Cape Peninsula
University of Technology

THE IMPACT OF SKILLS SHORTAGE IN THE HEATING, VENTILATION AND AIR CONDITIONING INDUSTRY IN THE WESTERN CAPE

by

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I, Thomas A. Lubbe, declare that the contents of this dissertation/thesis represent my own unaided work, and that the dissertation/thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

……..

SIGNATURE

10 January 2020

……..

DATE

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ABSTRACT

This thesis examined the impact skills shortage among artisans in the heating, ventilation and air conditioning (HVAC) field have on the industry.

The rationale for this investigation is based on the view of engineers and company owners in the HVAC industry that there is a dire need to train more artisans and to improving the skills of already qualified artisans.

The thesis employed a mixed method research approach and reviewed relevant literature. Empirical data was obtained from HVAC contracting companies being members of the South African Refrigeration and Air Conditioning Contractors Association (SARACCA) in the Western Cape.

The study demonstrates that there is a shortage of skilled and qualified artisans in the HVAC industry. Although there are individuals within the HVAC industry who are passionate about training, their efforts cannot supply the whole industry with knowledgeable qualified artisans. More emphasis should be placed on basic education, the level of artisan training, continuous training of qualified artisans and the retention of skilled artisans.

Based on the findings, the study concluded that skilled artisans and poor quality workmanship is being experienced on a continuous basis. The lack of skilled artisans and the cost implication to obtain skilled artisans force companies to employ unskilled labour.

It is recommended that the industry should work closer with government agencies to ensure that training being offered by private training institutions and colleges is aligned with the industry requirements. This together with an improved education system will secure skilled artisans.

Keywords and –phrases:

Artisans, skills shortage, air conditioning, refrigeration, training, staff retention, technicians, reasons for skills shortages, unemployment

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CHAPTER ONE

INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Employees fulfil an important role in any organisation. If they do not have the required skills they can cause irreparable harm to the organisation and their colleagues but if they do have the required skills they can assist organisations to become forces to be reckoned with in the industry, benefitting all stakeholders.

Smith holds that as early as the 1700s people realised that better training and performing more complicated and advanced tasks than a normal labourer should earn a worker a higher wage. He also posits that people should be trained during an apprenticeship and that during this stage they should be independent (Smith, 1776:141-142). The better one's training and the better one's work performance the better one should be paid.

Acquiring skills is of the utmost importance, not only for the organisation but also for the individual. Skills are not acquired overnight, it is a time consuming process that requires the assistance and guidance of mentors, trainers and organisations willing to invest in their staff and the industry.

According to the Compact Oxford English Dictionary (Judy Pearsall, 2014), terms used in this proposal are defined as follows:

> *"Skill - the ability to do something well, expertise or dexterity".*
>
> *"Knowledge - information and skills acquired through experience or education".*
>
> *"Dexterity skills in performing task, especially with the hands".*

Not only does one require dexterity in the heating, ventilation and air conditioning (HVAC) industry, but also problem solving skills.

The discussion regarding learner ship is not new and Adam Smith discussed this in his book, The Wealth of Nations, which he wrote between 1766 and 1776. During this time an apprenticeship was seven years in duration (Smith, 1776:165).

The Manufacturing, Engineering and Related Services Sector Education and Training Authorities (merSETA, 2019) currently guide the training and minimum entry

requirements. According to its website, the organisation does not offer training but rather facilitates training by outside companies by paying grants to these companies. The organisation also identifies scarce skills, offers accreditation to training providers and monitors training. It identifies skills gaps and implements projects to close these gaps (merSETA, 2019). This was confirmed by the Minister of Higher Education, Mrs Pandor, in the government gazette (Department of Basic Education, 2014).

Based on the researcher's experience, these guidelines are too simple and this has a direct impact on an artisan's personal development and the growth of the industry.

In a recent article in the Refrigeration and Air Conditioning Africa Journal (Anon, n.d.), the writer mentioned that the reform of the sector education and training authorities (SETAs) has been discussed since 2015 with the idea to implement the National Skills Development Strategy (NSDS). The former Minister of Education, Blade Nzimande, was not satisfied with the way the SETAs were administered and the Department of Higher Education and Training made numerous attempts to restructure the SETAs to no avail. Instead, in December 2016, the SETAs were re-established for a further two years, from 2018 to 2020. Minister Pandor recently proposed four guiding principles to take over from the SETAs post 2020. One, there must be alignment between skills development strategies, national priorities and an industrial policy framework. Two, all economic sectors must be covered by the SETAs. Three, the SETAs must be financially stable and operationally viable. Four, specific functions of the SETAs must be grouped together (this will reduce the current 21 SETAs to 15. Numerous stakeholders have raised their concerns regarding the third principle).

In the same article, Sean Jones, (Managing Director of the Artisan Training Institute (ATI)), wrote that reducing the number of SETAs will not necessarily lead to improved performance and that the performance should be measured by the level of engagements and professionalism together with job creation. According to Jones, consultation between the SETAs and the industry they serve should be critical. Misalignment of their focus on skills development with the requirements of the industry will affect employment prospects for the youth.

This sentiment was echoed by Jeff Hobbs from Techniskills when he claimed that "the standard and quality of trained people we do produce are not always up to scratch". Hobbs refers to the poor state of training currently available. Grant Laidlaw from the Air Conditioning and Refrigeration Academy (ACRA) confirms Hobbs views in the

sense that, based on an independent report assessing the skills in the industry, it was found that 95% of the people working in the industry are not qualified to do so (Koegelenberg, n.d.).

In the Government Gazette/Staatskoerant REPUBLIC OF SOUTH AFRICA/REPUBLIEK VAN SUID AFRIKA Vol. 645 7 March/Maart 2019 No. 42290 the minister posited that: “The NDP calls for such an improvement in the quality of education and training to enhance the capabilities of our people so that they are active participants in developing the potential of the country” (Department of Basic Education, 2014).

In addition to the skills shortage in this industry, the cost to replace employees also has a vital role in the industry, as a substantial number of companies are small (fewer than six employees) and do not have a human resource department with skilled interviewers.

There is a dearth of studies related to the industry under investigation, the region and the impact the shortage of skills has on this industry. Although this research focused on a specific area, it could be extended at a later stage to involve the whole of South Africa.

1.2 PROBLEM STATEMENT

The shortage of skilled artisans challenges companies’ ability to render quality services to customers and unskilled people are hired to work in the absence of qualified, skilled artisans. This, together with the low number of skilled among qualified artisans, is resulting in diminished service quality and growth.

No evidence was found of regulated continuous training for artisans to assist them to keep up to date with the latest developments and legislation.

Working with qualified artisans in the heating, ventilation and air conditioning (HVAC) industry every day, the researcher’s experience is that artisans do not have the required skills and that incorrect diagnostics and poor quality workmanship seems to be the norm in the industry.

One of the skills required is the ability to complete a task correctly the first time, within a pre-defined time frame and in line with legislation. Legislation in this context refers to the National Building Regulations - SABS 0400, the Wiring of Premises - SABS

0142-1, the Occupational Health and Safety Act 85 of 1993, Construction Regulations GN No R1010 applicable under the Occupational Health and Safety Act, as promulgated on the 18th of July 2003, SANS 10147:2014 (South African National Standard, Refrigerating Systems, including plants associated with air conditioning systems) and the Montreal Protocol as adopted on 15 October 2016 that includes the Kigali amendment.

Although legislation does exist, it is not strictly enforced and only a limited number of artisans comply. Adhering to legislation should be one of the skills practiced by any artisan.

An employer that utilises unskilled/unqualified labour may be held liable should something go wrong during or after completion of the work.

The end user takes a risk by contracting unskilled and unqualified people to perform a job.

A contributing factor to employing unskilled and/or unqualified staff is the lack of youngsters entering the HVAC industry. Young people are simply not interested in entering this industry.

1.2.1 Aim and Objectives of the Study

Being involved in the HVAC industry for the past 32 years, the researcher has first-hand experience of the lack of skilled and qualified technicians. As the older members of the industry depart, no young artisans are there to fill the gaps. Reflecting on the increase of sales of air conditioning equipment in the region and the continuous demand for cold storage, there is an ever decreasing number of skilled and qualified technicians to install and maintain the HVAC equipment being sold.

It is also the researcher's opinion that the end users do not fully comprehend the negative impacts that could result from employing companies that do not have a skilled and qualified labour force.

The planned outcome would be to determine:

- the reasons for young people not entering the HVAC industry despite unemployment among the youth in 2018 at 52.8% (Anon, 2018);
- the reasons for companies not investing in the training of new talent and

- the impact the lack of skilled and qualified artisans has on the stakeholders.

All stakeholders in the HVAC industry should benefit from this research.

- The clients, as they will gain access to the best possible advice and service.
- The employers, as they will have access to competent, skilled staff and have the knowledge that the front liners, (in this context front liners are those people in an organisation that will be the first to make contact with the client), will be able to deliver quality service to the clients and assist in growing the business.
- The employees, as they will be able to work with confidence, offer good service and be in a position to negotiate better wages. This in turn will contribute to the economy.
- The industry, as it will be able to attract potential artisans if the industry is able to offer training, employment and personal growth to individuals.

1.2.2 Research Questions

Does the lack of skilled and qualified HVAC artisans have a devastating impact on the industry's ability to work within the framework of competitive business practises and legislation?

Research sub-questions

- Do artisans have the required skills?
- What do employers perceive as good service?
- Do companies plan strategically for training?
- Do the instructors have the skills and sufficient subject knowledge to impart to the students?
- Should artisans be required to remain up to date with the latest developments in their field by attending regulated refresher courses annually?
- In what way is merSETA assisting companies that currently offer training?

The objective of this study was to answer the questions listed above.

In conclusion, the lack of skilled and qualified HVAC artisans has a devastating impact on the industry's ability to work within the framework of competitive business practises and legislation.

1.2.3 Rationale and Significance of the Study

The purpose of this study was to critically investigate the factors listed hereunder.

- The current skills acquired by artisans and if these skills and knowledge are sufficient to benefit employers and clients.
- The need for continuous training will also be investigated and information gathered will be used to establish a platform for implementing regulated continuous training.
- The impact the government (merSETA) has on training.
- The cost involved to train staff and employ new staff.
- The lack of young people entering the HVAC market.

The industry is in dire need of additional qualified, skilled artisans. This is the perception of members of the industry. The research will also be used to establish whether or not this perception is factual.

1.2.4 Hypothesis

The lack of skilled artisans has a devastating impact on growth, employment and profitability in the HVAC industry.

Working with qualified artisans in the HVAC industry every day, the researcher's experience is that they do not have the required skills to assist their employers in gaining a competitive advantage and thus assisting their companies to grow.

Incorrect diagnostics, poor quality workmanship and a complete disregard for legislation seems to be the norm.

The lack of young people entering the industry should be a major concern.

1.3 THESIS OUTLINE

The following is an outline of the chapters contained in this thesis.

Chapter one presents an overview of this research and describes the problem statement, describes the aim and objective of the study. The rationale and the significance of this study are discussed and the research question with sub-questions are introduced to the reader and the hypothesis is stated.

Chapter two provides an overview of the literature related to the impact of the skills shortage in the heating, ventilation and air-conditioning industry. Special attention was given to the important of staff in an organisation, the current unemployment levels in South Africa and Governments role in addressing unemployment. Further attention were given to identify skills shortage, and to confirm that there is indeed skills shortage, the reason why there is skills shortage and then the important's of staff development and the retention of staff in an organisation.

In Chapter three the research design and methodology were identified in the following headings:

- Research Paradigm
- Research Method
- Research Design
- Research Population
- Sample Method/Technique and Sample Size
- Data Collection Instruments
- Data Collection
- Data Coding and Analysis

Special attention was also given to the ethical consideration of this thesis and the limitations of the research was highlighted.

In chapter four the data was analysed and the results of the questionnaires were presented. As an introduction to the chapter, the coding and presentation of the data was explained. The analysis for the quantitative questions in the form of a graph and/or an explanation was done followed by the analysis of the qualitative questions. (The questionnaire is available in annexure D of this document.)

Chapter five (the last chapter) was dedicated to the discussions of the findings. Each of the questions and sub-questions as highlighted in chapter one were answered taking the results of the questionnaire in consideration. Three recommendations were done and suggestions for future research were identified. In the last paragraph of chapter five the following was concluded; the lack of skilled and qualified HVAC artisans has a devastating impact on the industry's ability to work within the framework of competitive business practises and legislation.

1.4 CHAPTER SUMMARY

Chapter One presented an introduction to the research and discussed the importance of skilled, qualified staff in an organisation. The reader was taken through the process of the problem statement and how such a statement could be justified.

The aim and objectives of the study were highlighted and the planned outcome was discussed.

The research question and sub-questions were stipulated and the hypothesis was formulated and the rationale and significance of the study was discussed.

Chapter Two discusses the importance of staff, unemployment and the government's role in addressing unemployment, evidence of skills shortages, reasons for skills shortages and the development and retention of human capital.

CHAPTER TWO

OVERVIEW OF THE IMPACT OF THE SKILLS SHORTAGE IN THE HEATING, VENTILATION AND AIR-CONDITIONING INDUSTRY IN THE WESTERN CAPE

2.1 INTRODUCTION

Chapter one investigated and discussed the problem statement and the ways in which the skills shortage affects businesses. The rationale, significance, aim and objective of this study was discussed. The research questions were examined and the hypotheses stated. The testing of the hypotheses is presented in Chapter five. This study aimed to examine the impact of the skills shortage on service delivery in the air-conditioning industry. In the absence of acceptable service levels companies will not be able to grow and will ultimately fail.

In this section the researcher aims to take the reader from the broad concept of why companies exist to the defining statement that skills are important for growth. The shortage of skilled workers in the HVAC industry in the Western Cape is the focus of this chapter.

2.2 IMPORTANCE OF STAFF

Companies employ staff to assist in increasing shareholder value.

A business enterprise's vision statement expresses its focus and gives direction to what that company desires to become, whereas the mission statement addresses the question, "What is our business"(Ehlers & Lazenby, 2012:69, 71). With the mission and vision statements in place, companies can focus on a strategy to gain a competitive advantage over their competition(Ehlers & Lazenby, 2012:3).

According to Stone (2005:5), management is defined as "the act of getting things done through people".

Swanepoel, Erasmus and Schenk (Swanepoel, B. J. (Ed), Erasmus, B. J. & Schenk, 2009) place people at the centre of the value chain in their conceptualisation diagram depicting organisational value creation. This establishes the importance of people in an organisation.

Following on from the previous statement, it is not just a case of employing people but employing the correctly skilled people to assist companies to obtain a competitive advantage.

All the work in the HVAC industry is performed by people and the largest portion thereof should be undertaken by artisans.

In the company in which the researcher is employed the artisans are referred to as “front liners”. In the majority of cases the artisan is the first person to make contact with the client when arriving on site. This first interaction can determine the relationship between the company and the client going forward, hence the importance of employing skilled technicians.

According to Schlechter et al. (2014), having the appropriate skills at one’s disposal is a critical component of competitiveness.

The Global Competitiveness Index 4.0 measures national competitiveness in 140 countries defined as the set of institutions, policies and factors that determine the level of productivity. In 2018 South Africa was ranked 67 out of the 140 countries and five places below its 2017 position (World Economic Forum, 2018).

Schlechter et al. (2014) posit that this is a clear indication that the level of skills is declining and this is preventing South Africa from being competitive in the global market.

The focus areas of the Global Competitiveness Index 4.0 are the institutions, policies and other factors that drive productivity. The factors are organised into 12 “pillars” to calculate the level of a country’s productivity.

- Pillar 1 - Institutions
- Pillar 2 - Infrastructure
- Pillar 3 - ICT adoption
- Pillar 4 - Macroeconomic stability
- Pillar 5 - Health
- Pillar 6 - Skills
- Pillar 7 - Product market
- Pillar 8 - Labour market
- Pillar 9 - Financial system

Pillar 10 - Market size

Pillar 11 - Business dynamism

Pillar 12 - Innovation capability

Table 2.1 presents a summary of the level of skills in South Africa based on research conducted by the World Economic Forum (WEF) (World Economic Forum, 2018).

Focussing on Pillar 6, the WEF captures the quantity and quality of education and the general level of skills among the workforce. The importance of this is that the competencies and skills of the workforce are embedded by means of education. The WEF has concluded that populations with high levels of education are more productive and have a better ability to perform the required tasks. They are also able to create new knowledge and applications and they were found to transfer their knowledge more efficiently than those with lower levels of education (World Economic Forum, 2018).

Table 2.1: Skills

South Africa 67th/140		
Index Component	**Rank/140**	**Best Performer**
Mean years of schooling	53	Finland
Extent of staff training	55	Switzerland
Quality of vocational training	85	Switzerland
Skillset of graduates	98	Switzerland
Digital skills among population	116	Sweden
Ease of finding skilled employees	77	United States
Schooling expectancy in years	78	Multiple (9)
Critical thinking in teaching	78	United States
Pupil-to-teacher ratio in primary education	107	Multiple (6)

Botha mentioned that the shortage of talent will prevent companies from growing and thereby prevent them from gaining a competitive edge, which could jeopardise their survival (Botha et al., 2011).

In the current era employees' knowledge and skills are the main competitive enablers. Without skilled and knowledgeable employees companies will not be able to grow and compete in the market (Botha et al., 2011).

Finding and or retaining knowledgeable and skilled employees has forced a paradigm shift in which the employer-employee relationship has changed and is currently in favour of the employee (Botha et al., 2011).

The following two quotes by Richard Branson say it best. "*Train people well enough so they can leave, treat them well enough so they don't want to"* and *"I have always believed that the way you treat your employees is the way they will treat your customers, and that people flourish when they are praised"* (Medrut, 2018).

The importance of people and their abilities to add value to the organisation has thus been established.

2.3 UNEMPLOYMENT

According to Fin24 (Anon, n.d.), the unemployment rate in South Africa increased to 27.6% in the first quarter of 2019 compared to 27.1% in the last quarter of 2018.

This is in line with what economists predicted for the first quarter of 2019, according to Fin24 (Anon, n.d.).

It is estimated that in South Africa, (in the first quarter of 2019), there were 16.3 million people employed and 6.2 million unemployed people between the ages of 15 and 64.

This situation is unfortunately worsening and according to Stats SA, unemployment increased to 29% in the second quarter of 2019. Two different values contributed to this increase. The first was 150 000 people of working age entering the labour market and the second was that 455 000 people lost their jobs. Employment increased by 21 000 people. The total number of unemployed people increased by 476 000 between the first and second quarters.

Unemployment is increasing and yet the number of young people entering the HVAC industry is declining. During an interview with Mark Rogers (M. Rogers, personal communication, July 30, 2019), he opined that a number of young people enter the industry and their employment is terminated relatively quickly because as soon as they begin to earn an income their extended family lay claim to that money. The youngsters

entering this market are often from families in which the members are not formally employed and although the wages are low, in most cases this is the only income the family has. The money is spent on survival and nothing is left to pay for transport to get to and from work. This results in the young worker/apprentice either being fired or just not showing up for work.

Mark Rogers and his team identified this challenge and planned to take a holistic approach in which the worker/apprentice could reside at the training facility for the duration of the training. They would be able to study and work without external factors preventing them from achieving long term employment. According to Mr. Rogers, the stakeholders that committed to assist in supplying equipment for the training facility and the local municipality that would have assisted with housing for the students, withdrew from their commitment at the last minute and he was forced to abandon the project.

South Africa is currently experiencing an economic crisis, as is the rest of the world, and only 2% economic growth was achieved between 2008 and 2012 and this has contributed to the unemployment crisis South Africa is experiencing.

2.4 GOVERNMENT'S ROLE IN ADDRESSING UNEMPLOYMENT

In a recent radio interview, Bernard Swanepoel, Chairman of the Small Business Institute, claimed that unemployment has reached a crisis level and that the government should not be generating employment but rather improving the circumstances to encourage employment creation. He made reference in the interview to the last time the government attempted to generate employment. Approximately 30 000 people were appointed at the Electricity Supply Commission (ESKOM), which created an additional strain on ESKOM. According to a recent article by Kevin Brandt, the salary expense to ESKOM is the second highest expense for the power utility and with operational reforms and cost-cutting to take place over the next four years totalling R33 billion, job losses will occur, thus exacerbating the company's problems (Kevin Brandt, 2019).

According to Andile Sicetsha's article, GCIS Acting Director-General, Phumla Williams, said that the government has placed economic growth and job creation at the centre of the national agenda. Williams also said that for creating sustainable jobs and growing the economy, local and foreign investments significantly contribute to reducing

inequality, unemployment and poverty. This is in line with the national goals of socio-economic development (Andile Sicetsha, 2019).

Andile Sicetsha posits that according to Williams, decisive steps are being taken to reduce unemployment. These steps include strengthening critical public institutions, restoring good governance, rebuilding investor confidence and ending corruption.

A number of the short and long term interventions the government has put together to reignite the economy are the Youth Employment Service, the Jobs Summit, the Economic Stimulus Recovery Plan and the Investment Conference.

Concrete interventions by government, labour, business and the community sector by means of the Jobs Summit estimate that 275 000 jobs will be created per annum. Another boost was the announcement at the South African investment conference of investments to the value of R290 billion.

The above-mentioned references seem to be in line with the comment made by Bernard Swanepoel in the opening paragraph of this section that government should not be generating work but rather improving current circumstances to encourage employment creation.

2.5 WHAT IS A SKILLS SHORTAGE?

According to Trendle, there is no universal, agreed upon definition for the term labour or skills shortage. The term can refer to a mismatch between industry requirements and the ability of the workforce or it can mean a shortage of adequately qualified individuals in the labour force (Trendle, 2008).

In the social demand model the planner bases requirements on what is socially acceptable for that specific occupation.

