# A conceptual framework for success factors required for a South African small and medium size foundry

**By**

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Lastly, I would like to thank everyone who directly or indirectly contributed to the success of this study. I am forever indebted to you. May God richly bless you.

# GLOSSARY OF ACRONYMS

| | |
|---|---|
| B-BBEE | Broad Based Black Economic Empowerment |
| BITKOM | Bundesverband Informationswirtschaft, Telekommunikation und neue Medien e.V. |
| BRICS | Brazil, Russia, India, China, and South Africa |
| CAD | Computer Aided Design |
| CEO | Chief Executive Officer |
| CNC | Computer Aided Numerically Controlled |
| CPI | Consumer Price Index |
| CPS | Cyber-Physical Systems |
| CSIR | Council for Scientific and Industrial Research |
| CSR | Corporate Social Responsibility |
| CSRE | Communal Sharing Relationship Ethics |
| DBA | Doctor of Business Administration |
| DCF | Discounted Cash Flow |
| DED | Department of Economic Development |
| DTIC | Department of Trade Industry and Competition |
| EBITDA | Earnings Before Interest, Taxes, Depreciation, and Amortization |
| EDTEA | Economic Development Tourism and Environmental Affairs |
| EEC | Ekurhuleni East TVET College |
| EO | Entrepreneurial Orientation |
| ESKOM | Electricity Supply Commission |
| EU | European Union |
| GDED | Gauteng Department of Economic Development |
| GDP | Gross Domestic Product |
| GFTC | Gauteng Foundry Training Centre |
| IC | Intellectual Capital |
| ICT | Information and Communications Technology |

| | |
|---|---|
| IFRS | International Financial Reporting Standards |
| ILO | International Labour Organization |
| IPA | Interpretive Phenomenological Analysis |
| IT | Information Technology |
| KPI | Key Performance Indicators |
| merSETA | Manufacturing, Engineering and Related Services Sector Education and Training Authority |
| MSME | Micro, Small & Medium Enterprises |
| NAFTA | Northern American Free Trade Agreement |
| NAV | Net Asset Value |
| NESA | National Energy Regulator of South Africa |
| NFTN | National Foundry Technology Network |
| OECD | Organisation for Economic Co-operation and Development |
| QCTO | Quality Council for Trades and Occupations |
| R&D | Research and Development |
| RFID | Radio Frequency Identification |
| SEDA | Small Enterprises Development Agency |
| SEM | Structural Equation Modelling |
| SAIF | South African Institute of Foundrymen |
| SME | Small and Medium-Sized Enterprise |
| SOI | Sustainability Oriented Initiatives |
| SPSS | Statistical Package for Social Sciences |
| SWOT | Strengths, Weaknesses, Opportunities and Threats |
| TA | Thematic Analysis |
| TIPS | Trade & Industry Policy Strategies |
| TQM | Total Quality Management |
| UKZN | University of KwaZulu-Natal |

ABSTRACT

South Africa has witnessed an unprecedented decline in the number of foundries over the past four decades, with literature reflecting that there has been about 73 percent reduction in the number of foundries in South Africa in this period. The purpose of this research is to investigate the contribution of four sets of factors, which are: entrepreneur's individual characteristics, internal non-individual factors, external-non individual factors, and operational approaches of a foundry as definitive of success. The research also sought to establish intervention measures that could be implemented to make these foundries more sustainable. Through hypothesis testing, the research also sought to establish relationships between the four sets of factors and intervention measures.

The target population was 117 small and medium enterprise foundries in South Africa. Sample sizes were 303 participants for the quantitative strands and 11 participants for the qualitative strand. Judgemental purposive sampling was employed for the qualitative strand and cluster sampling for quantitative strand. Two questionnaires were the only tools used for collecting data, one personally administered for the qualitative strand, and another administered online for the quantitative strand. Convergent mixed methods approach was employed, where both qualitative and quantitative data was collected, analysed, and compared to identify where the two strands converged. The factors upon which the two data strands converged were accepted as the success factors required to effectively run an SME foundry in South Africa. Structural equation modelling and thematic analysis were used for data analysis of quantitative and qualitative strands respectively.

It was verified that intervention measures had a positive relationship with the entrepreneur's individual characteristics, external non-individual characteristics, and operations approach of SME foundries. The hypothesis of a relationship between intervention measures and internal non-individual characteristics of a foundry was not supported, hence it was rejected. Ultimately, a framework outlining the success factors and intervention measures required as well as their relationships was postulated.

This research contributes to the novel knowledge on success factors required to run SME foundries through the suggested framework. In the penultimate, recommendations and suggestions for future studies are proffered.

Key words: Foundry, SMEs, Success factors, Intervention measures, South Africa.

