with the TVET training institutions have no formal obligation to honour their assumed relationship with the institutions. At the same time, the number of available apprenticeships vary each year, and students have to dedicate a significant amount of personal

effort to secure apprenticeships in industry. This lack of a streamlined and formal system for apprenticeships/internships in industry contributes to the mismatch in practical experiences students acquire in their trades.

For example, because of the limited opportunities available for internships, students tend to take any apprenticeship/internship offers, even if the practical experience is not related to their core trades or area of expertise. Most strikingly, moreover, is that a majority of students are shut out completely from gaining any practice in industry, which adds to their unemployability – the report further discusses this point later in the next sections. For now, suffice to say, is that due to the undefined links between industry and TVET training institutions, industry does not play an influential role in the development of TVET curriculum and practical training, as well as testing of TVET trainees.

Nevertheless, there are some instances where industry also supports DIVT and the vocational institutions through the provision of employees working in industry to facilitate training in the TVET training institutions. Furthermore, industry (for example, Swaziland Electricity Company (SEC) and RSSC) will sometimes provide the relevant equipment for skills training and testing. However, this assistance is not enough as TVET is a skills intensive field requiring substantial investments in equipment and machinery.

A key challenge in acquiring up-to-date machinery is the dynamic nature of technological change and advancement among industries (Weller and Gontero, 2016). The lack of engagement in advice and research on future skill needs, and the lack of dynamic industry informed curricula is a major barrier the TEVT system in Swaziland is yet to deal with. Attempts to introduce an appropriate levy on industry for TVET provision has failed to reach a consensus in the country, leaving the role industry plays to support TVET at a bare minimum.

3.5. Swaziland's Qualifications Framework

The TVET system in the country lacks quality assurance and an effective coordination mechanism (MOET, 2015; World Bank, 2014). Though the TVET and Education Policy advocates for the development of a TVET qualification framework, including the development of national standards, to date, these have not been developed. Most TVET training institutions in the country have thus adopted the City and Guilds framework for curriculum development and certification. This framework, however, has proven to be non-conducive to the development of relevant skills for the local industries in Swaziland. TVET institutions indicate that the City and Guilds curriculum is based on South African and United Kingdom developments within their TVET and industry sectors, thus some programmes become irrelevant in providing the necessary skills for industries in Swaziland.

Institutions like SCOT have tended to move away from the City and Guilds curriculum while Gwamile VOCTIM and Ngwane Park Youth and Training Centre continuously try to adapt the curriculum by adding more Swazi industry relevant courses over and above what the City and Guilds curriculum offers. Presently, there is no curriculum setting or certification body for the TVET training institutions in Swaziland. Apart from the grade testing provided by DIVT, TVET training institutions in country carry out their own certification. This has led to an observed lack of vertical education pathways between the training institutions, which has resulted in no identifiable linkages or pathways between TVET and other tertiary institutions, especially in the recognition of prior learning.

TVET institutions in the country mostly offer certificates and diploma level qualifications. Most TVET stakeholders, however, expressed positive expectations towards the operationalisation of the SQF to provide the relevant, and much needed framework for TVET

qualification and competence measurement. Institutions reflected that though they have made efforts to upgrade some of their programmes, they have not been able to review their curriculum since establishment due to the lack of resources and national guiding framework. Vocational institutions rely on students' internship reports which provide some information about current industry requirements including major industrial (technological) changes. Nonetheless, due to the lack of funds to procure up-to-date equipment, very few of the internship recommendations end up being implemented. It points to the need to develop and implement a framework that will ensure that TVET education is continuously updated to align it with industry skill needs.

The SQF is a credits based and outcome-based learning instrument. The learning outcomes focus on three strands which are: knowledge; skills; and competencies. The SQF promotes independent learning amongst learners, through the internet, text books, and any other learning method that can enhance understanding of the subject matter. The advantage of the SQF is that it is comparable to level grade testing in the sense that students have to demonstrate understanding (knowledge) and skill at each outcome (competency) level of their learning such that every step of the learning process/qualification will be graded and awarded a systematised number of credits.

This presents an opportunity for the development of education pathways and recognition of prior learning within the national education system. Most importantly, employers/industry, will be able to use the harmonised qualifications system to determine the level of skill a potential employee will have. The SQF is in line with the SADC Qualifications Framework for the 15 member states. This facilitates the mobility of students within the SADC institutions of higher learning, which is an opportunity for Swazi students to easily enrol in external universities within the region. The SQF also allows TVET training institutions to develop curricula that will enable students to acquire higher qualifications that will enhance the acquisition of more credits. More credits will increase their chances of employment within the SADC industries.

As new as the SQF may be, it is not without its own set of challenges. The implementation of the new outcomes based learning comes with a lot of changes requiring an overhaul of the whole education system at a significant financial cost because the implementation phase has to cater for: training of lecturers; and teachers; review of curriculum from junior secondary to tertiary; stakeholder consultations and involvement in the design of the new curriculum; and review of the assessment and certification frameworks and learning materials. Worth-noting though is that through assistance from the European Union under the Free Primary Education Programme, the Ministry of Education reviewed the primary education curriculum using the qualifications framework guidelines (Dlamini, 2017: *Pers. Comm.*).

3.6. Provisions for Competency-Based Standards

There is no nationally endorsed competency based standards framework for TVET in Swaziland. A competency-based system is an important component of the TVET system because vocational education concentrates on the ability for one to do things, thus places emphasis on the development of specialised practical skills. Though this may be catered for under specific professional associations, such as the nurses' association, there is a lack of (or knowledge of) national occupational standards in some fields. At the moment in Swaziland, the only tool equivalent to a competency based standard for TVET is the DIVT grade testing system. This appears to be one of the key opportunities within the TVET system in Swaziland. The DIVT grade testing aligns the skills tested with the occupational trades. This system is an outcome based system which looks at the ability for one to do the work, thus is also open to even self-taught artisans, technicians, and TVET trainees. In the automotive, electrical

engineering, and ICT industries, self-trained individuals can be tested on the level of their practical competencies within their trades.

The DIVT grading system has three (3) levels/grades that test competency and knowledge within a specific trade. DIVT provides testing for sixteen (16) trades inclusive of automotive and electrical engineering, but not for ICTs. The three 3 levels of testing, are as follows: Grade 3 is the introductory level, testing basic knowledge of skills and basic parts; Grade 2 is the second level test, which tests competency and some knowledge of basic concepts and principles; while Grade 1 is the highest level meant for advanced understanding of theoretical and technical aspects of the trade. A DIVT report covering the period 2010-2016 shows that there are fewer students testing for the Grade 2 level, and even fewer for Grade 1. The report reveals that in 2016, 87 technicians passed the Grade 1 test through DIVT, 152 passed Grade 2 level, while 431 passed the Grade 3 level test. A majority of students from SCOT and Gwamile VOCTIM are within the Grade 2 level with a much smaller number of Grade 1 technicians because the Grade 1 level requires a higher level of knowledge, vocational training, and practice and experience in industry.

3.7. Delivery and Assessment

According to the Commonwealth (2013), a strong TVET system requires guidelines and standards to govern training. This includes appropriately qualified instructors and trainers, suitable facilities and resources, and quality assurance processes for assessment. In Swaziland there is currently no national body that monitors and evaluates the delivery and assessment of TVET.

Delivery and assessment tend to vary with each TVET training provider. From the quality and relevance of the equipment used, to the structure of the curriculum and modules, to the level of qualifications required for trainers and instructors and the types and levels of certificates offered, TVET delivery varies according to the specific training institution. Nonetheless, training institutions face similar challenges in terms of lack of financial and physical resources.

The lack of suitable and up-to-date equipment and materials significantly affects the quality of TVET delivery across the TVET training institutions. The public TVET institutions are by in large underfunded, and mostly lack resources to procure equipment and materials for practice in the different training workshops and laboratories. For instance, SCOT and Gwamile VOCTIM are public entities funded by the government. But, while government funding takes care of the staff salaries within these two TVET training institutions, it does not completely cover operational costs to support the procurement of up-to-date equipment and machinery for the practical work that students need in order to practice and apply the skills learned.

Moreover, another key barrier that affects TVET delivery in Swaziland is the lack of flexibility in the TVET system. Flexibility in the TVET system relates to a shift from the rigid fixed time for learning (8AM to 5PM), to the introduction of internet or online learning such as massive open online courses (MOOCs), where students can learn in their own time and pace. Massive Open Online Courses (MOOCs) are free online courses available to a large number of geographically dispersed students as well as provide an affordable and flexible way to learn new skills, advance careers, and deliver quality and up-to-date educational experiences at a massive scale. Therefore, what it means is that, a greater part of SCOT and Gwamile VOCTIM can be dedicated to the provision of state-of-art workshops to allow students to apply the online-based theory into practical skills. What is more, is that both SCOT and Gwamile VOCTIM can increase their capacity to service a greater proportion of the population within each trade rather than the 25-30 students they enrol on average each year. This type of 'learn on your own online and practice in the workshops' can easily accommodate even full-time

employed technicians and artisans to allocate time for late afternoon or evening classes for practice in the workshops.

Marope, Chakroun, and Holmes (2015) call for TVET institutions to shift to more flexible education systems through the use of information communications technologies. The authors contend that ICTs provide a platform to better facilitate and accelerate TVET learning. This increases access to TVET skill development among the different groups in society, and the overall potential of TVET system to supply the much needed skills in the economy. However, the World Bank (2014) found that only 4% of the surveyed TVET training institutions used ICT in the delivery of TVET, while most programmes were offered on full-time bases with minimal flexibility. This shows that there is still very low absorption of ICT as a mode for facilitating and enhancing learning in the country, and this delays progress and as a result, TVET delivery and assessment in Swaziland lags behind when compared to other developing countries.

3.8. Capacity and Quality of TVET in Swaziland

The reality for Swaziland is that the demand for tertiary education is high. With over 16,000 young people graduating from high school in 2015, and the University of Swaziland only absorbing 2,144 (UNISWA, 2016) and Limkokwing University of Creative Technology and the Southern African Nazarene University both enrolled about 2,000 students each, which leaves a large number (about 10, 000) of high school leavers to fill many of the TVET training institutions in the country.

The World Bank (2013) reports that the 70 TVET institutions in Swaziland enrol at least 6,881 trainees per year. Out of the total number of TVET enrolment, 36% enrol in public institutions, 48% enrol in private institutions, while 16% enrol in "other" institutions. SCOT and Gwamile VOCTIM enrolled a total of 917 and 139 students, respectively from 1st year to final year in 2015 (MoET, 2016). This shows that regardless of the quality of the education, or certification process, graduates are willing to enrol in any of the available training institutions to develop their skills and knowledge.

The question that arises is what makes for a successful TVET education system?

Available evidence points towards a system that has instructors who possess a high level of skill, knowledge, and industry-related experience to provide students with industry relevant knowledge. This also includes the need for teacher training on latest technologies and other industry developments. In Swaziland, TVET trainers have a varied level of qualifications in different trades. Between SCOT and Gwamile VOCTIM, the highest qualification instructors have is a Master's degree at SCOT, and B-Tech and mostly Diploma qualifications at Gwamile VOCTIM, the lowest being the grade testing certificate. However, TVET stakeholders pointed out during the Focus Group Discussions (FGDs) that the higher the qualifications (Master's and PhDs) of instructors and students alike tend to dwell on theoretical knowledge rather than the much needed practical knowledge and applications. Through the FGDs it became clear that the continuous upgrading of skills and knowledge for both highly qualified and low qualified instructors is vital to the production of competent TVET graduates that are at par with current industry trends and skill needs.

In reality, however, this is precisely the greatest challenge facing TVET instructors in Swaziland: most of the instructors have outdated qualifications and have no formal linkages with industry to update their skills and keep up with industry developments, especially technological advancements. Through the FGDs, the TVET providers expressed that there are limited opportunities for trainers to further their education or to improve their skills. In addition to that, most of the staff is above the age of 40, and so does not have the propensity

to go out of their way to take up learning opportunities and engagements with industry for personal and skills development.

For the few that do in fact seek out additional training, do not always return to their TVET training career, but end up working within industry because of better salaries and prospects for career growth. Prospects for the continuous development of the TVET instructors are available as a majority of them are willing to further develop their skills to the highest possible levels. Table 3.8.1 below describes the qualifications of the instructors in the four institutions namely, SCOT, Gwamile VOCTIM, Manzini Industrial Training Centre (MITC) and Ngwane Park Youth and Training Centre, including their age ranges, and training needs.

Table 3.8.1. Characteristics of Instructors in the TVET Training Institutions in Swaziland

Institution	Department	Number of Instructors	Instructor Age Groups	Instructor Qualifications	Training Needs
1. SCOT	I. Electrical Engineering	Three (3) permanent and one (1) part-time	✓ One (1) within the ages 40-55 years ✓ Three (3) above 60 years	✓ Four (4) Bachelor's Degree in Electronics Engineering	▪ At least one (1) Master's Degree in Electronics Engineering
	II. ICT	Nine (9) permanent	✓ All 9 instructors aged between 34-45 years	✓ Four (4) Bachelor's Degrees in Computer Science ✓ Five (5) Master's in Computer Science	▪ Additional Master's Degrees in Computer Science ▪ At least one (1) PhD in Computer Science
2. Gwamile VOCTIM	I. Electrical Engineering	Four (4) permanent	✓ All four instructors aged between 45-60 years	✓ Two (2) Diploma in Electrical Engineering ✓ One Diploma in A/C ✓ One (1) FTC part 111 C+G	▪ Master's Degrees in Heavy Current & Refrigeration
	II. Automotive	Six (6) permanent	✓ Four (4) aged between 34-45 years ✓ Two (2) aged 60 and above	✓ MVT Part 3, Grade 1 ✓ B-Tech Transport MNG ✓ Level 2 Master Technician	▪ An additional B-Tech Transport MNG ▪ At least one (1) Master's Degree
3. MITC	I. Electrical Engineering	Two (2) permanent	✓ Two (2) above 45 years	✓ TVET Instructor's Diploma	▪ Bachelor's Degree in Electronics Engineering
	II. ICT	Two (2) permanent	✓ Two (2) above 45 years	✓ Bachelor's Degree in Adult Education	▪ Bachelor's Degree in Computer Science
	III. Automotive	Two (2) permanent	✓ Two (2) above 45 years	✓ TVET Instructor's Diploma	▪ Bachelor's Degree
4. Ngwane Park Training Centre	I. ICT	Three (3) permanent	✓ Three (3) aged between 24-35 years	✓ Two (2) Bachelor's Degree ✓ One (1) Master's Degree	▪ Master's Degree in Computer Sciences ▪ PhD in Computer Sciences

Source: Data from SCOT, Gwamile VOCTIM, MITC, and Ngwane Park Training Centre (2017)

Notes: The table shows instructor characteristics with respect to the total number, age groups, and qualifications. The table also identifies the training needs based on the instructors' current qualifications.

4. TVET Labour Analysis (A Focus on the Automotive, Electrical Engineering, and ICT Industries)

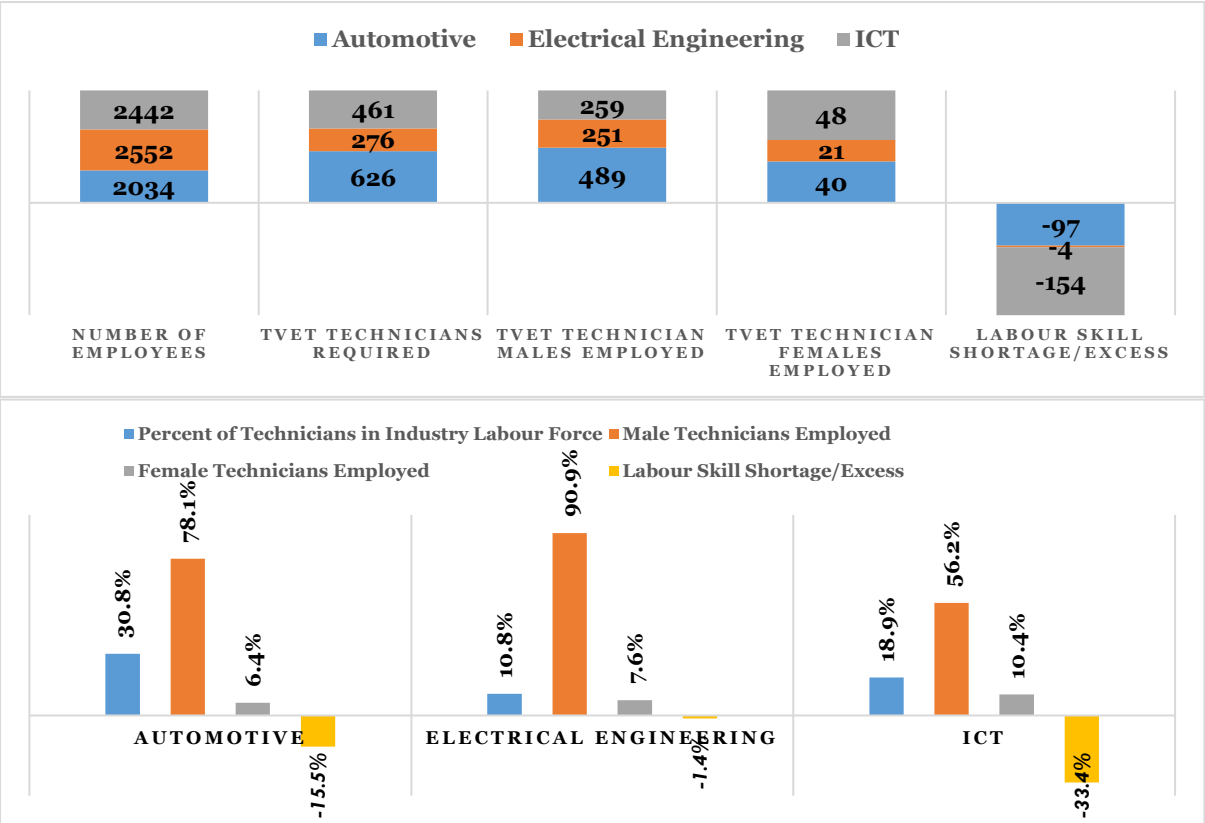
4.1. Structure of the TVET Labour Force

The focus of this study is to generate information on the industry labour force requirements in automotive, electrical engineering, and ICT industries that provide employment opportunities for TVET graduates in Swaziland. The preceding chapters the report mapped out the gaps in the systems and their causes.

In this section, the report provides a comprehensive analysis of the TVET labour force in the industries considered in this study. Figure 4.1.1 provides an estimated structure of the general TVET labour force within the three focus industries. It compares the general labour force against the TVET technicians needed within each industry, as well as provides an analysis of the gender dynamics in terms of the number of males versus female technicians working within each industry. Among the 166 companies interviewed, about 2,000-2,500 employees work within each of the automotive, electrical engineering, and ICT industries.

The electrical engineering (2,552 employees among 37 companies), followed by the ICT industry (2,442 employees in 37 companies) employ the most number of people, while the automotive industry lags behind with 2,034 employees in 92 companies. The average number of employees per company is: 68 within the electrical engineering industry; 66 within the ICT industry; and 22 employees per company within the automotive industry. In terms of the technical and vocational labour force representation within each industry, the study finds that of the sampled companies, an estimated 30.8% of the labour force within the automotive industry are technicians, 18.9% in the ICT industry, and only 10.8% in the electrical engineering industry.

Figure 4.1.1: Estimated Structure of the Industry Labour Force



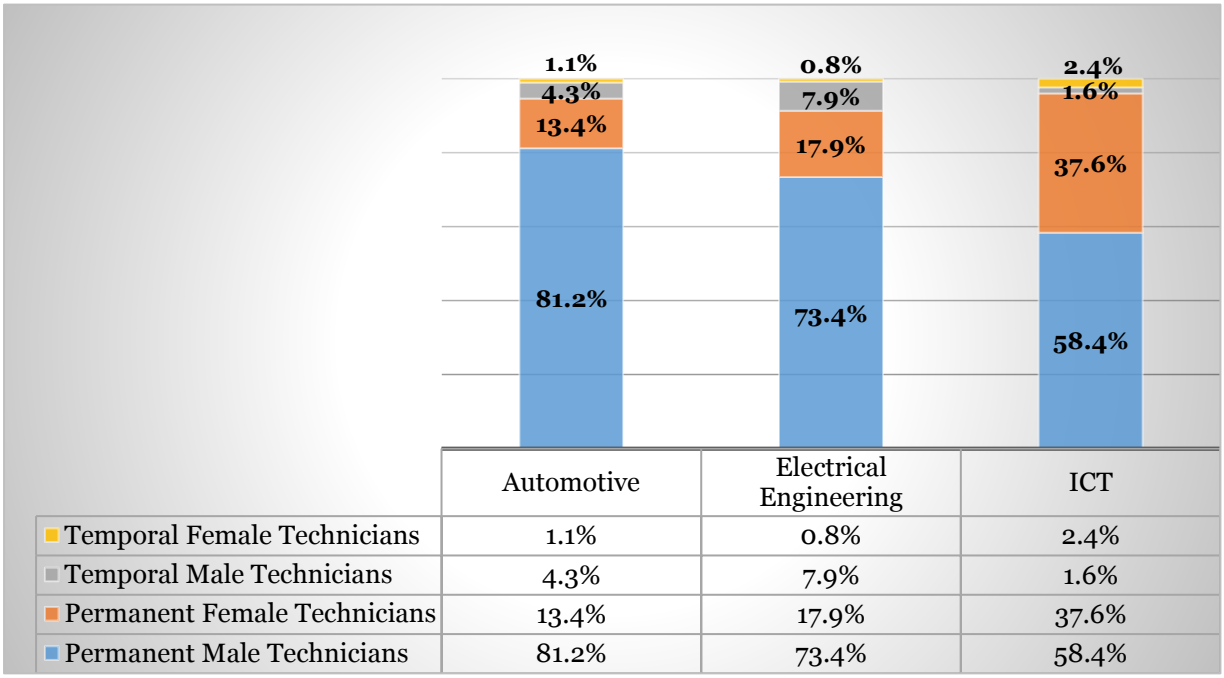
Source: SEPARC, Using Employer Survey Data (2017)

All the three industries are by far, dominated by male employees. About 90.9% of the technician positions available in the electrical engineering industry are filled by males compared to 78.1% male technicians in the automotive industry, and 56.2% male technicians in the ICT industry as demonstrated by Figure 4.1.1 above. Of the three industries, female technicians are much more represented in the ICT industry as it has the higher percentage of female technicians at 10.4% compared to 6.4% in the automotive industry, and 7.6% in the electrical engineering industry.

Figure 4.1.2 shows that males are overrepresented in the permanent technician positions, even in part-time positions, which include temporal and seasonal technician labour. To illustrate, the distribution of permanent positions is as follows: 81.2% male technicians versus 13.4% female technicians in the automotive industry; 73.4% male technicians versus 17.9% female technicians in the electrical engineering industry; and 58.4% male technicians versus 37.6% female technicians in the ICT industry. The ICT and automotive industries have a significant number of technician positions that are available but unfilled because of various reasons. The ICT industry has about two thirds (66.6%) of the technician positions filled while the automotive industry has about 85% of the TVET positions filled. On the other hand, the electrical engineering has well over 98% of the TVET positions filled.

These statistics indicate that while the electrical engineering industry seems to have an oversupply of electricians, and other technicians needed, the ICT (-33.4%) and automotive (-15.5%) industries have a shortage of technicians for a significant number of the positions currently available in these industries. Even though automotive garages litter the country's industrial towns, including ICT companies, these industries are not able to find highly qualified and specialised technicians. It is an area of opportunity for TVET students and graduates, particularly, the aspiring female technicians and artisans. Just as well, the skills shortage signifies the need for appropriate interventions to transform the TVET system in Swaziland into an industry-demand-driven system to produce TVET graduates can easily fill the highly specialised technical and vocational positions.

Figure 4.1.2: Composition of Permanent and Temporal Technician Positions

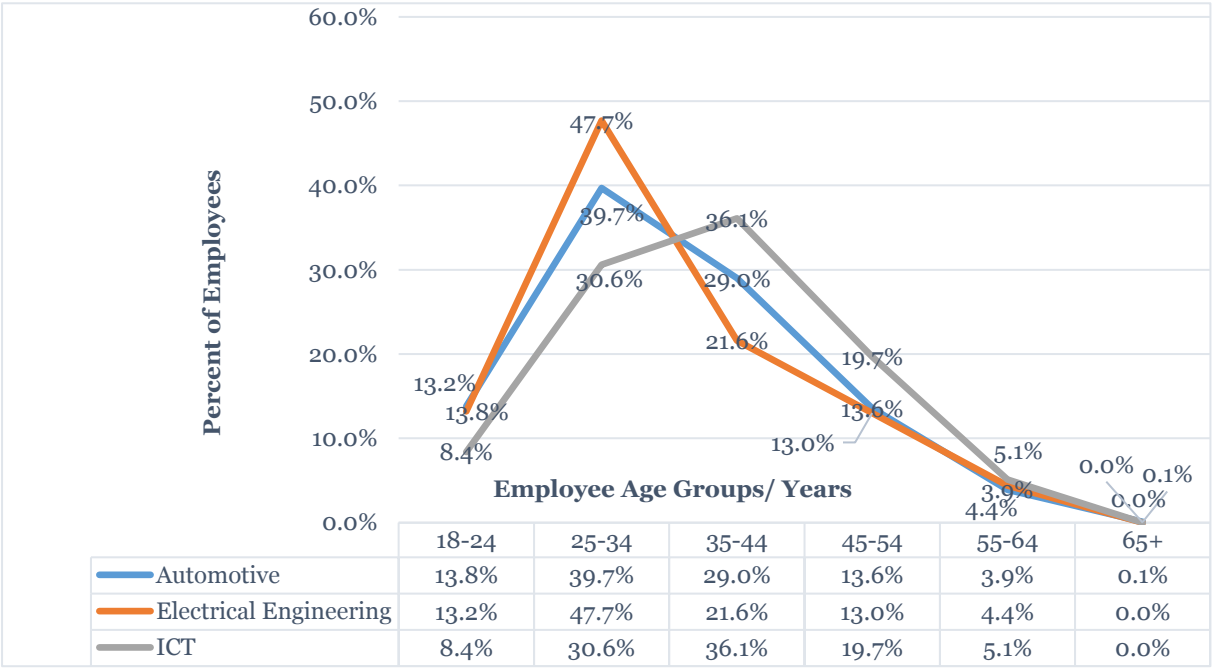


	Automotive	Electrical Engineering	ICT
Temporal Female Technicians	1.1%	0.8%	2.4%
Temporal Male Technicians	4.3%	7.9%	1.6%
Permanent Female Technicians	13.4%	17.9%	37.6%
Permanent Male Technicians	81.2%	73.4%	58.4%

Source: SEPARC, Using TVET Employer Survey Data (2017)

In terms of the employee age groups typically found within the three focus industries, the study finds that in all three industries the bulk of the employees are young, falling between the ages 18-44. Specifically, the electrical engineering industry has the youngest human capital with 60.9% of the employees aged between 18 and 34. Similarly, the automotive industry has 53.5% of its employees aged between 18 and 34, while the ICT industry has a greater number of the employees (55.7%) aged between 35 and 54. Generally, Swaziland has a young population; therefore, less than 6% of the human resources in all three industries are older employees above 55. Again, the fact that all three industries have a generally young labour force is an opportunity for growth as younger people have the propensity to upgrade or upskill themselves in line with the developments in each of the three industries.