The DEWR definition refers to the fact that employers are unable, or have difficulty, to fill specific positions taking the current levels of location accessibility, conditions of employment and remuneration into consideration (Trendle, 2008:4).

Trendle (2008:5) also refers to the “internal rate of return” definition, which stipulates that the occupations in which shortages occur are those with a higher rate of return on average. The sum of the direct costs, (training, education, supplies, etc.), and the indirect costs, (wages during training period), are used to define the investment cost.

This is then used to calculate the “internal rate of return” by determining the interest rate that compares the present value of benefits with costs.

Monopsonistic labour markets exist when there is only one company/stakeholder interested in the specific skill. This company can then control the market supply and the labour cost (Trendle, 2008:6).

The microeconomic theory developed by Kenneth J. Arrow and William M. Capron in 1959 seems to be the most credible and widely used definition, according to Trendle.

Their definition focusses on the shortage of engineers at a particular pay level and not the skills required to perform the work. According to Arrow & Capron (1959), the shortage will only be evident when the industry cannot find engineers to appoint at a certain salary. When the salary is increased more engineers are available to be appointed and the shortage will gradually decrease until there is a point of equilibrium.

Although these authors explained the shortage of engineers during that time in their paper titled “*Dynamic Shortages and Price Rises: The Engineer-Scientist Case”,* in the journal, The Quarterly Journal of Economics, they did not address the skill shortage; only the shortage of engineers and scientists. They must have assumed that all engineers are suitably trained and could perform the task for which they were appointed (Arrow & Capron, 1959).

Windapo (2015:2) perhaps has a more relevant definition: *“Skills shortage can be described as an insufficient supply of suitably qualified workers willing to work under existing market conditions, particularly at prevailing wages.”*

2.6 EVIDENCE OF SKILLS SHORTAGES

“The HVAC&R industry falls within the scarce skills category and the situation will only improve when we start training personnel to meet the demand,” (Koegelenberg, n.d.)

Schlechter et al. (2014) found that the primary cause for concern when filling vacancies in South Africa is the artisan job family. They also found that an ageing workforce and a negative perception of the nature of the blue-collar work are contributing factors to the decline in artisan numbers. A decline in skilled instructors does not make the artisan job family an attractive work opportunity, resulting in fewer students applying for apprenticeships. Several semi-government training centres have closed and the

cost to train an artisan until successfully qualified is costly and time consuming, a cost numerous small companies cannot afford.

Strauss & Du Toit (2010:308) posit that due to the current situation in South Africa in which certain issues such as black economic empowerment and quotas have been the main focus, the development of skills was neglected.

Bussin and Toerien agreed that there is a lack of knowledgeable workers to meet global demand and in South Africa this situation is worsened by the decreasing standard of training and the migration of knowledgeable workers (Bussin & Toerien, 2015).

In research related to the skilled labour supply in the construction industry, Windapo (2015) echoed what Bussin and Toerien mentioned by referring to the low standards of education and positing that there is a correlation between the quality of work, lack of education, certification and the skills shortage in the construction industry. Although the air conditioning and refrigeration industry is seen as part of the construction industry, air conditioning and refrigeration, as a trade, was not included in Windapo's research.

According to Hall and Sandelands, (2009:216), there is a strong sense that all companies in the South African engineering and construction sector are facing the same severe skills shortages, especially among artisans and supervisors. They also posit that the problem is exacerbated by the shortage of skilled instructors.

This sentiment is bolstered by the fact that there are only three recognised training facilities and only two assessment centres in the Western Cape listed on the Manufacturing, Engineering and Related Services Sector Education and Training Authorities' (merSETA) official website (merSETA, 2019).

Watermeyer & Pillay (2012:46) found that the perceived shortage of engineers in South Africa is not new and has been under discussion since 1971. They hold that the engineering profession performs an important function in the maintenance of infrastructure in South Africa. They assessed the importance of the duties of engineers in areas such as health, safety and environmental aspects provided for in legislation.

Empirical studies have found that insufficient training of artisans is recognised as one of the main reasons for the lack of skilled artisans (Jordaan & Barry, 2009).

During a recent interview with Mr. Hennie Basson, (H. Basson, personal communication, July 31, 2019) (a director at Cold Fact situated in Paarl with more than 30 years of experience in the industry), he echoed this sentiment. Mr. Basson has in his private capacity rewritten the training material for the South African Qualification & Certification Committee (SAQCC) due to the various interpretations by the different training providers of the original document that was purchased from the City of Gilles in London.

With reference to the SAQCC certification, the Department of Labour published the "Pressure Equipment Regulations" in the Government Gazette in July 2009 and it came into effect on October 1st 2009. This forms part of the Occupational Health and Safety Act Number 85 of 1993. Revision 1 with guide notes was published in 2015 and Revision 2 was published in November 2017. This Occupational Health and Safety Act brought into effect the law that all technicians working on a pressure vessel must have the required training and certification to do so. Air conditioning equipment, including the small air conditioning systems installed in bedrooms or the refrigerator in one's kitchen, are considered pressure equipment. This implies that a technician working on household refrigerators must also have the required training and certification to do so.

After work has been completed on a pressure system (air conditioner/refrigeration system) a certificate of compliance should be issued by the technician that performed the task and handed to the owner of the system.

There are various levels of certification for technicians to perform tasks on different sized cooling capacity equipment, but to be able to obtain certification the technician must have successfully completed his/her training and trade test. This bring us back to the problem that we do not have skilled and qualified technicians to perform the work, not to mention the certification as stipulated by law. (The concept is similar to that of driving a vehicle. You must have a valid licence to drive a vehicle on the roads. You will require a different licence for different sized vehicles. The same for working on pressure systems and the SAQCC certification.)

Currently, the SAQCC certification is only valid for three years. During a recent talk at the South African Institute of Refrigeration and Air Conditioning monthly meeting, it was estimated that there are in excess of 15000 people working on air conditioning systems in South Africa and only approximately 1000 have obtained the SAQCC

certification that allows them to work on pressure systems, and in this case air conditioning and refrigeration systems, legally.

According to Mr. Basson (H. Basson, personal communication, July 31, 2019), the organisation that was tasked to write the SAQCC training material did not complete the job, hence the varied training being offered by the different training providers based on their interpretation of the original document.

Geoff Hobbs mentioned that the industry is not producing enough artisans and that the quality of the trained people is not up to standard (Koegelenberg, n.d.)

In the same article Geoff's sentiment is echoed by Grant Laidlaw from ACRA and Isolde Döbelin from OTTC. All three training academy owners blame this on the poor quality of training being offered to students/apprentices.

Rasool also confirms that in South Africa the skills shortage is a significant problem (Rasool & Botha, 2011:1). This author confirms that the skills shortage is preventing job creation in South Africa and limiting economic growth.

According to Botha et al. (2011), current literature has revealed that organisations are uncertain about how to proceed with the talent management decisions due to the shrinking of the global talent pool.

Air-conditioning and refrigeration are diverse and specialised fields requiring technical expertise. These two specialised fields include facets such as thermodynamics, fluid mechanics and strengths of material, electrical engineering, electronic engineering and environmental engineering. Artisans are exposed to all of these fields every day and their skills and training should assist them in making informed decisions to benefit themselves, the client and the business.

2.7 REASONS FOR SKILLS SHORTAGES

According to Schlechter et al. (2014), having the appropriate skills is a critical component of competitiveness.

Although this statement is relevant (Schlechter et al., 2014:2), the same journal article referred to another reason for the skills shortage; larger companies reducing costs to boost profits with the cost of training and skills development the first to be cut from the budget.

In the foreword of the Government Gazette (Vol.645 of 7 March 2019, no. 42290) Minister Pandor calls for an improvement of the quality of education and training offered to the people. This is clearly an indication that the minister has identified the lack of quality as a concern (Department of Basic Education, 2014).

From the evidence presented, it seems that one of the main reasons for the skills shortage is the poor quality training and diminished commitment of the government and industry.

Others hold that although poor quality training is a significant factor contributing to the skills shortage, this is not the only item to consider. Facets such as better wages, skills immigration policy, reviewing labour policies, improving industrial, monetary and fiscal policies, technological advancements and competition policies should also be considered.

Although there are numerous factors to consider and consensus has been reached that training is a significant obstacle, it will not resolve the problem in the short term.

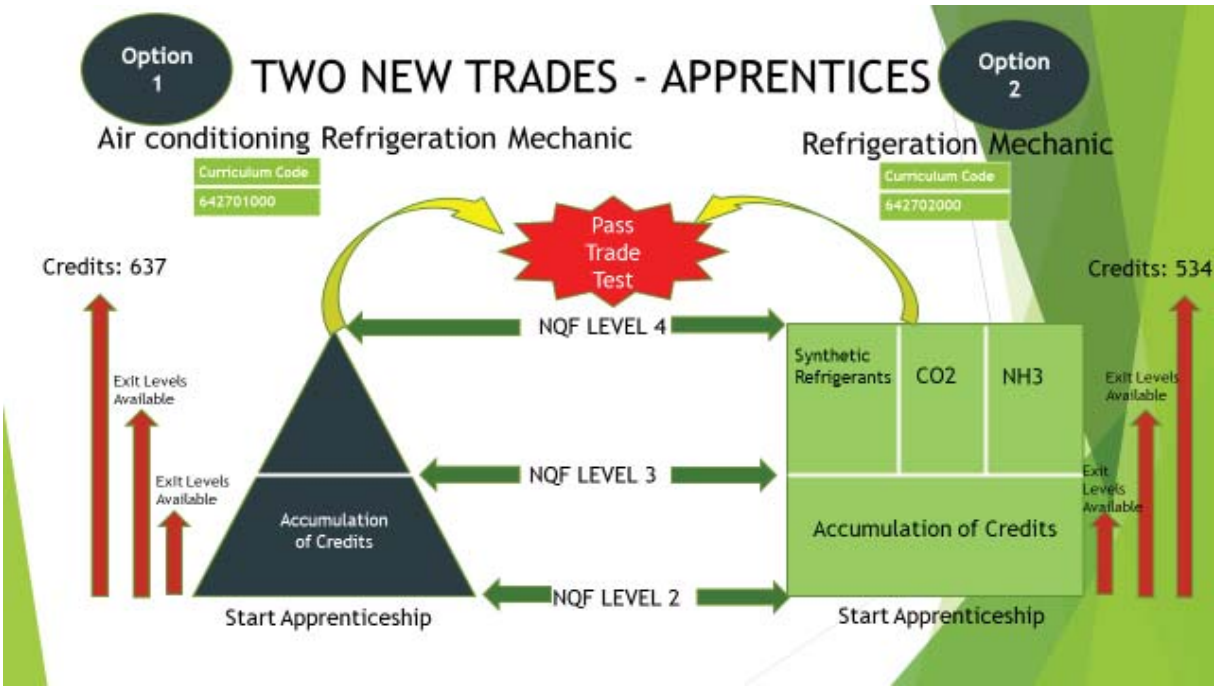
Rasool & Botha (2011:2) also addressed emigration and although one of the main reasons for the skills shortage is inferior training, another reason is the emigration of skilled labour. This came into effect with the implementation of affirmative action and employment equity plans. During this period a large gap was created when skilled labour was lost due to the policies mentioned above and no skilled labour was available to replace those that emigrated.

Rasool & Botha (2011:2) also attribute emigration to not only the affirmative action and employment equity plans but also to the high level of crime in South Africa, better salaries being offered aboard, the perception of a more stable economy elsewhere, a better future for their children and improved healthcare.

Schlechter et al. (2014:1-2) mentioned that the cost to successfully train artisans to the level of qualification is high. They also referred to the negative perception of the “blue-collar” work environment, a reduction in apprentice’s numbers and closures of training facilities as contributing factors to the shortage of skilled labour. Due to the limited number of skilled artisans, companies poach workers with better offers and promises, leaving the previous employer with a skills gap. International recruitment of skilled artisans also contributes to the skills shortage in the HVAC industry.

In the HVAC industry technicians are trained under the Quality Council for Trade and Occupation (QCTO) umbrella where they have to do theoretical training from level N1 as well as practical training. Under the proposed new training framework, exit levels exist for students when they experience difficulties completing their studies. They will, however, be permitted to re-enter the training system at a later stage.

Figure 2.1: Understanding the levels of the apprentice



Courtesy: Hennie Basson

From N1 to N3 is distance learning but according to Hennie Basson, no training is offered for N4 to N6 locally either and this is also distance training. Should a college wish to offer training at N4 level and above, there must be a minimum of ten students and they must give the department notice of at least 18 months in advance of the examination. At that stage the department will appoint an examiner for the test that will take place in 18 months from said date.

If one does reach this stage, the curricula are outdated. Hennie Basson produced copies of the existing curricula. The N4 curriculum (ANNEXURE A) was last updated in January 1980, N5 (ANNEXURE B) in January 1981 and N6 (ANNEXURE C) in September 1981.

These documents are in Afrikaans and were typed on a typewriter and have never been updated. The N4 curriculum was copied from a copy with updates included by hand in the margins.

In an industry in which mathematics is required for studying in the field of air conditioning and refrigeration, Rasool posits that the inferior schooling for black learners in the past is a contributing factor to young people not entering an industry in which mathematics is a prerequisite (Rasool & Botha, 2011).

Skills development also requires coordination between training organisations, firms and education (Petersen et al., 2016). Without the industry's involvement and proper communication between the industry and the training providers, no adequate training can be developed and taught to the new entrants. Rasool & Botha (2011:7) highlight the importance of communication between industry and tertiary institutions. They posit that training does take place and that graduates are produced, but for industries in which the demand is not growing.

These authors also found that in the FET sector, the training being offered is at a lower level than the Grade 12 qualification the new student has recently completed. In their study they found the levels to be at the Grade 10 and Grade 11 level of education.

According to Petersen et al. (2016), a significant challenge when developing skills at the intermediate level is that the vocational education and training colleges, as well as local training colleges, lack the required capabilities.

According to Rasool, there is little hope of addressing the skills shortage with the high failure rate at universities, colleges and schools (Rasool & Botha, 2011:6).

Windapo (2015:3) holds that there are numerous reasons for people not entering the construction industry. According to his research, the poor image of the industry, the role of government or the lack thereof, the poor quality and relevance of the training being provided, the demand for certain construction services, economic conditions, the aging work force and the requirement to be certified are all contributing factors.

Windapo also refers to the physical demand on the staff and the long working hours as deterrents. (When a freezer facility experiences a system failure during the night, the technician must go to the site and find the fault and effect repairs. If not, millions of rand of stock will go to waste.)

Due to the prevailing adverse economic conditions in the country, construction companies rarely appoint permanent staff and rather appoint staff on a contract basis

for a specific project. There is no long term job security and this also deters young people from entering the industry.

Artisans must be hands-on and in current times the youth have no desire to work with their hands or perform physical labour. Their preference is to work with computers. The building industry, which includes the HVAC industry, has struggled to attract young people willing to enter the market and complete their studies to the level of certification.

2.8 DEVELOPMENT AND RETENTION OF HUMAN CAPITAL

Ehlers and Lazenby (2012:61) included developing human capital as an important factor of strategic leadership. They defined human capital as “the knowledge and skills of an organisation’s entire work force”.

Human capital, in this case artisans, must be attracted, developed and retained (Schlechter et al., 2014).

The attraction and retention of artisans, (those with scarce skills), is becoming more and more difficult for companies. The scarcity of these skilled artisans is as a result of the demand outweighing the supply (Schlechter et al., 2014).

There is a significant difference between being qualified as a technician/artisan and having the skills to perform the required duties. Skills take years to acquire and being qualified does not automatically provide one with those skills (Rasool & Botha, 2011:8). Smith (1776) echoed this in his book when he mentioned that in the 1700s an apprentice took seven years to qualify as an artisan.

Schlechter et al. (2014) found that there are a number of factors contributing to the retention of skilled artisans. According to them, the skilled artisan has become a scarce resource and the demand overweighs the supply. The fact that there are fewer youngsters entering the “blue-collar” market is another concerning factor contributing to the shortage of skilled labour. As the demand for artisans increases it is becoming more and more important to attract and retain skilled staff.

Past research has identify numerous successful retention strategies but Schlechter et al. (2014:3) recognised that a rewards program is the best option, although difficult to implement. This approach focusses on the individual’s needs. Preferences include those described hereunder.

Deeper Impact; the financial and non-financial rewards combined can have a positive influence on employees' commitment and motivation and improve the employer - employee relationship.

Increased engagement; having employees involved in the design of their own salaries conveys a positive message about the company's values.

Flexibility to meet individual needs; offering relational rewards may induce loyalty, as the company recognises individuals' needs.

Retaining talent; relational rewards address the positive psychological contract. This in turn attracts and retains the staff, in this case the artisans, it needs.

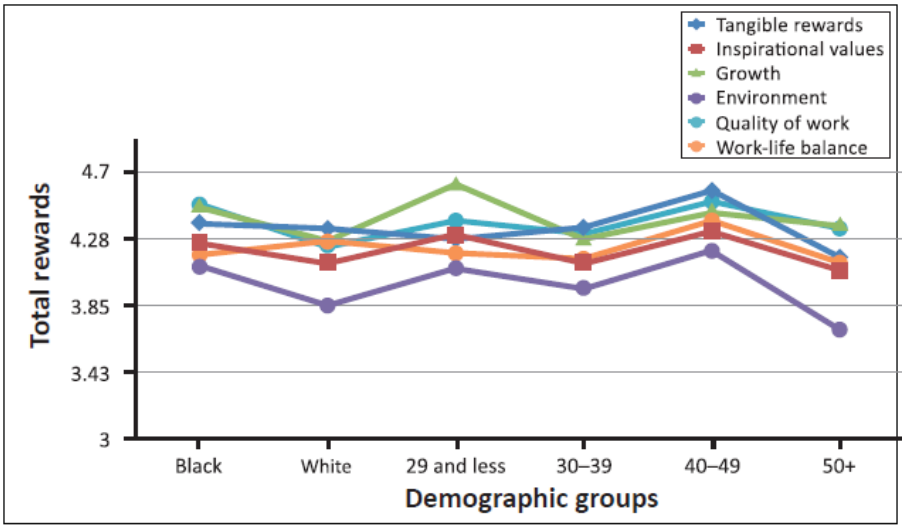
Although Schlechter et al. (2014) referred to the total reward model above, they also mentioned the changes in the work force demographic that make this total reward model more challenging. The changes are the age profile of the artisans and the equity legislation that companies seek to remedy as a quick fix by poaching equity candidates from other companies, which makes these artisans expensive and mobile.

They further confirmed that employee retention efforts must not only focus on the retention of existing staff with crucial skills but also attract new staff to join the organisation.

Strategies employed to retain existing employees and attract new employees include well-defined and clear human resource planning and established selection and recruitment processes. Organisations must develop and maintain a strategic attraction and retention plan to engage artisans to perform at their peak.

Although remuneration is an important aspect of employment, it is not the most important reason for employee retention. Schlechter et al. (2014) found that demographic groups and the age of the technicians demand different rewards, as can been seen in Figure 2.2.

Figure 2.2: Means of total rewards for various demographic groups.



Source: Schlechter et al., 2014

Jordaan & Barry (2009) interviewed a number of artisans and found that remuneration was the main reason for the shortage of artisans and lack of training was the second.

Retention of artisans is not a simple one solution fits all scenario. As the age of the artisan changes, so do their priorities. As youngsters, money seems to be the most important factor but as the artisans get older and have families, the security of having a fixed and secure income becomes more important. A balance between work and home life is also important at the age when there are young children and both parents have to be involved with the children. The need for tangible rewards peaks at the same time as the work / life balance peaks.

Bussin & Brigman (2019:1) in their study refer to the high cost of replacing staff. These direct costs according to them can be as much as 2.5 times the annual salary of the person being replaces. Their research has revealed that retaining staff is more than just paying higher wages than the opposition, but by creating a work environment that reveal mutual trust, treat all with respect, embraces diversity and offering challenging career opportunities. Long gone are the days where there is a surplus of staff for ineffective human resource strategies.

They have also made the distinction between knowledge workers and traditional workers. They have identified knowledge workers as workers that deal with complex issues and where a day cannot be planned (unpredictable). They also with non-repetitive multidisciplinary tasks. These talent workers normally seek lifelong

employment and security whereas the traditional workers are looking for advancement opportunities and skills development. The retention strategies for these type of workers are complete different according to Bussin & Brigman (2019:2).

As mentioned previously, one of the reasons for people not entering the artisan profession is the long hours they would have to work and the effect that will have on their work / life balance.

2.9 CHAPTER SUMMARY

This chapter reviewed the formulation of the data taking the reader from the broad concept of why companies exist to the actual topic of a shortage of skills.

The importance of staff in an organisation and the unemployment situation in South Africa was discussed. The government's role in addressing unemployment and reasons behind the notion that the government should not get involved with creating employment but should rather improve the circumstances to encourage employment were advanced.

The term skills shortage was defined from various perspectives.

The shortage of skills has been researched and it has been found that there is a larger problem pertaining to skills shortages, regardless of the definition presented in Section 2.6 above. The reasons behind the shortage of skills were discussed in detail as well as the importance of developing and retaining human capital. It was found that the total reward system was the best option to use and that it is complicated and difficult to maintain, as the artisans' age and stage in their personal lives change.

Chapter Three focuses on the design and methodology employed in this study as well as sample selection, ethical concerns, the significance of the research and the study's limitations.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

Chapter Two presented a discussion of the existing knowledge pertaining to the subject under investigation, focusing on the importance of skills to individuals and to organizations under the headings: importance of staff; unemployment; government's role in addressing unemployment; evidence of skills shortages; reasons for skills shortages and the development and retention of human capital.

Chapter Three focuses on the design and methodology employed in this study as well as sample selection, ethical concerns, the significance of the research and the study's limitations.