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# CHAPTER ONE- INTRODUCTION AND OVERVIEW OF THE STUDY

## 1.0 INTRODUCTION

Foundries are one of the largest industries scaffolding the economic growth of the world economy hence their contributions to successful operations cannot be overlooked. In line with the above, Pancha (2010) comments that the foundry industry is a major supplier of components to most manufacturing companies that promote the economic growth of many countries. Agbo and Ayeni (2017) thus highly value the foundry industry, describing it as the mother of all industries. This is justified by the fact that the foundry produces major components for agricultural machines, automotive, textile industries, general engineering tools, quarry industries, defence industry, industrial machinery, energy equipment, power plants, cement manufacturing equipment, construction industry, mining industry and railway equipment. All these and other facets are crucial in enhancing economic development and sustainability (Okwelle and Ikendi, 2015). This study investigates factors required for a South African SME foundry to thrive on the market with the purpose of generating and developing a conceptual framework that facilitates the successful operations of foundries in the South African market.

This chapter commences with the background to the study, moving on to proffer a brief review of the foundry industry on both a global scale and the South African level. Other aspects covered in this chapter include an overview of the study, research problem, objectives, and questions. The study's contribution to the body of knowledge, as well as the outline of the study are also presented and defended. The chapter terminates by presenting a conceptual framework for the success of SMEs in the foundry sector in South Africa.

## 1.1 BACKGROUND

A two-pronged approach was adopted in explaining the background to this study. Firstly, the status of foundries at a global scale is discussed, showing in the process how major players are faring. The second approach assesses the position of the South African foundry industry over the past decade.

### 1.1.1 Overview of foundry industry on a global scale

The output of metals globally has remained stable over the years and the same volumes are expected to be produced till year 2025. For the sake of comparisons, Büchner (2019) classified metal grades produced by foundries as iron and ductile iron, copper-based grades and aluminium based grades. Figure 1-1 below shows world output, as well as future projections of iron and ductile grades as given by Büchner (2019).