Figure 4.1.3: Structure of the Labour Force Age-Groups



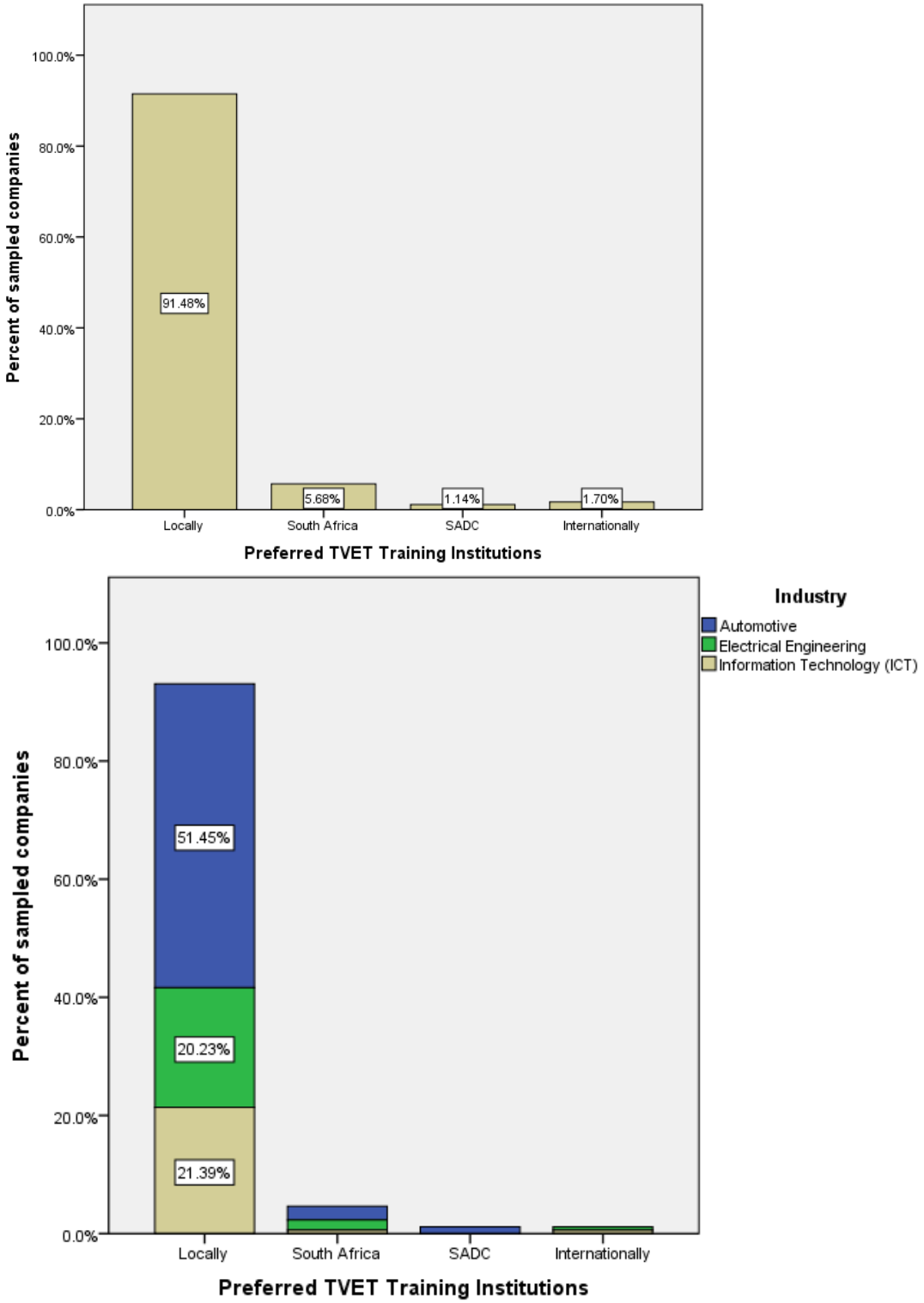
	18-24	25-34	35-44	45-54	55-64	65+
Automotive	13.8%	39.7%	29.0%	13.6%	3.9%	0.1%
Electrical Engineering	13.2%	47.7%	21.6%	13.0%	4.4%	0.0%
ICT	8.4%	30.6%	36.1%	19.7%	5.1%	0.0%

Source: SEPARC, Using TVET Employer Survey Data (2017)

4.2. Sources of TVET Labour Force

Employers have a choice to hire either local TVET graduates or source their incoming employees from South Africa and beyond. The study finds that the companies involved in the automotive, electrical engineering, and ICT industries obtain most of their employees from local TVET training institutions. In about 91.5% of the time, the sampled companies reported that they sourced their technicians from the local TVET training institutions (see Figure 4.2.1 below). This means in 9 out of 10 cases, employers will hire technicians trained in local TVET institutions such as SCOT, Gwamile VOCTIM, Ngwane Park Youth Training Centre, among other training institutions. For the remaining 1 case, or 10% of the time, employers tend to seek technicians from South Africa (5.68%), broader SADC regions (1.14%), and internationally (1.70%). All the three industries are fairly/equally represented in technicians sourced from South African training institutions, while the automotive industry tends to also seek technicians beyond South Africa but within SADC (e.g., Mozambique), and the electrical and ICT industries sometimes have to seek technicians beyond SADC and Africa as shown in Figure 4.2.1.

Figure 4.2.1: Sources of TVET Labour

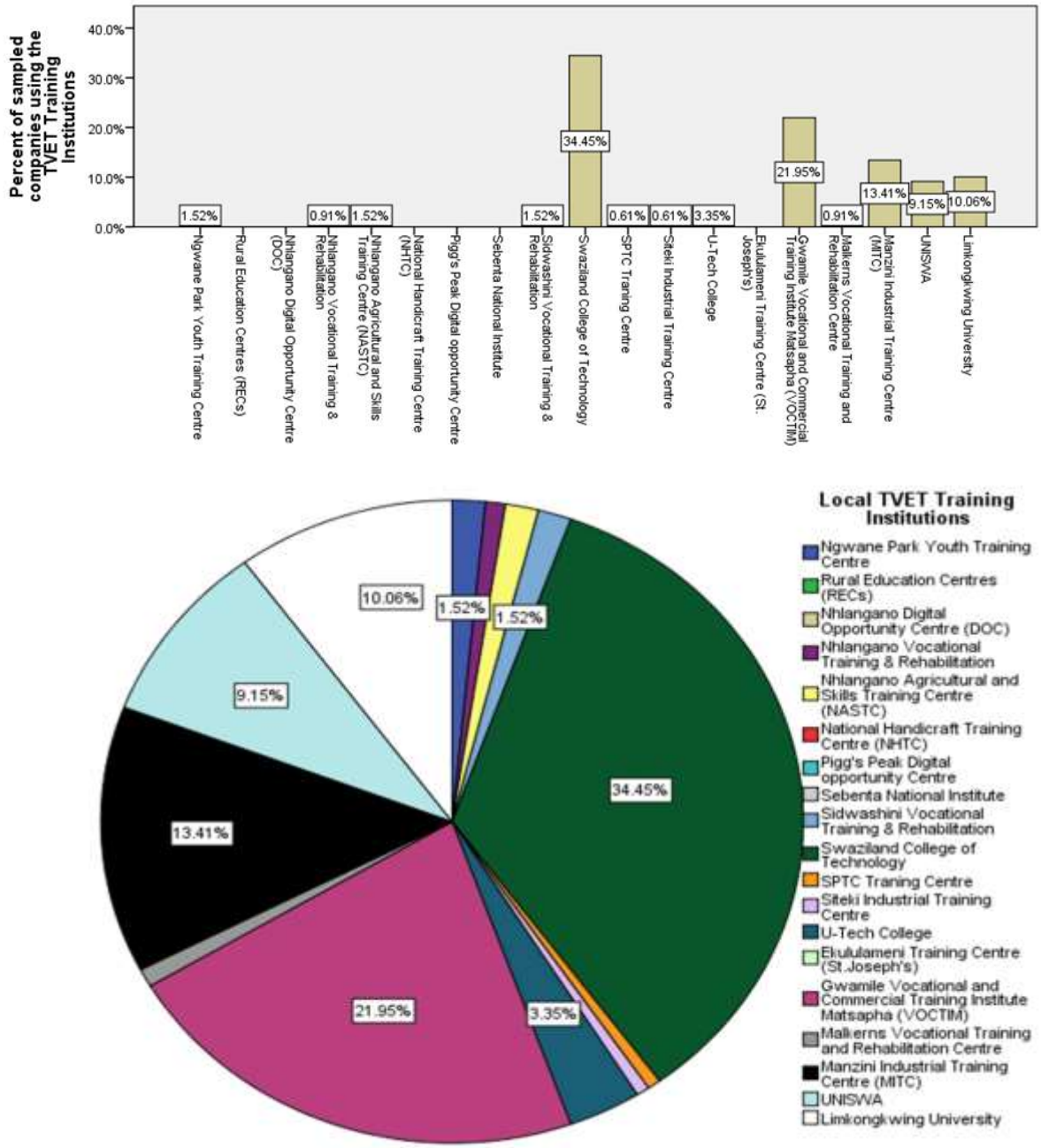


Source: SEPARC, Using Employer Survey Data (2017)

Zooming into the specific training institutions illustrated in Figure 4.2.2, the data reveal that in decreasing order, employers are more likely to hire new technician employees from SCOT (34.45%), Gwamile VOCTIM (21.95%), MITC (13.41%), Limkokwing University (10.06%),

University of Swaziland (UNISWA) (9.15%); and U-Tech College (3.35%). Of all the training institutions that produce technicians, the study finds that graduates from SCOT and Gwamile VOCTIM are typically the first choice/the first to be hired within the automotive, electrical engineering, and ICT industries. Other training institutions that play a role in supplying technicians within these three focus industries include: Ngwane Park Youth Training Centre (1.52%); Nhlangano Agricultural and Skills Training Centre (NASTC) (1.52%); Sidwashini Vocational Training and Rehabilitation (1.52%); Malkerns Vocational Training and Rehabilitation Centre (0.91%); Siteki Industrial Training Centre (0.61%); and Swaziland Post and Telecommunications Corporation (SPTC) Training Centre (0.61%).

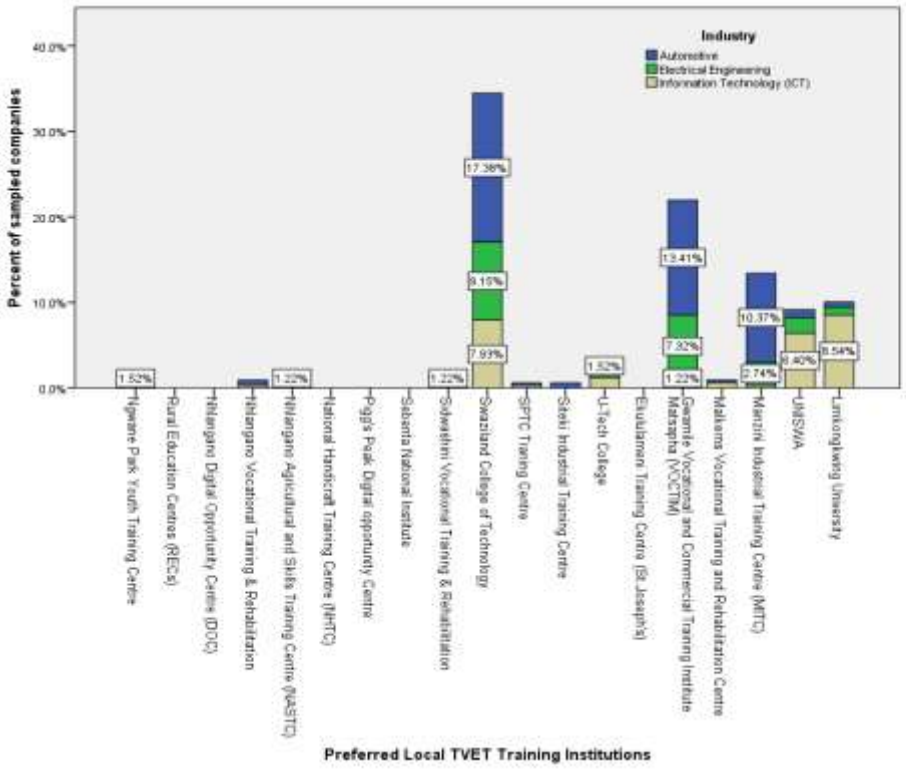
Figure 4.2.2: TVET Labour Source Among TVET Training Institutions in Swaziland



Source: SEPARC, Using Employer Survey Data (2017)

Comparing the key TVET training institutions that supply technicians for the automotive, electrical engineering, and ICT industries in the country, the analysis also finds that SCOT supplies a greater share of all three types of technicians: 17.38%; 9.15%; and 7.93% respectively (see Figure 4.2.3). Likewise, Figure 4.2.3 also demonstrates that Gwamile VOCTIM supplies a sizeable number of automotive (13.41%), and electrical engineering (7.32%) technicians, while MITC supplies a comparable but slightly smaller number of automotive technicians (10.37%), and some electricians (2.74%). Even though Limkokwing University and UNISWA are not TVET institutions/technical colleges per se, the employer survey indicates that these institutions supply a significant share of ICT technicians, 8.54% and 6.40%, respectively, as illustrated in Figure 4.2.3 below. U-Tech, though a smaller college located in Big-Bend that is often easily forgotten, seems to be a significant player in the automotive (1.52%) and ICT (1.22%) industries as employers do mention it as one of the suppliers of skilled technicians in the country.

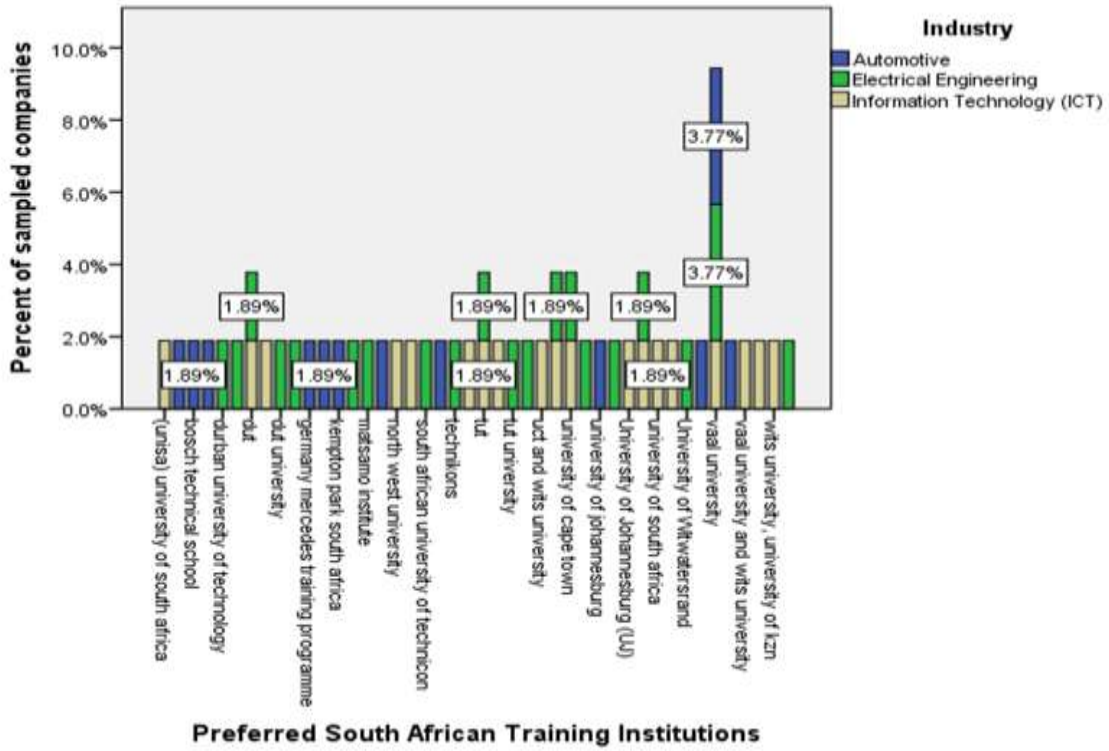
Figure 4.2.3: TVET Employer Preferred Local Training Institutions



Source: SEPARC, Using Employer Survey Data (2017)

Of the South African training institutions, the key suppliers of technicians for companies in Swaziland as shown in Figure 4.2.4 below include; Tshwane University of Technology (TUT) for electrical engineering, and ICT; Durban University of Technology (DUT) for electrical engineering, and ICT; Vaal University of Technology (VUT) for automotive, electrical engineering, and ICT; Bosch Technical School for automotive; University of Johannesburg (UJ) for automotive, electrical engineering, and ICT; University of South Africa for ICT, University of Cape Town (UCT) for electrical engineering, and ICT; University of Witwatersrand (WITS) for electrical engineering, and ICT; and University of KwaZulu-Natal (KZN) for ICT.

Figure 4.2.4: Preferred South African TVET Training Institutions



Source: SEPARC, Using Employer Survey Data (2017)

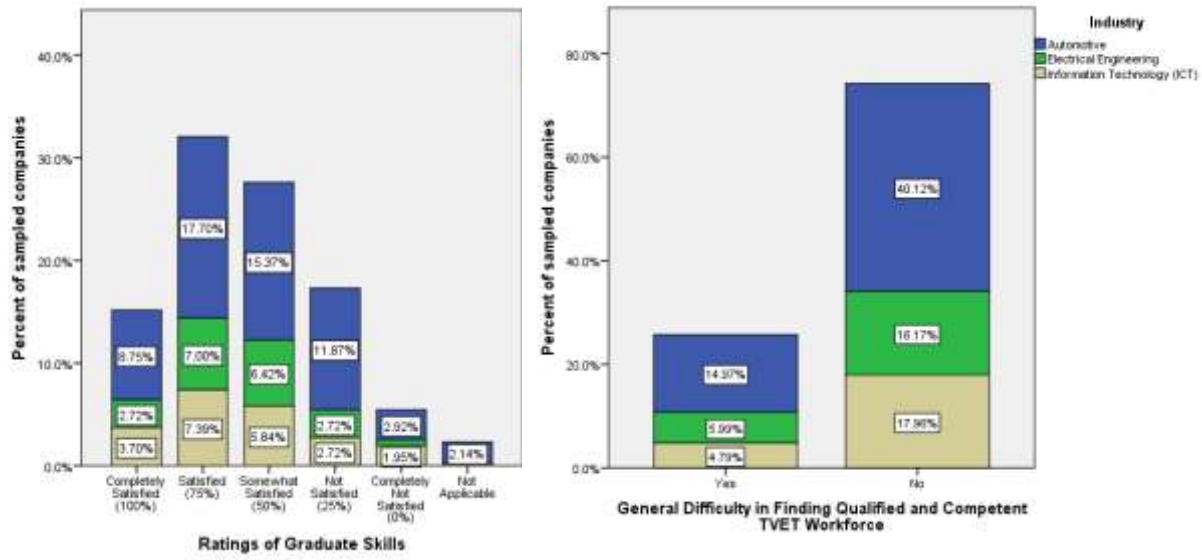
5. Skills Gaps Analysis for the Automotive, Electrical Engineering, and ICT Industries in Swaziland

5.1. General Employer Satisfactions on TVET Graduates' Technical Skills

In terms of the general satisfaction level with graduates, the study finds that less than 20% (15.17%) of the sampled companies within the three focus industries are completely satisfied with the TVET graduates' skill levels. About half of the sampled companies (44.94%) are 25%-50% satisfied with the skills demonstrated by graduates with only 32.09% satisfied to a more acceptable level (75% satisfied) (see Figure 5.1.1 below). Less than 5% (4.87%) of the sampled companies are completely dissatisfied with skills demonstrated by the TVET graduates and these companies fall mostly within the automotive (2.92%) and the ICT industry (1.95%). Essentially, the analysis reveals that about 1 in 5 of the TVET graduates produced by the TVET system in Swaziland will have the acceptable skill level demanded by industry.

Half of the TVET graduates will have the basic skills required in their trades but requiring additional training or upskilling to meet industry needs, and about one third of the TVET graduates can easily be absorbed by industry without needing any major additional training. On average, about a quarter (25.75%) of the sampled companies indicate that they face difficulties finding a qualified and competent TVET workforce (also see Figure 5.1.1 below). Comparing the automotive, electrical engineering, and ICT industries, the study finds that the automotive industry faces the greatest challenge finding a labour force calculated to be about 14.97% of the sampled companies or well over half (58.1%) of the companies that indicate that "yes" they do indeed face difficulties in finding a qualified and competent TVET workforce. An estimated 23.3% of these companies are in the electrical engineering industry while the remaining 18.6% of the companies that generally struggle finding the required labour force are in the ICT industry.

Figure 5.1.1: General Satisfaction with TVET Graduate Skills



Source: SEPARC, Using Employer Survey (2017)

Within the technical and vocational work domain, technicians are expected to have a basket of specialised practical and theoretical skills in order to perform their jobs. These skills, as rated by the table above include: operating of machinery and instruments; industrial processes; technology applications and computer skills; hand-working and machining

materials; methods of measurement; quality control; knowledge of industry standards, work methods and procedures; work organisation; communication; technical documentation; theory; practicals; safety; and work ethic. Comparing the three industries, the automotive industry employers are the most dissatisfied with the skills demonstrated by the TVET graduates.

The average mean score in the automotive industry is 2.65 as shown in Table 5.1.1 signifying a 47% satisfaction level. The electrical engineering industry (2.40 mean score) trails behind with a 52% satisfaction level, followed by the ICT industry with a mean score of 2.38 signifying a 52.4% satisfaction level. Combining all three industries, the average industry satisfaction level with the TVET graduate skills gets a 2.53 mean score or 49.4% satisfaction level. It means that of the graduates produced by the TVET system in Swaziland, within the automotive, electrical engineering, and ICT industries, the employers are on average 50% satisfied with the skill level of the graduates. In a sense, the graduates are "half-cooked" or 50% skilled, and so employers have no choice but to dedicate time and resources to re-train or provide additional training to incoming TVET graduates. Across all three industries, graduates are highly competent in theory, especially the ICT graduates of which their employers are 62.2% satisfied with their theoretical knowledge capacity.

For the automotive industry, the biggest skill deficiencies include challenges with technological applications and computer skills (31.8% satisfaction level), and practical skills (38.2% satisfaction level). Other key skill deficiencies exhibited by the automotive TVET graduates include quality control (42% satisfaction level), technical documentation (43.6% satisfaction level), safety (44.6% satisfaction level), and industrial processes (45% satisfaction level). In short, automotive graduates lack practical experience working on the different systems of a car, particularly, the electronics or computer systems of a car. The graduates also have difficulties producing satisfactory reports on their work orders/assignments in order to provide clear communication to their workshop managers and clients.

For the electrical engineering industry, graduates have problems maintaining quality control (46.2% satisfaction level), and applying their knowledge on standards, work methods and procedures within the industry (48.2% satisfaction level). Just like the automotive graduates, electrical engineering graduates lack communication and writing skills to produce satisfactory reports on their job assignments. In addition, the electrical engineering graduates also lack practical experience/skills (49.8% satisfaction level), including safety judgement (50.2% satisfaction level) to carry out work procedures to a level that is deemed acceptable by the employers. Other skills that need attention within the electrical engineering industry include technology applications and computers skills as well as hand working, machining and materials. Though the graduates in this industry have challenges with the manual dexterity in hand working and machining materials, their employers indicate a significant level of satisfaction with their ability to operate machinery and instruments (58.4% satisfaction level).

The ICT industry faces two major skill challenges: hand working, machinery, materials (43.2% satisfaction level), and problems with practical skills/aptitudes to carry out work assignments (43.6% satisfaction level). It points to the lack of practical exposure in working with the various ICT hardware, and installing computer systems within the industry. Other key skills that need attention within the ICT industry include industrial processes (46.8% satisfaction level), methods of measurement (47.8 satisfaction level), and quality control (49% satisfaction level). Without the proper training in these three skills, the ICT TVET graduates tend to provide shorty jobs that are not up to the standard expected by the ICT employers. Besides their mastery of the ICT theory, ICT graduates seem to have good communication skills (58.4% employer satisfaction level), work ethic, and flexibility.