3.1.1 Research Paradigm

Mixed method research was identified as the third paradigm in educational research (Johnson & Onwuegbuzie, 2007).

The passionate disputes between advocates of quantitative research versus qualitative research has continued unabated for more than a century. Due to these disputes, purists have emerged for both of these paradigms (Johnson & Onwuegbuzie, 2007).

The positivist/post positivist paradigm predominantly utilises quantitative approaches (Johnson & Onwuegbuzie, 2007; Mackenzie & Knipe, 2006).

The qualitative method is used predominantly in the interpretivist/constructivist paradigm (Mackenzie & Knipe, 2006; Johnson & Onwuegbuzie, 2007).

Where Johnson & Onwuegbuzie refer to the mixed method as a third paradigm, Mackenzie & Knipe have referred to the mixed method as the transformative paradigm (Mackenzie & Knipe, 2006).

With the pragmatic paradigm, quantitative and/or qualitative methods can be used and are normally matched to the purpose of the research and specific research questions (Mackenzie & Knipe, 2006).

This study employed the transformative paradigm, which allowed the use of both quantitative and qualitative approaches to data collection. This offered the researcher a greater diversity of stance, values and positioning (Mackenzie & Knipe, 2006).

3.1.2 Research Method

A mixed research methodology was employed in this study. The hypothesis was tested using a quantitative research methodology (Nauom, 1998). Leedy holds that quantitative research may be considered cold in that it considers only facts (Leedy, 1997).

The researcher was made aware of an HVAC training facility that was planned to begin operating in 2019 but that subsequently decided to not proceed. The researcher has also learned of a member of the industry under discussion that is currently consulting with the Department of Labour to compile national training guidelines.

Due to this new information, the researcher chose to conduct open-ended interviews with both parties, as the initial observation is that these two actions are in opposition to each other.

It was the researcher's belief that a structured questionnaire with an open-ended section for general comments to the SARACCA members would deliver the best results, as participants would remain anonymous. An open-ended interview with the two parties, as referred to above, would offer valuable insights.

Ellis & Levy (2008) mentioned that the quantitative, qualitative and mixed methods are the most commonly used approaches They did not stress the advantages of one over another but postulated that the methodology must address the how, when, where and who questions and must be detailed.

Hofstee holds that only one method should be utilised but that a combination of methods will improve the results (Hofstee, 2013:114).

3.1.3 Research Design

In his book, Hofstee referred to 16 types of research design and claimed that more are available (Hofstee, 2013:120).

After careful consideration the researcher chose to utilise a survey based research method. Hofstee (2013:122) posits that this research method can take on a variety of forms, from structured questions to unstructured interviews.

Creswell (2014:13) refers to survey based research as quantitative opinions of the population and structured interviews for data collection.

Data were collected from the SARACCA members by means of questionnaires comprising a number of self-administered, closed, structured questions with a section allowing for general comments and clarification of the closed, structured questions. These questionnaires were reasonably easy to complete.

Unstructured, in-depth interviews with the two parties, as referred to previously, offered the best results. The researcher chose a mixed method approach to obtain the relevant information to test the hypothesis.

3.1.4 Research Population

The researcher approached the South African Refrigeration and Air Conditioning Contractors Association (SARACCA) to obtain the names of registered HVAC companies in the Western Cape. The sample size was determined by the number (24) of registered companies in the Western Cape currently on the SARACCA website (Anon, n.d.).

The South African Refrigeration and Air Conditioning Contractors Association (SARACCA) was established more than 50 years ago. This organisation represents contractors' interests in the refrigeration and air conditioning industry and currently has 24 members in the Western Cape. Membership is not compulsory and the association does not necessarily represent all contractors in the Western Cape, but does represent the larger established companies.

Written permission was obtained from the director of SARACCA to circulate the questionnaire among the Western Cape members.

3.1.5 Sample Method/Technique and Sample Size

The researcher opted to make use of the census survey method as a research strategy. The sample size was identified as the current Western Cape members of

SARACCA as identified on the SARACCA website (Anon, n.d.). All the representatives of the members were requested to complete the questionnaire.

3.1.6 Data Collection Instruments

The researcher opted for self-administered questionnaires containing closed, structured questions and a section allowing for general comments and clarification of answers to the structured questions. These questionnaires were reasonably easy to complete.

Unstructured, in-depth interviews with the two parties, as referred to previously, were deemed to offer the best results. The credibility of the information obtained from the sample group and the unstructured, in-depth interviews relied on the willingness of the participants to share accurate information.

The researcher believed that the study would benefit the stakeholders in the HVAC industry. Creswell (2014:199) posits that as long as the research will benefit the participants, the information should be accurate. Hofstee (2013:58) echoed this sentiment. The information obtained from the unstructured, in-depth interviews was used to test the hypothesis.

3.1.7 Data Collection

Data were collected from the SARACCA members by means of a number of self-administered questionnaires containing closed, structured questions and a number of open-ended questions that allowed the participants to explain their answers in certain circumstances. The questionnaires were delivered to the chairperson of the Western Cape branch of SARACCA who distributed them at the quarterly meeting of members.

The face to face interviews were conducted by the researcher during which the participants told their stories and shared their experiences.

3.1.8 Data Coding and Analysis

The researcher attended lectures by Dr Corrie Uys on the use of the Statistical Package for the Social Sciences (SPSS) system (as originally named). The same programme is currently known as “IBM SPSS Statistics”. Having received training on the SPSS system, the researcher utilised that instrument to analyse the data obtained from the completed questionnaires. The information obtained from the unstructured, in-depth interviews was used to test the hypothesis.

3.1.9 Ethical Considerations

The researcher conformed to the ethical standards set by the university and of research in general. No details pertaining to the individuals and/or companies that took part were requested and/or recorded. The anonymity of the participants was protected where requested.

With regard to informed consent, the expected benefits and purpose of this study were shared with the participants and it was explained to them that their participation in the survey was voluntary. Any areas they found to be unclear were clarified.

Debriefing was available for those that provided their contact details on the questionnaire and requested such.

It was decided beforehand that should an ethical issue arise, the researcher would act upon the guidance of the ethics committee of the university.

The researcher also made the work available for scrutiny by the ethics committee prior to submission thereof.

The researcher took all reasonable precautions to prevent any potential for harm to the participants during the study.

The questionnaire was submitted to the Cape Peninsula University of Technology's ethics committee and ethical clearance was granted to conduct the study.

3.1.10 Limitations of the Research

The limitations listed hereunder applied to this research.

- This study focused on the HVAC sector in the Western Cape.
- Drivers such as organizational cultures, remuneration and long-term employment did not form part of this study.
- Although the focus group covered a vast area, it was limited to one region and it would not be advisable to generalise the findings of this study to other areas of South Africa.
- The information obtained via quantitative methods might not be 100% accurate. The people completing the research questionnaire might have felt exposed when providing their perceptions of their own abilities and knowledge.

- The sample group comprised well-established companies that have been in the HVAC industry for an extended period. It is possible that the information obtained from them via the questionnaire was not representative of the HVAC industry where smaller companies are involved.

3.2 CHAPTER SUMMARY

In this chapter, the research paradigm (mixed method approach), research method, research design and research population were discussed. The sample size was determined by the current members of SARACCA in the Western Cape. The data collection instrument (a self-administered questionnaire containing closed, structured questions and a number of open-ended questions allowed the participants to explain their answers in certain circumstances for the SARACCA members and two unstructured interviews with members of the industry) was discussed. It was mentioned that data coding would be performed using the SPSS program. The ethical considerations and limitations were highlighted.

In Chapter Four the coding and presentation of data is discussed as well as the research questions. The data from the quantitative study is analysed and interpreted. The qualitative part of the questionnaire is also analysed.

CHAPTER FOUR

DATA ANALYSIS AND RESULTS OF THE QUESTIONNAIRES

4.1 INTRODUCTION

In Chapter Three the research paradigm (mixed method approach), research method, research design and research population were discussed. The sample size was determined by the current members of SARACCA in the Western Cape. The data collection instrument was discussed. This was a self-administered questionnaire containing closed, structured questions and a number of open-ended questions that allowed the participants to explain their answers in certain circumstances for the SARACCA members, and two unstructured interviews with members of the industry. It was mentioned that data coding would be performed using the SPSS program. The ethical considerations and limitations were highlighted.

In Chapter Four the coding and presentation of data is discussed, as well as the research questions. The data from the quantitative study is analysed and interpreted. The qualitative part of the questionnaire is also analysed.

4.2 CODING AND PRESENTATION OF DATA

The questionnaire, with a cover letter explaining the research and the importance of the results for the industry, the ethics clearance from the university and the letter of permission from the director of SARACCA to conduct the study was sent to 20 Western Cape members of SARACCA with a request to complete the questionnaire. Of the 20 questionnaires that were distributed 12 replies were received.

4.3 RESEARCH QUESTIONS

The research questions, as highlighted on page 5 and as mentioned hereunder, were taken into consideration when the questionnaire was drafted. The questions formulated for the study follow.

Does the lack of skilled and qualified HVAC artisans have a devastating impact on the industry’s ability to work within the framework of competitive business practises and legislation?

4.3.1 Research sub-questions

- Do artisans have the required skills?

- What do employers perceive as good service?
- Do companies plan strategically for training?
- Do the instructors have the skills and sufficient subject knowledge to impart to the students?
- Should artisans be required to remain up to date with the latest developments in their field by attending regulated refresher courses annually?
- In what way is merSETA assisting companies that currently offer training?

The questions were specifically worded to address various issues in the HVAC industry.

The questions were related to the skills shortage in the HVAC industry in the Western Cape and the impact that skills shortage has on the industry; the ways in which the end users and employers are affected. The questions also addressed the retention of staff and the cost to replace skilled staff. Respondents were also asked questions related to the government's involvement in addressing the shortage of skills. The questionnaire was divided into three sections (refer to ANNEXURE D). Section A, "Biographical information (independent variables)", dealt with the respondents' biographic information and Section B, "Survey pertaining to the skills shortage in the HVAC industry in the Western Cape" dealt with the reasons for the shortage of skills. In Section C, "Survey pertaining to the skills shortage and the economic impact thereof", the questions were structured to determine the economic impact of the skills shortage. An open ended question was incorporated into sections B and C allowing the respondents to offer their own opinions/comments related to that specific section.

4.4 CODING AND PRESENTATION OF DATA

The questionnaire, with a cover letter explaining the research and the importance of the results for the industry, the ethics clearance from the university and the letter of permission from the director of SARACCA to conduct the study was sent to 20 of the 24 Western Cape SARACCA members. Of the 20, only 13 responded with completed questionnaires. The information contained in those questionnaires was then captured into a workable table from where it was transferred to the SPSS programme. The SPSS programme then analysed the bulk quantitative raw data and produced a workable format. SPSS was used as this programme seems to be preferred by researchers and the researcher had attended lectures presented by Dr Corrie Uys from the Cape Peninsula University of Technology on the use of the programme.

Under the gender options, data was presented as ‘1’ for male, `2 for female and `3 ` for other, as indicated in Table 4.1.

Table 4.1: Gender

Gender	Code
Male	1
Female	2
Other	3

The respondent’s position in the company was presented as indicated in Table 4.2.

Table 4.2: Position

Position	Code
Owner/Shareholder/Director	1
Manager	2
Engineer	3
Finance	4
Other	5

The respondent’s age was presented as indicated in Table 4.3.

Table 4.3: Age

Age	Code
Under 21	1
21-30	2
31-40	3
41-50	4
51-60	5
61 and over	6

The duration of the respondent's involvement in the HVAC industry in years was presented as indicated in Table 4.4.

Table 4.4: Length of Time

Time	Code
0-5	1
6-10	2
11-15	3
16-20	4
21-25	5
25 and more	6

The respondent's highest qualification was presented as indicated in Table 4.5.

Table 4.5: Qualification

Qualification	Code
High School	1
Diploma	2
Degree	3
Master's Degree	4
Doctoral	5
Other	6

Questions 6, 7, 11, 13, 14, 16, 18 and 22 required Yes or No answers, as indicated in Table 4.6.

Table 4.6: Option

Option	Code
Yes	1
No	2

The percentage of staff allocation in the company was presented as indicated in Table 4.7.

Table 4.7: Percentage

Percentage	Code
Management	1
Technical Staff	2
Administrative Staff	3

The age distribution for the various positions in the company was as reflected in Table 4.8.

Table 4.8: Age distribution

Age distribution	Code
Under 21	1
21-30	2
31-40	3
41-50	4
51-60	5
61 and over	6

The question asking if the technicians were SAQCC registered was scored as indicated in Table 4.9.

Table 4.9: SAQCC registered

SAQCC registered	Code
All	1
None	2
Some	3

Questions 12 (17 sub-questions) and 21 (7 sub-questions) were scored using the Likert scale, an example of which is presented in Table 4.10.

Table 4.10: Likert scale comparison

Likert scale comparison	Code
Strongly Agree	1
Agree	2
Not certain	3
Disagree	4
Strongly Disagree	5

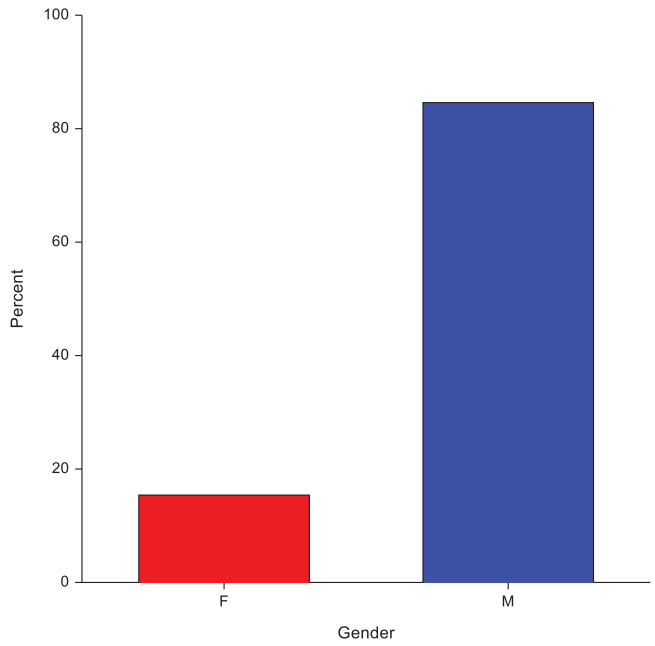
The researcher also made use of open ended questions to allow the respondents the opportunity to identify concerns and advance suggestions outside the structured quantitative questions. These qualitative questions are analysed in the latter part of this chapter.

4.5 DATA ANALYSIS AND INTERPRETATION

The researcher chose a self-administered questionnaire to better understand the skills shortage and the impact it has on the HVAC industry. The questionnaire was divided into three sections. Section A: biographical information (independent variables), Section B: survey pertaining to the skills shortages in the HVAC industry of the Western Cape and Section C: survey pertaining to the skills shortage and the economic impact thereof.

4.6 BIOGRAPHICAL INFORMATION

Figure 4.1: Gender representation



The respondents' gender was taken into consideration to establish the gender balance in the industry. The presentation was that 84.62% of the respondents were male and 15.38% were female. In an environment dominated by men it was pleasing to note that more women are entering the HVAC industry and the researcher has noticed that companies are employing more women as apprentices than they did a short while ago. The questionnaires also indicated that of the women that completed the questionnaire, only 50% had a technical qualification.

Figure 4.2: Position in the company

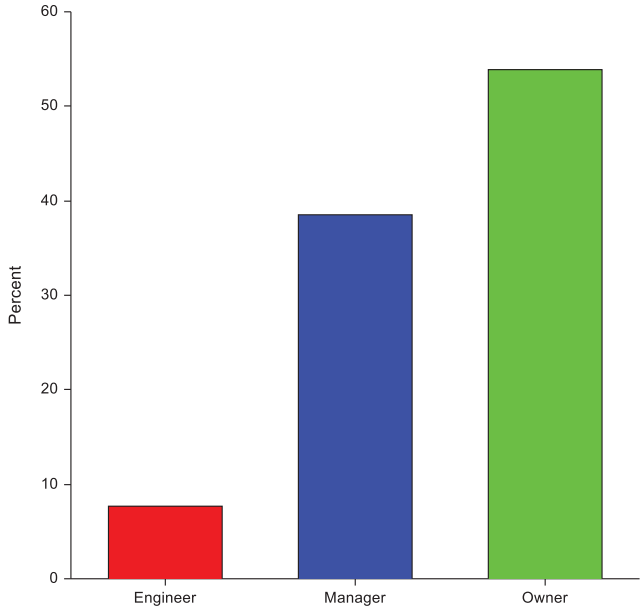
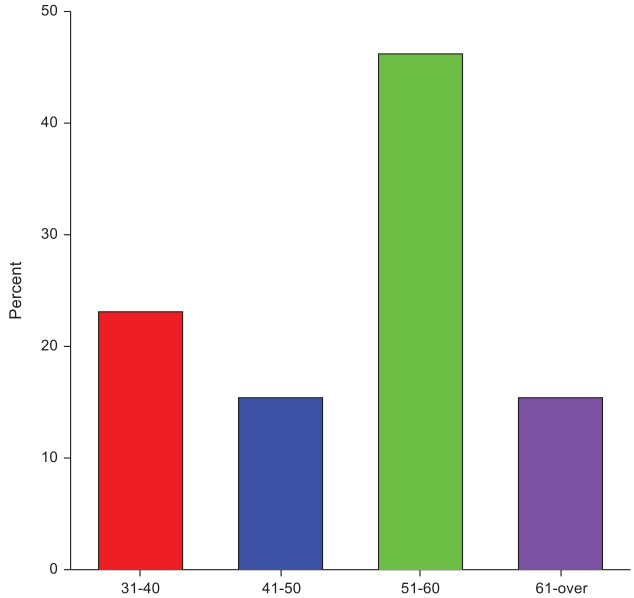


Figure 4.2 indicates that 7.69% of the respondents were engineers and not in a management nor shareholder capacity in the company. From the information at hand, 92.31% of the respondents that completed the questionnaire were in senior positions in the company. 38.46% were managers and the majority of 53.85% were owners. This indicates that the owners are hands-on in the industry and involved with the daily activities within their companies.

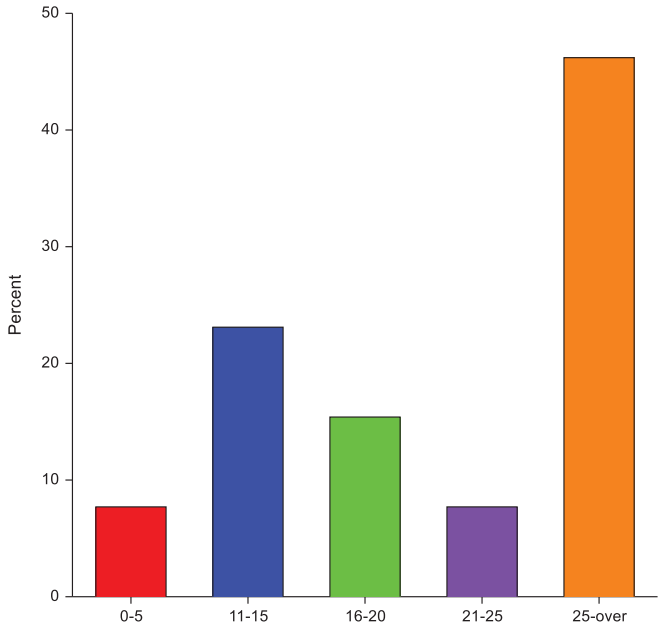
Figure 4.3: Age of the respondents



This question was asked to determine the age of the respondents and to ascertain if there is a contingency plan in place for developing young managers and engineers.

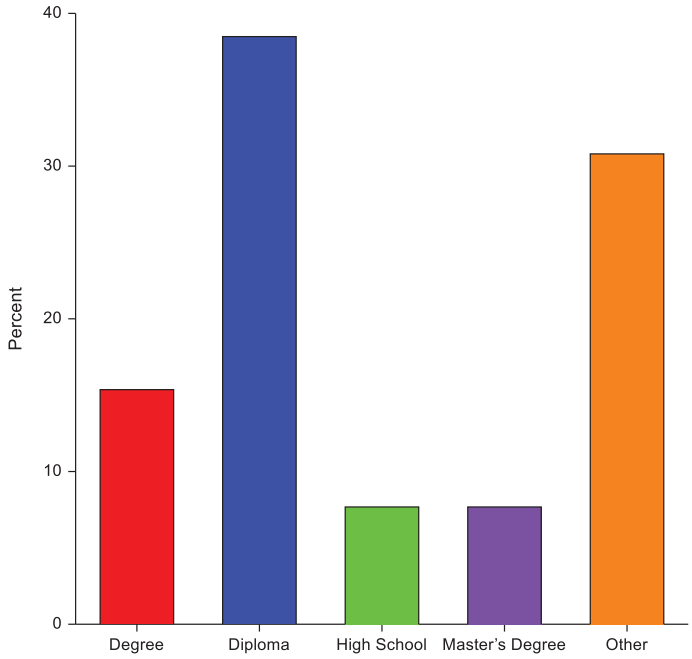
Based on the information obtained from the questionnaire, the majority of the respondents (46.15%) were between the ages of 51 and 60, 23.08% between 31 and 40 years of age, 15.38% between 41 and 50 years of age and the same percentage were 61 and older. The implication is that more attention should be directed towards implementing a succession plan.