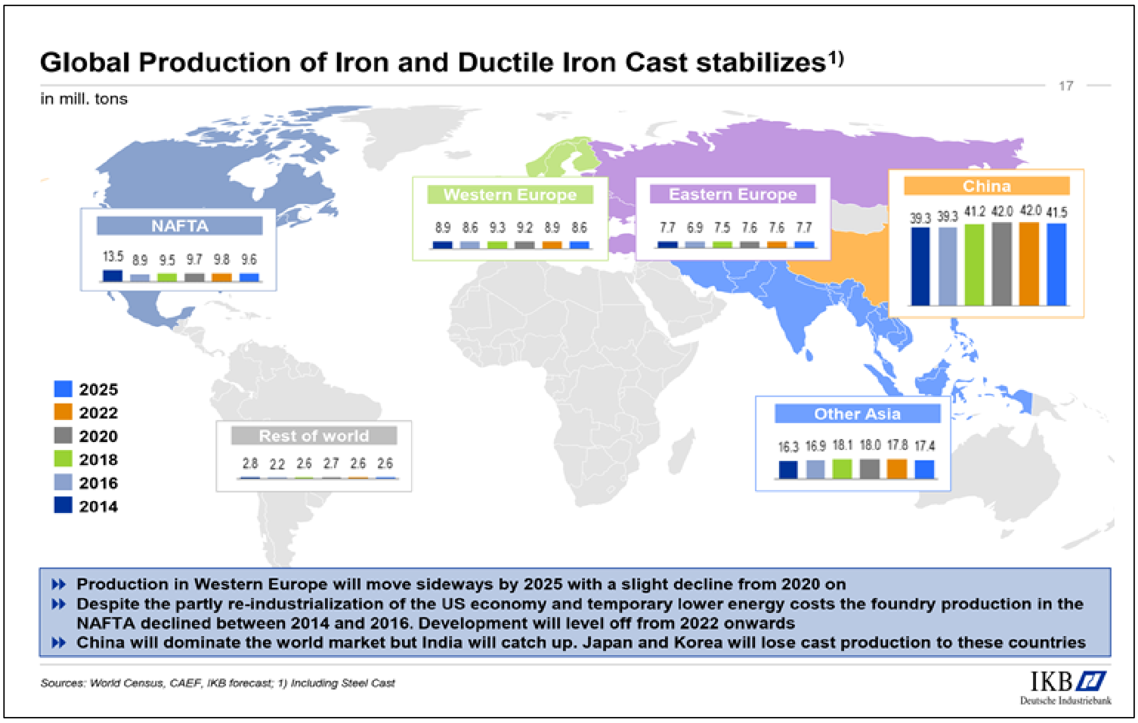


**Fig 1-1: Global production of iron and ductile iron**
**Source: Büchner (2019:17).**

From Figure 1-1 above, it can be concluded that the global production of foundries averages about 87.3 million tonnes per annum. A closer look also clarifies that China is the biggest producer of iron and ductile iron grades at an average of 40.8 million tonnes per annum, which also equates to about 46.7% of the world's production. The second largest producer of iron and ductile iron grades is the rest of Asia, producing an average of 17.4 million tonnes per annum, which also equates to 19.9% of the world's production. In the third place are countries falling in the North American Free Trade Agreement (NAFTA) cluster that produce 10.1 million tonnes per annum or 11.6% of world production. Western Europe falls in fourth place with annual production of 8.9 million tonnes or 10.2%. Eastern Europe takes fifth place with annual production of 7.5 million tonnes, which equates to 8.6 %. The rest of the world produces 2.6 million tonnes of iron and ductile iron castings, which equates to 3% of the world's production.

Looking at aluminium-based cast products, world production from year 2014 to 2025 is expected to increase. Figure 1-2 below shows annual production by region, as suggested by Büchner (2019).

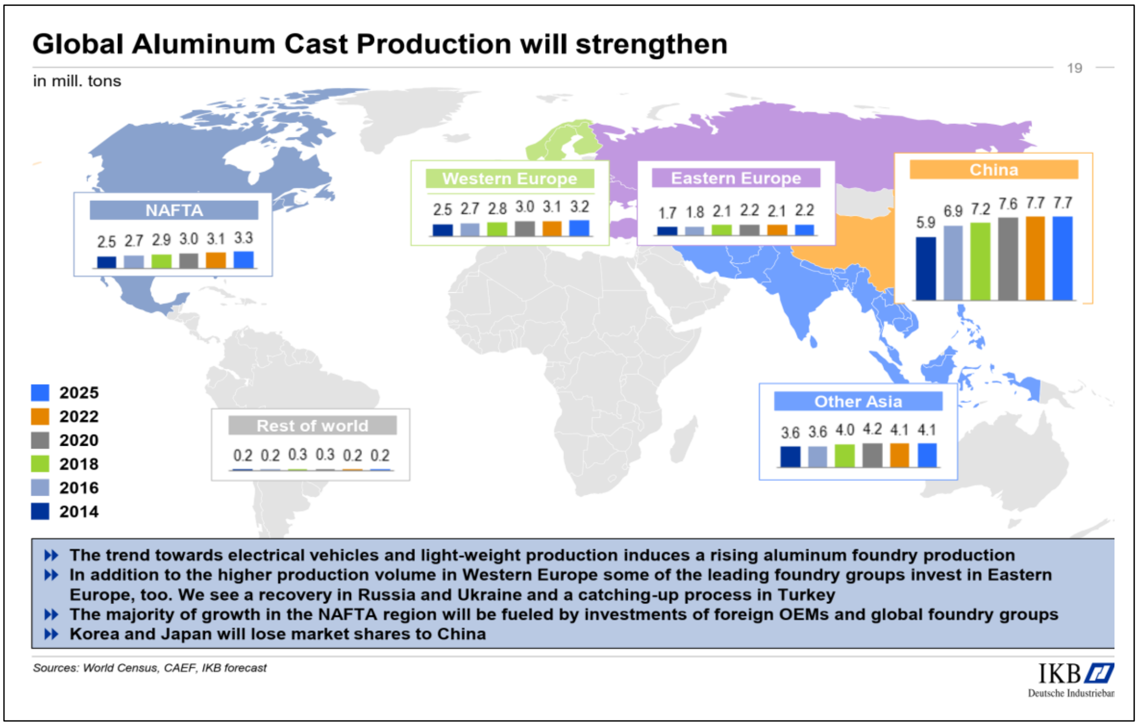


**Fig 1-2: Global production of cast aluminium**
**Source: Büchner (2019:19)**

An analysis of Figure 1-2 above shows that the total global production of aluminium-based castings is approximately 19.14 million tonnes per annum. China tops the list with an annual production of 7.16 million tonnes, which equates to 37.4% of total production. The rest of Asia produces an average of 3.93 million tonnes, which is equivalent to 20.5% of the world's total production. The NAFTA cluster takes third position at an average annual production of 2.92 million tonnes or 15.3%. In fourth place is Western Europe which produces 2.88 million tonnes or 15% of the world's production. Eastern Europe is in fifth position, at a total average tonnage of 2.02 million or 10.6%. The rest of the world produces 0.23 million tonnes of aluminium-based castings, which equates to 1.2%.

As for copper-based metal grades, world production has been increasing over the years since 2014 and forecasts show that this trend should continue till 2025 (Büchner, 2019). Figure 1-3 below shows total production of copper-based alloy castings by region.