Table 5.1.1. Specific Ratings of the Typical TVET Graduate Technical Skills

INDUSTRY	Automotive		Electrical Engineering		Information Technology (ICT)		INDUSTRY AVERAGE	
	Mean Score	Std. Deviation	Mean Score	Std. Deviation	Mean Score	Std. Deviation	Mean Score	Std. Deviation
Industry Average Skill Score/ Benchmarking score	**2.65**	1.11	**2.40**	0.79	**2.38**	0.78	**2.53**	1.00
Operating Machinery and Instruments	2.49	1.037	2.08	.595	2.29	.802	2.36	.915
Industrial Processes	2.75	1.331	2.38	.758	2.66	1.146	2.65	1.188
Technology applications & Computer skills	3.41	1.294	2.41	.798	2.32	.904	2.94	1.231
Hand working and machining materials	2.45	1.083	2.41	.832	2.84	1.001	2.53	1.023
Methods of Measurement	2.45	1.020	2.32	.818	2.61	.790	2.46	.929
Quality Control	2.90	1.258	2.76	.863	2.55	.828	2.79	1.097
Knowledge of Standards, Work Methods, procedures	2.47	.977	2.59	.927	2.45	.724	2.49	.911
Work Organisation	2.34	.929	2.32	.818	2.18	.563	2.30	.832
Communication	2.47	1.172	2.57	.899	2.08	.632	2.40	1.024
Technical Documentation	2.82	1.167	2.49	.768	2.42	.722	2.65	1.012
Theory	2.25	1.281	2.22	.712	1.89	.509	2.16	1.043
Practicals	3.09	1.210	2.51	.768	2.82	1.087	2.90	1.117
Safety	2.77	1.110	2.49	.870	2.26	.760	2.59	1.007
Work Ethic	2.51	.908	2.22	.712	2.11	.606	2.35	.822
Flexibility/Adaptability	2.53	.845	2.30	.702	2.16	.679	2.40	.791

Source: SEPARC, Using Employer Survey Data (2017)

Notes: The Table shows the average mean scores of TVET graduates in the different skills sets required by the automotive, electrical engineering and ICT industries. The skills rating uses a 5-point score (1=100% Completely Satisfied; 2= 75% Satisfied; 3= 50% Satisfied; 4= 25% Satisfied; 5= 0% Satisfied). Therefore, the higher the score, the less satisfied the employers are with the skills demonstrated by the TVET graduates. The Industry Average Score highlighted in black is an average score for all the skills-set within each industry and so any score above it is considered dissatisfactory in terms of the TVET graduates' skills.

5.2. Automotive, Electrical Engineering, and ICT Core Businesses in Swaziland

5.2.1. Core Business Activities, Scarce and Readily Available Technicians in the Automotive Industry

The automotive industry consists of all companies and activities involved in the manufacturing of motor vehicles including components such as, engines, and bodies, but excludes tires, batteries and fuel (Rae and Binder, 2017). The automotive industry according to Tanenbaum and Holstein (2015) originated from Europe in the late 19th century, however, the United States of America completely dominated the world industry for the first half of the 20th century through the invention of mass production techniques. The mass production consists of application of the principles of specialisation, division of labour, and standardisation of parts to the manufacture of goods (Tanenbaum and Holstein, 2015).

However, Swaziland is still lagging behind in the automotive industry. The country mostly deals with automobile repairs in this sector as there are no assembling plants nor manufacturing firms within Swaziland's boundaries. A high number of automotive industries import vehicles into the country, for example, Leites, Carson Motors, Mbabane Motors, Kia Motors, to name just a few. Generally, the majority of transportation in Swaziland relies on roads, with very limited air cargo (though this might change with the newly built King Mswati III International Airport in Sikhuphe). Currently, there are a total of 170,000 vehicles, but existing vocational training institutions do not have computer diagnostics courses, or the relevant equipment or lecturers. Thus people often have to go to South Africa to service their vehicles because of gaps in the expertise of local automotive technicians.

Therefore, in terms of the core automotive businesses in Swaziland, the country does not have an automotive manufacturing industry *per se* but a growing industry in auto-repairs, limited car dealerships, auto-spares dealers, and car maintenance/servicing. Lately, the country has had an influx of imported (mainly from Japan) used cars increasing the total volume of cars available in the country as well as opportunities for auto-spares, car servicing, and other specialised services, particularly, automatic gearbox repairs. What is happening is that the imported cars are coming with advanced technology systems that the local automotive industry has not fully caught up with. Some of these cars include the luxury German-made vehicles such as Mercedes Benz, Volkswagen, and Audi, among others, that require sophisticated servicing systems that are currently not available in Swaziland. Furthermore, when the cars break-down, spare parts are often hard to find locally, and have to be imported directly from Japan/Europe and from South Africa.

The study finds that this is an opportunity for more specialised auto spare dealerships to be established in the country, and more skills to be acquired and natured in servicing other car-brands than the usual Toyota, Nissan, Ford, Mazda, Opel, Isuzu, Chevrolet, Kia, and Hyundai. Generally, in the early centuries the automotive industry was about how fast, how far, and how reliable, and safe cars could be (Knapp, 2015). Nowadays, the automotive industry is much more advanced requiring experts in networking, digitisation, wireless technology, big data experts among other advanced features of a modern car. As a result of these technological advancements, the automotive industry in the country is struggling to keep up with these technological changes, increasing changes in car makes, models, and associated functionalities. Table 5.2.1.1 below provides a summary of the scarce and abundant technicians in this industry including the key skill competencies and deficiencies. Appendix 1 – attached at the end of the report – provides a comprehensive inventory of the scarce and abundant technicians, including the key skill competencies and deficiencies.

Table 5.2.1.1. Key Scarce Technicians, Abundant Technicians and Skill Competencies and Deficiencies: Automotive Industry

Scarce Technicians:	▪ Heavy duty mechanics/heavy plant mechanics ▪ Vehicle programmers & diagnostic specialists ▪ Vehicle electricians and wiring specialists ▪ Computer box specialists ▪ Workshop Managers and Grade 1 mechanics
Abundant Technicians:	▪ Basic car servicing and repair mechanics ▪ Panel beaters and spray painters ▪ Grade 3 mechanics
Key Skill Competencies:	▪ Good in servicing cars, changing oil, brakes, shock absorbers and tyres ▪ Overhauling engines, manual gearbox ▪ Basic mechanical skills, basic spray painting, and panel beating skill ▪ Easy mechanical diagnosis and replacing fluids and basic vehicle components
Key Skill Deficiencies:	▪ Very good on theory but limited practical experience and cannot fix complex problems, Lack confidence in own skill, outdated skills, lack of advanced car servicing skills and lack of specialists ▪ Cannot understand high level needs. Lack confidence in own skill, outdated skills, lack of advanced car servicing skills and lack of specialists ▪ Lack of wiring skills, computer box repairs, automatic gearbox repairs, poor hydraulics knowledge ▪ Lack of knowledge and innovation on newer engines and car models and have no auto-electrical skills

Source: SEPARC, Using Employer Survey Data (2017)

5.2.2. Core Business Activities, Scarce and Readily Available Technicians in the Electrical Engineering Industry

The electrical and electronics industry has been growing at a rapid pace over the last 10 years. Largely associated with the energy sector, the electronics industry has also played a large role in technological development, advancing green technologies and facilitating the use of renewable energies and energy management systems. Also through the development and improvement of equipment in information and communication, robotics, computing hardware and power, medicine and security, entertainment and business. The sector has realised many innovations and technology intensive inventions for households, which has enabled it to benefit and grow from the growing demand for electric and electronic appliances and equipment in Swaziland.

The electrical and electronic engineering industry in Swaziland is constituted of a diversity of sectors. These include the energy and electricity sector, communication, manufacturing, construction, and others. The Swaziland Electricity Company is one such company which is responsible for electricity supply in Swaziland. Other companies in the electronic and engineering sector in Swaziland are the electronic repairs companies, Swaziland Post and Telecommunications Corporation (SPTC), MORMOND, MTN, Royal Swaziland Sugar Corporation (RSSC), and others. The core business activity in the electrical engineering

industry include, installations, repairs, manufacturing, electric appliance and equipment sales, air conditioning and refrigeration, house wiring, industrial wiring, electronics and robotics, home, office, and industry support.

Electrical engineers are employed in various fields of different industries, and similarly their skill base is diversified. From basic electronic and circuit board theories to the manufacturing and designing of computer and communication systems, and the management of power stations and research projects. Engineers require a diverse set of skills to maneuverer the different areas of the economy in which engineering is key. For instance, nowadays the move towards automated machines and electric cars requires more than a basic understanding of electronics. UNESCO (2010) argues that the engineering profession is a vocation or occupation based upon specialised education and training. This requires that skills are developed specifically for each field, and that they remain relevant to industry needs. In Swaziland however, the skills supply for the engineering sector is not enough. Currently, the majority of electrical training courses focus on basic electrical. Although such skills can be applied for ordinary house wiring, the quality, content, and equipment for such training may not be able to meet the demand for infrastructure development, and rural electrification projects.

Swaziland needs high-voltage and low-voltage industrial wiring and advanced control electrical engineers. The World Bank (2014) cites that TVET institutions in the country do not produce enough electrical and electronic technicians, while these skills are fundamental to the growth of the processing and manufacturing industry in Swaziland. This is also corroborated by Hlophe and Dlamini (2017) who find that only 6.8% of the research and development personnel in the country were in the field of engineering and technology. This lack of skills inhibits the potential growth of new industries in the country and lower the speed of technological development in already existing industries. The gap is related by the World Bank (2014) to the lack of highly specialised facilities and training equipment to develop the relevant skills. Local training institutions are not able to develop highly skilled engineers to drive economic growth. Table 5.2.2.1 below provides a summary of the scarce and abundant technicians in this industry including the key skill competencies and deficiencies. Again, Appendix 1 attached at the end of the report provides a comprehensive inventory of the scarce and abundant technicians including the key skill competencies and deficiencies.

Table 5.2.2.1. Key Scarce Technicians, Abundant Technicians and Skill Competencies and Deficiencies: Electrical Engineering Industry

Scarce Technicians:	▪ Millwrights, broiler makers ▪ Electrician and mechanical fitter skills combined, maintenance engineers, instrumentation technicians ▪ Air conditioning technicians, refrigerator technicians
Abundant Technicians:	▪ Fitters and linesmen ▪ Technicians with Diplomas in Electrical Engineering
Key Skill Competencies:	▪ Good in theory, numerical problem solving, drawing, problem analysis ▪ Ability to read and interpret electrical circuits, good in troubleshooting, can work on high voltage ▪ Good in basic wiring and electrical appliance repairs
Key Skill Deficiencies:	▪ Lack of millwright certificates, lack of trade test and industry safety practical ▪ Cannot do industrial electrical (phase 3), lack of practical experience and take time to finish tasks

Source: SEPARC, Using Employer Survey Data (2017)

5.2.3. Core Business Activities, Scarce and Readily Available Technicians in the ICT Industry

Information Communication Technology (ICT) is one of the fastest growing sectors in the global economy, more especially in Africa. With Kenya and Rwanda taking the lead in ICT investment and innovations, ICT continues to play a fundamental role in uplifting the lives of many people in the African continent. Taking much interest in the global community, is the use of ICT in the evolving "green" and "smart" economy, such as in big data management and analytics, and in the use of smart electricity grids (OECD, 2012). In sub-Saharan Africa the primary goal is to first provide basic infrastructure to facilitate innovation and accessibility of ICT to all populations, where the take up of ICT is fuelled by innovation.

The Ministry of ICT governs ICT development in the country. The ministry is responsible for the provision of an equitable environment for the development and use of information technologies in the country. However, the development of the ICT industry has been relatively slow in the past years, only picking up after the establishment of the regulator of the ICT industry in the country; the Swaziland Communication Commission in 2013. The establishment of the commission came at a time when the industry was highly monopolised and only growing at a snail's pace. The Swaziland Electronic Communications Act of 2013 enabled the liberalisation and licensing of the ICT industry, improving the business environment and enabling the participation of other industry actors.

The ICT industry is widely spread throughout the economy. However, this may be classified according to those that supply ICT tools (hardware and software), and those that use ICT as a core tool in their job, and those that use ICT regularly but their work does not focus on ICT (OECD, 2012). The major players in the ICT industry are SPTC, MTN, Swazi Mobile, Real Image, Computronics, Netcom, among others. In the second category, this includes insurance and financial companies, and other service providers such as DataNet, First National Bank and other financial institutions, and RSSC. Consumers and households are also among the

largest users of ICT in the procurement of services and also personal interaction. The ICT industry in Swaziland is characterised by a diversity of products and services. This includes telecommunication services, information services and technologies, and the audio-visual sector. The ICT industry has grown from only 1 mobile service provider in 2010 to 2 as of 2017, and increased the number of internet service providers to 9 in 2017. ICT plays a huge role in boosting innovation and improving the delivery of public services. Marope, Chakroun and Holmes (2015) consider ICT as an enabler for development and a source of new opportunities.

The growth of ICT in the country has also been seen in the introduction of mobile banking services with local banks, and the adoption of the e-governance system, and mobile public services. The government has also made commendable strides in starting the digital migration programme which unfortunately has not yielded satisfactory results as the up-take of set-top boxes is progressing slowly. However digital migration also brings a potential growth in the local ICT industry especially in the fields of visual technologies, media and information. In Swaziland mobile coverage was at 94.9% in 2011.

With the growing fields of green ICT, internet-based services and smart technologies, the need for ICT related skill will continue to grow globally. Skills Panorama (2016) predicts that 2015-2025 the world will employ about 70% more ICT technicians in the financial and insurance sector. From these world developments, a number of opportunities in ICT are identifiable as prospective areas of growth for the Swazi economy, such as in agriculture, health, and tourism. The integration of ICT in these sectors will continue to offer more opportunities. ICT provides the opportunity to level the development field, putting countries at par in the access to information and opportunities that enable innovation and social entrepreneurship.

Even so, a number of factors have led to some countries remaining behind. In most instances the growth of the industry is minimally met by the level of ICT skills offered in the country. In Swaziland this is largely caused by a lack of technical skills base and advanced skills in hardware and software engineering, operating systems and cyber security (Director of Communications, 2017). According to national GDP data the ICT sector contributes only 2% to national GDP (CSO, 2015). This is significantly low considering the potential of this sector. Another factor hindering the growth of the ICT industry in Swaziland is the lack of access to technology and low infrastructure development.

For instance, there is slow internet connectivity due to a small bandwidth, and ICT infrastructure has not covered all areas of the country, especially the rural areas and peri-urban areas. While mobile coverage is high in the country, mobile internet access is still very expensive, which limits the number of people accessing and using the internet. The World Bank (2014) reports that there is a limited use of ICT for online delivery of training in the education sector. This is also met with challenges in the costs of internet, low or lack of access to ICT resources such as computers and slow policy processes (Mndzebele, 2013) in the public sector. This affects the level of utilisation of ICT and the exploration of its maximum benefit to the growth of the economy.

Nonetheless, the industry has a great potential for growth. Hlophe (2017) illustrates that this sector is the second most innovative industry in the country after manufacturing. With greater investment in ICT, the country could reap the greatest benefit from its use and integration into other sectors of the economy. The potential growth of the ICT industry in the country largely lies on the ability to develop the relevant skills to meet industry needs and also the creativity and innovation levels that can bring new breakthroughs in the country's industrial development. This comes with a diversity of skill requirement and a continually changing skill base. Table 5.2.3.1 below provides a summary of the scarce and abundant technicians in this industry including the key skill competencies and deficiencies. Again, Appendix 1 attached at

the end of the report provides a comprehensive inventory of the scarce and abundant technicians including the key skill competencies and deficiencies.

Table 5.2.3.1. Key Scarce Technicians, Abundant Technicians and Skill Competencies and Deficiencies: ICT industry

Scarce Technicians:	▪ Network Engineers and Operators ▪ Programming, Software, and Systems Developers
Abundant Technicians:	▪ Computer operators ▪ Support Technicians ▪ Database administrators ▪ IT administrators
Key Skill Competencies:	▪ Theoretical knowledge, can install programs in PC, can assembly, and can provide basic computer hardware and software support ▪ Understanding programming language (C+, C++) and hardware installation, troubleshooting, installing new programmes, cabling, planning, assembling and disassembling
Key Skill Deficiencies:	▪ Lack of knowledge in routing and switching, designing full networks according to company specifications. ▪ Lack of experience in programming, coding, and software development, graphics and internet systems, printing specialists. Lack of knowledge on security systems and specialised software for retail, accounting, and banking, and business analytics

Source: SEPARC, Using Employer Survey (Data)

5.3. SWOT Analysis for the Automotive Industry

	STRENGTHS	WEAKNESSES	OPPORTUNITIES	THREATS
TVET PROVIDERS	▪ Provide theoretical knowledge ▪ Has some equipment in workshops	▪ No money for equipment (equipment is obsolete). ▪ No relationship between automotive companies and training institutions ▪ No enough practical training ▪ Staff too old, not conversant with new knowledge and equipment ▪ Only national diploma offered, no progression in qualification	▪ Automation ▪ Diagnosis ▪ Motor programing ▪ Auto electronics	▪ Mushrooming of unregulated and unregistered colleges
INDUSTRY	▪ Workers are not discouraged by the low wages	▪ Lack of spares and equipment locally ▪ No qualified technicians ▪ Industry is not regulated	▪ Entrepreneurship ▪ Specialisation ▪ Technological advancements – increased efficiency and productivity	▪ Influx of foreigners because they provide cheap labour ▪ Technological advances resulting in loss of jobs

Source: SEPARC, 2017

5.4. SWOT Analysis for the Electrical Engineering Industry

	STRENGTHS	WEAKNESSES	OPPORTUNITIES	THREATS
TVET PROVIDERS	▪ Fault finding ▪ Theory of electrical engineering ▪ Troubleshooting ▪ Designing circuits ▪ Spotting emergency ▪ specification of trenching ▪ Diagnostics	▪ Lack of new and latest machines ▪ Lack of practical knowledge ▪ Lack of programming and configuration skills	▪ Solar technicians ▪ More industrial and housing technicians	▪ Expensive machines thus hard to purchase.
INDUSTRY	▪ Industry is regulated ▪ Wiring	▪ Lack of confidence in technicians ▪ Lack of working equipment and tools ▪ Lack of qualified engineers.	▪ Alternative power sources like thermal power and solar stations ▪ increased construction in the country	▪ High Competition ▪ Dependence on South Africa's power supply threat to growth of industry ▪ Safety

Source: SEPARC, 2017

5.5. SWOT Analysis for the ICT Industry

	STRENGTHS	WEAKNESSES	OPPORTUNITIES	THREATS
TVET PROVIDERS	▪ Students are taught enough theoretical knowledge ▪ Availability of computers in computer labs	▪ Students lack practical knowledge ▪ Students not taught industry standards e.g., Molex/CISO networking standards ▪ No relationship between industry and training institution	▪ System development and analysis ▪ Programming ▪ Hardware technicians (printers) ▪ Increased ICT services e.g., business, retail, banking, websites ▪ Video over IP (VOIP) ▪ Internet of things (IOT) ▪ Networking	▪ Slow and unreliable internet ▪ Cyber security
INDUSTRY	▪ ICT industry regulation ▪ National support for digitisation	▪ Lack of highly skilled technicians ▪ Lack of system developers ▪ Lack of locally high skilled programmers and logging systems	▪ Increased digitisation and automation ▪ Programming ▪ Hardware and software installation, ▪ networking skills ▪ database skills ▪ specialisation	▪ ICT infrastructure constraints ▪ Cyber security threats ▪ Lack of Information security laws

Source: SEPARC, 2017

The SWOT analysis shows that there are more weaknesses in TVET in Swaziland than there are strengths among all the three industries. Weaknesses range from the structural constraints in terms of collaborative linkages, to the actual delivery of TVET in terms of the lack of skills supplied by the training institutions. The lack of equipment in the automotive and electrical engineering industries still remains a major challenge in addition to students lagging behind in practical knowledge. The ICT industry lacks personnel in cyber security, and systems developers, while the outsourcing of these highly advanced skills is a threat to skills incubation and growth of this local industry. Nonetheless, there are also many opportunities for TVET in the automotive, electrical engineering and ICT industries. Opportunities in the TVET system range from an untapped skills supply to new foreseeable areas of industrial development such as auto electronics in the automotive industry, artificial intelligence in the ICT industry and alternative power supply in the electrical engineering industry. This shows that there is still more that needs to be done to improve TVET to leverage the opportunities available in the country to drive industrial growth and development. There is also a need to address the threats

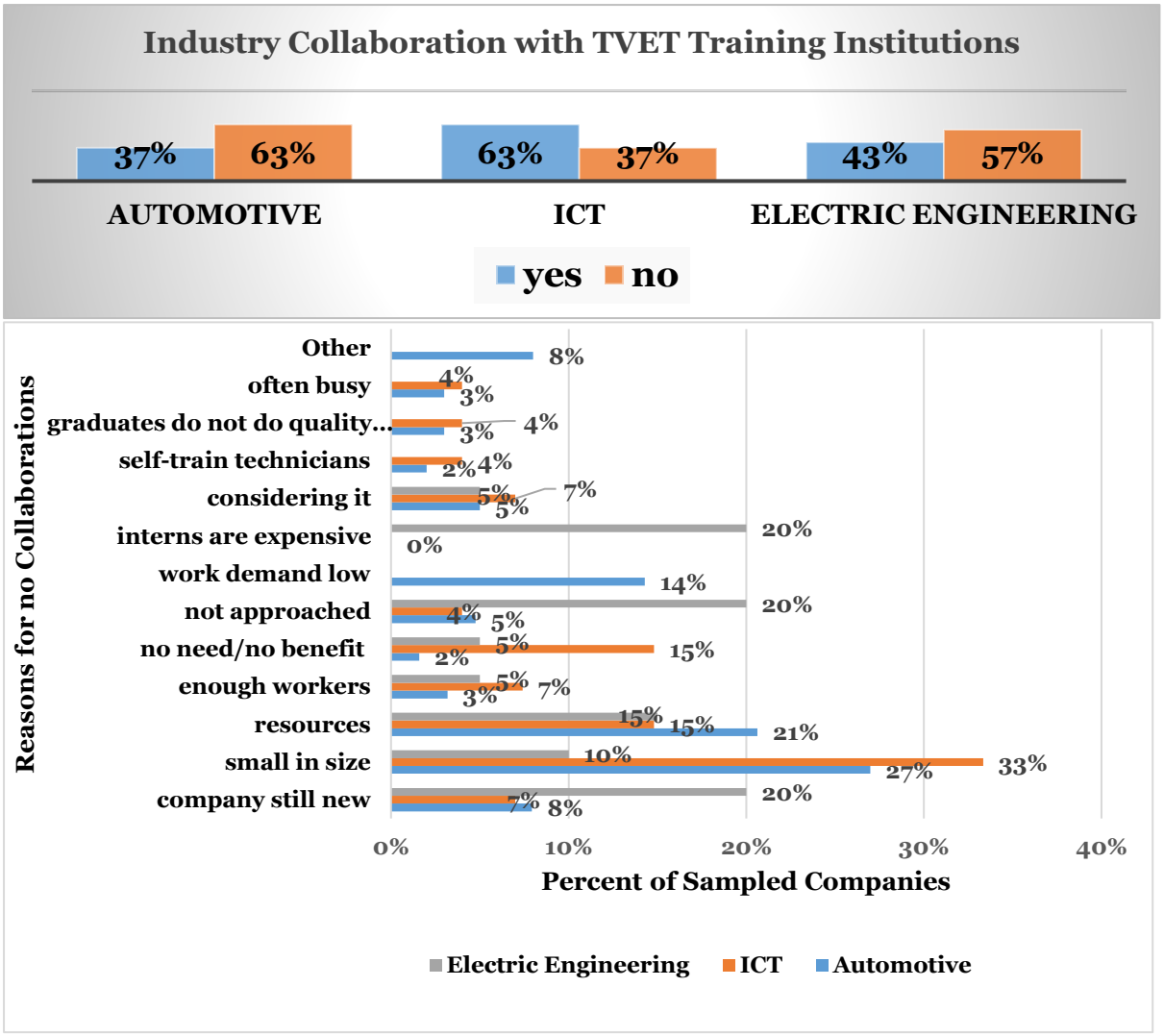
and weaknesses in each of the industries to ensure that TVET is effective, leads to employment creation and the employability of the TVET graduates.

6. Factors Contributing to TVET-Industry Skills Gap in the Automotive, Electrical Engineering, and ICT Industries

6.1. TVET institutions and Industry Collaborations

TVET delivery is not comprehensive without the involvement of the industries that absorb the TVET throughputs. Involving industries in TVET enhances the acquisition of skills relevant to market demand as industry participation is critical in ensuring that TVET delivery is responsive to, and relevant for labour market and industry needs. This is largely through participation in and consultation in curriculum development and other partnerships. This section analyses the level of interaction between the TVET providers and the industry. It examines the kind of linkages that exist in each industry. Figure 6.1.1 below provides a summary of the proportion of companies that collaborate with TVET training institutions and the reasons for no collaborations while Figure 6.1.2 provides a summary of the types of collaborations disaggregated according to each industry.

Figure 6.1.1: General TVET-Industry Collaborations

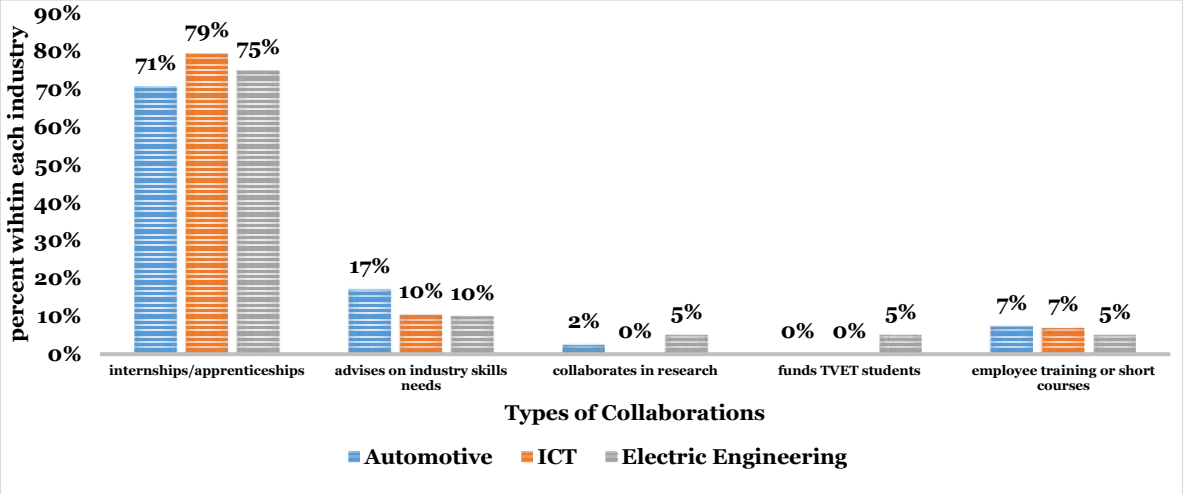


Source: SEPARC, USING Employer Survey (2017)

On Figure 6.1.1 other non-collaborative reasons for the automotive industry were related to the fact that some companies feel that they easily find employees (2%), some were about to

close (2%), others feel that collaboration is risky (2%) while the last few have no operating permits (3%), hence do not collaborate with TVET institutions. The level of engagement of the industry with TVET institutions is of paramount importance in the country, especially in the development of the relevant skills needed in the industry. This is so that it will enhance the student's exposure to industry and also facilitate their employment in the industry.