Figure 4.4: Duration of involvement in the HVAC industry in years



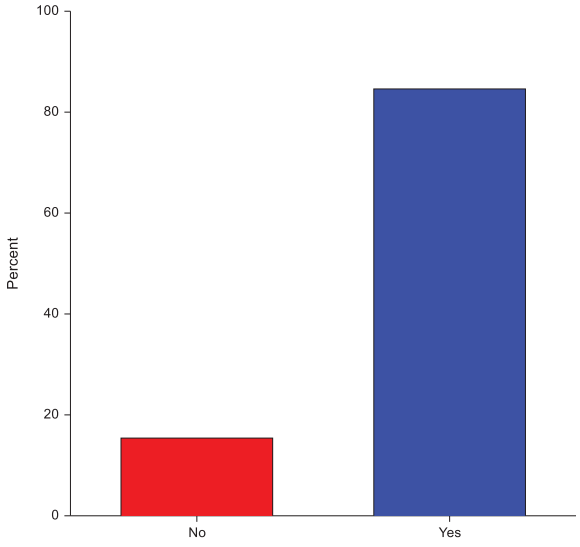
The majority of the respondents (46.15%) had been involved with the HVAC industry for more than 25 years. 7.69% of the respondents had been involved for fewer than 5 years and the same percentage between 21 and 25 years. 23.08% had been involved for between 11 and 15 years and 15.38% for between 16 and 20 years. The reason for this question was to determine the average amount of time the respondents had been involved with the industry. This information was crucial for the researcher to understand that the respondents had sufficient experience in the industry to be aware of all the challenges.

Figure 4.5: Respondents' highest level of education



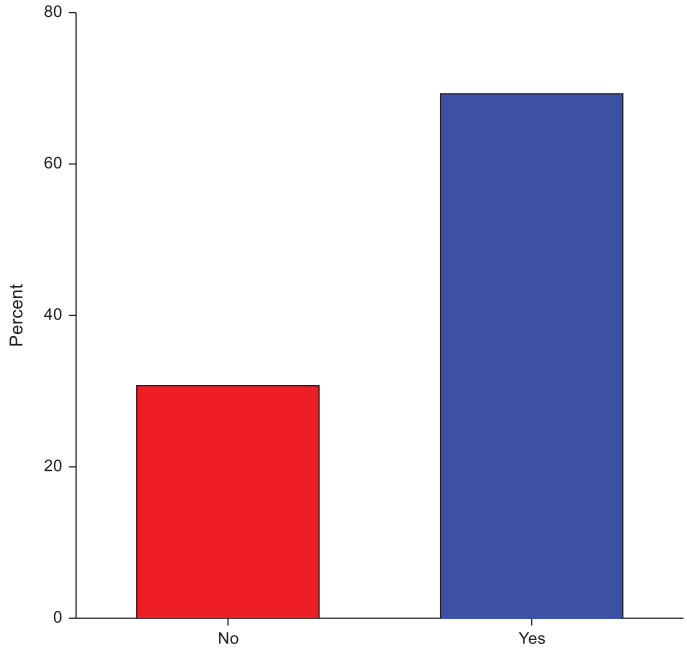
This question was asked to determine the respondents' level of education. The completed questionnaires indicated that most of the respondents had a diploma (38.46%), 30.77% of the respondents had a qualification other than high school (75% of this group indicated that they were qualified artisans), such as a diploma, degree or master's degree. 15.38% had a degree, 7.69% a high school certificate and 7.69% had a master's degree. The respondents' qualifications were taken into consideration when referring to a skills shortage and to determine whether or not the respondents had skills themselves.

Figure 4.6: Percentage of respondents with/without technical qualifications



Most of the respondents (84.62%) indicated that their qualifications were technical and 15.38% indicated that their qualifications were not technical. These respondents had either a degree or a master's degree in their field of study. This information can also be used to determine the responses pertaining to the questions related to skills, as they should have a technical understanding of the skills required to be an HVAC artisan.

Figure 4.7: Percentage of respondents that were artisans



This question was asked to determine the respondents' technical abilities and if they would have an understanding of the tasks artisans are required to perform and whether or not they are capable of performing the tasks they are trained and qualified to perform. 69.23% of the respondents replied in the affirmative to this question and that lent credibility to the answers that follow.

Question 8 requested the respondents to indicate the approximate percentage (%) of management, technical and administrative staff in relation to their total staff component. The average distribution of staff was as follows: management = 14.8%; technical staff = 72.1% and administrative staff = 13.1%.

Question 9 was structured to determine the general age of the various staff types within the company. This information was gathered to assist the researcher in determining if the HVAC industry is moving into an era in which there will be a shortage of artisans to perform the work.

Table 4.11: Percentage of technicians representing the age groups

Technicians	
Under 21	0,00%
21-30	12,93%
31-40	35,34%
41-50	34,48%
51-60	15,52%
61 and over	1,72%

Table 4.11 indicates that the concentration of artisans is between 31 and 50 years of age with 51.72% of the artisans older than 40 years of age. This is concerning taking in consideration that the total rewards for artisans begin decreasing from 39 onwards (refer to Figure 2.2). This is an indication that their age and stage of their lives change and that they are not as driven as the younger generation.

Table 4.12: Percentage of assistants representing the age groups

Assistants	
Under 21	4,39%
21-30	36,59%
31-40	25,85%
41-50	25,85%
51-60	7,32%
61 and over	0,00%

In the HVAC industry an artisan always has an assistant when performing the required tasks. The second person is present to assist with not only carrying equipment and passing on tools, but also for health and safety reasons. The tasks are normally manual and the reason for asking this question was to determine the average age of the assistants. According to the feedback from the questionnaires, the majority of the assistants are younger than 31 years of age.

Table 4.13: Percentage of apprentices/learners representing the age groups

Apprentices/Learners	
Under 21	17,86%
21-30	64,29%
31-40	17,86%
41-50	0,00%
51-60	0,00%
61 and over	0,00%

In the previous chapter, reference was made to the average age of the artisans and the potential gap between young artisans entering the HVAC industry and the artisans leaving the trade due to retirement, emigration and advancement in the company. Figure 4.7 indicated the respondents that used to be artisans before they became owners/directors and managers.

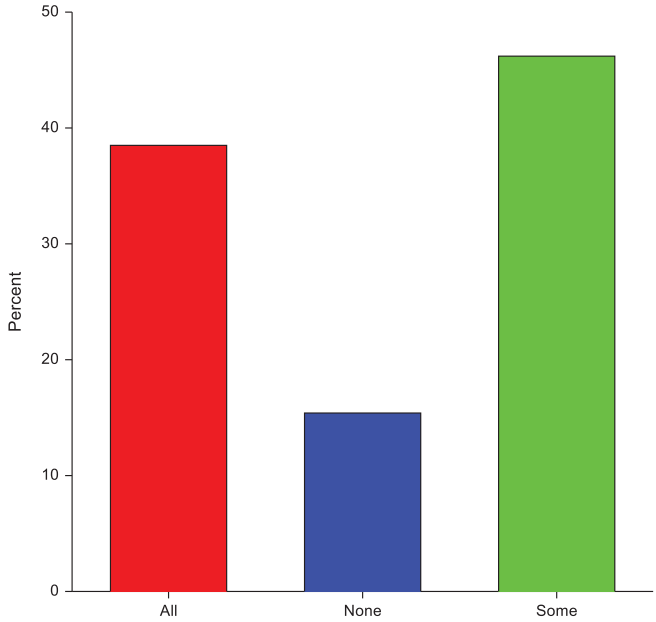
Although the researcher remains of the opinion that there will be a shortage of artisans in the near future, Table 4.13 indicates that the respondents have been planning to fill the potential gap.

Table 4.14: Percentage of management staff representing the age groups

Management	
Under 21	0,00%
21-30	2,56%
31-40	28,21%
41-50	38,46%
51-60	23,08%
61 and over	7,69%

The percentage of management staff representing the age groups indicates a balance between youth and experience among the respondents. This indicates that the respondents have a succession plan in place for when the experienced managers retire.

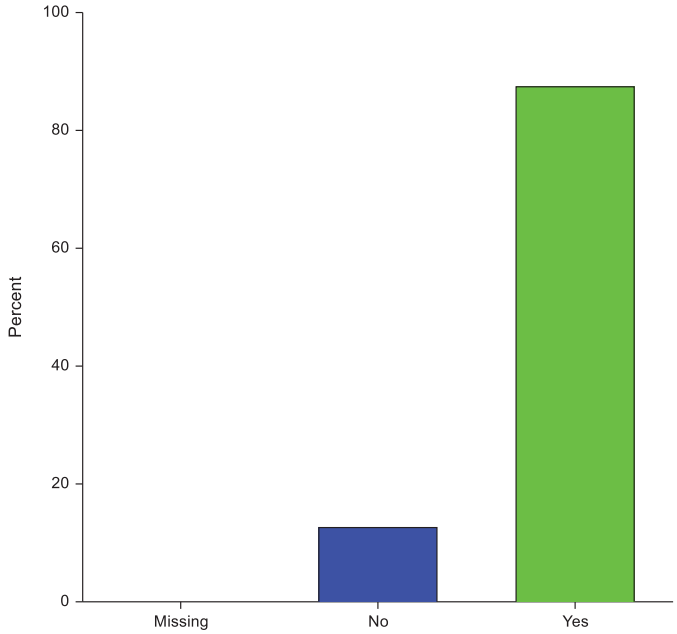
Figure 4.8: Are all your technicians (where applicable) SAQCC registered?



All technicians/artisans are required to be SAQCC registered ("Pressure Equipment Regulations" in the Government Gazette in July 2009 that came into effect on October 1st 2009. This is part of the Occupational Health and Safety Act Number 85 of 1993. Revision 1 with guide notes was published in 2015 and Revision 2 was published in November 2017.) This question was asked to determine compliance by the respondents. (Must thank them for their honesty.)

Not all the respondents have sent their artisans for the training required to be registered. 38.46% of the respondents confirmed that all their technicians have completed the required training and that they are registered SAQCC technicians. 15.38% said that none of their staff is SAQCC registered and 46.15% confirmed that several of their staff members have completed the training and are registered.

Figure 4.9: Is there a timeline in place to have the balance of the artisans SAQCC registered?



Of the respondents who indicated that several or none of their staff members are SAQCC registered, 12.50% indicated that they have no plan to have their staff registered and 87.50% do have a plan to have their staff registered.

4.7 SURVEY PERTAINING TO SKILLS SHORTAGES IN THE HVAC INDUSTRY IN THE WESTERN CAPE

To obtain a better understanding from the respondents, Question 12 and sub-questions 12.1 to 12.17 were asked using the Likert scale (Strongly Agree, Agree, Not Certain, Disagree, Strongly Disagree). In questions 13, 14, 16 and 18 the respondents had to select a yes or no option. In question 15 the respondents had to indicate the percentage of apprentices/learners that will qualify as artisans. Questions 17, 19 and 20 were open ended and are explained in more detail under the heading; “ANALYSING THE QUALITATIVE PART OF THE QUESTIONNAIRE”.

Figure 4.10: Respondents' perception of whether or not there is a shortage of skills

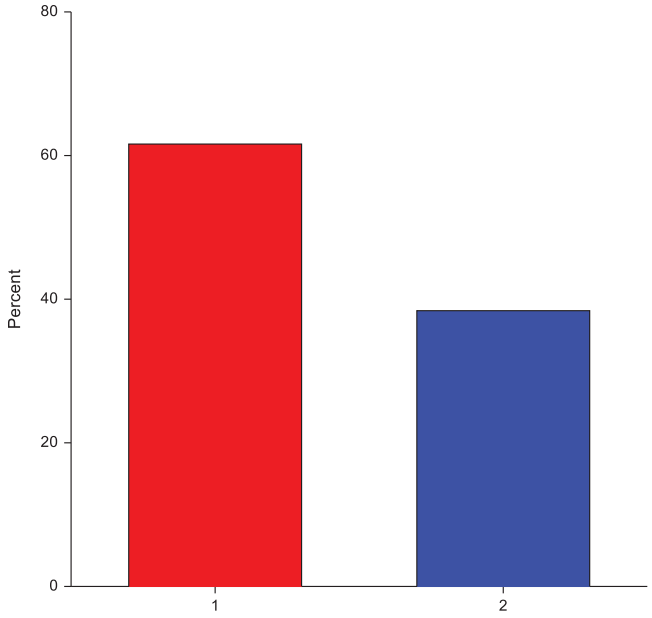
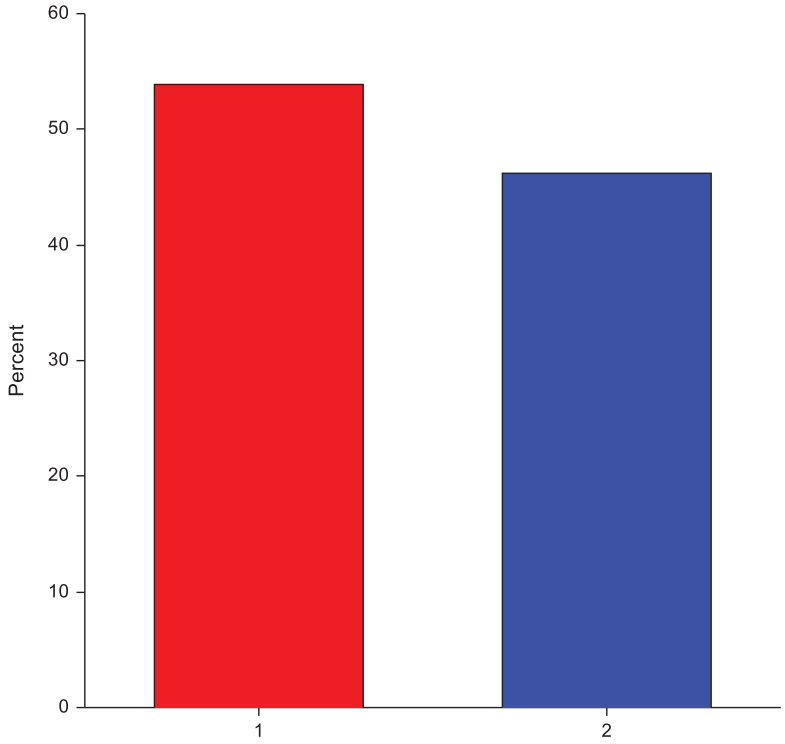


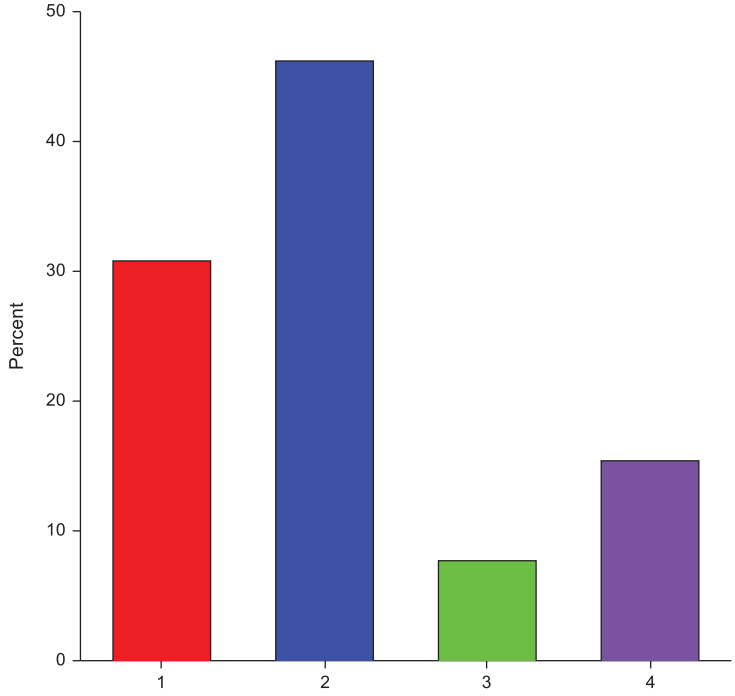
Figure 4.10 above indicates the respondents' opinions regarding whether or not there is a skills shortage in the HVAC industry in the Western Cape. The results indicate that 61.54% answered in the affirmative and 38.46% answered negatively. This is the breakdown of answers to the first sub-question, "Do artisans have the required skills?" Based on the responses from the respondents, there is a shortage of skilled artisans. The skills shortage in the HVAC industry in the Western Cape can be added to statements made by Koegelenberg (n.d.), Schlechter et al. (2014), Strauss & Du Toit (2010:308), Bussin & Toerien (2015), Windapo (2015), Hall & Sandelands (2009:216), Watermeyer & Pillay (2012:46), Jordaan & Barry (2009), H. Basson (personal communication dated July 31, 2019), Rasool & Botha (2011:1) and Botha et al. (2011), among other authors.

Figure 4.11: A lack of education is a reason for the skills shortage



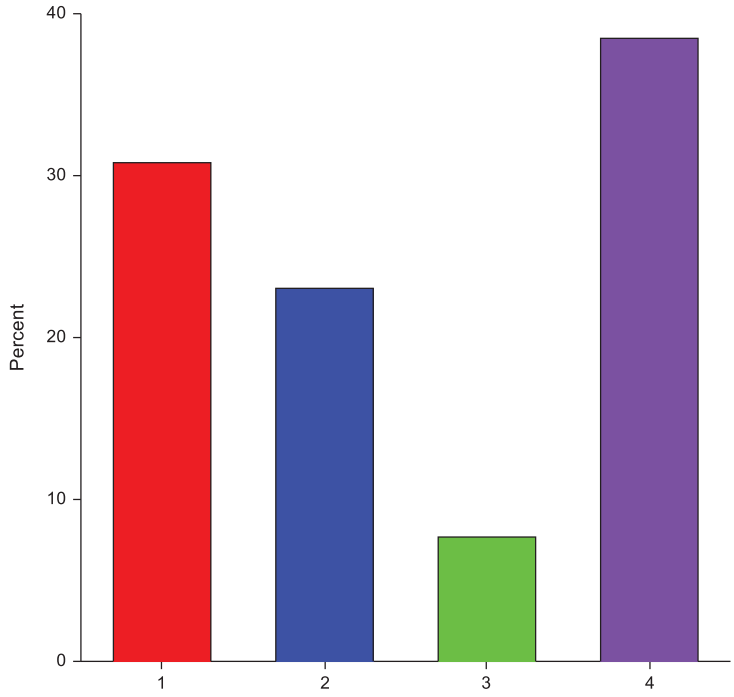
With regard to the level of education and how this can affect the skills shortage, 53.85% of the respondents strongly agreed that lack of education is the reason for the skills shortage and 46.15% agreed with this statement.

Figure 4.12: The lack of effective educators is a reason for the shortage of skills



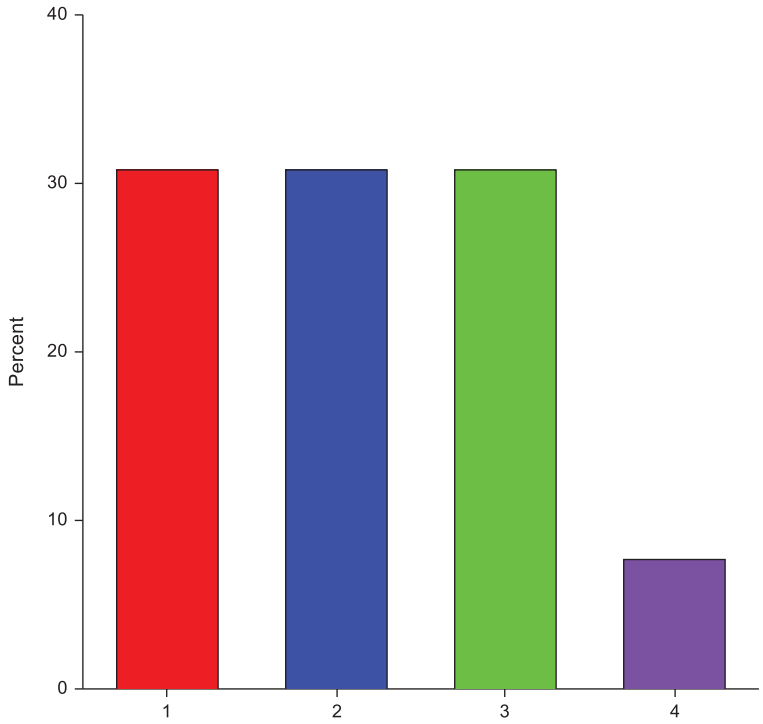
In reference to the question about whether or not the skills shortage in the HVAC industry is related to a lack of effective educators, the responses were that 30.77% strongly agreed with the statement, 46.15% agreed, 7.69% were not certain and 15.38% disagreed. Although the majority were in agreement and support the research conducted by Windapo (2015:3), it was pleasing to note that a number of the respondents perceived the educators to be effective, as their staff had benefitted from training. Hall and Sandelands (2009:216) and Windapo's (2015:3) findings are in agreement with the responses from this study's respondents.

Figure 4.13: Representing the lack of quality training facilities



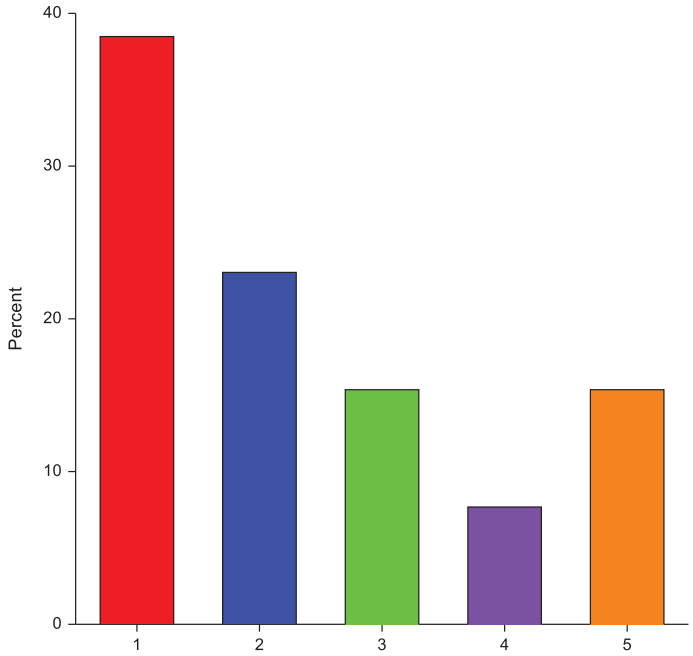
30.77% of the respondents strongly agreed that the available training facilities are of a good quality, 23.08% agreed, 7.69% remained uncertain and the highest percentage disagreed, 38.46%. This can be related to personal experience and the quality of the training they received at the various training facilities. The sum of those that strongly agreed and agreed (53.85%) supports the research undertaken by Windapo (2015).