Figure 6.1.2: Types of Collaborations between Industry and TVET Training Institutions



Source: SEPARC, Using Survey Data (2017)

The study finds that there is minimal collaboration between the automotive industry and the TVET training institutions. The results show that only 37% of the surveyed companies within the automotive industry collaborate with the TVET institutions whilst 63% do not. The major form of collaboration between TVET training institutions in the automotive industry (70.7%) involves provision of internships and apprenticeships for the students as shown in Figure 6.1.2 above. Other areas in which the industry collaborates with TVET training institutions include TVET training institutions in advising on industry skills needs 17.1%, using TVET institutions for training their employees 7.3%, and collaborating in research at 2.4%.

However, even though companies state that they collaborate with the TVET training institutions, the number/proportion of companies involved is low. The reasons about 63% of the sampled companies do not collaborate or do not see the need to engage with TVET providers in the country were largely due to the fact that the sizes of the individual companies on average are still small and so have limited capacity in physical and financial resources to host trainees and graduates for apprenticeships. A majority of the companies hold the view that apprenticeships/internships are expensive, yet the automotive industry in general has low work demand or opportunities to make sizeable profits due to high competition.

In the electrical engineering industry, there is almost a balance between companies that do not collaborate with industry and those that do: there are slightly more companies that do not collaborate with TVET institutions calculated to be 57% compared to those that do collaborate with TVET institutions at 43% (see Figure 6.1.1 above). The study finds that collaborations in the electrical engineering industry typically include providing internships at 75%, advising on industry skill needs at 10%, collaborating in research, funding TVET students (5%), and training employees also at 5% as shown in Figure 6.1.2. Based on the sampled companies in this study, the electrical engineering industry is the only industry among the three that offers financial support to TVET students.

The electrical engineering industry stated that the reasons for not collaborating with TVET training institutions in the country are for the most part due to the fact that the industry is not well-developed, and like the automotive industry face serious challenges in the availability of resources that can be committed to support TVET trainees and graduates. So this industry also holds the view that interns/apprenticeships are expensive, but they also indicate that despite the challenge with resource, TVET training institutions have not really taken-up the initiative to approach the industry and deliberate areas for collaborations and partnerships. It points to the lack of a structured collaboration and partnership system between TVET training institutions and industry, thus inhibiting development in technical skills and opportunities within the TVET sector. For the most part, this contributes to a mismatch in the skills produced by TVET institutions versus the skills required by industry.

The ICT industry is the most interactive with the TVET training institutions. Of the surveyed companies in this sector, 63% indicate that they engage or collaborate with TVET training institutions against 37% that do not. Figure 6.1.2 reveals the three major areas of collaboration with TVET institutions in the ICT sector which are: the provision of internships 79.3%; advising on industry skill needs 10.3%; and assisting in training of employees in the TVET training institutions at 6.9%. None of the ICT companies participate in the design and development of the curriculum, nor do they collaborate in research nor do they provide funding to TVET institutions and TVET students alike.

The companies that do not collaborate with TVET providers stated that they do not collaborate with the TVET providers because they are small in size, they lack resources and that they simply do not see the need for collaborations. Moreover, most of the companies complain that students do not have practical knowledge needed for the ICT jobs such that the ICT employers often have to give incoming TVET graduates additional training. Others stated that having the interns in their companies does not help them or add value to their companies.

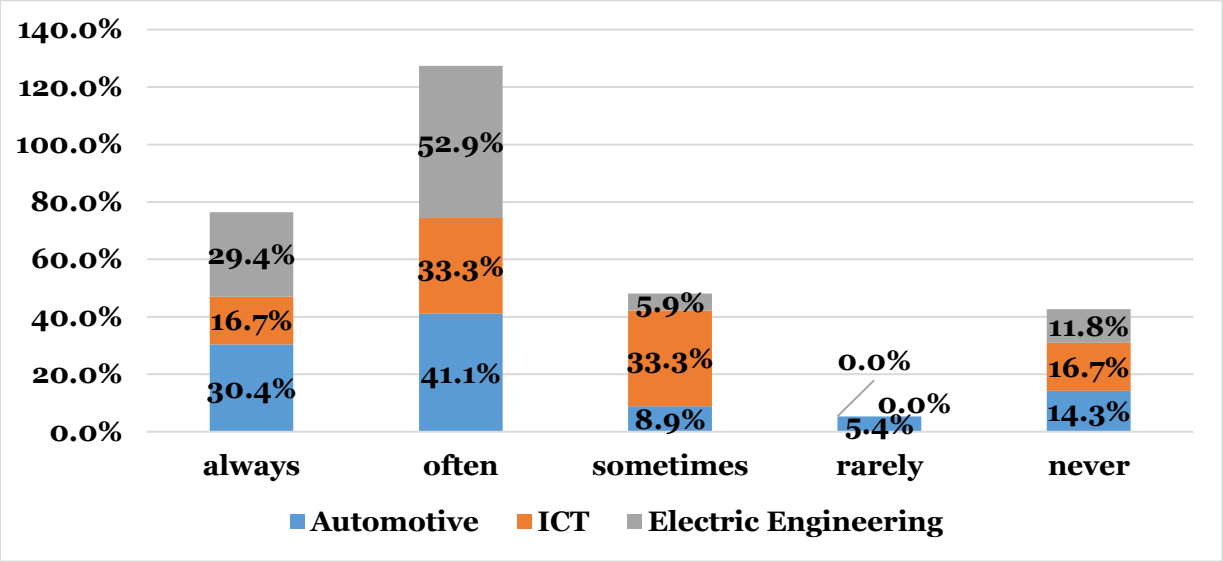
The ICT companies indicate that 17% of the students do not require additional training when hired, while 33% sometimes, and often require additional training, and 17% definitely always require training. This shows that most of the time students are unaware of the work that is done in the industry compared to what they learn in school. Again, it points to the need for more collaborations between the ICT industry and TVET providers to strengthen productive interaction and curb unemployment.

The study finds that the biggest challenge between industry and the provision of a qualified and competent labour force, is that industry does not recognise its role in providing the needed practical experience and resources to enhance TVET training in Swaziland. Yet the companies still complain that they almost always have to provide additional training to TVET graduates. The TVET training institutions are not without fault or responsibility, they too on the other hand, are to large extent, not proactive enough in pushing for enabling formal collaborations and partnerships with industry to strengthen the practical aspects and relevancy of their training programmes to industry needs. To illustrate, the study finds that TVET graduates often and always require additional training when they are employed.

Only 14% of the graduates employed by the sampled companies never require additional training while 9% sometimes a majority 71% often or always require additional training (see Figure 6.1.3 below). Even for those students that are able to find apprenticeships/internship opportunities, a significant number of them end up not being absorbed by industry because of the gaps between what they learn in the TVET training institutions versus the skills they need when it is time to work. Within the electrical engineering industry, the analysis finds that in 88% of the time, students in this field require additional training when they go to industry.

Only 12% of the students that go to industry require no training, while 53% often, 29% always and 6% sometimes require additional training.

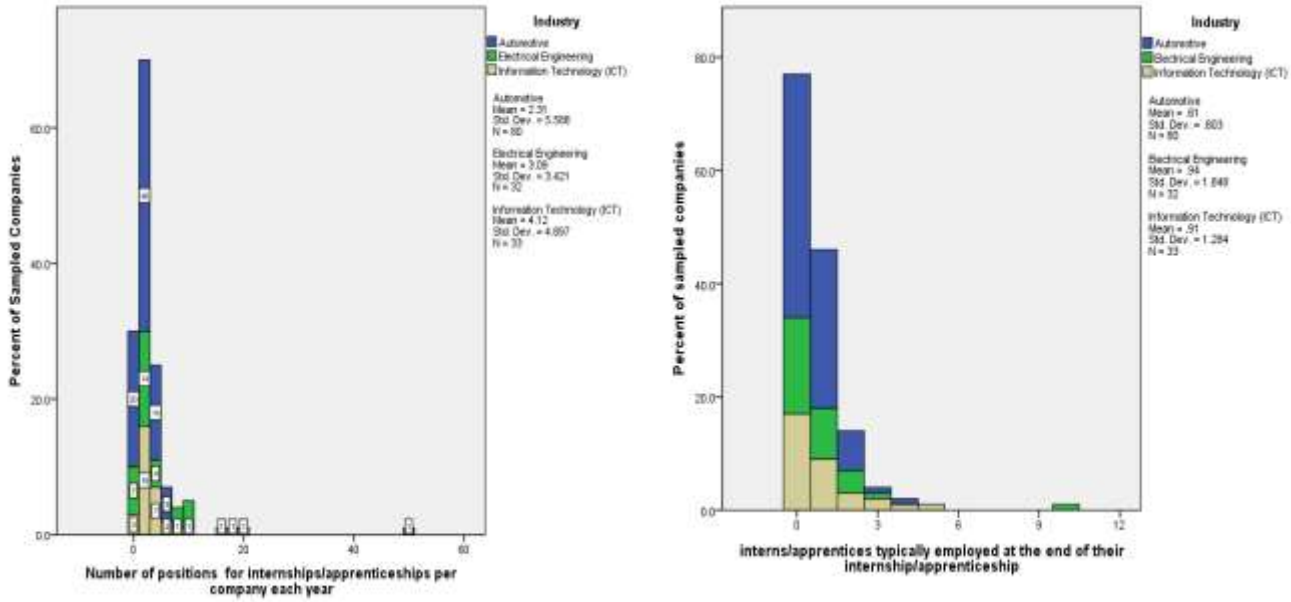
Figure 6.1.3: General Additional Training Required by TVET Graduates at the Time of Employment



Source: SEPARC, Using Employer Survey (2017)

Figures 6.1.4 and 6.1.5 below show the dynamics between the number of companies providing internship positions between the three industries and the level of absorption of the interns for permanent employment after their internship/apprenticeship programmes. On average each company in the automotive industry offers 2 (2.31) internship positions, electrical engineering 3 (3.42), and ICT offers the highest internship on average 5 (4.89) per company each year (see Figure 6.1.4).

Figure 6.1.4: Companies Offering Internship Positions Including Absorption of Interns into Permanent Employment

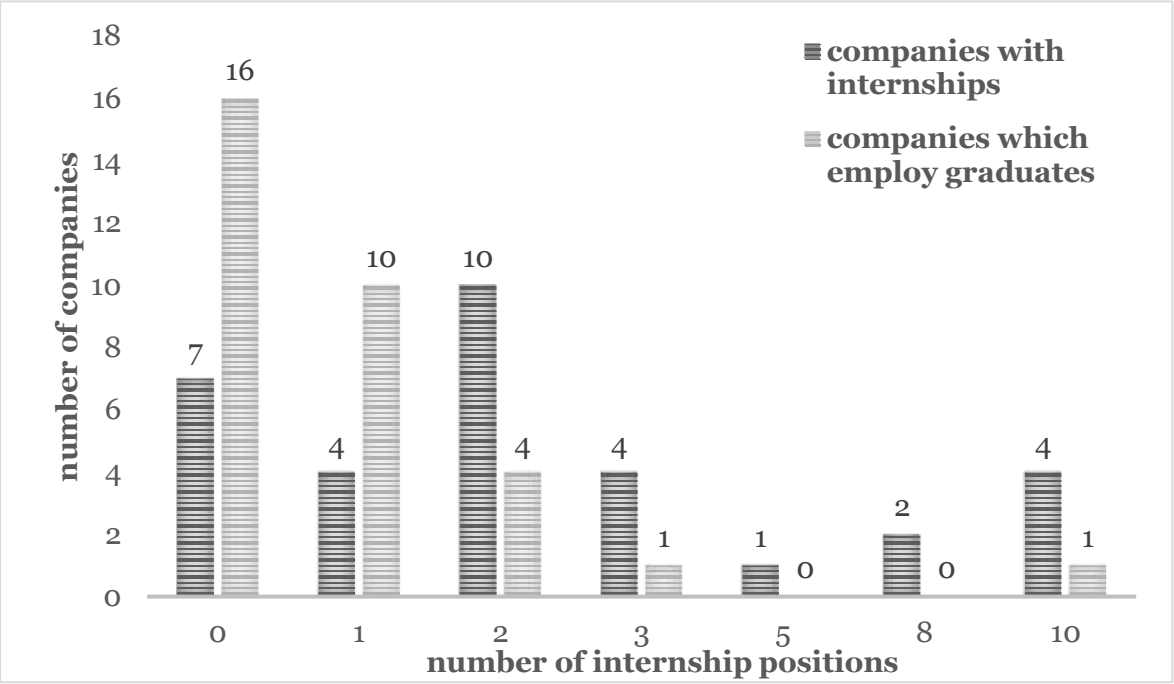


Source: SEPARC, Using Employer Survey (2017)

The data as depicted in Figure 6.1.5 reveal that though 32 companies provide internships (equivalent to 19.3% of the sampled companies), only 14 of these 32 companies (43.8%) that provide internships absorb students after their internships or only 8.4% of the total sampled companies absorb students after an internship programme. From the 410 internship positions each year, the study calculates that only 106 of the interns (25.8%) end up being hired by the same companies that provide them internships: 32% in the electrical engineering; 27.1% in automotive; and a much smaller 18.8% in the ICT industry.

The ICT industry provides the most internships, the companies in this industry demonstrate much limited capacity to absorb a bigger share of the graduates for permanent employment. The findings show that a majority of the companies in all the three industries either do not employ any interns, or just one of them if they do. Figure 6.1.4 shows that on average in increasing order, the automotive companies hire a range of 0 to 1.44 interns each year, followed by the electrical engineering companies hiring 0 to 2.788 interns, and ICT companies hiring the most interns between 0 to 2.194 interns each year. Overall, the analysis suggests that a majority of the graduates are left without employment when they complete their internship programmes and training with the TVET training institutions.

Figure 6.1.5. Annual Available Internship Positions Employment of TVET Trainees Internship Programmes



Source: SEPARC, Using Survey Data (2017)

6.2. Physical Resources

The study also finds that the absence of physical resources is a contributor to the TVET-industry skills gap in all three focus industries. This is because TVET training institutions by their nature, are meant to be practice oriented institutions; hence, the inadequate provision of equipment and materials for practical training inhibits the skill competencies supplied by the TVET training institutions versus those expected by industry. For example, the analysis finds that most of the TVET institutions have a shortage of up-to-date equipment and materials. This is a much more serious problem in the automotive and electrical engineering training departments, and not so much in the ICT departments as most students have access to a

computer. Appendix 2 provides an inventory of the equipment and materials currently in use for training at SCOT and Gwamile VOCTIM.

In the automotive department students lack practical knowledge of modern vehicles, auto electronics, and motor vehicle computer systems such as fixing vehicle computer boxes. According to the students this is because they have no access to working tool boxes, practicals in specialised vehicles, and dismantling and assembling vehicles. They also mention that while some equipment is available, it has to be shared among them thus decreasing the level of exposure per student. The automotive industry employers in the FGDs emphasise the fact that the industry is changing at a fast pace, and so the challenge is that the equipment and tools required to fix cars are also continuously changing. Therefore, TVET institutions in the country have to upgrade their equipment to keep up technological developments in industry.

Similarly, the electrical engineering training departments lack equipment and materials which impedes the skills development of the trainees to participate effectively in the industry. Electrical engineering companies point out that when students come to industry, they often have never seen or used some of the machinery and equipment current in the industry. For instance, when asked why students lack competences in areas such as programming/operating some of the machines, hand working, and machining materials, students point out that they only encounter such activities and equipment when they get apprenticeships or employment. Other students attribute their lack of practical skills to poor labs/workshops in the training institutions. Specifically, the electrical engineering department lacks equipment for conducting tests on transformers, and insulation resistance, and students lack knowledge on safety related to work in these workshops.

The ICT industry is no different. Students point out that their training is more focused on theory than practical knowledge and applications. This is not surprising given that this is also one of the key issues raised by industry, that the TVET graduates in Swaziland have limited exposure to the applications of ICT skills and practical work within the industry. The reason is that students are only taught the basics within courses such as programming and networking without covering advanced topics that expose them to practical work on the theory learned. They do not get the opportunity to explore variable programming languages and go in-depth with their networking skills. This is associated with inadequate facilities to conduct practical work, for instance, students do not have personal laptops which would enable them to do more personal practice after classes. Another challenge is that SCOT and Gwamile VOCTIM do not have network testing labs, IT workshops, network tool boxes, and pen testing labs for security testing. Over and above these challenges, students have to deal with an unreliable network and slow internet connection. The unreliability of the internet, on top of the high data costs in Swaziland create barriers for both students and instructors to improve their skills through self-training.

During the key informant interviews, the TVET institutions highlighted that it has been difficult to update their equipment and training facilities because of the lack of resources. Since TVET equipment and machinery on its own is expensive, TVET institutions fail to have enough equipment for the number of students in each classroom. This also affects the availability of more advanced, and expensive equipment in the teaching facilities and workshops. Another reason that contributes to TVET training institutions lacking up-to-date equipment and machinery has been the fast changing environment in which technological innovations are happening. Due to the lack of research and adequate information on technological advancements, the TVET institutions have failed to keep up with the latest technologies to realign their training programmes accordingly. Most of the training institutions operate on old and unchanging curriculum and syllabus, some as old as the 1980s.

6.3. Institutional Environment Supporting TVET

The institutional environment in the TVET training sector is also a contributing factor to the skills gap challenges facing Swaziland. There is an observed lack of coordination within the TVET system in Swaziland. For example, there is little to no collaboration among the TVET institutions, which contributes to a fragmented and haphazard delivery of TVET training between the different TVET institutions. Key to the issue is that there is no TVET delivery assessment and monitoring framework to guide TVET providers and assess their performance. Thus there is no structured support system to enable and monitor the efficiency and effectiveness of TVET training and practice. The absence of a governing structure for TVET affects the financing of TVET including how it is monitored and evaluated. For instance, there are no set financing models for TVET training except for the insufficient government subventions in the public TVET training institutions.

There is also no structured mechanism of collaboration within the TVET system, for instance, between industry and TVET providers. Furthermore, there is also a lack of collaboration between the DIVT and the TVET providers. Thus there is an observed lack of interaction in the development and design of TVET curriculum, and in the financial support for TVET institutions by industry. Students have point out that the DIVT grading system does not consider their national diplomas within the DIVT grading system while they spend 3 years in the tertiary institutions with an added 3-6 months internship programme. As the Swaziland qualification framework is being developed, it is important to consider the certification processes, development, and grading systems of the TVET education system so that the process is fair and speaks to all the TVET qualifications available within the country.

The institutional environment is also a barrier to the growth of the two TVET institutions, Gwamile VOCTIM and SCOT, because of its binding rules. The two TVET providers are bound under government procedures as government entities thus follow the long government procurement processes which delay the procurement of necessary, and urgently needed equipment and workshop materials. This delays the availability and use of material and equipment in the workshops, which may result in students not being able to use certain equipment or put their theoretical knowledge into real industry practice. Moreover, this classification inhibits their ability to generate income from providing services to the public through establishing spin-off companies, to operate their own financial/bank accounts, and raise own resources to complement the government annual subvention. Thus this affects the delivery, and resources available to TVET delivery.

The legislative and regulatory frameworks in the country needs to improve to support TVET. For instance, there is a need for a legal framework that guides the establishment of TVET institutions, as presently there is only the DIVT act (1982). There is also a need to improve the industry legal frameworks to support local industrial growth. For instance, SPTC autonomy over the internet supply affects the growth of the ICT industry, and the utilisation of the internet in learning and delivery of TVET. This is because the present internet supply is expensive while also unreliable. Similarly, the lack of regulation in the automotive, and electrical engineering industries affects the trajectory of development within these industries. For instance, the influx of the bush mechanics and the influx of the import cars. Whilst increasing tacit knowledge for mechanics and increasing the demand for highly skilled technicians, the import cars are also creating challenges for the automotive industry in terms of the availability of equipment and material to fix the cars locally, while the growth of the bush mechanics is affecting the regulation of wages in this industry.

6.4. Funding of TVET in Swaziland

The challenge with TVET is that it is marred by huge implementation costs. It requires financial resources in providing the technical expertise and equipment necessary to perform the technical and vocational jobs. Lecturers have to continuously update their knowledge and skills through professional development activities which come at a substantial cost while the equipment and materials required for training also carry their own hefty price tag. However, the study finds that funding allocated to TVET training institutions in the country is low, and does not adequately provide for the technological developments of the sector. Although government requires TVET training institutions to submit annual budgets to provide for service delivery needs each year, the budgets allocated are usually lower than the submitted budgets. For instance, in 2017, SCOT was allocated a budget of E25M instead of the E200M requested to cover all necessary equipment and instructors' needs. Budget cuts within government often compromise service delivery.

On the other hand, industry is not contributing anything substantial towards the development of TVET skills in the country. As discussed in the previous sections, none of the three industry companies provide any financial support to TVET institutions nor do they provide funding support for equipment and machinery. Financial resources are key to TVET operations, as well in-kind donations in the form of used equipment, such as cars and computers, which can be of great value in enhancing TVET practical training in the country. These resource challenges call for the development of multiple and sustainable funding sources to support TVET training and practice in Swaziland. The other alternative that could contribute to additional funding for the TVET institutions is the students' tuition fees. The problem is that student tuition fees are deposited in special accounts for both SCOT and Gwamile VOCTIM which are only accessible through the established government procurement procedures. It tends to be a lengthy and time-consuming process that impedes on the ability of TVET training institutions to procure and obtain valuable training equipment and material to keep up with industry developments.

6.5. Curricula and Training Modules

The study finds that the different TVET institutions use different curriculum and follow different certification processes. This section reviews the curriculum and level of qualification offered by the TVET training providers within the three focus industries.

6.5.1. The Delivery of Automotive Training in Swaziland

I. Gwamile VOCTIM

Gwamile VOCTIM, similarly to SCOT provides a 3-year training course in motor mechanics, which is also broken into 1-year theory, 1-year internship, and 1-year theory after the internship (Mokoena, 2017: *Pers. Comm.*). The entry requirement is a pass in Form Five with maths and science as part of the passed courses, which is similar to SCOT's entry requirement. Gwamile VOCTIM uses the City and Guilds Curriculum for training. Gwamile VOCTIM observes that there is limited participation of females in automotive as there are 48 trainees, and only 2 are females. By the end of the training programme at Gwamile VOCTIM, graduates have to be familiar with assembling and disassembling of vehicle parts. That is where the industry plays an important role during the internship programme. Lack of innovation among the instructors is a cause for concern as they replicate what they were taught at SCOT years ago even though the automotive industry back then is now significantly different to the automotive industry today which continues to grow and change at a fast pace. Catching up with the industry developments therefore becomes a problem.

II. Swaziland College of Technology (SCOT)

SCOT provides a 3-year training course in motor mechanics, with a 3 months long internship period (Mdluli, 2017: *Pers. Comm.*). The demand for the course is quite high as the college receives more than 300 applications each year; however, the availability of equipment determines final intake numbers. In 2017, a total of 24 students enrolled under the motor mechanics programme. The entry requirement is a pass in Form Five, with maths and science required as compulsory courses. Before SCOT took the decision to localise its curriculum, from the motor mechanics programme also used the City and Guilds Curriculum. The advantage of the local curriculum is that new knowledge required by the industry is infused as and when it is needed, and identified through the internship reports. Upon completion, students qualify for a National Diploma in Motor Mechanics. One of the challenges faced by the department is that they do not have motor vehicle props for students to practise on. As a result, students practice on their lecturers' cars, but cannot disassemble the cars, which limits the acquisition and extent of practical skills.

III. Manzini Industrial and Training Centre (MITC)

The major difference between SCOT, Gwamile VOCTIM, and MITC is that MITC enrols learners who drop out of school, be it primary, or secondary, or high school level (Magongo, 2017: *Pers. Comm.*). Regardless of when they drop-out of school, at the time of enrolment at MITC, these trainees have to be above the age of 18 years. MITC provides a 2-year course in automotive, with 1-year for theory, and 1-year for practice. It has a capacity for 48 trainees per year with 2 instructors. MITC also uses the City and Guilds Curriculum, just like the major players SCOT and Gwamile VOCTIM. The internship programme therefore plays an important role in providing learners with practical skills need to excel in industry. During the first year of training, however, trainees practice on vehicles brought to the institution by customers for maintenance. The influx of imported cars has increased maintenance opportunities for the institution, with also a need for a diverse skill set. The electrification and computerisation of the vehicles is one area which poses a challenge for skill development at MITC. This is because of the lack of modern equipment to improve the curriculum/courses offered.

6.5.2. The Delivery of Electrical Engineering Training in Swaziland

I. Gwamile VOCTIM

The Gwamile VOCTIM uses the City and Guilds curriculum. The duration of the course is 18 months with no attachment. This will change in 2018 from the current 18 months to a period of 2 years. It has a capacity of 25 trainees per year, with a low participation of female trainees, as there are 3 females this year (12%), out of the 25 trainees. The entry requirement is a pass in Form 5, with credits in physical science, maths, and English. However, Gwamile VOCTIM struggles with keeping up with industry relevant equipment and machinery for training students. The equipment used during training is about 50% relevant to industry. Student tuition fees contribute 20-30% to the budget of the institution, and are too low to assist in the procurement of suitable and up-to-date equipment. For the limited amount of money available, government procurement procedures have to be followed, and so equipment procurement takes longer periods and thus frustrates any efforts geared towards the speedy replacement or deployment of equipment in the college. Nevertheless, through the Taiwan TVET Enhancement Project, Gwamile VOCTIM has been funded with a fully equipped industrial automation control workshop, and trainers have been hired to facilitate instructor training for using the workshop equipment.