Figure 4.14: Representing the negative image held of the industry



Schlechter et al. (2014) found the negative perception of the nature of the blue-collar work to be a reason for people not entering the industry. The respondents agreed with this statement. 30.77% strongly agreed, 30.77% agreed, 30.77% remained uncertain and 7.69% disagreed.

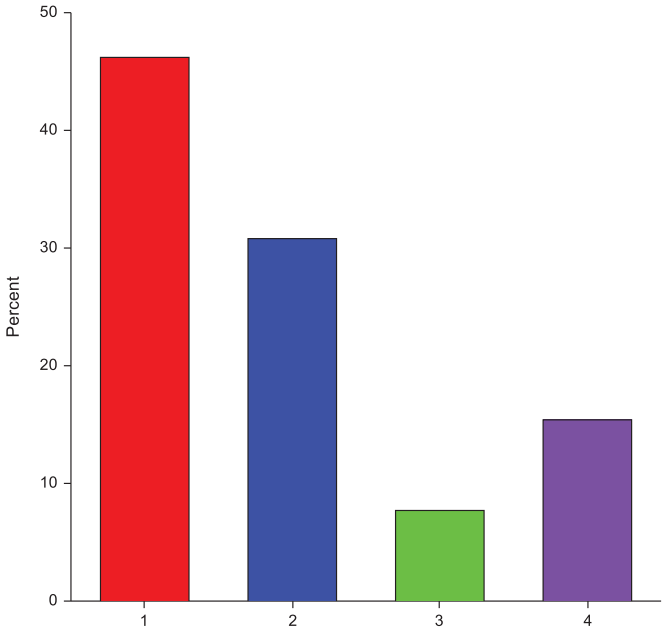
Figure 4.15: The shortage of skills is due to the lack of young people entering the industry



Upon analysing the respondents' answers, the researcher attempted to match the answers to the companies that have apprentices and learners in place. The company with the most apprentices in the age group 21-30 was the one that strongly agreed with question 12.7. It was also found that a number of the companies that strongly disagreed also have apprentices in the age group 21-30. The majority were in agreement that this is a cause for concern that should be addressed. This supports research conducted by Schlechter et al. (2014).

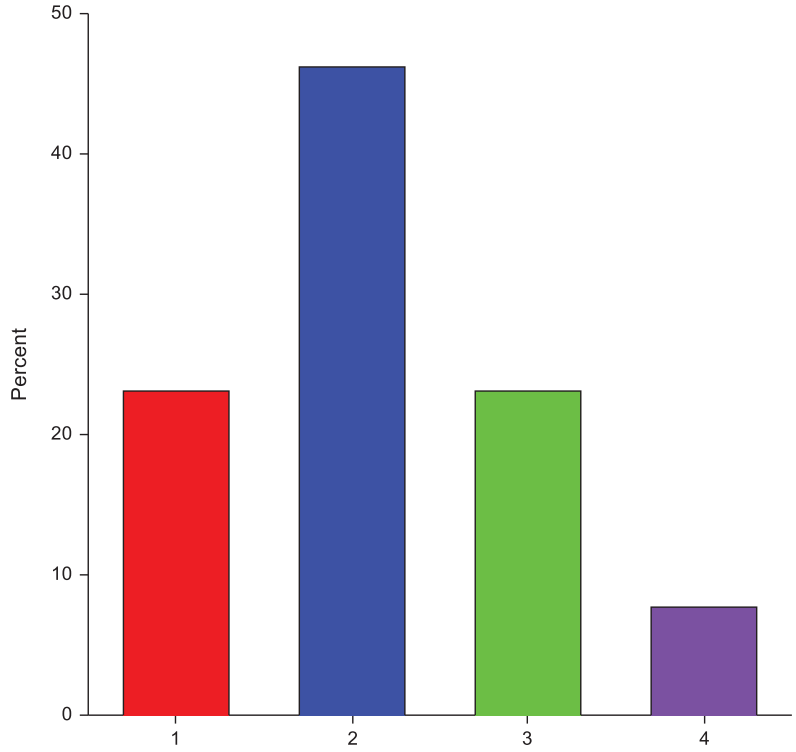
38.46% strongly agreed, 23.08% agreed, 15.38% were uncertain, 7.69% disagreed and 15.38% strongly disagreed.

Figure 4.16: The shortage of skills is due to the experienced artisans retiring



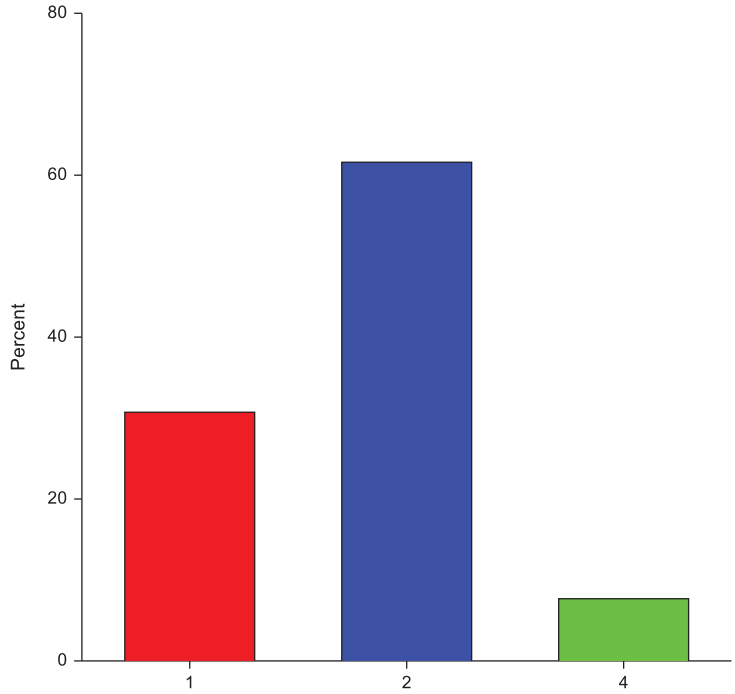
This question coincided with the previous question illustrated in Figure 4.15 (the shortage of skills is due to the lack of young people entering the industry). 46.15% strongly agreed that the retirement of artisans contributes to the shortage of skills, 30.77% agreed, 7.69% were uncertain and 15.38% disagreed.

Figure 4.17: The shortage of skills is due to experienced artisans emigrating



Rasool & Botha (2011:2) attribute emigration to not only the country's affirmative action and employment equity plans but also to the high level of crime in South Africa, better salaries being offered aboard, the perception of a more stable economy elsewhere, a better future for children and improved healthcare. This question was structured to test the mentioned research. 23.08% of the respondents strongly agreed with this statement, 46.15% agreed, 23.08% were uncertain and 7.69% disagreed. Based on the results, the majority of the respondents (69.23%) agreed.

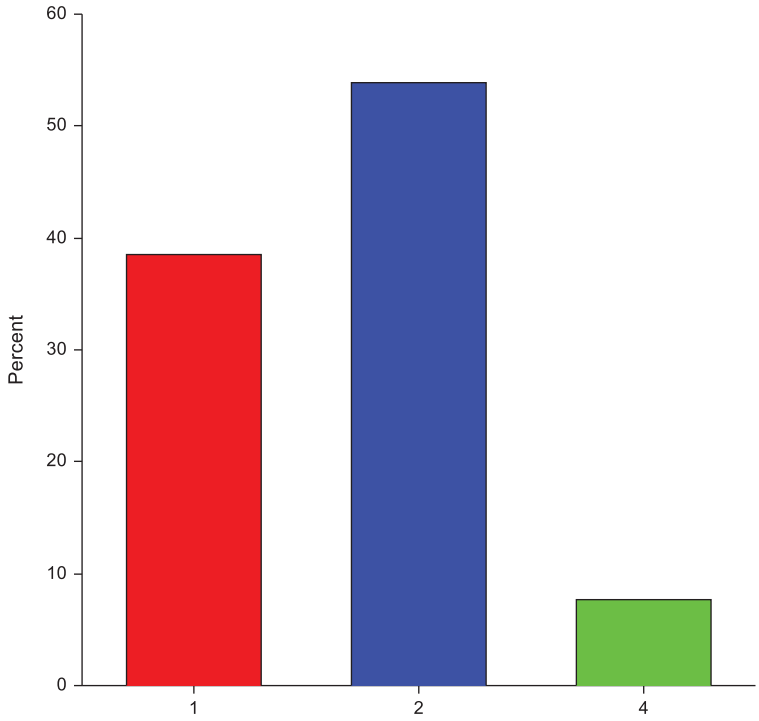
Figure 4.18: The better one's work performance the better one should be remunerated



This question was structured to test Smith's (1776) claim that as early as the 1700s people realised that better training and performing more complicated and advanced tasks than another labourer should earn a worker a higher wage. He also posits that people should be trained during an apprenticeship and that during this stage they should be independent (Smith, 1776:141-142). The better one's training and the better one's work performance the better one should be remunerated.

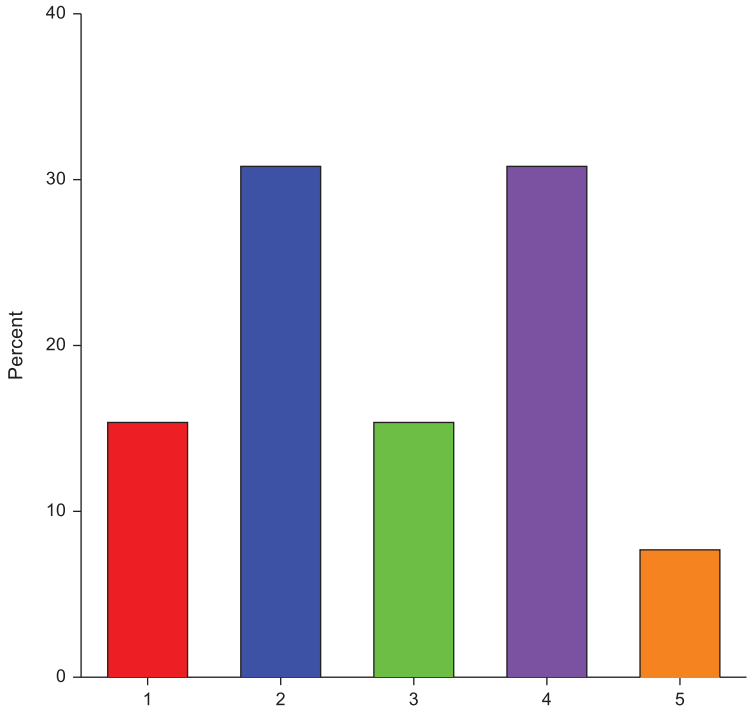
The responses indicated that 30.77% of the respondents strongly agreed, 61.54% agreed (cumulative 92.31%) and 7.69% disagreed.

Figure 4.19: Does a lack of skills affect staff members' social status?



The reason for this question was to determine whether or not the workers' lack of skills has an impact on their social status. Figure 4.19 indicates that skills should be rewarded and this reward (higher salary) will enable the workers to better their economic status and thus improve their social status. The response to this question was that 38.46% strongly agreed, 53.85% agreed and 7.69% disagreed. The respondent that opted for the disagreed option also disagreed in answer to the statement, "The lack of skills affects the economic status of your staff."

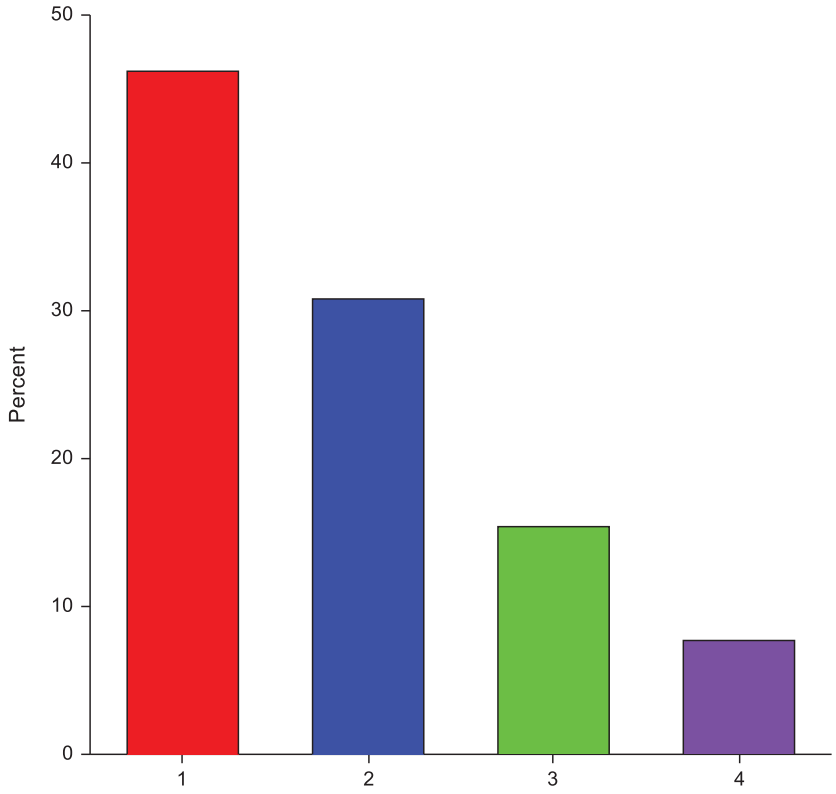
Figure 4.20: What is merSETA's role in providing the HVAC industry with skilled individuals?



This information was required to answer one of the sub-questions; "In what way is merSETA assisting companies that currently offer training?"

The information obtained was unexpected. It was encouraging to note that a number of the respondents had positive interactions with merSETA. For the statement; "merSETA has a key role in providing the HVAC industry with skilled individuals", 15.38% strongly agreed, 30.77% agreed, 15.38% were uncertain, 30.77% disagreed and 7.69% strongly disagreed. The responses were not all negative and it is fair to say that the responses were more positive than negative, although merSETA should have had a more significant effect in assisting the industry with developing skilled artisans.

Figure 4.21: Should the government upgrade the education system relevant to the HVAC industry?



This information was obtained in response to the statement in 12.4. “Skills shortages can be related to the lack of training facilities.” 46.15% of the respondents strongly agreed and 30.77% agreed with the statement. This corresponds with the general consensus that the government is failing to provide sufficient training facilities for the people. 15.38% were uncertain and 7.69% disagreed.

Figure 4.22: Are foreigners preferred employees?

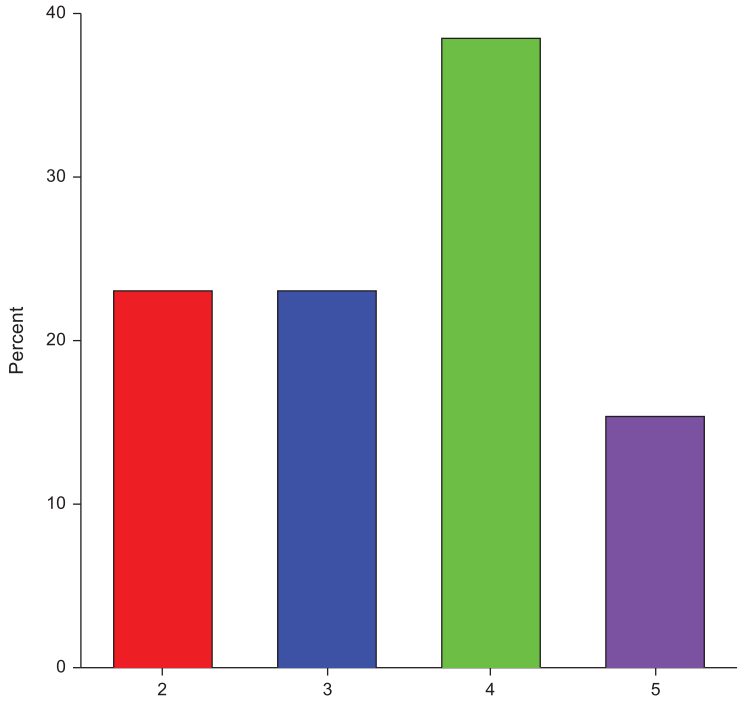
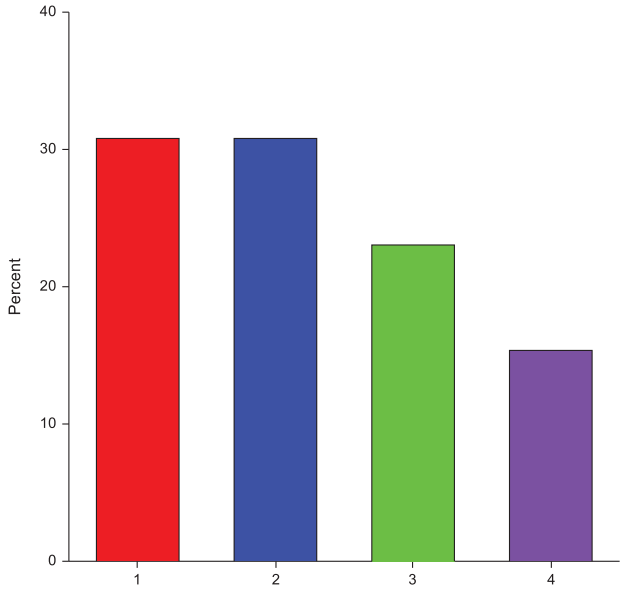


Figure 4.22 illustrates that a number of individual companies had positive experiences employing foreigners but that a number of companies had negative experiences. None of the respondents strongly agreed that foreigners are preferred employees. 23.08% agreed that foreigners are preferred employees, 23.08% were uncertain, 38.46% disagreed and 15.38% strongly disagreed. Based on the information obtained from the respondents, employers generally prefer local labour.

Figure 4.23: Does a shortage of skills contribute to slow economic growth?

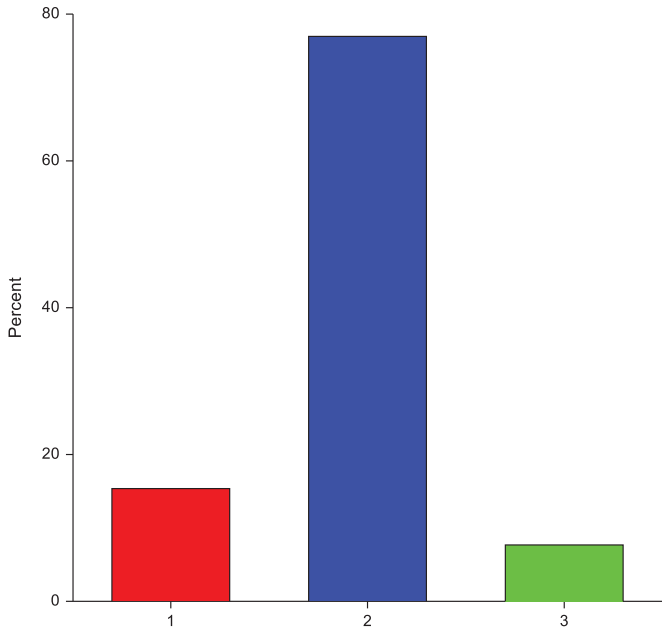


According to Adam Smith (1776:141-142), people with higher skills should be paid more to reflect their ability to do the work. Employees with higher incomes can spend more money and hence stimulate the economy. The statement “Skills shortages contribute to a slow economic growth” was made to ascertain if the same sentiment applies in today’s environment as it did in the 1700s.

30.77% strongly agreed and the same percentage (30.77%) agreed that a skills shortage slows economic growth. Of the respondents, 23.08% were uncertain if a skills shortage slows economic growth and 15.38% disagreed with the statement.

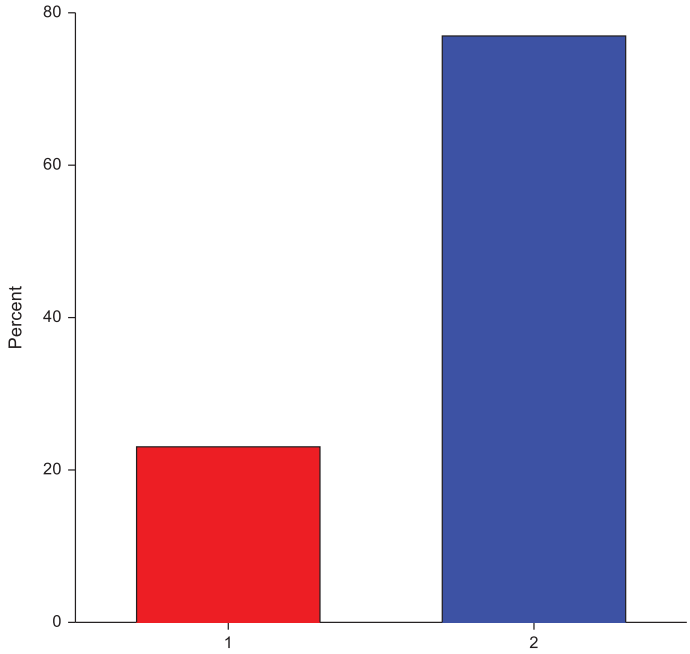
The Department of Higher Education and Training (Anon, n.d.) identified the key driver for economic growth as the training of artisans.

Figure 4.24: Do trained technicians comply with health & safety legislation?