II. Swaziland College of Technology (SCOT)

SCOT offers a three-year programme in electrical engineering with a 3-month internship period. This is the National Diploma in Electrical and Electronic Engineering. The entry requirements for the engineering department are Mathematics, Physical Science, English, and any other science. The department uses a National Diploma curriculum which was localised in the 1990s after using city and guilds curriculum for a very long time. The present national diploma is also currently under transformation since the department is getting assistance for curriculum development from the Chin Yi University in Taiwan which assists in the development of the curriculum and examination. The electrical and electronic engineering programme has a capacity to enrol 30 trainees per year, which is determined by the availability of training equipment. This is a significant improvement considering that in years gone by, the college enrolled only 16 students. The course content covers electrical installation technology, computer applications, instrumentation and control and many other courses. The department is the most understaffed department at the college with mostly lecturers above the retirement age. This is a challenge in terms of keeping training up with industry development as, at this age there are minimal opportunities for skill development for the instructors. This is especially so given that there is a high demand for the programme as the College receives a high number of applicants per year, which is usually around 300. The high demand for the programme has motivated the College to offer it on a part-time basis, a process that will start in 2018. The College intends to also offer short courses on a part-time basis to upgrade industry employees. Through the Taiwan TVET Enhancement Project, new and up-to-date equipment has been added to the workshop facilities at SCOT. These include 25 sets of desktops, and 25 sets of 21.5 inch LED monitors which will improve delivery of trainings for the students.

III. Manzini Industrial and Training Centre (MITC)

Under the electrical engineering and electronics department, the MITC offers two programmes. These are industrial and household electrical engineering, with more emphasis on the household electrification and electronics as this is where most students easily find jobs. There are no entry requirements for this programme. A total of 30 young people enrol to the electrical course every year, for a duration of 12 months, and 6 or more months for industrial attachment. MITC uses her own curriculum for training in this programme, where students graduate with a certificate. There are two instructors in the programme who are 40 years and above. The development and revision of the programme has not been done since the institution was established, however instructors may suggest course content through management.

6.5.3. The Delivery of ICT Training in Swaziland

I. Swaziland College of Technology (SCOT)

The Swaziland College of Technology (SCOT) offers two programmes under the ICT department. The first is the 3-year part-time Diploma in Information Technology. This programme presently has 18 first year and 15 second year students. The IT course content constitutes of systems software, informatics, development software, and database systems among others. The second programme is the 3-year full-time Diploma in Computer Science. The programme covers computer networks, router fundamentals and systems analysis and design, among others. The computer sciences programme has a capacity for up to 36 students, each with their individual computer. The IT programme offers afternoon classes which are able to cater for employed people as it is largely offered for this group, whilst the computer science programme does not cater for them. For all programmes students are required to

conduct a research project in the final year and a 3-month internship programme from which students graduate with a diploma certificate.

There is high demand for the ICT programmes at SCOT, but with a limited capacity the college only accepts a small number (25-30) of students. The entry requirements for the ICT department include credits in Mathematics, Physical Science and English language. The department uses up-to-date computers and software. Through the Taiwan TVET Enhancement Project, the ICT department at SCOT now has: 20 sets of Arduino Circuit Boards; access to Adobe Creative Cloud for graphic design, video editing, web development, photography, along with a set of mobile applications; a 3-3-3 base server; and a Dell 1550 projector. The key challenge faced by the department, however is the poor internet connectivity and poor speed. Nonetheless, the department is equipped to meet industry needs in its curriculum as it employs a young staff, ranging between the ages of 34-44 years old. In total the department has 9 lecturers.

II. Ngwane Park Youth and Training Centre

The ICT curriculum provided by the Ngwane Park Youth and Training Centre is a 3 year programme with a 6-month internship period. Course content covers developing systems, networking and assembling and disassembling computers. The programme is based on the City and Guilds curriculum and examination. To ensure that the curriculum is in line with local industry developments instructors get new knowledge through the internship reports of students. The ICT programme at Ngwane Park is graded at Level 2 and 3 according to the UK Diploma. To enrol in this programme, a student needs at least 3 credits in Form 5 and an aggregate score of 78%. The programme has capacity for 30 students each year (from year 1 to year 3), and just like SCOT, ICT has a balanced participation of both male and female students. The delivery of ICT at Ngwane Park is done by 3 instructors. The challenges faced by the institution include the lack of new and up-to date software as computer software is not always purchased by the institution. This largely depends on the ability for instructors to access new software. Moreover, in 2017 only 15 students enrolled in the programme. This 50% drop in demand for ICT is because the tuition fee at the centre is much higher than other TVET institutions, while also the operation of the centre are largely dependent on this tuition fee.

III. Manzini Industrial and Training Centre (MITC)

Similarly, the MITC offers a programme in ICT. This programme covers basic computer studies under the International Computer Drivers Licence (ICDL), which is an externally examined module. It offers modules in Microsoft Office, file management, and internet and website applications. This programme is flexible – it can be done at the pace determined by the student. The programme has a capacity for up to 24 learners under 2 instructors. The institution experiences a high demand for this programme, with a lot of students and professionals enrolling for basic ICT skill as a fundamental and basic requirement for employment.

Discussions from the focus groups and the key informant interviews highlighted that even though certain structures and curriculum are in place, the curriculum offered at the schools is mostly outdated, and not aligned to the present industry developments. One student made an example that the ICT industry is presently using the CAT7 cables for Ethernet while the ICT module as SCOT still refers to CAT6 as the latest cable in existence. Although the assessment reports produced by industries after internships provide information on skills gaps, TVET institutions cite funding challenges as a barrier to review the curriculum and modules. Hence this highlights that outdated curriculum and modules are a contributing factor to the skills gap in the country. There is therefore a need for TVET institutions to review curriculum to adjust

to industry developments and technological advancements and for industry to support such initiatives.

Moreover, because of the lack of specialisation in the curriculum/modules taught by the TVET providers, industry stated that students come to them not knowing what specific areas they are good in. This leads to the company trying the students on different fields of the industry, which eventually does not benefit the company. The electrical engineering industry pointed out that students are not confident of the knowledge and skill that they possess, thus they end up not proactively participating in a company's daily work. While in the automotive industry the focus group discussions highlighted that most students do not know how to fix the different car models in the industry and attend to the varied complexities of different car brands. This shows that there is a lack of knowledge or understanding of the different fields of specialization within the field of study among students. Thus the need for career guidance within the TVET institutions to guide students on selecting career paths and assisting them to identify their strengths in specialized fields of study. This could also focus on instilling management and leadership skills to encourage students to be proactive when they go to industry.

6.6. Capacity of TVET Instructors

The most common problem that developing countries face is an oversupply of low-level skills and an undersupply of high-level industry skills. Similarly, in the TVET education system the study finds that there is a shortage of highly skilled instructors in TVET. From the focus group discussions, it came out clear that TVET instructors also needed to upgrade their skills and knowledge to the level of the technological advancement in industry. Some of the questionnaire responses and graduates even suggest that students should be taught by people who work in industry, or people from outside the country who have the varied practical exposure in their respective industries. They also share that trainers themselves are not aware of the latest equipment and materials nor do they know how to use them. Therefore, before they can impart any level of knowledge to the students they need to regularly upgrade their own skills. The other important issue that comes through is that it is difficult those instructors who receive skill development opportunities, such obtaining advanced degree in South Africa, Taiwan, among other countries. These upskilled instructors tend leave the TVET training institutions to work in industry. It is a challenge for TVET institutions as they end up not being able to maintain/sustain a highly trained staff. It therefore, call for the introduction of binding contracts for those instructors and other staff that are afforded skill-upgrading opportunities. Nevertheless, the TVET training institutions, particularly SCOT and Gwamile VOCTIM, have room for improvement in crafting attractive/competitive remuneration packages as incentives to retain their valuable TVET personnel.

The study also highlights that in most TVET training institutions and departments, except for the ICT department at SCOT; most instructors are above the age of 40, and within their retirement age. This is also a challenge for TVET provision as the old instructors are unable to upgrade their skills to keep up with the changing environment. Thus the capacity of the TVET instructors also contributes to the skills gap. This is also very important as the jobs in the industry continue to change and the skills needed by industry also change. Consequently, a weak education or TVET system results in adverse skills gaps that create unemployment, which in turn, affects the productivity and development of each country's economy.

6.7. TVET Internship/Apprenticeship Programme

Students enrolled in TVET institutions in automotive, electrical engineering, and ICT programmes acquire practical skills from industries through the internship programme. The internship programme places students in industries that accept interns for a period ranging from 3months, for SCOT, and 1 year for Gwamile VOCTIM. The internship programme usually

begins after 1 full year of training. The study results indicate that the main challenge students face during internship is that there is no formal arrangement between the TVET training institutions and industry. This means trainees have to identify the industries on their own, and inform their supervisors about the industry that has accepted them as interns. Verification letters are then written by the college to authenticate the students' identities with the training institutions. A total of 49 students who have internship attachment experiences were interviewed (19 for automotive, 12 for electrical engineering, and 18 for ICT). Table 6.7.1 below presents a list of companies providing internships in the year 2017.

Table 6.7.1. Industries Providing Internships in the Year 2017

Automotive	**Electrical Engineering**	**ICT**
▪ RSSC ▪ DUDAS Investments ▪ Mlobi Investment ▪ Oil Monkey Garage ▪ Swazi Truck Auto Centre ▪ Inyatsi Construction Company ▪ Leites (Toyota) Garage ▪ Chrisilda ▪ Usutu Forest Products ▪ Carson Wheels, ▪ Talisman Hire ▪ Henwood ▪ AG Thomas ▪ Coastal Hire Swaziland ▪ SPMG Transport ▪ Umbutfo Swaziland Defence Force ▪ Nsimbi Investments ▪ University of Swaziland ▪ Khethas Auto Garage ▪ Auto Transmac ▪ Ben 10 Motors	▪ RSSC ▪ Municipal Council of Mbabane ▪ Swaziland Electricity Company ▪ Palfridge ▪ Swaziland Post and Telecommunications Corporation ▪ Exipro Swaziland ▪ Fridge Factory	▪ Computer Technologies ▪ Swaziland Broadcasting and Information Services ▪ Swaziland Post and Telecommunications Corporation ▪ Ministry of Agriculture ▪ IHM ▪ Government Computer Services ▪ Eileen Light ▪ Swaziland National Provident Fund ▪ PC Systems ▪ HMIS Mankayane ▪ Town Board ▪ Computronics

Source: Data from Interviews with TVET trainees (2017)

During internship, trainees are given tasks to perform, and placed under supervisors who monitor their day to day activities in the company. Table 6.7.2 below describes the students' tasks performed during the internship programme.

Table 6.7.2. Tasks Performed by TVET Trainees during their Internship Programmes

Electrical	Automotive	ICT
▪ Motor fixing and lamp replacing	▪ Servicing vehicles	▪ Installing application software, PCs
▪ Maintaining of street lights	▪ Repairing electrical faults on vehicles	▪ Configuring Microsoft Outlook accounts
▪ Attending to machine breakdown	▪ Referring cars to South African garages	▪ Fixing network faults
▪ Fixing faulty landlines	▪ Assist technicians with all tasks	▪ Networking and troubleshooting
▪ Maintaining the grinding machine	▪ Replacing technicians while on leave	▪ Attending to user problems
▪ Maintaining electrical equipment	▪ Cleaning workshops	▪ Attending to hardware and software problems
▪ Repairing electronics and wiring new structures	▪ Attending to breakdowns locally and internationally	▪ Back-up data base

Source: Data from interviews with TVET trainees (2017)

Students, however, complain that it is not easy to get an internship attachment because (1) industries assume that they will break their machines due to lack of experience, (2) all three industries are saturated by graduates for ICT and electrical engineering, whereas the automotive industry is saturated by Mozambicans, and (3) the reputation of the training institution also has an influence whether a graduate is accepted by a company or not. This does not take away the appreciation that students have for the internship programme as it gives them real life practical skills and experience. The students explained that often times, the tasks given to them during internship are not part of the syllabus, which gives them more exposure to new knowledge and skills. Over and above the practical skills relevant to their training, trainees acquire administrative knowledge including; dealing with other employees' behaviours, communication skills, team work, health, and safety in the workplace.

For the electrical engineering trainees, new skills acquired during internships that were not covered during training include; motor overhauling; erecting overhead lines; installing low voltage and high voltage lines, and building an automatic control circuit for any newly installed machine. New skills acquired by the ICT trainees that are not covered by the syllabus include; computer repair, server configuration; programme production, and engineering studies. For the automotive industries the new skills are customer care, two stroke engines, vehicles diagnosis and fitting new parts while reading schematic diagrams.

Trainees were asked about the skills they feel will be in demand in the next 2-5 years. Table 6.7.3 describes the future skills that would be in demand.

Table 6.7.3. Future Skills Demand in Swaziland

Electrical	**Automotive**	**ICT**
▪ Transformer technicians	▪ Computer diagnosis	▪ Programming skills
▪ Computer skills	▪ Electrical and hydraulics skills	▪ Networking
▪ Installing Cameras	▪ Facilitation skills	▪ Computer science
▪ Supervising skills	▪ Skills on new technologies in the market	▪ System analyst and development
▪ Mechanical engineering	▪ Computer box and vehicle programming	▪ Fibre splicing
▪ Mounting light emitting diodes, electrical supplies fitter	▪ Auto electronics	▪ Artificial intelligence and cyber security
		▪ Video over IP (VOIP), internet of things (IOT), financial technology software developers

Source: Data from Interviews with TVET trainees (2017)

7. Conclusion and Recommendations

7.1. Conclusion

The study investigates the gap between the skills supplied by the TVET training institutions against those demanded/needed by industry with a focus on the automotive, electrical engineering, and ICT industries in Swaziland. Human capital is a fundamental component of economic development; economists argue that the key to economic growth lies in the talent, know-how, skills and capabilities of the human capital. Hence, the government of Swaziland partnered with the government of the Republic of China (Taiwan) to provide assistance in upgrading technical and vocational skills in the country. This is because TVET has emerged as a credible route for producing the necessary skill and knowledge that feeds directly into industry, thus enhancing the employability of individuals, and employment creation.

Four objectives guide the TVET and Industry skills gap: (i) to ascertain the development trends in each of the three industries and specify the existing challenges and opportunities; (ii) to assess the capacity and quality of Swaziland's TVET system and its position to serve the skills required by industry; (iii) to identify the gaps between the skills supplied by TVET training institutions in Swaziland, (particularly, SCOT, and Gwamile VOCTIM) versus the skills demanded by the automotive, electrical, and ICT industries; and (iv) to recommend strategies for reducing the labour force skills gap within the three focus industries.

First, starting with the automotive industry, the study finds that Swaziland does not have an automotive manufacturing industry, but a growing industry in auto-repairs, auto-spares, and used car dealerships. Generally, the country is struggling to keep up with technology advancements in this industry, as newer car models demand specialised skill-sets in vehicle computer systems, and associated functionalities. The influx of imported Japanese used vehicles is creating an opportunity for more specialised auto-spare dealerships, advanced skills in auto mechanics beyond the usual brands such Toyota, Nissan, Ford, Mazda, Opel, Isuzu, Chevrolet, Kia, and Hyundai. On the scarce auto mechanic technicians, the study finds that heavy duty mechanics, vehicle programmers, and diagnostic specialists, vehicle electricians, computer box specialists and warehouse/garage managers including Grade 1 qualified technicians are difficult to find in Swaziland. In contrast, Grade 3 mechanics, who usually have the national diploma in auto mechanics are easy to find, including basic car servicing and auto-repair mechanics, panel beaters, and spray painters. TVET graduates in this industry are competent in general auto-repairs and vehicle servicing, and have an impressive mastery of the theory on basic vehicle systems. The automotive graduates struggle with complex problems/advanced servicing skills and with lack of specialisation in critical systems such as automatic gearboxes, vehicle electronics, and computer diagnostics.

Second, the electrical engineering industry in Swaziland constitutes a diversity of sectors such as energy sector, communication, manufacturing, construction, and electronics. Typical electrical engineering business activity in the country includes general installations, electrical repairs and maintenance, electricity production, sale of electrical appliances, air conditioning, wiring, electronics, and home and industrial electrical support. However, the current skills supply in this industry is not enough: the majority of electrical training courses provide skills on basic electrical engineering only useful for ordinary jobs such as house wiring to the detriment of advanced low-voltage and high-voltage industry electrical needs and advanced control electrical engineers. The key scarce technicians in the electrical engineering industry includes millwrights, broiler makers, industrial electricians, and special electrical technicians in air-conditioning and refrigeration. The country has an oversupply of national diplomas in electrical engineering; therefore, can easily find fitters and linesmen. Graduates in this industry lack the higher qualifications such as millwright certificates and specialisations in

advanced and industrial electrical engineering. They too, like the automotive industry graduates, are much more competence on the theoretical aspects of the skill rather than practical competencies in implementing job assignments from start to finish without requiring major supervision.

Third, ICT development in the country has been relatively slow, only picking up after the establishment of the ICT industry regulator in 2013. Though growing at a snail's pace, the ICT industry spans throughout the economy characterised by diverse products and services. These include computer sales and repairs, network installations and management, banking and retail, graphic designing and printing, hardware and machinery, programming, office support, and systems development and management. The biggest challenge facing this industry is the lack of access to technology, and low infrastructure development. The country suffers from high internet costs, slow internet, and limited ICT infrastructure in the four regions of the country. The key scarce technicians in this industry are network engineers and operators, programmers, and software and system developers. The country's ICT graduates are competent in installations and running of software, but lack the skills in advanced coding and programming to develop original/Swazi-owned software and systems. Furthermore, the ICT graduates show outstanding mastery of the ICT theory, can understand basic computer programming, and can provide home and office support in basic assembly/disassembly and set-up of computer hardware.

Generally, less than 20% of the sampled companies in all three industries are completely satisfied with the TVET graduate skill level. An estimated half of the total companies sampled are 25% - 50% satisfied with the skills demonstrated by the incoming graduates with only a third (32%) satisfied to a more acceptable level (75% satisfied with the skills). Not surprisingly, the study finds that only about 14% of the TVET graduates never have to be re-trained/provided additional training when they are employed by the industries. A majority of the students (86% on average) require additional training to be able to successfully perform well in their respective industries. The study finds that, though the TVET graduates lack the practical skills relevant to their respective industry, collaboration between the TVET training institutions and industry is limited, and also a major contributing factor to the low skills demonstrated by TVET graduates.

Only 37% of the sampled companies collaborate with TVET institutions, and the typical types of collaborations involve provision of internships (75% of the time), advice on industry skills needs (9.1% of the time) and training of TVET instructors about 6.4% of the time on average. A majority of the companies hold the view that apprenticeships/internships are expensive, the industries are not-well developed to provide internships/apprenticeships, and lack the time and resources to train TVET trainees on practical industry skills. Essentially, the industries do not recognise their role and value in assisting in the training of TVET skills in Swaziland, yet still complain about the lowly skilled and too much focus on theory among the TVET graduates. TVET training institutions, including the TVET coordinating structures of government such as DIVT, are also dragging their feet in making the industry appreciate its role in the development of TVET skills by pushing for more formal collaborations and partnerships between industry and TEVT skill providers.

The study finds that the TVET system in Swaziland has a number of challenges in terms of efficiency and effectiveness. The TVET system has a weak institutional and coordination support system. There is a lack of coordination among TVET institutions and an absence of mechanisms to monitor and assess the delivery and quality of TVET. While all three industries are growing rapidly in the country and showing great potential, the TVET providers are falling behind, owing to a great extent, to outdated curriculum that is not responsive to the present trends in industrial development. Moreover, the instructors in the TVET institutions lack the

necessary exposure, and advanced technical skills to provide TVET skills that can be easily absorbed by the automotive, electrical and, ICT industries in Swaziland.

The major reality about TVET in Swaziland contributing to the different industry and TVET skill gaps is that TVET is not adequately funded, even though it requires substantial investments in equipment and materials to provide for the practical skills necessary to develop the technical expertise required by industry. More likely than not, TVET trainees in the key technical and vocational training institutions such as SCOT, Gwamile VOCTIM, Ngwane Youth Training Centre, and MITC, are being trained on obsolete equipment, irrelevant curricula and course modules without getting the industry opportunities to practice and perfect their skills. This inhibits the exposure students get to certain material and equipment and thus impacts their ability to apply practical skills and knowledge when time comes to work industry.

Hence, the study finds that indeed there is a significant mismatch between the skills supplied by the TVET training institutions in the country versus the skills demanded by industry. The skills gap is as a result of the weak institutional environment supporting TVET in Swaziland. There is a lack of coordination among TVET institutions, and an absence of mechanisms to monitor and assess the delivery and quality of TVET. While all three industries are growing rapidly in the country and showing great potential for GDP production and employment creation, the TVET providers are falling behind, owing to a great extent, to outdated curriculum that is not responsive to the present trends in industrial development, outdated qualifications of TVET instructors; non-existent relations between TVET institutions and industry, the general funding of TVET, and lack of appropriate facilities and resources for the practical skilling of potential technicians and artisans in the country.

7.2. Recommendations

VI. TVET Governance

1. Establish the Directorate of TVET in the Ministry of Education and Training to coordinate the TVET sector in collaboration with the Ministry of Commerce, Industry and Trade;
2. Formulate and adopt legislation for TVET;
3. Incorporate grade testing in the TVET curricula to allow for assessment of tertiary qualification;
4. The Ministry of Education and Training should develop a national curriculum framework for TVET and provide a qualifications and grading or certification system that is based on competency standards;
5. The Government of Swaziland should establish a TVET qualifications authority which will standardise the level of skills and qualifications offered in Swazi training institutions, nationally and to those within the SADC region and internationally;
6. Transform DIVT into a parastatal to improve its efficiency and effectiveness, while also increasing its scope beyond grade testing and apprenticeships, and align it with the latest industry developments and technology advancements.

VII. Funding and Resource Mobilisation

7. Develop multiple and sustainable funding sources to support TVET training and practice in Swaziland;
8. Increase funding for TVET training institutions to ensure that it stays relevant and up-to-date with industry developments;

9. The Government of Swaziland should develop sustainability strategies and continuation plans for TVET projects that are funded by development partners;
10. Provide a special fund for updating machinery, equipment, and materials in TVET training workshops also ensuring proper management and continuous monitoring and upgrading of the equipment;
11. The Government should subsidise the purchasing of new equipment and software by training institutions;

VIII. Structures and Systems

12. Enable public TVET institutions access to student tuition fees to cater for the immediate needs of the training institutions;
13. Improve the efficiency and effectiveness of the TVET system by establishing mechanisms for monitoring and assessing TVET delivery and quality assurance;
14. Establish training centres where TVET instructors, students and industry employees can continually upgrade their skills and knowledge, such as continuing education centres;
15. Establish a system for the formal engagement, and increased participation of industry on the development, design and reviewing or upgrading of TVET curriculum;
16. Introduce tax rebates for companies offering apprenticeship programmes;
17. Given that DIVT does not grade tertiary qualifications, ensure that tertiary qualifications are graded at the institution level.

IX. Curriculum and Internships

18. Review and update TVET curriculum periodically, to meet industry technological developments;
19. Introduce B-Tech qualifications since the National Diploma is not enough for the development requirement of the industry;
20. Establish a formal or structured system for internship/apprenticeship provision between industry and TVET training institutions;
21. Introduce more self-development programmes for TVET students to provide career guidance and entrepreneurial or management skills, regarding the different fields of TVET and specialisation opportunities;
22. Extend and adopt a minimum 1-year internship programme within the TVET sector to allow for more time to acquire practical experiences amongst TVET trainees;
23. Training institutions need to introduce specialised ICT programmes especially retail programming, accounting and auditing ICT specialists, software development, and network engineers;
24. Introduce skills and technology exposure at lower levels of the education system, e.g., Secondary School;
25. Provide practical training workshops for TVET students to focus on practical skills in servers, networking, and developing ICT systems as demanded by industry;
26. Expose trainees to more advanced levels of ICT (hardware, software, and systems);
27. Ensure students are exposed to a wide range of operating systems and software other than Windows and Microsoft Office;
28. Incorporate entrepreneurship into the syllabus and provide workshops to equip students with business skills.

X. Capacity Building in TVET

29. Currently the highest level of qualifications offered by TVET in the country are diplomas. There is need to improve the capacity and quality of the TVET institutions to a level where they can also offer degrees;
30. Provide special training to lecturers at SCOT and VOCTIM to update their skills and knowledge in line with the latest technology developments in the ICT, electrical engineering and automotive industries;
31. Create an enabling environment for more internet providers in the country besides SPTC;
32. Stakeholders in ICT need to form an association for inclusive development of the sector.

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INTERVIEW SCHEDULE

Institution	Position	Name	Date
Gwamile VOCTIM	Principal	Mr Mokoena	30/08/2017
SCOT	Principal and Vice Principal	Dr Grace Mdluli and Mrs Nhlengetfwa	30/08/2017
Ministry of ICT	Director Communication and his managers	Mr Andreas Dlamini	12/09/2017
Ministry of ICT	Director Information and Media Development	Mr Phesheya Dube	11/09/2017
Ngwane Park Youth and Training Centre	Principal and ICT instructors	Mr Mahlalela	12/09/2017
Government Computer Services	Director and his managers	Mr Sipho Vilakati, Xolile Nxumalo and Ntokozo Nxumalo	19/09/2017
DIVT	Director and his heads	Mr Jele, Mr Hlatshwayo	13/09/2017
CTA	Director and his heads	Mr Khumalo	
SEC	Human Resource Development – Training and Development	Mrs Nhleko	03/10/2017
Swaziland Higher Education Council	Director	Mr Mboni Dlamini	04/10/2017
Ministry of Education	TVET Officer	Mr Simelane	04/10/2017
MITC	Director and vice	Mr Magongo	29/08/2017
SCOT	ICT lecturer (pp HOD)	Mr Manyatsi	01/11/2107
SCOT	HOD electrical engineering	Mr Mwaba	01/11/2107
Gwamile VOCTIM	HOD Automotive and instructor	Mr Nosi and Mr Mngometulu	30/10/2017
Gwamile VOCTIM	Electrical Engineering	Mr Xaba	30/10/2017

9. Appendix 1: Inventory of TVET Technicians and Key Skill Competencies and Deficiencies

Automotive Trade/Technician Name	**Technician Availability**	***Minimum Qualifications***	**Preferred Qualifications**	**Local Technician Source**	**Non-local Technician Source**	**Employer Satisfaction with Technicians**	**Future Additional Technicians**	**Key Skill Competencies**	**Key Skill Deficiencies**
repairs and services	Never (0%)	*heavy duty driver's license, grade 3 mechanical certificate*	*2 years working experience*	VOCTIM, MITC		Satisfied		engine repairs, gearbox fitting	work ethic
repairs and services	Never (0%)	*all employees have no technical training; they got experience on the job*				Not Applicable			
panel beater	Never (0%)	*grade 1 certificate in panel beating*	*grade 1 certificate in panel beating*	SCOT		Satisfied	10	practical experience	
glass remover	Rarely (25%)	*grade test, windscreen and glass fitting certificate, form 5 certificate*	*2 years working experience*	MITC		Somewhat Satisfied		method of work, work ethic	machine operations
mechanic	Rarely (25%)	*diploma in mechanic*			vaal university, car training programmes centres	Somewhat Satisfied		repair of c.v. joints	
turner	Rarely (25%)	*grade 1 mechanic certificate, Grade 2 mechanic certificate*	*diploma in automotive engineering, 2 years working experience*	SCOT, VOTIM, MITC		Somewhat Satisfied		workshop operations, machinery operations	

repairs and services	Rarely (25%)	*diploma in automotive engineering, Work experience, form 5 certificate*	*degree in automotive engineering, 3 years experience*	SCOT, VOTIM, MITC		Completely Satisfied		work communication, work ethic	lack of thoroughly trained technicians
heavy-plant mechanic	Rarely (25%)	*certificate in heavy plant mechanics, level 2 (n levels South Africa), experience in heavy plant mechanics field with a good reference*	*university qualification degree or masters*	SCOT, UTECH	any institutions	Satisfied	4	grades from vocational training, willingness to learn, computer literacy, precision in the task given	limited practical experience, irrelevant practical experience
mechanic	Rarely (25%)	*certificate in mechanic, grade 1certificate in mechanic*	*5-years' experience, able to work under minimum supervision, fluent in English, well behaved*	VOCTIM		Somewhat Satisfied	5	work within a stipulated time, service cars without complications, computing	lack experience in mechanics
mechanic	Rarely (25%)	*diploma in motor mechanic specialising in Mercedes cars*			Germany Mercedes training programme	Completely Satisfied	1	Mercedes wind screen replacement, understanding of all Mercedes vehicles parts	
mechanical manager	Rarely (25%)	*grade 2, 5 years of work experience*	*grade 1*	SCOT, VOCTIM		Satisfied		mechanical understanding	
general motor mechanics	Rarely (25%)	*certificate in motor mechanics*	*grade 2 certificate in mechanic*	Siteki_ITC, MITC		Satisfied		servicing cars, changing brake pads, changing shock absorbers, changing wheel bearings	lack experience in engine related problems
vehicle programmer and diagnostics	Rarely (25%)	*diploma in programing*	*diploma in programming*	Nhlangano_DOC		Satisfied			weakness in general programming and diagnostics

workshop manager	Some times (50%)	*degree in automotive engineering, heavy duty license, grade 3 mechanic certificate, form 5*	*degree in automotive engineering, 3 years working experience as a workshop manager, computer literacy*	SCOT, MITC		Somewhat Satisfied		machinery management, ensures safety measures are kept, stock controller, diagnoser	lack of computer skills
motor mechanic	Some times (50%)	*motor mechanic certificate grade 1*	*motor mechanic certificate grade 1*	SCOT		Satisfied		practical experience, keen to learn, cooperative, hardworking	need more practical training
motor mechanic	Some times (50%)	*grade 3 certificate in motor mechanic*	*grade 1 certificate in motor mechanic*	VOCTIM, MITC		Somewhat Satisfied	2	good in theoretical explanations	lack practice
welder	Some times (50%)	*welding certificate*		SCOT		Somewhat Satisfied	3	good in theory	lack experience
automotive (mechanical engineering)	Some times (50%)	*grade 3 certificate in motor mechanic*	*3 years work experience, competent, fluent in English, work under minimum supervision*	SCOT, VOCTIM		Satisfied		repair the tractors, service tractors, work within a stipulated time	
auto mechanics	Some times (50%)	*diploma in electronics and electrical*	*degree in auto mechanics*	SCOT, UNISWA			1	basic electronic	lack experience in auto heavy plant machines operations
mechanical fitter	Some times (50%)	*grade 1 certificate in fitting, grade 2 certificate in fitting, grade 3 certificate in fitting*	*grade 1 certificate in fitting*	SCOT, UNISWA		Somewhat Satisfied	2	committed in their work, know the theory	lack of the practical aspects of the job, lack of cooperation, they think they know everything, take too much time to finish a given job
car electrician	Some times (50%)	*experience in that field*	*grade 1 certificate in that field*	VOCTIM		Satisfied	1	experience, good reference from others, having the right skills and instruments to do the task	cables types

auto mechanic technician	Some times (50%)	*certificate in mechanic*	*n6 series*	SCOT, VOCTIM		Somewhat Satisfied	0		repairing motor bikes, operating machines
heavy plant mechanic	Some times (50%)	*heavy plant mechanic certificate*	*grade one mechanic heavy plant*	SCOT, VOCTIM, MITC		Not Satisfied			practicals
car parts salesperson	Some times (50%)	*college certificate*	*form 5*	VOCTIM		Somewhat Satisfied		good communication skills	lack of bosch diesel vehicles parts
mechanic	Some times (50%)	*certificate motor mechenic*	*n series certificate*	VOCTIM		Somewhat Satisfied	1	theory	machine operating, working ethics, latest cars, new parts understanding
senior mechanical technician	Some times (50%)	*certificate in mechanical*	*certificate in mechanical*	SCOT, VOCTIM, MITC	vaal university	Satisfied	2	car repairing, engine fixing	fixing car computer box
engine mechanic	Some times (50%)	*certificate in mechanical*		Siteki_ITC		Somewhat Satisfied	2	wheels balancing, engine performance testing	gear box repositioning
motor mechanic	Some times (50%)	*diploma in mechanical, motor mechanic certificate*	*motor mechanic certificate*	MITC		Satisfied	3	good working industry understanding, good rhetorical part	experience in operating machines, naming of vehicles, fixing tools
mechanical manager	Some times (50%)	*grade 1*		SCOT		Satisfied	2	mechanical knowledge and understanding of cars, ability to fix cars	may not have a mechanical calling yet they knows the job
panel beater	Some times (50%)	*have experience in the job*	*have experience in the job*			Completely Satisfied		good practical experience, committed to the job	can't do mechanic work

mechanic	Often (75%)	*diploma in mechanical, grade testing certificate*		VOCTIM, MITC		Somewhat Satisfied		car repairing	
gear box technician	Often (75%)	*motor mechanic certificate*	*car repairing experience*	SCOT, VOCTIM, MITC		Satisfied	1	gear box repairing	
educator/instructor	Often (75%)	*diploma in automotive engineering, diploma in education and training*	*degree in automotive engineering, previous work experience*	SCOT		Satisfied		spray painting, education, vehicle mechanic	auto electrical
engine fitter	Often (75%)	*grade 2 mechanic certificate, grade 1mechanic certificate, diploma in automotive engineering*	*diploma in automotive engineering, grade 3 certificate, professional work experience*	SCOT, VOCTIM, MITC		Satisfied		engine fitting, gear box fitting	
engine over hauler	Often (75%)	*grade 3 mechanical certificate*	*diploma in automotive engineering*	SCOT, VOCTIM, MITC		Somewhat Satisfied		theory, order of work, handling tools and equipment	electronics
auto electrician	Often (75%)	*certificate in auto electrician, experience in that field*	*grade 1 certificate in auto electrician*	VOCTIM		Not Satisfied	2	certificate to show he is qualified	
heavy-plant mechanic	Often (75%)	*form 5*	*grade 3 trade test in heavy plant mechanics*	SCOT, VOCTIM, MITC		Satisfied	2	good grades, flexibility to work odd hours, good theoretical knowledge	poor hydraulics knowledge
heavy-plant mechanic	Often (75%)	*certificate and experience from a college*	*vast experience, knowledge theoretically and practical in that field with a degree*	VOCTIM		Satisfied			

computer box technician	Often (75%)	*computer literate*	*diploma in automotive, certificate in mechanical engineering*	VOCTIM		Satisfied	1	ability to find mechanical problems in a motor vehicle, ability to understand and interpret what the computer instructs	knowing theory and no practical knowledge
sales representatives	Often (75%)	*o level*	*computer literate, experience in sales, qualification from a reputation tertiary institution (certificate)*	Nhlangano_VTR, NASTC		Satisfied	4	theatrically knowledgeable	practically inexperience
panel beater	Often (75%)	*no need for qualification because they have the experience in the job, they have practical experience*	*no need for qualification because they have experience in the job, they have practical experience*			Satisfied	3	required experience for the job	
automotive mechanic	Often (75%)	*diploma in automotive*	*diploma in automotive*	SCOT		Satisfied	2	good practical experience, good theoretical knowledge, committed to work, honest and reliable	
mechanical engineer	Often (75%)	*grade 3 motor mechanic certificate*	*grade 1 motor mechanic certificate*	MITC		Satisfied	2	good in theory, quick to grasp the needed practices in the work place	lack of experience, lack of confidence in their skill
mechanical engineer	Often (75%)	*o'level/igcse certificate, grade 3 certificate in mechanical engineering*	*grade 1 certificate in mechanical engineering*	SCOT, VOCTIM		Satisfied	2	very good at theory, very good in taking instructions	lack of practical experience
filters and turners	Often (75%)	*grade 3*	*grade 2*	SCOT, VOCTIM		Satisfied		often lack experience	good in theory

automotive engineer	Often (75%)	*grade 3 certificate in automotive engineering*	*grade 1 certificate in automotive engineering*	SCOT, MITC		Somewhat Satisfied	1	good in safety, good in workshop keeping, good in theory	lack of practical experience in servicing cars
mechanic engineer	Often (75%)	*diploma in automotive engineering, o'level/igcse certificate*	*grade1 mechanical engineering*	SCOT, VOCTIM		Somewhat Satisfied	1	good at theory, good at taking instructions	lack practical experience
automotive mechanic	Often (75%)	*certificate in mechanical engineering*	*grade 3*	VOCTIM		Satisfied		good at theory	not able to do certain tasks without supervision
panel beater	Often (75%)	*form 5 certificate*	*diploma in panel beating*	SCOT		Somewhat Satisfied	3	very good in theory, very quick in learning	lack practical exposure, they have different methods from what is needed in the field
auto mechanical engineer	Often (75%)	*grade 3 certificate in mechanical engineering*	*grade 2 certificate in mechanical engineering*	SCOT, VOCTIM		Satisfied	2	good in theory, good in understanding basic concepts of engineering	lack in practical experience
panel beaters	Often (75%)	*certificate in panel beating*		MITC		Satisfied		good in theory	lack practice
mechanical engineers	Often (75%)	*diploma in mechanical engineering, grade 3 certificate in mechanical engineering*	*degree in mechanical engineering, grade 1 certificate in mechanical engineering*	SCOT, VOCTIM, MITC, UNISWA		Satisfied		good understanding of theory, good in taking instructions	lack of work experience, lack of work ethics
panel beaters	Often (75%)	*diploma in panel beating*		VOCTIM		Somewhat Satisfied	1	theoretical knowledge, practical knowledge	lack of confidence in their skill
motor mechanic	Often (75%)	*grade 1 and grade 2*	*degree in mechanical engineering*	SCOT		Satisfied		fixing engines, overhauling of engines, fixing brakes	

service manager	Often (75%)	*knowledge on the mechanical services*		SCOT		Satisfied	0	automotive diagnosis, management skills, problem solving, replace fuel and air filters, inspect and repair or replace all components on modern suspension system	
motor mechanic technician	Often (75%)	*grade 3 mechanic*		SCOT		Satisfied		overhauling engine, fix cam and shaft bearing, fixing pistol and pistol rings, grinding valves	
mechanic	Often (75%)	*from experience never graded in any institution*				Satisfied		overhauling engine, fixing brakes, fixing pistol, diagnosis and problem solving in motor vehicles, fixing bearings	
mechanic technician	Often (75%)	*certificate in motor automotive*	*mechanical engineering*	NASTC		Not Satisfied	3	overhauling of engine, repair folk lifts	lack knowledge and skill in electronics
mechanic specialist	Often (75%)	*mechanical certificate, grade 3 scot*			kempton park south africa	Satisfied		diagnosis of motor vehicle problems, overhauling of engines, fixing brakes, fixing pistol, fixing of bearings	poor in electronics, motor wiring, fixing of lights
motor mechanic	Often (75%)	*from working experience*				Satisfied		panel beating, overhauling of the motor vehicle engine, fixing brakes	
motor mechanic technician	Often (75%)	*grade 3*	*mechanical engineering degree*			Satisfied		overhauling of engines, fixing of	poor in wiring motor cars, fixing indicators

								brakes, fixing gear box, fixing of bearings	
electrical technician	Often (75%)	*grade 5 scot certificate*	*degree in electronics*	SCOT		Satisfied		car wiring, light fixing, wipers fixing, fix indicators, fixing alternators	failure to reprogramme motor vehicles
motor mechanic	Often (75%)	*diploma in mechanic*	*certificate in grade testing*	SCOT, VOCTIM		Satisfied		vehicles repairing, engine testing, uses of advanced equipment	machine operating system, lack of knowledge on car diagnosis using a computer box system
motor mechanic	Often (75%)	*motor mechanic certificate*	*motor mechanic certificate*	MITC		Somewhat Satisfied	2	wind screen replacing	vehicles different parts, assembling engine
director of vocational skills	Often (75%)	*diploma in mechanical*	*metal work certificate, diploma metal work, management and leadership skills*	SCOT, MITC		Somewhat Satisfied	0	good behaviours	working ethics
motor mechanic	Often (75%)	*certificate in motor mechanic*	*certificate in motor mechanics*	MITC		Somewhat Satisfied	2	sound understanding of car parts	lack of operating machines, lack of advanced car services understanding
mechanical manager	Often (75%)	*grade 1*		VOCTIM		Satisfied		good mechanical and motor skills	poor in fixing gear boxes
mechanical officers	Often (75%)	*grade 2, willingness to learn*		SCOT		Completely Satisfied	0	mechanical skills	
mechanical intern	Often (75%)	*grade 3, fast learner and willingness to learn*		SCOT, VOCTIM		Satisfied	3	willingness to learn mechanical work	being pushed

mechanical engineer	Often (75%)	*grade 3*				Satisfied	1	motor mechanic knowledge	auto electrical knowledge
motor technicians	Often (75%)	*understanding for motor parts, understanding of cars, grade three*		SCOT		Satisfied		understanding of motor parts	
auto electricians	Often (75%)	*grade 2 trade test, diploma in electrical engineering*	*diploma in electrical engineering, grade 1 trade test*	SCOT, VOCTIM		Completely Satisfied	1	have practical experience through grade trade testing	have some difficulty with car electronics
mechanics	Often (75%)	*certificate in motor mechanics*	*certificate in motor mechanics*	UTECH		Satisfied	1	gearbox fixing, engine fixing	panel beating
mechanics	Often (75%)	*grade 1 certificate in mechanic*	*grade 1 certificate in mechanic*	SCOT	university of Johannesburg	Completely Satisfied	1	have theoretical knowledge, committed to work	lack practical experience
welding technicians	Often (75%)	*form 5*			technical colleagues	Satisfied			
diesel fuel injection technicians	Often (75%)	*bosch diesel fuel certificate*	*bosch deseal fuel certificate*	RECs	bosch technical school	Completely Satisfied			
panel beater	Always (100 %)	*certificate in panel beating, experience in panel beating, grade 1 in panel beating*	*boiler making*	SCOT		Satisfied		best panel beaters, their work is neat, they keep time, they are efficient	do not meet craftsmanship standards
panel beater	Always (100 %)	*grade 1 in panel beating*	*grade 2 in panel beating*	MITC		Satisfied	3	welding all types of vehicle, spray painting all sort of cars	lack of up-to-date skills to match the changes in technology, experience as they only come full of theory they learned in college

electrical engineer	Always (100 %)	*academic certificate in electrical engineering, experience in the electrical industry*	*tertiary qualification with vast experience and good reference*	SCOT, VOCTIM, MITC, UNISWA		Satisfied		electrical oriented, product knowledge	no practical knowledge or experience
workshop supervisor	Always (100 %)	*diploma in motor mechanic, knowledge in motor mechanic, grade 3 trade test certificate*	*diploma in motor mechanic*	SCOT		Satisfied		able to fix machine and the trucks, able to trouble shoot	cannot fix complex problems
automotive mechanic	Always (100 %)	*n6 certificate, n1 certificate*	*n6 certificate*	SCOT		Satisfied	1	good in hydraulic fitting, good theoretical knowledge, committed to work, flexible in doing job	cannot fix electrical wires in cars
workshop manager	Always (100 %)	*diploma in automotive engineering, 5 years working experience*	*diploma in automotive engineering*	SCOT		Satisfied	2	experience and organisational culture	need further training on the job, supervisory management skills
motor wiring specialist	Always (100 %)	*certificate in electronics*				Satisfied		reconditioned of starter motors, repair alternators, repair wipers, wiring of motor cars	failure to repair computer box in vehicles
workshop manager	Always (100 %)	*city and guilt technician part 3*	*n3 in south Africa*	SCOT, SPTC_TC		Not Satisfied		technical sound, good in theory, management, leadership skills	decision making, allocating the work, management of projects, workshop loading
motor mechanic	Always (100 %)	*diploma in mechanic*	*certificate grade testing, diploma in mechanic*	SCOT, VOCTIM		Satisfied		car repairing, good understanding of all car parts	practical experience

car mechanic	Always (100 %)	*diploma in motor mechanical*	*certificate in motor mechanical*	SCOT, VOCTIM	Milites Dei academy	Not Satisfied	2	theory	car diagnosis
panel beater experts	Always (100 %)	*certificate in panel beating*		MITC		Satisfied	1	understanding of full body parts	panel beating techniques
sales agent	Always (100 %)	*university degree/diploma sales and marketing*	*business certificate*	SCOT, UNISWA, LIMKOKWING		Satisfied	0	good communication skills	cars industry operations
motor mechanics	Always (100 %)	*grade 2, two years of experience*		SCOT		Somewhat Satisfied		panel beating skills, mechanical skill	auto electrical skills, car computer skills
motor mechanics	Always (100 %)	*grade 3, experience in mechanics*		SCOT, VOCTIM, NPYTC, MITC		Completely Satisfied		panel beating, mechanical knowledge and understanding	elements that need specialization such as fixing car air conditions, auto electronic skills
spray painter and panel beating	Always (100 %)	*willingness to learn, experience in spray painting and panel beating*	*grade 3*	MITC		Satisfied		good knowledge of cars, and good knowledge on painting cars	cannot mix paint
motor spray painter and panel beater officer	Always (100 %)	*willingness to learn, experience in spray painting and panel beating*				Satisfied		knowledge of paints	
motor mechanics	Always (100 %)	*grade 3, experience in motor mechanic*		SCOT		Satisfied		knowledge and understanding of cars	auto electronic skills

mechanic	Always (100 %)	*certificate in mechanics*	*certificate in mechanics*	Sidwashini_VTR, MITC		Completely Satisfied	2	suspension fitment	engine related technicalities
automotive wiring	Always (100 %)	*diploma in automotive*	*grade testing, grade 3*	Sidwashini_VTR, SCOT, MITC		Completely Satisfied	2	good in wiring cars	have difficult in fault finding
mechanics	Always (100 %)	*diploma in mechanics*	*diploma in mechanics, 2 to 3 years work experience*	SCOT, VOCTIM		Somewhat Satisfied	2	have fitments skills	lack of practical experience
mechanic	Always (100 %)	*experience is the most vital qualification, certificate in mechanic*	*certificate in motor mechanic plus experience*	Sidwashini_VTR, VOCTIM, MITC		Satisfied	3	can loosen and fix the engine	need supervision in technical parts
mechanic	Always (100 %)	*certificate in mechanics*	*certificate in mechanics, at least 3 years work experience as a mechanic*	Sidwashini_VTR, MITC		Completely Satisfied	2	can do suspension fitment, good in changing of brakes	cannot fix engine related mechanical problems, clutch change
mechanics	Always (100 %)	*certificate in mechanics*	*certificate in mechanics, diploma in mechanics*	SCOT		Satisfied	3	paying attention to what they do and how they do things, good communication skills	insufficient practical skill
motor vehicle mechanic	Always (100 %)	*diploma in education and training, training certificate*	*degree in automotive engineering, previous teaching experience*	MITC, SCOT		Satisfied		motor mechanic	training
fitter	Always	*diploma in automotive engineering, form 5*	*diploma in automotive engineering, 2 years working experience*	MITC		Satisfied			

	(100 %)	*certificate, driver's license*							
Tyre fitter	Always (100 %)	*diploma in automotive engineering, grade 3 certificate in motor mechanic, form 5 certificate*	*degree in automotive engineering, 2 years practical experience*	MITC, SCOT		Satisfied		tyre fitting	
Car sales (New and used)	Always (100 %)	*diploma in automotive, grade test certificate, form 5 certificate*	*degree in automotive engineering, 2 years work experience*	MITC, SCOT		Satisfied			
Vehicle repairs	Always (100 %)	*heavy duty driver's license, grade 3 mechanical certificate*	*2 working experience*	MITC, SCOT		Satisfied		assembling of parts for repairs, work ethic, theory	
Motor vehicle service and repairs	Always (100 %)	*grade 3 mechanical certificate, form 5 certificate, practical experience*	*practical experience*	VOCTIM, MITC, SCOT		Satisfied		communication, theory	computer skills, electronics
spray painter	Always (100 %)	*certificate in spray painting, experience in spray painting, grade 1*	*experience is key even without qualification, grade tasted as SCOT*	MITC, SCOT		Satisfied		neat, can keep time, efficient in their work, good in team work	lack practical experience, are risk takers as they always want to experiment in the expense of clients vehicles
spray painter	Always (100 %)	*grade 1 spray painting*	*grade 2 spray painting*	MITC		Completely Satisfied		preparation for spray painting, good in spray painting	lack of up-to-date skills that matches changes in technology, need to know new equipment, not well educated to easily learn how to use new equipment

heavy plant mechanic	Always (100 %)	*diploma in mechanical*	*certificate in heavy plant*	VOCTIM		Completely Satisfied		basic mechanical techniques	heavy plant vehicles repairing, operating heavy plant machinery
information technology technicians	Always (100 %)	*computer certificate*	*associate degree in IT*	UNISWA, Limkokwing		Satisfied		computer basic, hardware installation	
auto electrician	Always (100 %)	*form 5*	*diploma in electrical engineering*	VOCTIM		Satisfied		auto wiring	
engine overhaul technician	Always (100 %)	*basic of motor mechanical*	*certificate from a reputable tvet institution*	VOCTIM		Satisfied		ability to listen to my instructions, show experience in the field, 1-2 years practice	poor practical knowledge, slow learners
motor mechanics	Always (100 %)	*diploma in motor mechanic, grade 3 trade test certificate*	*diploma in motor mechanic*	SCOT		Satisfied		able to trouble shoot, committed to work, able to fix cars and trucks	cannot fix complex staff
motor mechanic	Always (100 %)	*grade 3 motor mechanic certificate, grade 2 motor mechanic certificate, grade 1 motor mechanic certificate*	*grade 3 motor mechanic certificate, grade 2 motor mechanic certificate, grade 1 motor mechanic certificate*	SCOT, VOCTIM, NASTC		Completely Satisfied		have theoretical knowledge, are committed	lack practical experience
spray painter	Always (100 %)	*grade 1 certificate in spray painting*	*grade 1 certificate in spray painting*			Completely Satisfied		have good practical experience	
panel beater	Always (100 %)	*grade 2 certificate in panel beating*	*grade 2 certificate in panel beating*	VOCTIM, SCOT		Satisfied		good practical experience, good theoretical knowledge	

inspector of works	Always (100 %)	*diploma in automotive engineering, part 3 motor vehicle technician, 5 years working experience as technician 1*		SCOT		Completely Satisfied		familiar with organisational culture	require more on the job training
auto electrical engineering	Always (100 %)	*certificate in automotive electrical engineering*	*grade 1 in automotive electrical engineering*	MITC		Completely Satisfied		good in theory	lack confidence in their skill
auto electrician	Always (100 %)	*grade 3 auto electrical certificate*	*grade1 auto electrical certificate*			Completely Satisfied			
mechanical engineering	Always (100 %)	*certificate in electrical engineering*		VOCTIM		Completely Satisfied		good in theory, understand basic concepts	lack experience
motor mechanic	Always (100 %)	*o level/ igcse certificate, grade 3 mechanical engineering certificate*	*grade 1 mechanical engineering certificate*	SCOT		Completely Satisfied		good at theory, good at basic understanding of what is expected in the work place	lack experience, unable to adjust and adopt new skills
auto electrical engineer	Always (100 %)	*diploma in auto electronics*				Completely Satisfied			
motor mechanic	Always (100 %)	*grade 3 mechanical engineering certificate*		MITC		Completely Satisfied			
auto electricians	Always (100 %)	*certificate in auto electronics grade 3*	*grade 1 certificate in auto electronics*	MITC		Completely Satisfied		good at theory, can grasp quickly the trades of the field	lack of innovation when it comes to newer engines