Numerous accidents and incidents have occurred within the HVAC industry over the past years and this question was asked to ascertain if the qualified HVAC technicians comply with health and safety legislation. Of the respondents, 15.38% strongly agreed that their artisans do comply with the required health and safety regulations, 76.92% agreed and 7.69% were uncertain. It is pleasing to note that companies do implement health and safety (H&S) procedures to protect their staff, other people and property. The concerning factor was that 7.69% were unsure whether or not their staff comply with H&S requirements. Non-compliance and not adhering to such requirements can be catastrophic for those companies.

Figure 4.25: Do trained technicians follow the SAQCC regulations?



The “Pressure Equipment Regulations” were published by the Department of Labour in the Government Gazette in July 2009. This law came into effect on 1 October 2009. This regulation is part of the Occupational Health and Safety Act number 85 of 1993. Subsequent to this law, Revision 1 was published in 2015 and Revision 2 in November 2017. The South African Qualification and Certification Committee (SAQCC) was mandated by the Department of Labour with the responsibility to register and maintain a database of persons authorised to work on gas installations. SARACCA, as a member association of SAQCC, has been given the responsibility to follow the same process in the refrigeration and air conditioning industry. An extract from the Government Gazette, 15 July 2009 No. 32395 follows in 4.7.1.

4.7.1 Gas reticulation equipment and systems

17. (1) No person shall:

- *a) handle, store or distribute any gas in any manner. Which includes the filling of a container, other than in accordance with the relevant health and safety standard incorporated into these Regulations under section 44 of the Act;*
- *b) install or remove an appliance, pressure equipment or system for gas in any manner other than in accordance with the relevant safety standard incorporated into these Regulations under section 44 of the Act;*
- *c) install or remove a gas appliance, or a gas system or a gas reticulation system, unless such person is an authorised person; or*

d) use pressure equipment or systems for gas in any manner other than in accordance with the relevant safety standard incorporated into these Regulations under section 44 of the Act.

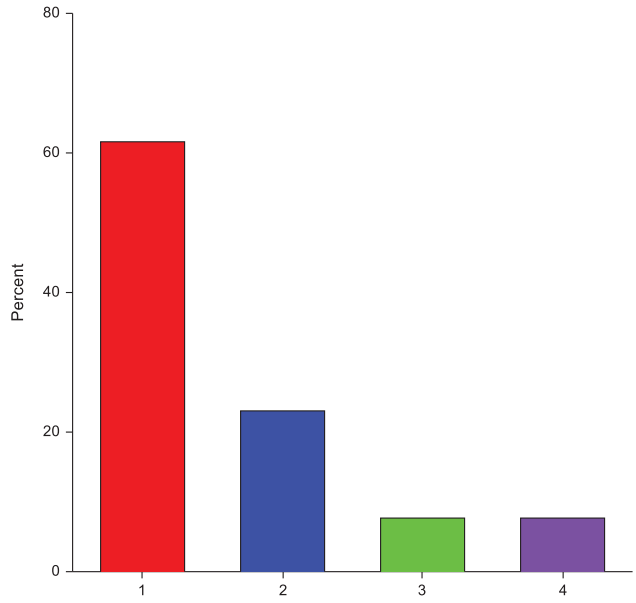
(2) After installation or re-installation, and before commissioning a gas system, the user shall ensure that an external inspection and a leak test are performed by an authorised person or an approved inspection authority as applicable in terms of sub-regulation (1)(c).

(3) An authorised person or an approved inspection authority shall issue a certificate of conformity after completion of a gas installation. Modification, alteration or change of user or ownership in the form of Annexure 1.

The regulations are specific and individuals as well as companies (individuals are registered under the name of the company when they complete their SAQCC certification and training) can be penalised with hefty fines and/or jail time if found guilty. These regulations were put in place to protect the artisan working on the system as well as the end-user and the environment. Another regulation is to prevent individuals from releasing ozone-depleting substances (ODS) into the atmosphere and to control the use of hydrochlorofluorocarbon refrigerants, as prescribed in the Montreal Protocol (DEA, 2015).

With regard to the question pertaining to whether or not trained technicians follow the SAQCC regulations, 23.08% strongly agreed and 76.92% agreed that they follow the SAQCC regulations.

Figure 4.26: Does continuous training increase skill levels?



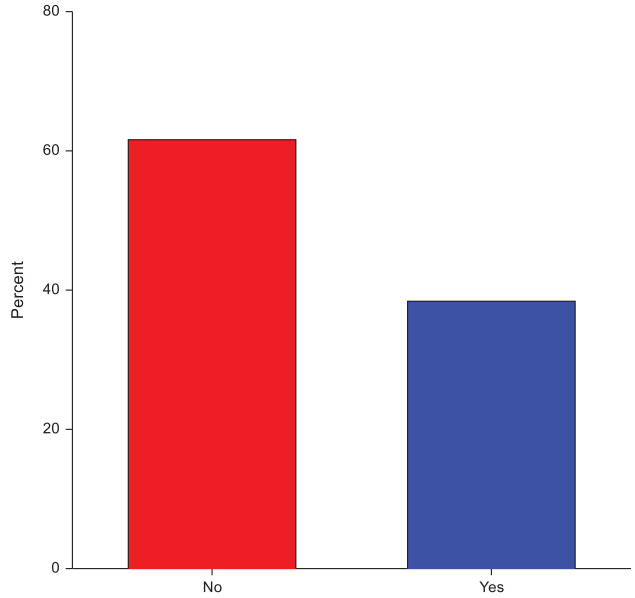
In the qualitative response section, one of the respondents commented that:

"Re-registration for already qualified and registered people at SAQCC is an unmanageable situation for small companies outside the Metropole. We should rather work on the accreditation points rewarding system as for Pr. Eng. If the amount of CPD points cannot be obtained, then re-registration and re-examination."

An overwhelming 61.54% of the respondents strongly agreed and 23.08% agreed with the statement. 7.69% were uncertain and 7.69% disagreed.

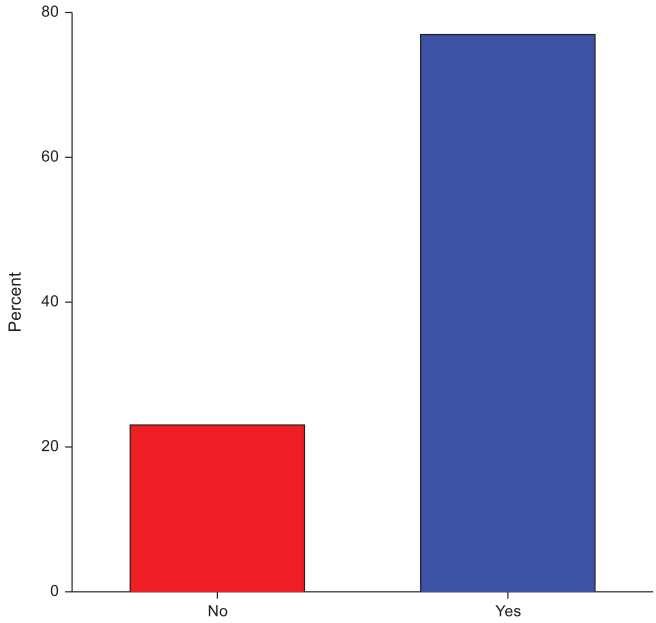
The question was asked to determine if continuous training will contribute to an increased level of skills. With attending continuous training, (on-line or in a classroom environment), artisans will be able to keep up with the latest regulations, equipment offerings and trends in the industry and ultimately benefit the end-user/client by being exposed to a knowledgeable artisan and high quality workmanship.

Figure 4.27: Have you lost technical staff due to emigration?



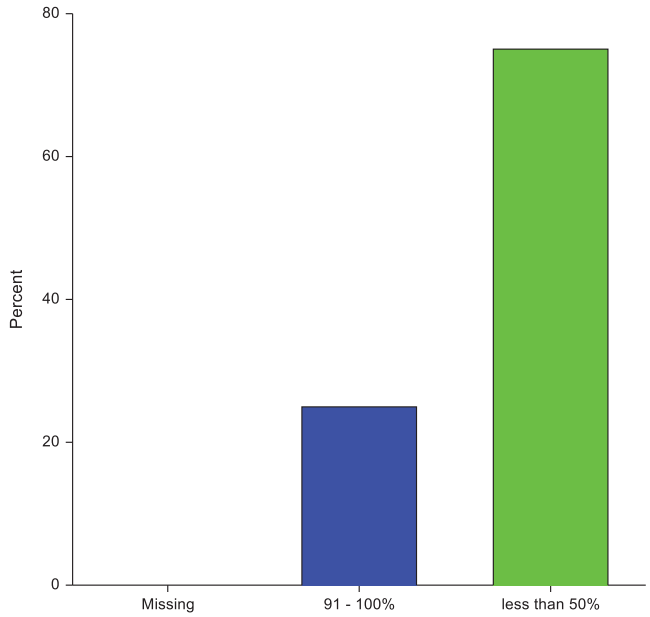
This question was asked to ascertain the veracity of the statement made by Rasool & Botha (2011:2) that emigration leads to a shortage of skills. 38.46% of the respondents answered in the affirmative and 61.54% answered in the negative to this question. Although not all the respondents had experienced the loss of artisans due to emigration, Rasool & Botha were correct in positing that emigration is a contributing factor to the shortage of skills.

Figure 4.28: Representing whether or not the respondents employ apprentices



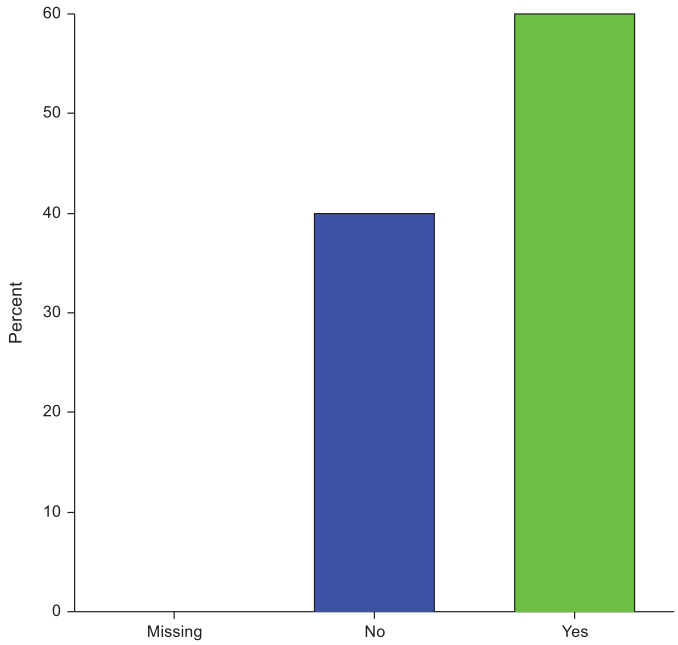
It is encouraging to note that 76.92% of the respondents did have an apprenticeship program in place to train more artisans. Unfortunately, 23.08% did not have an apprentice training scheme in place at the time of this study.

Figure 4.29: The percentage of apprentices that will qualify



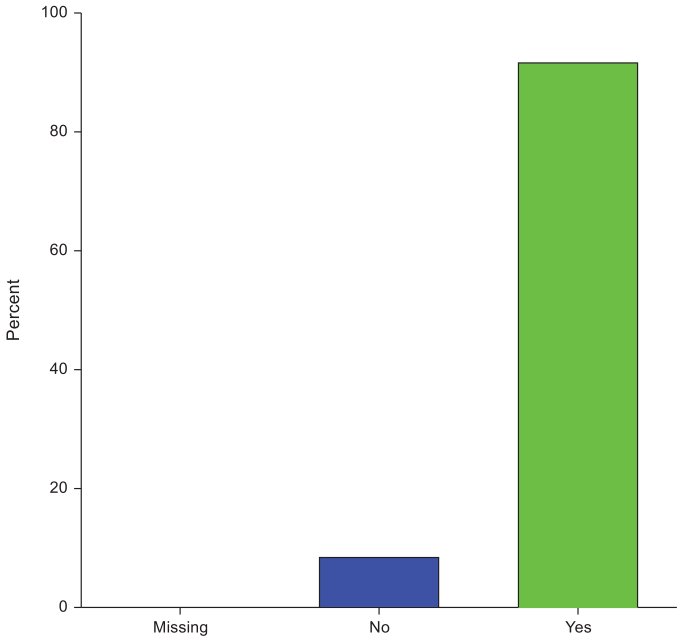
In attempting to determine the success rate of the apprentices in training at the various companies, it was alarming to learn that the majority of the respondents (75%) predict that fewer than 50% of the apprentices will qualify as artisans. Only 25% of the respondents said that they will have a success rate of between 91% and 100%. The reason for such a limited number of apprentices qualifying is an area for further research.

Figure 4.30: Does your company receive a grant from merSETA?



With the number of negative comments about the SETAs it is encouraging that there are companies that receive grants from merSETA. This question followed on from Question 14 (Figure 4.28: Representing whether or not the respondents employ apprentices). Only those respondents that answered yes to Question 14 were asked to comment on this question. Although 60% of the respondents answered yes to Question 14, that represents 60% of 76.92%, which equals 46.15% of the respondents that received grants from merSETA. This is not a satisfactory situation, hence the minister mentioning this in the Government Gazette (Department of Higher Education & Training, 2017:29).

Figure 4.31: Does your company budget for training?

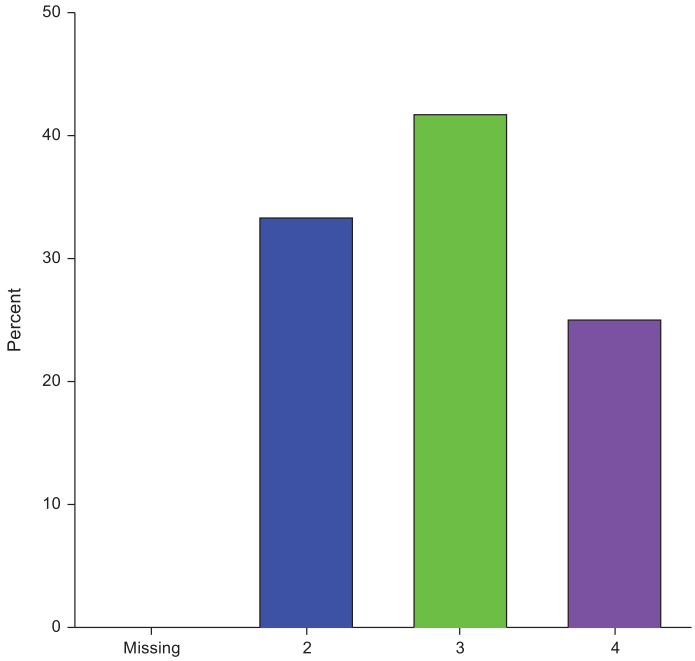


It is encouraging to note that a number of companies budget for the training of their staff. The question was asked to determine the importance of training for the respondents' companies and for the HVAC industry as a whole. This is a good indication that the respondents' companies support training and the improvement of their staff's skills. Of the respondents that answered this question, 91.67% budget for training and only 8.33% do not.

SURVEY PERTAINING TO THE SHORTAGE OF SKILLS AND THE ECONOMIC IMPACT THEREOF

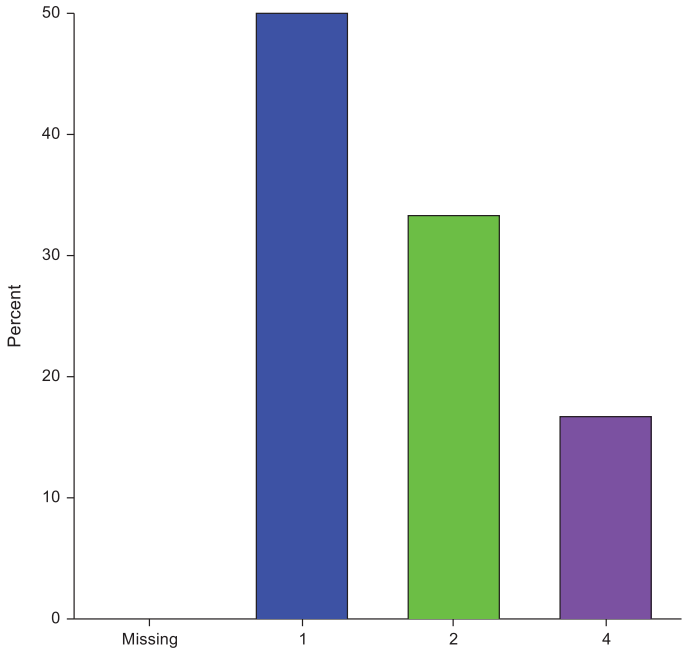
To obtain a better understanding from the respondents, Question 21 (with seven sub-questions) was asked using the Likert scale (Strongly Agree, Agree, Not Certain, Disagree, Strongly Disagree). In Question 22, (Have you considered the financial requirements to interview prospective employees and to employ them?) the respondents had to select a yes or no answer. In Question 23, the respondents had the opportunity to explain their selection in Question 22 by indicating a value in rand. Question 24 was an open ended question. Questions 23 and 24 are explained in more detail later in this chapter under the heading "ANALYSING THE QUALITATIVE PART OF THE QUESTIONNAIRE".

Figure 4.32: Representing if apprentices/learners receiving remuneration during their training contributes to a substantial percentage of learners not completing their training



During an interview with Mark Rogers (M. Rogers, personal communication, July 30, 2019), he opined that a number of young people enter the industry and their employment is terminated relatively quickly because as soon as they begin to earn an income their extended family lays claim to that money. The youngsters entering this market are often from families in which the members are not formally employed and although the wages are low, this is often the only income for the family. The money is spent on survival and nothing is left to pay for transport to get to and from work. This results in the young worker/apprentice either being fired or just not showing up for work. The question was formulated to test this theory and to ascertain the respondents' opinions pertaining to apprentices not being paid until they have qualified. This is also in response to the fact that education is expensive at universities and colleges where students do not earn an income while completing their studies, but rather have to pay to learn. The respondents' feedback indicated that 33.33% agreed, 41.67% were not certain and 25% disagreed. Although the results indicated a marginal (8.33%) favouring of the statement, it was not conclusive.

Figure 4.33: Is recruiting the correct staff costly?

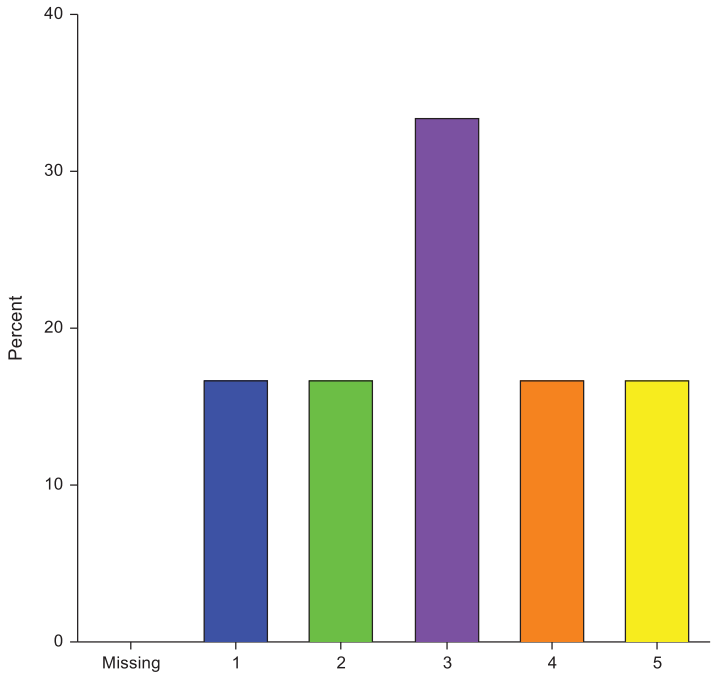


This question was asked to determine whether or not the respondents realise the financial impact recruiting the correct staff has on the company. This question also related to Questions 22 and 23. Question 22: Have you considered the financial requirements to interview prospective employees and to employ them? (This was a Yes/No answer option.) Question 23: If you answered Yes to Question 22, please provide an indication of the costs. (Questions 22 and 23 are analysed further in this chapter under the heading: ANALYSING THE QUALITATIVE PART OF THE QUESTIONNAIRE.

In answer to the question, 50% of the respondents strongly agreed that it is expensive to recruit the correct staff, 33.33% of the respondents agreed and 16.67% disagreed. Although this is addressed hereunder, it is important to highlight a section of the analysis of Questions 22 and 23. *Taking into consideration that the average annual salary of a technician can be R260, 000.00, the cost to replace someone in that salary range can be R650, 000.00. Of the three responses, only one respondent appears to have calculated the actual cost implication. This respondent indicated a cost of R500, 000.00. It should be considered as a significant concern that companies spend money without budgeting for a specific expense.*

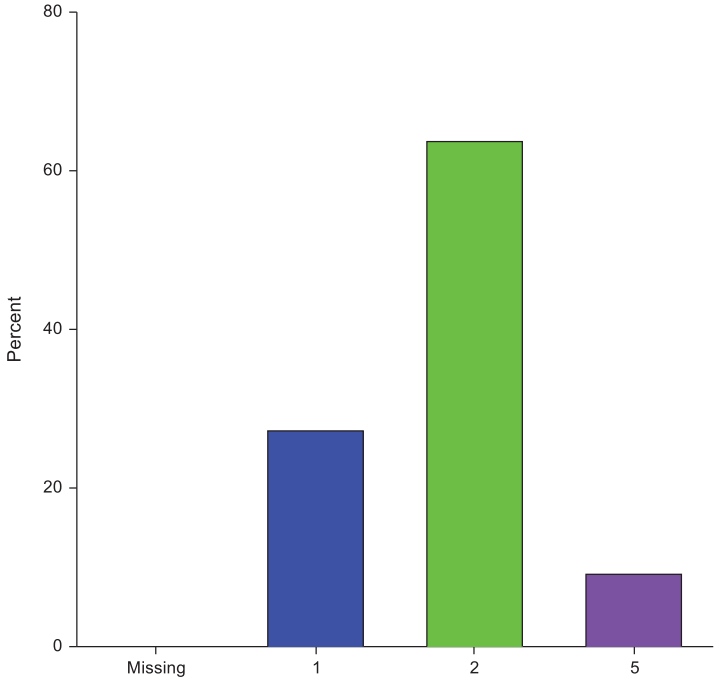
The affirmative response of 83.3% confirms that it is expensive and it is concerning that the respondents did not realise the extent of the cost.

Figure 4.34: Labour brokers reduce employment costs



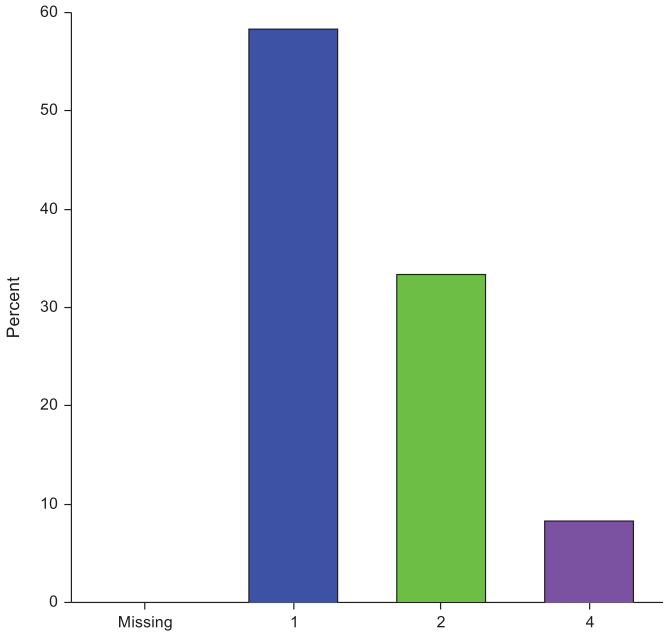
There are companies in the HVAC industry that make use of labour brokers. Being aware of this, the researcher asked this question to understand if it is financially beneficial for the respondents to make use of labour brokers rather than undertaking the recruiting process themselves. The results were inconclusive, as 16.67% strongly agreed, 16.67% agreed, 33.33% were uncertain, 16.67% disagreed and 16.67% strongly disagreed.

Figure 4.35: Retaining staff is more cost effective than recruiting new staff



This question followed on from the previous question. Although 27.27% strongly agreed, 63.64% agreed and only 9.09% strongly disagreed, the answers were meaningless based on the results obtained for Question 23. The respondents had not considered the costs involved in recruiting new staff and it can only be assumed that retention of staff might be a personal battle between management and staff not to “give in” to the demands and/or requests of the existing staff.

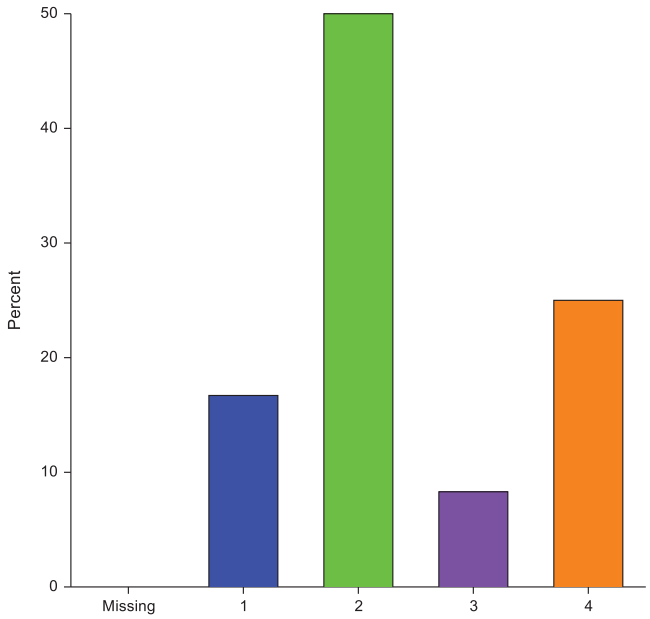
Figure 4.36: Does the shortage of skilled and qualified artisans increase the labour rate for skilled and qualified technicians?



Windapo (2015:2) advanced a relevant definition: *"Skills shortage can be described as an insufficient supply of suitably qualified workers willing to work under existing market conditions, particularly at prevailing wages."*

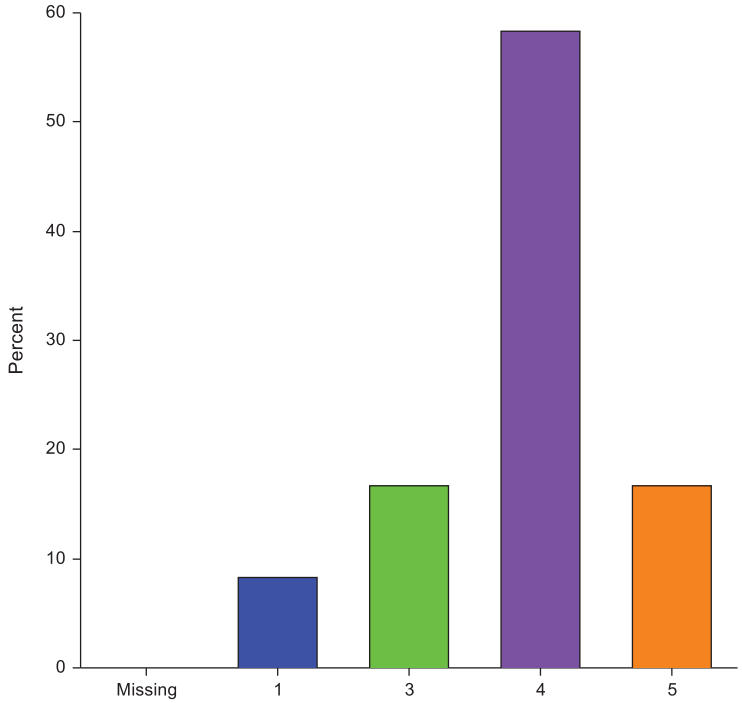
With the rate for artisans relatively constant in the market, the demand for higher wages performs an important role in attracting and retaining quality artisans. With the correct skills, artisans can negotiate for better wages and better working conditions. This question was asked to test the theory that as the demand grows, so do the wages. The respondents' feedback indicated that 58.33% strongly agree that this is the case, 33.33% agreed and only 8.33% disagreed. Based on these responses one can say with confidence that the theory is correct.

Figure 4.37: Does employing new technicians have a negative financial impact on the company?



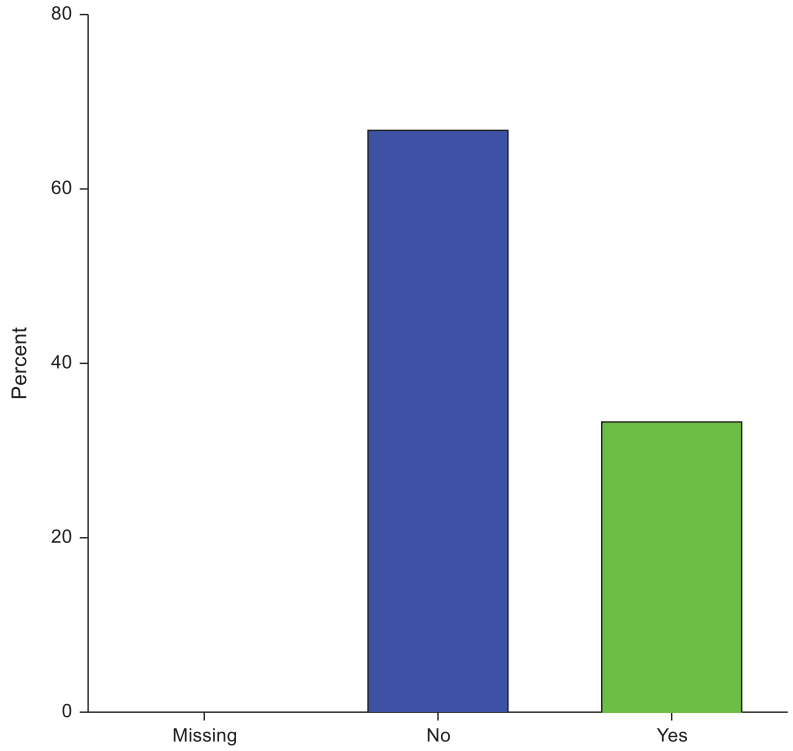
This question was asked to establish whether or not the respondents understand the importance of staff retention rather than replacing staff. 16.67% of the respondents strongly agreed that they have experienced a negative financial impact when employing new staff, 50% agreed, 8.33% were uncertain and 25% disagreed. This supports the responses to the statement that "*Staff retention is more cost effective than recruiting new technical staff."*

Figure 4.38: Apprentices should pay their employers for their training



When asked if employers should be paid by apprentice for their training at the employing company, 8.33% of the respondents strongly agreed, 16.67% were uncertain, 58.33% disagreed and 16.67% strongly disagreed. This question tested the age old saying that if you pay for something yourself you will appreciate it more. It can be said that with the country's current high unemployment rate, apprentices do not have the financial means to pay for an education and that the employer has the benefit of the apprentice's labour component. Asking apprentices to pay for training will not help to reduce unemployment but requiring that the apprentice sign an agreement to work for the company for a specific period on completion of training could be investigated and implemented should the company have positions to fill.

Figure 4.39: Have the employers considered the financial impact of interviewing and employing new staff?



Recruiting new staff is costly. This was supported by the statement that *"Recruiting the correct staff for the vacant position at your company is costly."* Also refer to Figure 4.35, which indicates that an overwhelming majority of 83.33% of the respondents strongly agreed and agreed with this statement. It was interesting to note that the majority who confirmed that it is costly to recruit staff had not calculated the financial impact. This is an area that requires investigation.

4.8 ANALYSING THE QUALITATIVE PART OF THE QUESTIONNAIRE

Not all the respondents made use of the opportunity to offer their own comments and opinions in the space allocated. There were however a number of interesting comments from several of the respondents.

In the section under the heading: Section B: Survey pertaining to skills shortages in the HVAC industry in the Western Cape, the respondents were given the opportunity to elaborate on their responses.

The first question with an option to provide reasons for their selection was Question 17, which was the last in a series of follow-up questions that led the respondents to provide their opinions in Question 17. The series of questions began with Question 14: Does your establishment currently have artisans/learners in training? This was followed by Question 15: If you answered yes to Question 14, what percentage of the employees in training will qualify as technicians? Question 16 followed with a yes or no option. Question 16: If you answered yes to Question 14, do you receive any grants from merSETA? Question 17 was the follow-up question giving the respondents the opportunity to explain their answer. Question 17: If you answered No to Question 16, please provide reasons. Several of the reasons provided are listed hereunder from the 42% of the respondents that selected the "No" option to Question 16.

> *"Far too much admin for small business that does not have the luxury of personnel Management. Poor support for companies that are far from Cape Town."*
>
> *"Not sure how to claim or if I can, as we are not an accredited training facility."*
>
> *"Trained personnel leave for better wages."*
>
> *"No current interns through merSETA."*
>
> *"MerSETA has been a very mute entity for many years. The payment of discretionary and other grants are erratic at best."*
>
> *"The employees that were trained are all qualified and still in our employ."*

Several of the respondents operate in areas outside the cities and found it difficult and expensive to train staff by sending them to training facilities in the city. The costs involved were excessive for smaller companies and they cannot afford for the people working for them to be absent while at training, let alone the cost to the company while studying, which includes accommodation and transport.

The results indicate that a number of companies do not know how to claim from merSETA. There seems to be poor communication from merSETA in informing companies that they can claim for training and that they do not have to be a registered trainer. In the Government Gazette (Department of Basic Education, 2019), the minister highlighted the scope of the SETAs. One of their responsibilities is to engage workplaces and stakeholders. The minister has also said that there must be a more streamlined and focussed approach by the SETAs, a clear indication that the current situation is ineffective.

A number of companies have the perception that spending time and money to train staff will have a negative effect on them, as the technicians that qualify will leave for better wages elsewhere.

The importance of retaining staff was discussed earlier in this report. Human capital, in this case artisans, must be attracted, developed and retained (Schlechter et al., 2014). The majority of the respondents have a staff complement of fewer than 50. In several cases these companies do not have the luxury of a human resource department with specialised human resource practitioners that are able to study and implement such programmes. The majority of the owners of these companies are engineers/technicians that have worked their way through the system to become owners of the companies or initiated their own companies. They often have inadequate human resource skills.

Bussin & Brigman (2019:1) refer to the high cost of replacing staff by positing that the direct costs can be as high as 2.5 times the annual salary of the person being replaced. This type if cost is impossible for smaller companies to absorb and they would rather prevent these costs if at all possible.

Several of the respondents have found a way to retain the staff that they trained and these people have remained in their employ. These respondents appear to train staff as required and make a concerted effort to retain them.

The next opportunity the respondents had to comment was in Question 19. This question was with regard to the fact that although the company may employ a qualified technician, that technician cannot work independently from the first day. The question was structured to answer the sub-question, “Do the instructors have the skills and sufficient subject knowledge to impart to the students?” The perception is that when a

company employs a qualified person with a degree, diploma or certificate, that person is able to perform the work for which they have studied and been employed. This question was asked to establish the level of education the students receive at the colleges. Question 19, “How long does it typically take for a newly employed technician to be able to work independently?”

A variety of answers was offered but the conclusion was that technicians do not receive sufficient training to work on their own from day one. They require in-service training in addition to them qualifying as a technician. The respondents indicated that the existing qualification alone is insufficient. The average time, in years, that the respondents felt a qualified technician would require for on the job training was an additional 2.25 years. (The average was calculated by taking the maximum value given by the respondents and dividing it by the number of answers).

Taking the above into consideration, for a technician to be able to work on his own and add value to a company will take approximately 6 years.

A number of the answers are listed hereunder.

“5-6 years”

“1 year”

“If he is employed as a technician, immediately .”

“2-3 years”

“6m-1year”

“3-5years”

“The time for completing certification varies but it can be done in as little as 6 months. While initial HVAC training may take less than a year, technicians may need to take state-required additional continuing education to maintain industry standards.”

“5 years”

“Immediately”

“Depends what skill level is referred to - proper technician at least 3 years.”

“2 years”

"Immediately (use of the word "technician" indicates qualified)."

"It depends on a number of factors such as length of service in the industry, technical sills / capabilities, level of training etc. It ranges from 3 months to a year."

The following question was added to offer the respondents an opportunity to provide relevant information of a general nature. "Q.20 Do you have any comments you would like to add to this section?"

"Re-registration for already qualified and registered people at SAQCC is an unmanageable situation for small companies outside the Metropole. We should rather work on the accreditation points rewarding system as for Pr. Eng. If the amount of CPD points cannot be obtained, then re-registration and re-examination."

"The grants provided by merSETA should rather be routed to proper training schools - trade centres; not leave it up to individual companies - a steady flow of learners should be guaranteed for the industry."

"Heating, air conditioning and ventilation (HVAC) technicians are in demand. Job opportunities in the field continue to grow as the industry demand for HVAC technician's increases. To become an HVAC technician you need to complete a degree, HVAC certificate program or formal apprenticeship. The time for completing certification varies but it can be done in as little as 6 months. While initial HVAC training may take less than a year technicians may need to take state-required additional continuing education to maintain industry standards."

"merSETA appears to be an employment agency with no clear and tangible contact with the industry."

"The training employees receive today is not of the same standard it used to be when apprentices went for their trade test at Olifantsfontein."

"merSETA - not enough skilled technicians."

The responses varied but the general consensus was that the training that technicians currently require is not provided during their training at the various colleges.

A number of the issues that smaller companies outside the metropole experience are that it is difficult and expensive to send their staff for training in the metropole. The suggestion that one of the respondents made with reference to online training is something to consider in the future.

The general perception is that merSETA is not adding value to the industry. This was also apparent in the Department of Basic Education (2019:35), where specific mention was made as to the ways in which the SETAs' functions should be streamlined.

It was also suggested that the SETAs should take control of the training and channel the funds to training facilities to train all technicians to a set standard. This type of comment is not in line with the SETAs' mandate; an indication that the SETAs' roles are not clearly defined nor communicated with the stakeholders in the industry.

One of the SETAs' mandates is to liaise with stakeholders in the industry and provide relevant data pertaining to the existing skills and to make projections for future needs (Department of Basic Education, 2019:35). Based on the responses, the SETAs have failed their mandate.

Question 23 was added to offer the respondents an opportunity to identify the perceived cost to replace staff, as numerous smaller companies do not have the luxury of a human resource department and do not realise the cost implication to their company when replacing staff or expanding.

Question 23 followed on from Question 22.

Question 22: Have you considered the financial requirements to interview prospective employees and to employ them?

Question 23: If you answered Yes to Question 22, please provide an indication of the costs.

R500, 000.00

R5, 000.00 - R10, 000.00 (start-up)

R1, 000.00 per interview

Only three respondents completed Question 23, although four responded "Yes" to Question 22.

Although three respondents indicated a cost, 66% of the respondents had not considered the extent of the costs. Based on the research conducted by (Bussin & Brigman, 2019), the cost to employ a new employee can be 2.5 times their annual salary. Taking into consideration that the average annual salary of a technician can be R260, 000.00, the cost to replace someone in that salary range can be R650, 000.00. Of the three responses, only one respondent appears to have calculated the actual cost implication. The respondent indicated a cost of R500, 000.00. It should be

considered as a significant concern that companies spend money without budgeting for such an expense.

The last of the open ended qualitative questions in the questionnaire was Question 24. This was added for the respondents to offer their opinions and to make recommendations they perceived as relevant to the field of study.

Q.24 Feel free to share any comments you may have.

> *"Please do away with the name "Technician" for a person who is actually supposed to be an "Artisan". There is a place for technician status and qualification and a huge difference from what an artisan is supposed to be. I would rather employ a good artisan with skills and experience than a "Technician" with a not-yet-competent artisan certificate. Similarly, I would rather employ a well-trained Technician that understands the ethics of design and construction, to be able to work and guide the artisan and be the interface to the engineer."*
>
> *"The Government should the TVET Colleges invest in refrigeration training as only one College has an operational facility."*
>
> *"There is a financial impact when it comes to employing technicians such as PPE, Vehicles, Petrol, Uniforms, Tools and Training if required."*
>
> *"In general the majority of the pool of potential new apprentices is badly lacking in maturity, fundamental abilities and basic discipline."*
>
> *"I do not think that employees selected for training initiatives should carry these costs. I feel that additional funding should be made available by the SETA's and Government. I do however feel that the employee should commit to the company for a period of at least 2-3 years in order for the company to see a return on their investment."*

Over the years the correct terminology for particular professions has been "abused". In several cases the hard-earned qualification has been used to describe a particular profession. For example, the reference to "engineer" has been added to "inflate" the importance of a profession. The term sales engineer is being widely used to describe sales representatives. Most of these sales representatives have no engineering qualification and no technical qualification. The comment from one of the respondents to refer to artisans as artisans and not technicians, *"Please do away with the name "Technician" for a person who is actually supposed to be an "Artisan",* was appreciated.

It was concerning to several of the respondents that there is only one TVET College in the Western Cape that can offer the required training and that has the facilities to perform the practical assessment. This was discussed in the preceding chapters.

The millennial generation is being judged as one that portrays themselves as being overly self-confident and self-absorbed. They also lack loyalty and their work ethic is lacking in the workplace. They display a reluctance to take on responsibility and develop relationships in the organizational context (Smith, 2018). Unfortunately, the world will have to adapt to the millennials' ways; only companies that have learnt to accommodate millennials will be able to employ and retain a work force in the near future.

4.9 CHAPTER SUMMARY

In this chapter the coding and presentation of data was discussed, as well as the research questions. The data from the quantitative study was analysed and interpreted, as was the qualitative part of the questionnaire.

Chapter Five presents a summary of the research discussion with recommendations, suggestions for future research and concluding remarks.

CHAPTER FIVE

DISCUSSION, RECOMMENDATIONS AND CONCLUSIONS

5.1 INTRODUCTION

In Chapter Four the coding and presentation of the data was discussed, as well as the research questions. The data from the quantitative study was analysed and interpreted, as was the qualitative part of the questionnaire.

Chapter Five presents a summary of the research discussion, recommendations, suggestions for future research and concluding remarks.

5.2 DISCUSSION OF THE FINDINGS

Information and results obtained from the study of existing literature and survey questionnaires was used to answer the research question; *"Does the lack of skilled and qualified HVAC artisans have a devastating impact on the industry's ability to work within the framework of competitive business practises and legislation?"*

In order to answer the main question, the following sub-questions were investigated.

5.2.1 Research sub-questions

- Do artisans have the required skills?
- What do employers perceive as good service?
- Do companies plan strategically for training?
- Do the instructors have the skills and sufficient subject knowledge to impart to the students?
- Should artisans be required to remain up to date with the latest developments in their field by attending regulated refresher courses annually?
- In what way is merSETA assisting companies that currently offer training?

A mixed method approach (quantitative and qualitative) was followed to obtain and analyse the data. Hofstee (2013:114) posits that a combination of methods enhances the results.