spray painters	Always (100 %)	*diploma in spray painting*		SCOT		Completely Satisfied		good in understanding the basics of spray painting	lack knowledge on the latest aspects of spray painting, lack knowledge on the latest paints in spray painting
mechanic level 1	Always (100 %)	*level 1 mechanic*				Satisfied		oil exchanging service, addictive services engines or cabin air filter services	diagnosis and problem solving
inspector of works	Always (100 %)	*degree in logistics and communication*	*degree in management, degree in motor mechanics*	SCOT		Satisfied		supervision of government cars, supervision government workshop	be good in management skills
salespersons	Always (100 %)	*sales and marketing certificate, certificate in mechanical*		VOCTIM, MITC, SCOT, Limkokwing		Satisfied		good communication, good customer service provision	motor bikes parts understanding
mechanics	Always (100 %)	*diploma in mechanical*	*certificate in grade testing*	VOCTIM, SCOT		Satisfied		good in repairing all vehicles, communication skills	practical experience
heavy plant drive testing technician	Always (100 %)	*heavy duty driver licence*		NASTC, VOCTIM, Nhlanganо_VTR		Satisfied		driving all heavy plant vehicles	

mechanic	Always (100 %)	*certificate in mechanical*		VOCTIM	Vaal university	Satisfied			bosch diesel heavy plant parts
motor mechanic	Always (100 %)	*mechanical certificate*	*n series certificate*	VOCTIM		Completely Satisfied		theory	operating machines, gear box repairing
spray painter	Always (100 %)	*certificate in full body spray painting*		MITC		Satisfied		good understanding of car spraying techniques	
mechanic	Always (100 %)	*certificate in mechanical*		UTECH		Satisfied		gear box repairing	computer box repair
wheel balancing	Always (100 %)	*motor mechanic certificate*		Sitek_ICT		Satisfied		wheels lining	
panel beating	Always (100 %)	*certificate in motor mechanic*	*experience working in a garage*	MITC		Completely Satisfied		good theory part of spray painting	practical skills
Mechanics	Always (100 %)	*diploma in motor mechanic*	*certificate in motor mechanic*	UTECH, VOCTIM, SCOT		Completely Satisfied		testing cars system, good driving skills	
mechanical assistants	Always (100 %)	*experience, grade 2*	*grade 1*	VOCTIM		Satisfied		understanding of cars	

mechanical assistants	Always (100 %)	*grade 3, experience in motor mechanic*		SCOT		Completely Satisfied		mechanical knowledge and understanding of cars	need to be supervised all the times
mechanical assistants	Always (100 %)	*grade 3, willingness to learn*		SCOT		Satisfied		know the engine	don't have auto electrical skills
assistant mechanics	Always (100 %)	*grade 3, willingness to learn*		VOCTIM		Completely Satisfied			some don't like the skill
mechanical assistant	Always (100 %)	*willingness to learn, drop out or form 5 certificate*		SCOT		Completely Satisfied		motor car services	
panel beaters	Always (100 %)	*grade 3, theory in industrial school*	*grade 3*	SCOT		Completely Satisfied		able to handle equipment	basic mechanical skills, basic spray painting, basic panel beating skill
mechanic assistants	Always (100 %)	*willingness to learn*		VOCTIM		Satisfied		knowledge and understanding of cars	
mechanic	Always (100 %)	*grade 1 trade test certificate*	*grade 1 trade test certificate*	VOCTIM, MITC, SCOT		Completely Satisfied		committed to work, have theoretical knowledge	need extra supervision, lack of practical experience, cannot see a problem in car when given task
motor mechanics	Always (100 %)	*diploma in automotive engineering*	*grade1 trade test*	VOCTIM, SCOT,		Satisfied		have practical experience, committed to work	

assistant mechanic	Always (100 %)	*n1 certificate in mechanical*	*n1 certificate in mechanical*			Satisfied		have theoretical knowledge	lack of practical experience in current things, they need a lot of supervision
panel beating	Always (100 %)	*certificate in panel beating*	*certificate in panel beating*			Completely Satisfied		good in straightening car bodies	lack of wiring skills
electrical technicians	Always (100 %)	*certificate in electronic*	*certificate in electronic*	VOCTIM, UTECH		Satisfied		good in the electronics	
Cylinder head	Always (100 %)	*grade 2 certificate, diploma in automotive engineering, form 5 certificate*	*diploma in automotive engineering, 2 years work experience in the same field*	MITC		Satisfied		repair heavy plant, diagnosis of heavy plant problems	
Engine fitter	Always (100 %)	*diploma in Automotive engineering, grade 3 certificate in mechanical engineering, from 5 certificate, 2 years work experience*	*degree in automotive engineering, heavy duty driving licence*	MITC		Satisfied			
Car parts sales	Always (100 %)					Satisfied		communication, work ethic, theory	
boiler maker	Always (100 %)	*certificate of boiler maker, experience in boiler maker*	*grade 1 boilermaker*	MITC		Satisfied		neat, efficient and effective, keep time, fast learners	do not have working experience, lack practice
heavy plant computerised technician	Always (100 %)	*heavy plant training program*				Completely Satisfied			basic heavy computer box operations,

									diagnosis using a computer
diesel mechanic	Always (100 %)	*basic mechanic experience*	*qualification in mechanical*	VOCTIM	Vaal University	Satisfied		operating machinery	heavy plant repairing
car electrical technician	Always (100 %)	*grade 2 certificate in auto electrical, grade 3 certificate in auto electrical*	*grade 1 in auto electrical*	MITC		Satisfied		good diagnostic abilities, being able to do the job precisely	failing to do a task given, show signs of being clueless about a certain problem requiring attention
spray painters	Always (100 %)	*grade 3 certificate in spray painting, grade 2 certificate in spray painting, grade 1 certificate in spray painting*	*grade 3 certificate in spray painting, grade 2 certificate in spray painting, grade 1 certificate in spray painting*	SCOT		Completely Satisfied		have practical experience	mis-judgment in doing work
motor mechanic	Always (100 %)	*grade 3 certificate in motor mechanic*	*grade 3 certificate in motor mechanic*			Satisfied		good in suspension, good in mechanic	
body and panel beater	Always (100 %)	*certificate in panel beating*				Satisfied		good in theory	lack of experience
welder	Always (100 %)	*grade 3 certificate in welding*	*grade1 certificate in welding*			Completely Satisfied		knowledge of theory, good at practical experience	lack of diversity in the work process, lack of innovation
Welders	Always (100 %)	*certificate in welding*				Satisfied			

Paint preparers	Always (100 %)	*o'level/igcse certificate*				Satisfied		good at tasking instructions and job execution, hard working	
mechanic level 2 on Kia motors	Always (100 %)	*level two motor mechanic Kia motors*				Completely Satisfied		mechanical diagnosis of vehicles, problem solving and repair, perform complete brakes service, including servicing disk, drum and hydraulic repairs, replacing fluids using available fluid exchange equipment	
mechanic level 1	Always (100 %)	*degree in mechanical engineering, diploma in mechanical engineering*	*certificate in mechanical engineering*	E TC, SCOT,		Completely Satisfied		quick but through basic preventative maintenance of automotive, oil change services, engine or cabin air filter services	diagnose and solve problem in automotive
junior mechanics	Always (100 %)	*grade 3, 2 to 3 years mechanical experience*	*grade 3*	ETIMO, VOCTIM,		Satisfied		good mechanical and motor skills	
senior mechanics	Always (100 %)	*grade 2, experience in motor mechanic*		SCOT		Satisfied		mechanical knowledge and understanding	none
mechanical intern	Always (100 %)	*grade 3*		VOCTIM		Completely Satisfied			know too much theory

spray painting	Always (100 %)	*form 3, general knowledge, experience*	*experience*	VOCTIM		Completely Satisfied		diagnosis of problems and solving them in heavy plant, overhauling engines	don't know how to mix the paint they only spray
auto electrician	Always (100 %)	*auto electrical certificate*	*auto electrical certificate*	VOCTIM, MITC,		Satisfied		eager to learn, can do simply things	don't know a multi-meter, lack practical experience, don't know new technology about new cars, can't do complicated staff, need a lot of supervision
car electrician	Always (100 %)	*certificate in electronics*	*experience in the job*			Completely Satisfied		good in fixing alternator	struggle with wiring
spray painter	Always (100 %)	*grade 1 certificate in spray painting*	*grade 1 certificate in spray painting*			Completely Satisfied		can prepare a car and paint it, can supervise and teach others	
panel beaters	Always (100 %)	*certificate in panel beating*	*certificate in panel beating*			Satisfied		good practical experience	
Spray painter	Always (100 %)	*diploma in automotive engineering, grade 3 mechanical engineering*	*diploma in automotive engineering, 2 years working experience*	MITC, SCOT, Nhlanganо_DOC					
small engine technician	Always (100 %)	*experience in mechanical*	*diploma in mechanical*	VOCTIM, SCOT, Nhlanganо_DOC				engine assembling	

car electrical technician	Always (100 %)	*either grade 3, 2, and 1 certificate electrical engineering*	*grade 3 certificate in electrical engineering, grade r2 certificate in electrical engineering, grade 1 certificate in electrical engineering*	SCOT, NPYTC		Somewhat Satisfied			
auto electrical mechanic	Always (100 %)	*grade 3 certificate in electronics*	*auto electrical certificate in electronics*	SCOT, RECs				assessment of vehicle to establish the removing damaged panels, extent of damage, stripping and refitting trim and panel interior, refitting new or repaired panels, repairing damaged bodywork using traditionally Dolly and hammer or more modern techniques	
spray painters	Always (100 %)	*certificate in spray painting*		MITC, RECs					
mechanic	Always (100 %)	*degree or diploma in mechanical engineering,*	*certificate in motor mechanic*	SCOT , RECs					
gearbox fitter	Always (100 %)	*diploma in automotive engineering, grade 3 mechanical engineering certificate, form 5 certificate*	*degree in automotive engineering, 2 years work experience*	SCOT		Satisfied		fixing starters, fixing alternators, check faults in lights, indicators, car wiring	

heavy plant mechanic 1	Always (100 %)	*degree in heavy plant mechanic engineering, mechanical engineering*		SCOT		Satisfied		diagnosis of problems in heavy plant, repair heavy plant, repair diesel engines, understanding transmissions and electronics	
assistant bosch diesel fuel technician	Always (100 %)	*certificate in mechanic*	*certificate in mechanic*	VOCTIM, MITC,		Satisfied		committed to their work	need supervision, lack practical experience, lack of knowledge, don't want to learn more
heavy plant mechanic 2	Always (100 %)	*degree in mechanic engineering*	*electrical engineering*	SCOT, RECs				engine models	
heavy plant mechanic 3	Always (100 %)	*degree in mechanical and electrical engineering*		SCOT				have practical experience	
panel heaters	Always (100 %)	*city and guilds certificate in vehicle body parts and paint operations*		RECS				can do good practical work	
auto electrician	Always (100 %)	*degree in electrical engineering and technology, degree in electronics*		SCOT, RECs				automotive paintings	

spray painters	Always (100 %)	*city& guilds certificate in painting*		SCOT				diagnose problems in automotive, problem solving in motor automotive, repair of engine in automotive, complete brake services, disk drum and hydraulic repairs, repair and replace all components on modern suspension systems	

ICT Trade/Technician Name	Technician Availability	*Minimum Qualifications*	*Preferred Qualifications*	Local Technician Source	Non-local Technician Sources	Employer Satisfaction with Technicians	Future Additional Technicians	Skill Competencies	Skill Deficiencies
network operators	Never (0%)	*degree in computer science, diploma in IT, diploma in electrical engineering*	*degree in computer science*	SCOT, Limkokwing		Completely Satisfied		have knowledge in IT, creativity, reliable and honest	lack of accountability, lack of integrity
principal network engineer	Rarely (25%)	*diploma in computer science, diploma in telecommunications*	*BSc in computer science, BSc in electronics, BSc in telecommunications, BSc in networking, BSc in software engineering*	SCOT, SPTC_TC		Somewhat Satisfied	4	competency depends on which institution students come from, UNISWA students are good in theory, Limkokwing students are good in practicals, scot students are good in the technical skills	cannot understand high level of needs, cannot implement the work to the end, some lack practical experience
computer technician	Rarely (25%)	*diploma in IT*	*certificate in IT*	SCOT, Limkokwing		Satisfied	1	hard drive installation, motherboard repairing	communications skills, marketing skills, screen repairing or replacements
facilities manager	Rarely (25%)	*diploma in computer science, diploma in telecommunications engineering*	*BSc in computer science, BSc in electronics, BSc in telecommunications, BSc in software engineering, BSc in networking*	SCOT, SPTC_TC		Somewhat Satisfied	4	some are best in practical experience, their experience depends on the institutions they come from	UNISWA students lack practical experience, scot students can't finish the job once started, Limkokwing students can't understand high level of needs

programming technician	Rarely (25%)	*associate degree in IT, diploma in IT*		SCOT		Completely Satisfied		coding basics	full course of programming
technicians	Rarely (25%)	*experience in technical skills, grade 3*		SCOT		Completely Satisfied		technical knowledge on how to fix problems	do not have technical experience
network and security support engineer	Rarely (25%)	*BSc in computer science, degree in IT*	*post graduate in IT management*		North West, TUT, DUT, UKZN, VUT , WITS		2	routing, switching, vlan segmentation, web, ftp	lack network monitory, remote management, vpn
marketing manager	Rarely (25%)	*diploma in sales and marketing, degree in IT, degree in marketing*	*diploma from sales and marketing, degree in marketing*	UNISWA			1	theoretical experience, good in planning and organised	lack of sales skills, lack of time management, lack of ability to close sales, lack of negotiating skills
information technology manager	Some times (50%)	*degree in IT, three years work experience*		SCOT, UNISWA, LIMKOKWING		Satisfied	1	technical knowhow in network repairs	need constant training due to technology advancement
Functional Consultant	Some times (50%)	*basic computer A+*	*accounting introduction*			Satisfied	3	technical skills, Microsoft expert, projects analyst, software engineering, understanding systems	only few people have master's and PhD, lack of skills, qualified but not fit for the skills

system administrator	Sometimes (50%)	*degree in IT, 3 years work experience*	*MCE*		PC training, University of Johannesburg (UJ)	Satisfied		able to understand and use server management programing, good with theoretical aspects of the job	lack of knowledge on servers, lack of practical experience on programming
printer machine technician	Sometimes (50%)	*electronics certificate*	*form 5 certificate*	VOCTIM		Somewhat Satisfied			repairing printers
system developers	Sometimes (50%)	*diploma in IT, 3 years work experience in system development*	*degree in IT*	SCOT, UNISWA		Somewhat Satisfied	3	knowledge in java skills, knowledge in php skills	lack knowledge in cisco skills, lack knowledge in python skills, lack knowledge in mobile app skills
computer repairs	Sometimes (50%)	*diploma in IT, some electrical knowledge*	*diploma in IT, electrical certificate, practical experience*	SCOT, UTECH		Somewhat Satisfied		theory, electrical knowledge	
cctv camera installation	Sometimes (50%)	*diploma in IT, experience in cctv camera installation, form 5*	*working experience in the above field, diploma in IT*	SCOT, Limkokwing		Somewhat Satisfied		installation, maintenance of cctv camera, theory	
graphic designer	Sometimes (50%)	*associate degree in graphic designer*		Limkokwing		Somewhat Satisfied		computer literacy	
information technology technicians	Sometimes (50%)	*diploma in IT, two years work experience*		SCOT, UNISWA		Satisfied		networking skills, maintain network, cisco skills	
public relations officer	Sometimes (50%)	*degree in commerce, degree in communication*	*degree in communication, degree in commerce*	UNISWA		Completely Satisfied		flexibility and commitment	lack of experience, lack of time management

computer technician	Some times (50%)	*network certificate, computer diploma, diploma in computer science*	*diploma in IT*			Satisfied		computer literate, good network administration	
network administrator	Some times (50%)	*degree in networks*	*networking master's degree, cisco certified network professional, cisco certified networking associate*		(UNISA)			ability to deploy network segments over server, understanding of the theoretical aspect of network administration	lack of network design strategies, lack of ability to work under pressure (slow)
programmer analyst	Some times (50%)	*diploma in computer science*	*BSc computer science, diploma in computer science*					design and develop software, implementation of the designs	weak practicals, people in Swaziland lack interest in such courses
computer instructor	Often (75%)	*computer certificate, Microsoft office certificate, basic training skills*	*basic training skills, diploma in IT*	Limkokwing		Somewhat Satisfied		Microsoft office	training skills
website designer	Often (75%)	*diploma in IT, form 5 certificate*	*diploma in ICT, 2 years working experience*	Limkokwing		Satisfied		updating website information, software installation	hardware systems
transmissions technician	Often (75%)	*diploma in IT, Diploma in BIT, form 5 certificate*	*degree in IT, Business communications*	Limkokwing		Somewhat Satisfied		programming, studio equipment management, office support, maintenance of systems	
office services	Often (75%)	*computer certificate, form 5 certificate, certificate in Microsoft office*	*diploma in IT*	Limkokwing		Satisfied		typing, scanning, photocopying	graphics
educator/instructor	Often (75%)	*diploma in IT, diploma in education*	*degree in IT, degree in education and training*	RECs	University of Pretoria	Satisfied	2	hardware systems	

IT support	Often (75%)	*diploma in IT, form 5, computer certificate*	*diploma in IT, practical experience*	RECs, SCOT, Limkok wing,	TUT	Satisfied		management of systems, customer service, theory	
Computer maintenance	Often (75%)	*diploma in IT, computer literacy, working experience*	*2 years practical work experience, degree in IT*	Limkok wing		Not Satisfied		IT support	hardware systems
IT systems Administration	Often (75%)	*BSc computer science, Microsoft system administration certification*	*BSc computer science degree with vast experience*	UNISWA		Satisfied	1	troubleshooting, networking	software development, databases
electrical engineer	Often (75%)	*experience and certificate*	*degree in the particular field, fluency in English and siSwati plus experience*	SCOT, VOCTIM		Satisfied		certificate grading scores, desktop support	internet inexperience
IT administrator	Often (75%)	*diploma in IT, degree in IT*	*degree in IT*	UNISWA		Satisfied	0	efficient in work, adequate experience in relation to the job, reliable and effective	
systems administrator	Often (75%)	*BSc degree in computer science, degree in IT*	*BSc in computer science*	RECs, SCOT	VUT, NW, TUT, UCT, WITS, KZN	Satisfied	2	good in project management, good analytical skills	lack of communication skills, lack human relations skills, lack of report writing skills
IT customer and business support	Often (75%)	*diploma in IT, degree in computer science*	*BSc in computer science*	SCOT, UNISWA		Completely Satisfied		networking, know systems, customer service, competence in interpersonal skills, understanding banking	managerial skills, lack of experience

graphic designer	Often (75%)	*diploma in graphic designing, associate degree in mass media communication, degree in journalism and copy writing, diploma in marketing, diploma in public relations*	*diploma in graphic design, associate degree in mass media communication, degree in journalists and copy writing, diplomat in marketing, diploma in public relations*	UNISWA, Limkokwing		Somewhat Satisfied	2	creative, flexible, willingness to learn, committed	lack of experience, lack of effectiveness, lack of time management, lack of analytical thinking
information technology technicians	Often (75%)	*BSc in IT*	*BSc in IT*	UNISWA		Satisfied	5	have theoretical knowledge, reliable, honest	lack of practical experience
information technology officer	Often (75%)	*diploma in IT , advanced degree in IT*	*degree in IT, diploma in IT*	SCOT, UNISWA		Somewhat Satisfied	2	computer literacy, good communication skills, good in software development skills, good in hardware skills, good in website management	lack of experience in pabx maintenance, cannot work without supervision
senior information technology manager	Often (75%)	*degree in IT, advanced diploma*	*degree in IT*	SCOT, UNISWA		Somewhat Satisfied	4	software support	practical exposure
graphic designer	Often (75%)	*associate degree in graphic design*		Limkokwing		Satisfied	1	computer literacy, computer software installation	marketing skills, work ethics
computer technician	Often (75%)	*degree in IT, associate degree in information techniques*	*diploma in ICT, certificate in computer*	SCOT, Limkokwing		Not Satisfied		theory, network devices	ICT hardware parts understanding, computer repairing
network technician	Often (75%)	*degree in computer science, diploma in IT*		NPYTC , SCOT		Satisfied		internet set up, networks monitoring	full network set up

information technology manager	Often (75%)	*degree in IT, experience in IT*		SCOT, UNISWA		Satisfied		networking skills	cisco skills
software installation	Often (75%)	*diploma in ICT, certificate in IT, form 5 certificate*	*diploma in ICT, 2 years working experience*	Limkokwing		Somewhat Satisfied		software updating, maintenance of network systems	
Cards design	Often (75%)	*diploma in IT, form 5*	*diploma in IT, certificate in Microsoft office, 2 years working experience*	Limkokwing		Satisfied		theory, Microsoft office	
assistant systems administrator	Often (75%)	*degree in IT, degree in computer science*	*degree in IT*	RECs, SCOT	north west university, university of cape town, wits university, tut, dut and ukzn	Satisfied		analytical skills, good project management	lack report writing skills, lack communication skills
information technology technicians	Often (75%)	*diploma in IT, degree in IT, certificate in IT*	*degree in IT*	UNISWA		Satisfied	2	good in desktop support, good information security, good in sql server administration, good in networking, good in server administration	lack a bit of information security, do not have IT governance
brander	Often (75%)	*degree in marketing, degree in public relations practitioner, associate degree in events management, degree in IT, degree in copy writing*	*degree in marketing, degree in public relations praactioner, associate degree in events management, degree in IT, degree in copy writing*	SCOT, UNISWA		Somewhat Satisfied	2	creative, flexible, willingness to learn	lack of experience, lack of analytic skills, lack of time management

banking systems technicians	Often (75%)	*BSc in IT*	*BSc in IT*	UNISWA		Satisfied	5	theoretical knowledge, committed to work, creativity skills, integrity, full of ambition	lack of practical experience, lack exposure to similar environment
system programmer	Often (75%)	*diploma in programming*	*degree in computer sciences, master's degree in computer science*	SCOT Sidwashuni_VTR		Somewhat Satisfied	2	understanding of programming language like c+, c++, hml and my sql, knowledge of relevant theory	lack of speed when it comes to programming, lack of experience
pabx technician	Often (75%)	*made certificate*	*city & guilds*	NPYTC, Sidwashini_VTR		Satisfied		installation of pabx systems,voip systems, programming pabx systems and ecn systems, cabling pabx systems	
IT technician	Often (75%)	*diploma in computer science, degree in computer science*	*n series certificate*	SCOT		Satisfied	2	installing new programs, cabling, planning, troubleshooting, dis assembly and assembling, programing	
graphic designer	Often (75%)	*associate degree in graphic design*		Limkokwing		Satisfied	1	computer literacy, working ethics, business management	
software developer	Often (75%)	*associate degree in IT, diploma in IT*		Limkokwing		Somewhat Satisfied			computer graphics, computer coding
computer technician	Often (75%)	*diploma in IT*		SCOT, Nhlanganano_VDI,		Somewhat Satisfied	1	hardware installation, good communication skills	