5.2.1.1 Skills Shortage

The results obtained from the questionnaire indicate that the respondents agree that there is a shortage of skills in the HVAC industry in the Western Cape. The results indicated that 61.54% strongly agreed with this statement and 38.46% agreed. All the respondents agreed with the statement. Based on the responses, it was confirmed that there is a shortage of skilled artisans, an artisan being a person that has already completed his/her training and is entering the labour market as a qualified person ready to perform his/her duties as an artisan. The skills shortage in the HVAC industry in the Western Cape can be added to the statements made by Koegelenberg (n.d.), Schlechter et al. (2014) and Strauss & Du Toit (2010:308). Bussin & Toerien (2015), Windapo (2015), Hall & Sandelands (2009:216), Watermeyer & Pillay (2012:46), Jordaan & Barry (2009), H. Basson (personal communication, July 31, 2019), Rasool & Botha (2011:1) and Botha et al. (2011) among other authors.

In addition, the fact that the apprentice does not receive the correct level of training to make him/her a skilled artisan can be as a result of a lack of proper education at the school level. The government should take responsibility for the poor quality of education at primary and secondary levels first. The results from the quantitative study confirm that the level of education affects the shortage of skills, as 53.85% of the respondents strongly agreed and 46.15% agreed that lack of education is the reason for the skills shortage.

The research also indicated that the lack of adequate training facilities contributes to the skills shortage in the HVAC industry. According to Basson (H. Basson, personal communication, July 31, 2019), the inability of the Department of Higher Education to address the shortage of skills has forced the private sector to become involved. According to Mr. Basson, the only TVET College in South Africa offering HVAC training is in Cape Town.

There are only three colleges in South Africa that are fully equipped to offer practical training (College of Cape Town, Limpopo College and Centurion College). At the time of the interviews, the departments offering refrigeration training at Limpopo College and Centurion College were closed, as there were no certified lecturers available. Although the College of Cape Town has a lecturer, he is not qualified/certified to offer the practical training (H. Basson, personal communication, July 31, 2019). Currently, teaching of theoretical subjects can only be undertaken via distance learning. The

examination papers are old and the same examination papers are being used year after year with no new and current content on which the students can be tested.

There are two private institutions in Cape Town that offer training, namely Techniskills (in Montague Gardens) and the HVAC Training Academy in Brackenfell.

Techniskills is a merSETA and South African Maritime Safety Authority (SAMSA) accredited training facility approved by SARACCA. They offer a wide range of unit standard based training tailored to industry's needs. Their fully equipped facility includes five working cold rooms, as well as other specialized equipment to meet industry requirements. They also offer a state of the art refrigeration trade test centre that meets the standards of both the industry and the National Artisan Moderating Body (NAMB)(Anon, 2019b).

Gavin Edwards at the HVAC Training Academy is only accredited to offer the unit standards for "Safe Handling of Refrigeration" training and has received a one year temporary accreditation from merSETA. After that year merSETA will re-evaluate his training and will then make a decision as to whether or not to offer accreditation for the training he is currently offering. At present the students will not receive a national qualification (H. Basson, personal communication, July 31, 2019).

To confirm the private sector's willingness to become involved, Mr. Basson, in his private capacity, is rewriting the curriculum for N1 to N3.

Mr. Basson also took it upon himself to rewrite the standard for the SAQCC training as a national standard for all to use.

Mr. Louis Vermeulen, the current chairman of the South African Institute of Refrigeration and Air Conditioning (SAIRAC), Cape Town Branch, confirmed that there are students eager to further their studies and do N4, N5 and N6, but there is no such training available in the Western Cape. Hennie Basson and Louis Vermeulen are in agreement that students should not be trained under the current standards (H. Basson, personal communication, July 31, 2019).

Mr. Rogers became concerned with the level of training and initiated his own training centre and attempted to involve local government but had to cancel the project due to commitments not being honoured (M. Rogers, personal communication, July 30, 2019).

5.2.1.2 Good service

What is good service? This is a more complex question than it appears at first glance.

With regard to the qualitative results pertaining to whether or not the artisans are suitably skilled after completing a trade test, the overwhelming response from the respondents was that artisans are not properly skilled after a trade test. Un-skilled or poorly skilled artisans will not be able to deliver good service. Good service and customer satisfaction go hand in hand and one cannot exist without the other.

5.2.1.3 Planning strategically for training

The research indicated that 91.67% of the respondents budget for training. Although a high percentage of the companies budgeted for training, the research also indicated that the majority of the respondents, (100% strongly agreed or agreed), believe that the quality of training offered is inferior and that although an apprentice may qualify as an artisan, they do not necessarily have the required skills.

Relevant supplementary training for artisans, apprentices and assistants is available. This training is performed by the two private service providers, namely Techniskills and the HVAC Training Academy. The SAQCC training is costly and the SAQCC certification must be renewed every three years. Companies need to plan for training.

5.2.1.4 Skilled Instructors

A number of talented and knowledgeable instructors with years of experience are employed by the private training institutions but there are also numerous unqualified and unskilled instructors. The feedback from the respondents (76.92% strongly agreed and agreed) was that there is a lack of skilled educators. This, together with inferior training facilities at the TVET colleges, contributes to the production of unskilled artisans.

5.2.1.5 Artisans keeping up to date with latest legislation and technology

"An organization's competitive advantage hinges on its ability to adapt rapidly and continuously to market change, and every business must develop the essential skills for capturing narrow windows of opportunity" (Setili, 2014). Setili (2014) explained the importance of employee autonomy and how important it is for companies to continuously adapt to new technology to grow the businesses to be profitable and

sustainable. Only companies that are adaptable can survive. Relevant and up to date skills are an important factor in a company's ability to adapt.

One of the responses:

> *"Re-registration for already qualified and registered people at SAQCC is an unmanageable situation for small companies outside the Metropole. We should rather work on the accreditation points rewarding system as for Pr. Eng. If the amount of CPD points cannot be obtained, then re-registration and re-examination."*

An overwhelming 61.54% strongly agreed and 23.08% agreed that continuous training for artisans is essential.

5.2.1.6 merSETA's involvement

The research indicated that merSETA adds no value to the HVAC industry. There seems to be a lack of communication between merSETA and the respondents' companies. Numerous companies do not understand the process that must be followed to claim and do not bother. The companies that do claim have to wait for extended periods for their claims to be processed.

5.3 RECOMMENDATIONS

The findings indicated that artisans lack the required skills and that the underlying problem is much more complex than simply upgrading the HVAC training facility, equipping it with testing equipment and employing more skilled lecturers. The primary and secondary education systems or the lack thereof are the primary reason for the skills shortage, not only in the HVAC industry but also in other industries in the country.

5.3.1 Recommendation one

A body such as SARACCA or SAIRAC, or any newly created one, should take charge and represent the HVAC industry at a national level to merSETA. The body must communicate all information to the industry and not only to a handful of "members". The body must also liaise with merSETA to communicate the proper requirements for the HVAC industry.

MerSETA must also meet its mandate. Minister Pandor recently proposed four guiding principles to take over from the SETAs post 2020. One, there must be alignment between skills development strategies, national priorities and an industrial policy framework. Two, all economic sectors must be covered by the SETAs. Three, the

SETAs must be financially stable and operationally viable. Four, specific functions of the SETAs must be grouped together.

5.3.2 Recommendation two

Although it is important for artisans to qualify and to undergo the required SAQCC training, it is also costly to redo the training every three years. Although the research has shown that companies do plan for training, it should not be wasted.

One of the respondents recommended an online training process that will require the artisan to undergo continuous training to remain up to date with the latest technology and with the changes to any regulations. This will be more beneficial than other forms of training and economically viable.

The artisans will have to register on a national framework where information (not personal) can be easily obtained to monitor the state of our artisans and also ways in which the artisans can be best served. Qualifications will be available on the system and references can be checked. The Construction Industry Development Board has a system whereby companies are registered and any person can access the system to view the status of the company (Anon, 2019a).

5.3.3 Recommendation three

South Africa's education system is not op to standard and the country's skills are ranked 84th on a list of 140 countries (World Economic Forum, 2018:525). South Africa was also ranked last out of 148 countries for maths and science education in 2019 by the World Economic Forum (WEF) (Wilkinson, 2019).

To become an artisan a student must have mathematics as a subject and not mathematics literacy. Subject choice at school is a challenge as students are not always provided with the correct information and advice. One cannot become an artisan without mathematics.

The Department of Basic Education must invest in a better education system for all. They must also employ the correct teachers/advisors to advise the scholars with regard to their career choices and the impact that choosing the easier subjects will have on their future.

5.4 SUGGESTIONS FOR FUTURE RESEARCH

This study focussed on the impact of the skills shortage in the heating, ventilation and air conditioning industry in the Western Cape.

The shortage of skills in the industry not only makes the industry unattractive for young talent entering the industry, but also gives the industry a “bad name” with clients and end-users.

5.4.1 Future research can be extended to areas such as those listed hereunder

- The research can be extended to include the whole of South Africa thus broadening the sample size to include a wider range of HVAC companies and not only those registered with SARACCA.
- The reason for the limited number of apprentices qualifying can be researched further.
- Employing new technicians has a negative financial impact on a company and why do companies not investigate retention of staff rather than replacement.
- The option to offer HVAC as a subject at technical schools.
- Research has been conducted in the past on ways to accommodate millennials in the work place, but not specifically in the technical fields of employment.
- A more accurate research on the actual financial implication to employ, train and retain artisans.

5.5 CONCLUSION

This chapter addressed the research question and answered the sub-questions by means of analysing the results of the research. Recommendations were made to address key elements. During the research, a number of related questions arose that can be researched and these were listed.

The original research question.

> *“Does the lack of skilled and qualified HVAC artisans have a devastating impact on the industry’s ability to work within the framework of competitive business practises and legislation?”*

There are numerous individuals that are passionate about training and education within the HVAC industry and they are eager to share their knowledge and experience with new entrants.

There are companies that do not appear to understand business principles and have a perception that training, recruiting and retention is expensive, as they have not undertaken the research to determine the financial impact it has on their companies.

In conclusion, the lack of skilled and qualified HVAC artisans has a devastating impact on the industry’s ability to work within the framework of competitive business practises and legislation.

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ANNEXURE A: N4 Curriculum

Refrigeration, Air-condition & Ventilation

N4

KOELING, LUGVERSORGING EN VENTILASIE N411

(Een 3-uurvraestel)

(Met ingang van Januarie 1980)

1. Veiligheidsmaatreëls: voorkoming van ongelukke; hantering van apparaat; noodhulp.

2. 'n Bondige behandeling van die volgende: Die gebruik van Celsius en Kelvin temperatuurskale. Eenhede van druk en die gebruik daarvan. digtheid; relatiewe digtheid; volume; spesifieke volume. Warmte-eenhede: Joule, waarneembare warmte, latente warmte. Die twee wette van termodinamika. Charle's se wet; Boyle se wet; die karakteristieke Gaswet; Dalton se wet.

3. Verdamping en kondensasie van vloeistowwe met temperatuur-verwantskap. Die gebruik van psigrometriese kaarte.

4. Die funksie van die volgende beheertoestelle: lae- en hoëkantvlotters; uitsettingskleppe; kapillêre buise; elektriese drukskakelaars; elektriese solenoïde-skakelaars; alle tipe termostaatskakelaars.

5. Funksie en doel van die volgende komponente: Koelmiddel-filtreerders, droërs; alle tipes verdampers, verkoelers en kompressors; olieopvangers (olieafskeier); vloeistof-opvangers; vloeistofreservoir; hitteruiler; ontvriesing-kontroles and metodes.

6. Koelmiddels: Alle soorte geskik vir verkoeling; eienskappe en chemiese simbole; hantering; veiligheidmaatreëls.

7. Warmteoordrag: geleiding; konveksie; straling; koëffisient van warmteoordrag.

8. Dampkompressiestelsels: Volumetriese rendement van die kompressor; uitwerking van suiervryruimte; kompressorspoed. Uitwerking van oorverhitting van die suigdamp en van oor-verkoelde vloeistof van die kondensator. Saamgestelde en kaskadekringe en kontroles vir lae temperatuur werk tussen-koelers.

Koelkamers - Algemene konstruksie en beginsels. koelkaste; vrieskaste; uitstalkaste; drankverkoelers en toonbanke; waterverkoelers en belugters; toepassings vir sjokolade-verkoeling; kommersiële roomysvervaardiging; abbatoir-verkoelingstelsels en verkoelingstelsels vir suiwelprodukte. Inleiding tot die absorpsie-eenhede.

9. Geïsoleerde strukture: Vereistes vir 'n goeie isolasiemateriaal.

10. Die koelingsiklus: Warmte - drukdiagramme; die aandui van die siklus op psigrometriese grafieke; aandui van foute op grafieke.

ANNEXURE B: N5 Curriculum

LB N5 JANUARIE 1981

KOELING, LUGVERSORGING EN VENTILASIE N521

(Een 3-uurvraestel)

1. Koeling

(a) Druk en drukskale; spesifieke volume; spesifieke warmtekapasiteit; warmteoordrag; temperatuurskale; verdamping en kondensasie met temperatuur- en druk-verwantskap.

(b) Basiese verkoelingsiklus en al die komponente benodig vir die eenheid: Kompressors - suiertipe, roterende tipe en sentrifugale tipe. Verkoelers - verdampertipe, lugverkoelde tipe en die dop- en buistipe. Verdampers - koperspoeltipe, dop- en buistipe. Die verdamperplaat-tipe en die A-raam-tipe. Al die toepaslike berekeninge.

(c) Die keuse en vereistes van koelmiddels. Hittelas. Infiltrasie - die effek op die hittelas. Dampverplasing. Geleiding - die effek op die hittelas. Ventilasie - die effek op die hittelas. Hittelas te wyte aan masjiene. Bepaling van die totale hittelas.

2. Lugversorging: Hittelasbepaling; kamerlugverkoeling; sentrale lugversorgingsinstallasies; lugeenhede; waterstelsels; waaier-stelsels vir lugreëling; pompstelsels vir lugreëling; industriële lugversorging; mobiele lugversorgingseenhede; Lugversorging en humiditeitsversorging vir fabrieke.

3. Ventilasie: natuurlike ventilasie; gebruike van psigrometriese kaarte; uitwerking op omgewingstoestande ten opsigte van lug-temperatuur en humiditeit vir die menslike gerief; natuurlike en geforseerde stelsels inlaat en uitlaat; verskillende metodes van verplasing van lug; verskillende soorte waaiers; wette en definisies van waaiers; verdampingsverkoelingstelsel; lug-verspreidingsapparaat en -filtreerders.

ANNEXURE C: N6 Curriculum

N6

SEPTEMBER 1981

KOELING, LUGVERSORGING EN VENTILASIE N631
(Een 3-uurvraestel)

1. Koeling

(a) Koelingskringlope en termodinamiese beginsels soos hitte en arbeid verrig; interne energie en entalpie; Carnot se omkeerbare kringloop.

(b) Eienskappe van vloeistowwe: Druk-temperatuur-, druk-volume-, druk-entalpie-, en druk-entropiediagramme. Natbol- en droëbolfraksie. Die gebruik van termodinamiese tabelle.

(c) Berekeninge op kompressors. Toepassings van kompressors op verskillende installasies. Interne konstruksie van kompressors.

(d) Dampkompressiestelsels: Algemene stelsels; industriële stelsels; nat- en droë drukstelsels; kaskade- en meer-trapstelsels.

(e) Absorpsieverkoeling: Periodieke en aaneenlopende stelsels; Daltor se wet; ewewig tussen n oplossing en sy damp; druk- emperatuurdiagramme en gebruike; berekeninge op die basiese siklus.

(f) Die vervaardiging van soliede CO_2 en vloeibare lug.

(g) Ysskaatsbane: Ontwerp; kontrole en beheer.

2. Lugversorging

(a) Berekening van ale en hoë temperatuurlas; interne hittelas; luginfiltrasie en vars lug.

(b) Verskillende toepassings soos by industriële, mobiele en huishoudelike eenhede; warm en koue lug; steurnisse soos vibrasie en geraas.

(c) Beheerstelsels: Elektries, pneumaties en hidroulies. Tipes en funksies van temperatuur- en humiditeitskontroles asook reguleerkleppe.

3. Ventilasie

(a) Konveksie; verspreidingstelsel; tipe luguitlate.

(b) Luggange; Verliese en lugvloei in gange; tipes waaiers; wette van toepassing op waaiers; keuse van waaiers; instrumente wat benodig word.

4. Meganiese instrumente: Gebruike, werking en instandhouding van die instrumente.

ANNEXURE D: Questionnaire

The impact of skills shortage in the heating, ventilation and air-conditioning industry in the Western Cape

This questionnaire is designed to test the hypothesis “The lack of skilled qualified HVAC artisans has a negative impact on the industry to be able to function within the framework of competitive business practices and legislation”.

The outcome of this research is expected to provide industry leaders with the necessary background information to government with drafting new related policies, amend existing ones and seek alternatives, which will facilitate minimising of skill shortages and to reduce poverty and unemployment.

Note: Please be assured that results of this questionnaire will be dealt with in confidence. The data obtained from this study will be treated as confidential and will be used for academic purposes only. Your participation in the completion of this survey is voluntary and appreciated. Please complete the questionnaire by following the instructions at each question. Please answer all questions.

Thank you for your co-operation. The results will be available once the dissertation has been approved.

Yours sincerely

Thomas A. Lubbe (Nols)
Researcher (082 413 2981)
Date:

Questionnaire

Section A: Biographical information

Q1 Please indicate your gender		
Tick one box from the option below		
Male		(1)
Female		(2)

Q2 Please indicate your position at your current company		
Tick one box from the option below		
Owner/Shareholder/Director		(1)
Manager		(2)
Engineer		(3)
Finance		(4)
Other		(5)

Q3 What is your age?		
Tick one box from the option below		
Under 21		(1)
21-30		(2)
31-40		(3)
41-50		(4)
51-60		(5)
61-over		(6)

Q4 Time involved with the industry (years)		
Tick one box from the option below		
0-5		(1)
6-10		(2)
11-15		(3)
16-20		(4)
21-25		(5)
25-over		(6)

Q5 Please indicate your highest level of education.		
Tick one box from the option below		
High School		(1)
Diploma		(2)
Degree		(3)
Master's Degree		(4)
Doctoral		(5)
Others		(6)

Q6 Is your qualification technical?		
Tick one box from the option below		
Yes		(1)
No		(2)

Q7 During your career, where you ever an apprentice?		
Tick one box from the option below		
Yes		(1)
No		(2)

Q.8 Please indicate the % of the following staff in relation to your total staff.	
Management	
Technical Staff	
Admin Staff	

Q.9 Average age of the following professions in your company.	
Technicians	
Assistance	
Apprentices/Learners	
Management	

Q. 10 Is all your technicians (where applicable) SAQCC registered?		
Tick one box from the option below		
Yes		(1)
No		(2)

Q.11 If you have answered NO in Q.10, do you have a timeline to get them SAQCC registered?		
Tick one box from the option below		
Yes		(1)
No		(2)

Section B: Survey on skill shortage in the HVAC industry of the Western Cape

Q.12 Please read each of the following statements regarding the perceived skill shortage in the HVAC industry of the Western Cape and rate your agreement by marking an X in the appropriate block.	Strongly Agree	Agree	Not Certain	Disagree	Strongly Disagree
12.1 There is a skill shortage in the HVAC Industry.					
12.2 Skill shortage can be related to a lack of education.					
12.3 Skill shortage can be related to the lack of good educators.					
12.4 Skill shortage can be related to the lack of training facilities.					
12.5 Skill shortage can be related to the negative image the construction industry portray.					
12.6 Skill shortage can be related to the lack of young people entering the HVAC industry					

12.7 Skill shortage can be related to the experienced professionals retiring.					
12.8 Skill shortage can be related to the experienced and skilled professionals migrating.					
12.9 The lack of skills effects the economic status of your staff.					
12.10 The lack of skills effects the social status of your staff.					
12.11 merSETA play a vital role in feeding the industry with skilled people.					
12.12 The educational system should be upgraded by Government.					
12.13 Foreigners are better employees.					
12.14 Skill shortage contribute to a slow economic growth.					
12.15 Trained technicians adhere to Health & Safety legislation					
12.16 Trained technicians adhere/follow the SAQCC regulations when working with refrigerant.					
12.17 Continuous training for technicians will contribute to increased service levels.					

Q.13 Have you lost any skilled technical staff members due to migration?	
Tick one box from the option below.	
Yes	
No	

Q.14 Do your company currently have artisans/learners in training?	
Tick one box from the option below.	
Yes	
No	

Q.15 If you have answered yes in Q.14, what % of the people will qualify as technicians?	
Tick one box from the option below.	
less than 50%	
51 - 75%	
76-90%	
91 - 100%	

Q.16 If you have answered yes in Q.14, do you get any grants from merSETA?	
Tick one box from the option below.	
Yes	
No	

Q.17 If you have answered NO in Q.16, please give reasons.

Q.18 Does your company budget for staff training?	
Tick one box from the option below.	
Yes	
No	

Q.19 How long does it take a new employed technician to work independently?

Q.20 Do you have any comments you would like to add to this section?

Section C: Survey on skill shortage and the economic impact.

Q.21 Please read each of the following statements regarding the perceived financial impact due to skill shortage in the HVAC industry of the Western Cape and rate your agreement by marking an X in the appropriate block.	Strongly Agree	Agree	Not Certain	Disagree	Strongly Disagree
Apprentices/Learners receiving remuneration contributes to a large % not completing their training.					
Recruiting the correct staff for the vacant position at your company is costly.					
Making use of labour brokers reduces the cost of employing new staff.					
Staff retention is more cost effective than recruiting new technical staff.					
The shortage of skilled and qualified artisans increase the labour rate for skilled and qualified technicians.					
Employing new technicians have a negative financial impact on the company.					
Apprentices/Learners, as any student, should pay the employer to receive the training.					

Q.22 Have you considered the financial layout to interview prospective employees and to employ them?	
Tick one box from the option below	
Yes	
No	

Q.23 If you have answered <u>YES</u> in Q.22, please give indication of costs.

Q.24 Should you have any comments, please do so below.

THANK YOU!