				Sidwashini_VDI					
network designers	Often (75%)	*diploma in it, cisco certificate*		Limkokwing		Satisfied	2		design network according to company specification, lack of security knowledge
information technology technician	Often (75%)	*computer science degree*	*degree in ICT, degree in education and training*	SCOT		Completely Satisfied		computer system, computer hardware installation, software installation	
application support engineer	Often (75%)	*degree in IT*	*post graduate in IT, post graduate in IT management*	SCOT	NWU, TUT, DUT, UKZN,UCT, WITS	Completely Satisfied		good in system security, good in payroll system, itul or codit	lack communication skills, lack of customer service
support technician 1st line	Often (75%)	*degree in electronic engineering, degree in it, degree in computer science, diploma in computer science, diploma in IT*	*degree in IT*	SCOT		Completely Satisfied		have theoretical knowledge	lack practical experience
network technician	Often (75%)	*networking certificate, networking diploma*	*degree in networking*	SCOT, Nhlanganо_VNE, Sidwashini_VNE	UNISA, WITS	Satisfied		ability to understand theory, ability to learn on site	lack of knowledge in routing and switching as a result of using virtual apps in tvets
level 3 technician	Often (75%)	*diploma in computer science*	*diploma in IT*	SCOT		Satisfied		software support, installation of application	

copy writer	Often (75%)	*degree in journalism, degree in mass media communication, degree in communication*	*degree in mass media communication, degree in communication, degree in journalism*			Completely Satisfied		flexibility	lack of practical experience, lack of time management
level 1 engineer	Often (75%)	*IT degree, computer science degree*		SCOT, UNISWA			2	software developer, implementation of IT programmes	
computer technicians	Always (100 %)	*a+ certificate, n+ ceremony, degree in computer science*	*MCSA certificate, a+ certificate, n+ certificate*	SCOT, UTECH		Satisfied	2	have theoretical knowledge, can install programs in pc, can assembly a pc, have knowledge in networking	lack of practical experience, lack of passion for the job, laziness
principal engineer	Always (100 %)	*diploma in electronic engineering, diploma in telecommunications engineering, diploma in IT*	*BSc in telecommunications engineering, BSc in electronic engineering, BSc in IT*	SCOT, Limkokwing		Satisfied	7	good in electronics computer skills, good in computer networking, have practical experience	focus on one aspect of the job and not like to diversify, shallow knowledge in the industry
information technology manager	Always (100 %)	*degree in computer science, degree in IT*	*degree in IT, degree in computer science*	SCOT		Satisfied	2	ability to supervise, ability to evaluate projects, ability to analyse complex issues, ability to develop and monitor budget, ability to communicate effectively	
computer operators	Always (100 %)	*diploma in IT*	*health care IT, degree in IT*	SCOT, Nhlangano_VDI, Sidwashini_VDI		Satisfied	4	good in practical skills, good in theory, good in time keeping, good in communication management skills, good in customer service	need extra training

information technology manager	Always (100 %)	*degree in IT, diploma in IT, certificate in it*	*degree in IT*	UNISWA		Satisfied	2	good in networking, good in server administration, good in sql server administration, good in information security, good in desktop support	lack a bit in information security
installation technician	Always (100 %)	*diploma in IT, diploma in computer science, diploma in electrical engineering*	*degree in electrical engineering, degree in IT*	SCOT, UNISWA		Satisfied	4	have practical experience, have theoretical knowledge	have difficult in adapting to work, do not have governance
ups technician	Always (100 %)	*trade certificate, city & guilds*	*city & guilds*	SCOT, Nhlangano_VTR, Sidwashini_VTR		Satisfied		provide emergency repair of electrical supplies, routine maintenance of electrical supplies	
ups technician	Always (100 %)	*trade certificate, city and guilt*	*city & guilds*	SCOT		Satisfied			
senior technician	Always (100 %)	*degree in computer science*	*city & guilds*	SCOT, Nhlangano_VDE, Sidwashini_VDE		Satisfied	2	good in software and hardware in computers, networking, programming, fibre optic, plotter	
network engineer	Always (100 %)	*diploma in computer science, ccna, n+, a+*	*ccna*	SCOT, UNISWA		Completely Satisfied	48	networking, troubleshooting, database	configuring routes, configuring switches

systems analyst	Always (100 %)	*degree in computer science, degree in IT*	*degree in IT, degree in computer science*	SCOT		Satisfied		good in client server architecture, good in unique and windows nt, good in network administration, good in desktop applications, good in internet and intranet technology	lacks programming skills, lack of business analysis skills
IT manager	Always (100 %)	*degree in IT*	*degree in IT*	SCOT, Nhlangano_VDE, Sidwashini_VDE		Satisfied		able to supervise, have management skills, good practical experience	
support technician 2nd line	Always (100 %)	*diploma in IT, diploma in computer science, diploma in electronic engineering*	*degree in electrical engineering, degree in it*	SCOT, UNISWA		Satisfied	4	have theoretical knowledge	lack practical experience
level 4 technician	Always (100 %)	*diploma in computer science*	*diploma in IT*	SCOT, Nhlangano_VDI, Sidwashini_VDI		Satisfied	10	good in software support, installation of applications, back up support, hardware of the machines or computer, identification, troubleshooting, repairs	
database Administrator	Always (100 %)	*degree in IT, degree in information systems, degree in mssq certificate*				Satisfied		troubleshooting, networking	

software developer	Always (100 %)	*degree in computer science, associate degree in information technology*		SCOT, UNISWA		Satisfied		software development	
senior programmer analyst	Always (100 %)	*BSc in IT*	*MSc IT*			Completely Satisfied		design and develop software, writing computer programs, updating computer program, repairing existing ones	
computer sales person	Always (100 %)	*certificate in sales and marketing*		NPYTC		Satisfied		good communication, business minded	
level 2 technician	Always (100 %)	*diploma in computer science*	*diploma in IT*	SCOT, Nhlangano_VDI, Sidwashini_VDI					
software developer	Always (100 %)	*associate degree in IT*		Limkokwing		Satisfied	1		software developer, software designer software designing,
computer hardware technician	Always (100 %)	*degree in computer science, associate degree in IT*				Completely Satisfied		connecting computer hardware	gps operating system
technicians	Always (100 %)	*n+, a+, two years work experience*		SCOT		Completely Satisfied		excellent network repair skills	lack of understanding latest computer hardware and connecting knowledge, constant training in new knowledge

Electrical Engineering Trade/Technician Name	**Technician Availability**	**Minimum Qualifications**	***Preferred Qualifications***	**Technician Source**	**Non-Local Sources**	**Employer Satisfaction with Technicians**	**Future Additional Technicians**	**Key Skill Competencies**	**Key Skill Deficiencies**
sale of electronic supplies	Never (0%)	*experience in selling electronic supplies*	*certificate in electrical engineering, 2 years working experience*	SCOT, MITC		Satisfied		good in theory	
millwrights (electrician plus mechanical fitter skills combined)	Never (0%)	*n3 certificate*	*technical certificate*		technikons	Satisfied		computer literate, valid driver's licence	
broiler maker machine technician	Rarely (25%)	*electronics certificate*		SCOT, UTECH		Somewhat Satisfied		machine operating	lack the millwright certificate
engineer in production	Never (0%)	*degree in mechanical engineering*	*ICT knowledge*			Somewhat Satisfied	1		
air conditioners technicians	Rarely (25%)	*diploma in engineering*	*technical university*	SCOT, VOCTIM		Somewhat Satisfied	3	understanding of concept, communication skills, technology, initiative	
maintenance manager	Rarely (25%)	*government certificate of competence in factory*	*MBA*	SCOT, VOCTIM	south african universities, and technikons	Somewhat Satisfied		technical skills, good in numerical, good in interpretations of technical drawing, problems analysis, skills variations, do	lacking basics knowledge of the work, syllabus is not in line with industry, thought what is not

								different tasks without too much supervision	demanded in the industry
regional engineer	Rarely (25%)	*degree in electronics*	*degree in electrical engineering*	SCOT	vaal university, kzn university, tut university, university of cape town, dut university	Satisfied	2	good leadership skills, good planning, project management skills, customer service skills, knowledge of engineering standards	too much theories and less practicals in their jobs, lack industrial safety practicals, lacking trade test, not recognised by other countries
air-conditioning technician	Rarely (25%)	*diploma in air conditioning*		SCOT, VOCTIM		Somewhat Satisfied		understand theory and technical part of the job	lack of budgeting skills
broiler maker	Rarely (25%)	*experience*	*work experience*	SCOT		Completely Satisfied	1	welding	lack experience
refrigerator technician	Rarely (25%)	*form 5*		VOCTIM		Satisfied	1		
electrician	Rarely (25%)	*grade 1 certificate in electrical engineering, certificate in electrical engineering grade 3*	*certificate in electrical engineering grade 1*	SCOT, VOCTIM		Somewhat Satisfied		good in theoretical knowledge, honest	lack simple basic refrigerator techniques
cctv cameras installations	Some times (50%)	*electrical certificate*	*diploma in IT, 2 years previous work experience*	SCOT, VOCTIM, MITC		Somewhat Satisfied		handling machinery and tools, safety measures	lack problem solving skills, little knowledge in practical work, lack decision making skills, not committed to work

boiler maker	Some times (50%)	*boiler making certificate grade 1*	*boiler making certificate grade 1*	SCOT, VOCTIM		Satisfied		good in theoretical knowledge, committed, have a little bit of experience	
maintenance engineer	Some times (50%)	*BSc in engineering*	*BSc in engineering*	SCOT, VOCTIM		Satisfied		good project management, good communication skills, skilled problem solving, computer literacy, report writing and negotiating skills	take time to finish work, lack practical experience, cannot read diagram and then apply it practically, lack of neatness
electrical technician	Some times (50%)	*grade 1 certificate in electronics*	*grade 1 certificate in electronics*	SCOT, VOCTIM	Matsamo Institute	Satisfied		good in practical experience, good theoretical knowledge, good in fixing television	
electrical technician	Some times (50%)	*grade 2*		SCOT		Satisfied		electrical wiring knowledge	cannot identify a problem in some materials, cannot fix power supply
electrical electrician	Some times (50%)	*certificate in electrical*	*electrical diploma*	SCOT, VOCTIM, MITC			1	cable identifying	
maintenance officers	Some times (50%)	*diploma in electrical*	*electrical engineer*	SCOT, UNISWA		Somewhat Satisfied		need further training	
civil engineer	Some times (50%)	*diploma in civil engineering, diploma in building studies*	*diploma in civil engineer+E298:E341ing, diploma in building studies*		VUT, DUT		1	good theoretical knowledge, reliable, good in practicals	
instrumentation technician	Some times (50%)	*experience in bakeries auto machines*		SCOT, UNISWA		Somewhat Satisfied	2	machines repairing, practicals in	

								operating heavy machinery	
boiler maker	Some times (50%)	*certificate in boils making, boiler maker trade test certificate, grade3*	*certificate in boiler making, diploma in boiler making*	SCOT, VOCTI M		Satisfied	2	skilful in making steel structures, good in welding, committed to work	
electronics repairs and services	Often (75%)	*electric engineering certificate, work experience*	*work experience*	SCOT, MITC		Somewha t Satisfied		repairs communication, computer skills, computer skills	
maintenance of traffic lights	Often (75%)	*grade 3 electric certificate*	*grade 3 electric certificate*	SCOT, VOCTI M		Satisfied		all the basics of electricity	work organisation, work ethic
civil engineer	Often (75%)	*diploma or degree in civil engineering, experience in that job*	*diploma or degree in civil engineering*	SCOT		Satisfied	2	being able to do the job as asked, good quantity surveying skills, theoretical knowledge in civil engineering, machine operations	
electrical technicians	Often (75%)	*form 5 certificate and experience*	*degree or diploma*	VOCTI M		Satisfied	1	theoretical knowledge	
maintenance and workshop machine operator	Often (75%)	*vocational certificate*	*diploma in mechanical engineering*	VOCTI M		Satisfied		practical knowledge	few work
electrical engineering	Often (75%)	*grade 2 trade test in electrical engineering*	*grade 1 trade test in electrical engineering*	SCOT, VOCTI M, MITC		Satisfied	2	good behaviour (sober habits), good application of theoretical knowledge	knowledge about safety, too much theoretical knowledge

artisans	Often (75%)	*grade 2 trade test certificate*	*diploma in artisan*	SCOT, VOCTIM		Somewhat Satisfied	2	workmanships is of high quality, level of execution is very high, problem solving skills, working flexible with groups, flexibility in working odd hours	poor practical knowledge
Electrical technician	Often (75%)	*experience*	*grade 1 certificate in electrical engineering or auto electrical*	SCOT, VOCTIM, MITC		Satisfied		theoretically knowledgeable	social life hinders the quality of the job performance thus sober individuals are more trust worthy, pay structures are compared with South Africa labour scales thus people tend to look for work outside
boiler makers	Often (75%)	*grade 3 certificate in boiler making*	*diploma in boiler making*	VOCTIM		Completely Satisfied		good in wielding, good theoretical knowledge, good in practicals	poor practical experience
electrical engineers	Often (75%)	*diploma in electrical engineering*	*master's degree in electrical engineering, experience with electronic utility interface, Ability to work with high level architectural electrical software*	NASTC, SCOT, UNISWA	UJ, UCT, WITS, DUT	Satisfied	2	develop ideas, excellent communication skills, experience, team workers	don't have practical experience

bio medical technician	Often (75%)	*diploma in mechanical engineering*	*degree bio medical engineering*	SCOT		Satisfied		fixing medical equipment, facility maintenance, set up electrical workshop, make maintenance plan for the machines, basic electrical maintenance	lack experience, lack exposure and skill
Electrical Engineering	Often (75%)	*grade 3 certificate in electrical engineering*	*minimum 3 years work experience*	SCOT, VOCTIM		Satisfied		competent, proactive, able to work under pressure	lack in management and logistics
radio technicians	Often (75%)	*certificate in electronics*		VOCTIM		Satisfied	0	electronics appliances knowledge	no deficiencies unless there is a shortage of cars to reach the place where there is a fault
senior electrician	Often (75%)	*national diploma in electrical engineering*	*degree in electrical engineering*	SCOT		Satisfied		ability to read drawings	
maintenance of buildings	Often (75%)	*grade 3 certificate in electrical engineering, form 5 certificate*	*diploma in electrical engineering*	SCOT, VOCTIM		Satisfied	2	good at everything	
electrical electrician	Often (75%)	*certificate in electrical*	*degree in electronics and electrical*	SCOT, UNISWA		Completely Satisfied	1	wiring types	lack practical training so company has to train
mechanical filters technician	Often (75%)	*electronics basic*	*diploma in electronics*	SCOT, UNISWA		Completely Satisfied	2	cable understanding	
branch superintendent	Often (75%)	*b-tech in electrical engineering*	*b-tech in electrical engineering*	SCOT	UKZN, DUT, TUT, UCT, VUT		1	customer relations skills, communication skills	

electrician	Often (75%)	*electrician diploma*		SCOT, VOCTIM			2	good in theory	lack of leadership skills, lack of planning skills
system administrator	Often (75%)	*diploma in information technology*	*certificate in information technology*	SCOT, Limkokwing		Satisfied	1	good ICT basic skills, gps working system	lack experience
foreman	Often (75%)	*grade 2, two years work experience*		SCOT, VOCTIM, MITC			2	ability to read drawings	
foreman	Often (75%)	*grade 3*		SCOT, VOCTIM		Satisfied	2	know how to read drawings	
electrician	Often (75%)	*grade 3, two years work experience*		SCOT		Satisfied		wiring skills	
technician	Often (75%)	*national diploma in electrical engineering*	*national diploma in electrical engineering*	UTECH	TUT, UP, UCT, UKZN, DUT	Completely Satisfied		communication skills, customer service skills	
electrician	Often (75%)	*n series diploma in electrical engineering*	*n series diploma in electrical engineering*	UTECH	TUT, VUT UKZN, DUT	Completely Satisfied		communication skills, customer service skills	lack reporting skills, lack of time management, lack computer skills
linesmen's	Often (75%)	*n4 diploma*	*n4 diploma*					customer service skills, workmanship strong, good inter personal skills	can't manage time, lack reporting skills, lack computer skills
electrician	Always (100%)	*diploma in electrical engineering*	*degree in electrical engineering*	SCOT, VOCTIM		Satisfied		good in theoretical knowledge, flexible in their job, have good practical experience	lack communication skills, lack reporting skills, lack of co-ordination skills
electrician	Always	*grade 3 trade test*	*diploma in electrical engineering*	SCOT, VOCTIM		Satisfied		good in trouble shooting, can work on	take time to finish a given task

	(100 %)							high voltage, good theoretical knowledge	
electrical engineer	Always (100 %)	*electrical grade 1*		SCOT		Satisfied		wiring harness	lack practical experience, not used to the environment, can't adapt easily
salesperson	Always (100 %)	*form 5 certificate*	*certificate in sales and marketing*	VOCTIM, MITC		Satisfied		good in electrical appliances	
site agent	Always (100 %)	*grade 3*	*grade 2*	SCOT, VOCTIM		Satisfied	3	understand electrical equipment and procedure	
electrician	Always (100 %)	*certificate as an electrician*	*certificate as an electrician*	UTECH, VOCTIM		Completely Satisfied	2	wiring	
electrician	Always (100 %)	*diploma in electrical engineering*	*diploma in electrical engineering*	VOCTIM		Completely Satisfied	1	good in installation, good in wiring	
electrician	Always (100 %)	*trade test from divt*	*n3 certificate in electrical, grade 2 trade test, N3 certificate*	SCOT	ehlandzeni/ mlumati technical college	Completely Satisfied	1	good practical knowledge, good theoretical knowledge	cannot do industrial electrical (3 phase)
assistant electrician	Always (100 %)	*diploma in electrical engineering, n6 certificate, n5 certificate, n4 certificate, n3 certificate*	*degree in electrical engineering*	SCOT, VOCTIM			2	good in practical experience, good theoretical knowledge, flexible in their job	

senior electrician	Always (100 %)	*grade 3 trade test, n1-3 certificate, diploma in electrical engineering*	*diploma in electrical engineering*	SCOT, VOCTIM			2	can do high complex electrical work, able to supervise	late delivery of a given job
electrical technician	Always (100 %)	*diploma in electrical engineering*	*diploma in electrical engineering*	SCOT, VOCTIM		Satisfied	2	ability to read and interpret electrical circuits, computer literacy, good trouble shooting, application of ohs measures, occupational and safety skills	lack of leadership skills
cell phone technician	Always (100 %)	*form 5*				Satisfied	2	screen replacement, software installation	lack of managerial skills
electrical engineer	Always (100 %)	*grade 3, experience*	*grade 2*	SCOT, VOCTIM			1	understand electrical equipment and procedures	
boiler maker	Always (100 %)	*certificate in boiler making*	*certificate in boiler making*	SCOT, VOCTIM			2	good practical experience, committed to work	
boiler maker	Always (100 %)	*nts3 certificate in boiler making*	*nts3 certificate in boiler making*		yskor pretoria		2	good in developing, good in drawings, good in welding, good in maintenance, good in structure building, computer box techniques	
senior technician	Always (100 %)	*national diploma in electrical engineering*	*national diploma in electrical engineering*	SCOT, UTECH	TUT, DUT, VUT, UCT, UP	Satisfied	3	customer service skills,	

building inspector	Always (100 %)	*diploma in building studies, diploma in construction*	*diploma in building studies, diploma in construction*	SCOT		Satisfied		good understanding of building and housing act, good communication skills, computer literacy	lack report writing skills, lack time management, lack computer litter
fitters	Always (100 %)	*grade 3 trade test, diploma in mechanical engineering, n1-6 certificates*	*diploma in mechanical engineering*	VOCTIM		Satisfied		able to fix machinery, good trouble shooting skills	
roadworks technician	Always (100 %)	*diploma in civil engineering*	*diploma in civil engineering*			Satisfied		good trouble shooting, committed to work, disciplined	lack the practical experience in fixing other machines
electricians	Always (100 %)	*grade 2, experience*		VOCTIM		Completely Satisfied		electrical knowledge and understanding	

10. Appendix 2: Inventory of Training Equipment (SCOT & Gwamile VOCTIM)

SCOT Equipment Inventory

Electronic lab

Block J

Description	Available	Needed
1. Soldering Iron	4	30
2. Power supply 5volts	7	10
3. Power supply 0volts to 12volts	10	20
4. Bread boards with 12volts	12	20
5. Single Bread boards	0	30
6. Oscilloscope two channels	20	
7. Oscilloscope four channels	0	30
8. Signal Generator	14	30
9. Digital multi meter	8	
10. Step down transformer	10	20
11. 9v battery charger	0	4
12. 1.5 battery charger	0	4
13. Full kits solar panels	0	4

We are hoping to get 24 computers from Taiwan with full software of simulation and printed circuit boards. 10 more will be needed.

General

Description	available	Needed
1. Projector	1	4
2. Printer	1	4
3. Air conditioner	1	4
4. Teacher's Table & chair in class	2	4
5. Scanner	1	4

Technical Drawing

Description	Available	Needed
1. Lecturer's drawing board	0	1
2. Lecturer's square grid	0	1
3. Lecturer's working table	0	1
4. Sanding block	0	1
5. Installable pencil sharpeners	0	1
6. Equipment drawers	0	2
7. Drawing table with accessories	0	30
8. Drawing table		
9. White boards	2	4

The drawing room was affected when renovations were carried out and it was never replaced properly - it was moved to another classroom.

Electrical work shop

Block P

Description	Available	Needed
1. Heavy duty Drilling machines They all needs to be serviced	5	5
2. Heavy duty grinder Needs service	1	1
3. Teaching aid geyser	1	3
4. Teaching aid Stoves	2	2
5. 3 phase motors		
6. 1 single phase motor		
7. Tools Enough for twenty students	20 sets	12sets
8. Work bench with vice grips	31	
9. Gallatin	1	
10. Cubic's	16	
11. Consumables (house wires)		

Challenge for this workshop

Not suitable for more than 25 students, they have to share tools and components.

The Cubic's were designed for 16 students.

Block P Lab

Germen equipment with house wiring and industrial wiring.

This lab was design for 15 students.

Industrial wiring

Block R

Description	Available	Needed
1.Industrial power wiring trainer (Wiring control panel)	2 sets	
2.Industrial power wiring Trainer (Test and maintenance panel)	2sets	
3.Lower voltage industrial wiring Training box (B Class)	1 set	
4.Aluminum workbench	8	
5.Aluminum Teacher table	1	
6.Three-phase power supply box	8 sets	
7.Chair	30	4
8.Material	6	
9.Toolbox	30 sets	4
10. Basic electricity Experiment Equipment	4	
11. blackboard	1	
12.Material cabinet	2	
13.Industrial wiring parts and consumables		
14.Industrial wiring power trainer (practical panel)	30 sets	4 sets

PLC lab

Block U

Description	Available	Needed
1. Programmable logic controller (PLC) Trainer	30 sets	4
2. Programmable Load Mechanism (1)	1	
3. Programmable Load Mechanism (2)	1	
4. Programmable Load mechanism(3)	1	
5. Air compressor	1	
6. Aluminium workbench	8	
7. Aluminium teacher table	1	
8. Three- phase power supply box	8 sets	
9. Chair	30	4
10. Material rack	4	
11. Laptop	30	4
12. Material Cabinet	2 sets	
13. Tool box	5 sets	
14. Repair spare parts	1 set	

Fully sponsored by the Taiwanese Government. It accommodates 30 students will we have 33 students which results in order students sharing

SCOT ICT EQUIPMENT INVENTORY

B-Tech lab
Total Number of Computers: 15
Computer Specification: Dell Optiplex 3020,Intel Core i5 4590 Processor @3.30 Ghz,500 GB,4GB RAM

ICT Lab
Total Number of Computers: 41
Computer Specification: Acer Veriton x4640 G,Intel Core i5 6400,Processor @2.70 Ghz,1TB,4GB RAM, Windows 10 pro

Engineering & Science Lab
Total Number of Computers: 40
Computer Specification: HP Pro 3300 mt i5-2400s @ Processor @2.50 Ghz,500 GB,3GB RAM,Windows 7
Mecer Dual Core E6300 @2.80 Ghz,2GB RAM,250 GB,Windows 7 Pro

Building & Civil lab
Total Number of Computers: 25
Computer Specification:
Mecer Dual Core E6300 @2.80 Ghz,2GB
RAM,250 GB,Windows 7 Pro

Business Admin lab
Total Number of Computers: 35
Computer Specification:
HP Compaq 6300,i5-3470 @3.20 Ghz,4 GB,
RAM 500GB ,Windows 7 Pro

Library Resource Lab
Total Number of Computers: 13
Computer Specification:
Mecer Dual Core E6300 @2.80 Ghz,2GB
RAM,250 GB,Windows 7 Pro

Design & Technology lab
Total Number of Computers: 28
Computer Specification:
Dell Optiplex 3080,Intel Core i5 4590,
Processor @3.30 Ghz,500GB,4GB RAM,
Windows 10 pro

Equipment needed
1. 10 X wireless fixed projectors
2. 4 X Servers
3. 5 X Industrial Printers
4. 5 X Industrial Photocopiers
5. Networking of Two labs
6. 5 X 48 port Cisco Switches
7. 30X laptops
8. 5X Ubiquiti Access points
9. 150 licenses X NOD 32 Antivirus
10. 10 X Corel Word perfect licenses
11. Autocad
12. Archicad
13. Adobe

ELECTRICAL EQUIPMENT IN NEED

NO.	ITEM NAME	SPECIFICATIONS OF ITEM	QTY.
1.	U.V Exposure Unit	H. 95 W. 405 D. 175 Wt. 3Kg with about TWO 8w replaceable fluorescent tubes. Built in timer and a mains ON/OFF switch with an indicator and an exposure area of about 245*225	2
2.	P.C.B processing etching tank, heated	Thermostatically controlled heating element adjustable over the range of 10-60˚C with indicators for mains and temperature plus knobs for adjustments. Suitable for use with ferric chloride etching solutions and supplied with a manually operated syphon pump for tank emptying.	2
3.	A3 flatbed plotter	Designed with 8 pen which are held firm on an electrostatic holder. It should have an advanced micro-step stepping motors, which deliver a pen speed of about 50cm per second(20ipc) fully compatible with application software such as that used for the design of printed circuit boards.	2
4.	PCB etching trays	Trays suitable for containing developing and etching solutions (sodium hydroxide and ferric chloride) size: L.313 W. 264 D 58 should be in different colours to allow coding.	6
5.	PCB drilling machine	With a stand to adjust for various heights and various sizes of drill bits.	2
6.	HP graphic plotter pens	A range of quality tip/plastic plotter pens. Each range should be of black and colour in 0.3mm sizes to 5 colour mix 0.7mm nib size.	20
7.	PCB processing chemicals	1. Ferric chloride hexahydrate crystals 2. Universal developer: a sodium hydroxide free powder concentrate for all standard alkaline developed positive photoresist and aqueous dry finish photoresist suitable for long shelf life in an unmixed form and about 3 to 4 weeks in a solution form.	100G
8.	Photoresist boards	Copper clad epoxy glass boards with positive photo-resist surface protected by a peel-off plastic film. Suitable for the manufacture of printed circuit boards, to use with chemicals such as sodium hydroxide as a developer and ferric chloride as an etchant.	20
9.	12Mhz function generator	A general purpose function generator having push button selected sine, square and triangle waveforms together with a T.T.L compatible square wave(5V) and an auxiliary facility for a provision (V.C.F) allowing the unit to be used for automatic frequency response testing.	12
10.	20Mhz dual trace oscilloscope	With the following features: 1. Sharply defined trace format 2. Ability to display TWO channels at magnification levels *1 or *10	12

		3. Single sweep and hands free (auto) triggering modes 4. 1 set of test leads.	
11.	Logic Tutor LT345MK2	Ideal for introducing logic tuition into syllabus on a small budget. Easy to use board for studies of digital techniques and principles supplied with a comprehensive teaching manual for ease of interconnection and understanding, all necessary inputs and logic indicators are built in and all logic elements are shown in mimic diagrams form on a panel.	15
12.	Desk top computers	Windows 8	6
13.	Laptop computer	Windows 8	6
14.	Printers		2
15.	Photocopying machine		2
16.	Overhead Projector		2
17.	Portable oxy acetylene outfit with tanks		3
18.	Refrigeration two stage rotary vacuum pump		3
19.	Soldering Iron Station		25
20.	AC electric motors(50Hz, 0.4-0.5A, 1330/2650rpm)		12
21.	High Voltage tester (max 1000V)		3
22.	Cable tracer Machine		
23.	Vibration tester	Fluke type	3
24.	Non-contact voltage detector	Adjustable sensitivity	24
25.	Clamp meters	Digital type	12
26.	Capacitor testers	(0….20000uF, with alligator clip	25
27.	Polarity tester		24
28	Temperature gun		2
29	Anemometer		1
30	Fin Comb		2
31	Halide torch	For leak detecting	4