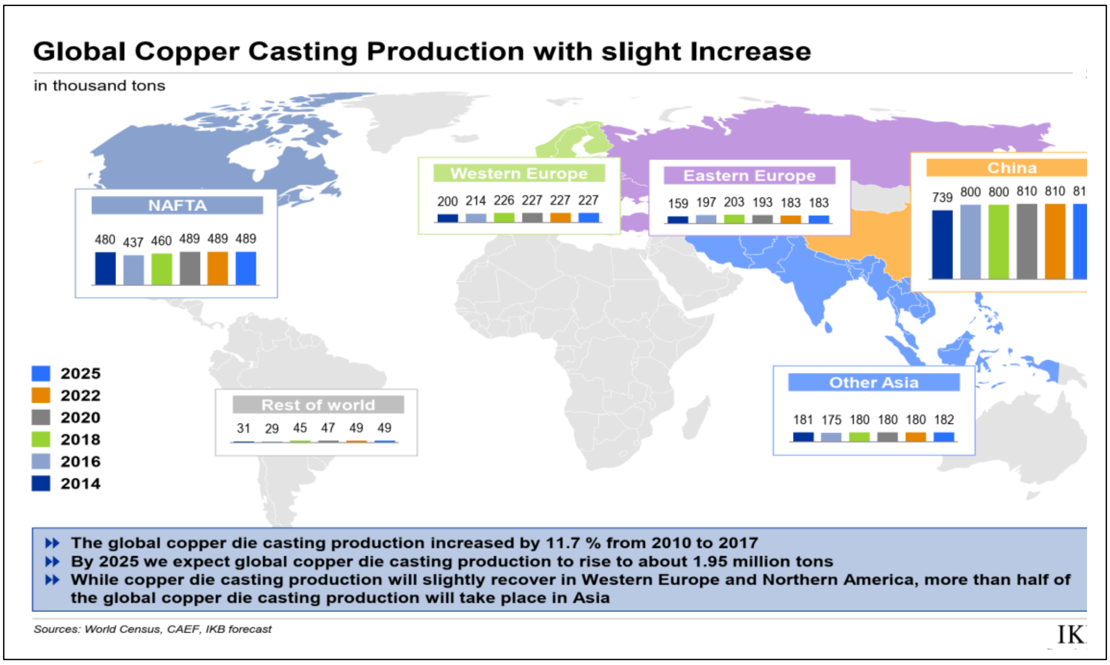


**Fig 1-3: Global production of copper casting**
**Source: Büchner (2019:21)**

An analysis of Figure 1-3 above shows that the average total annual production of copper-based castings is about 1.9 million tonnes for the twelve years analysed in this study. As in the other cases, China leads the pack with average production of 794.8 thousand tonnes or 41.9% of the world's production. NAFTA cluster is in second position with an average production of 474 thousand tonnes, equating to 25% of world's production. Western Europe is in third place with a total of 220 thousand tonnes per annum or 11.6% of total production. Eastern Europe is in the fourth position with average annual production of 186.3 thousand tonnes which equates to 9.8%. The rest of Asia is in fifth position with an average of 179.7 thousand tonnes which equates to 9.5%. The rest of the world produces an average of about 41.7 thousand tonnes, which is about 2.2% of the world's production.

### 1.1.2 Overview of the South African Foundry Industry

Using the approach employed by Büchner (2019) to analyse global production of castings in foundries, South Africa would be in the “rest of the world’ cluster which produces about 2.87 million tonnes of castings or 2.65% of the average world production. According to Mbanjwa (2015), total foundry output has been decreasing over the years. Table 1-1 below shows statistics of total annual production of South African foundries from 2003 to 2017.

**Table 1-1: Estimated iron base and ductile iron production**

| Year | 2007 | 2012 | 2013 | 2014 | 2017 |
|---|---|---|---|---|---|
| Tonnes | 562.6 | 397.8 | 343 | 349 | 390.5 |

**Source: Adapted from Madzivhandila (2015) and Modern Casting (2018)**

The table above shows annual production of iron base and ductile iron in South Africa. Based on the statistics above, it can be concluded that there has been a 30 percent decrease in production from 2007 to 2017.

**Table 1-2: Estimated aluminium alloy grades annual production in tonnes**

| Year | 2007 | 2012 | 2013 | 2014 | 2017 |
|---|---|---|---|---|---|
| Tonnes | 77 800 | 21 000 | 22 000 | 22 000 | 38 000 |

**Source: Adapted from Madzivhandila (2015) and Modern Casting (2018)**

It can be concluded. from Table 1-2 above that cast aluminium production decreased by almost 49 percent in comparing 2007 production to that of 2017.

**Table 1-3: Estimated copper- based alloy grades annual production in tonnes**

| Year | 2007 | 2012 | 2013 | 2014 | 2017 |
|---|---|---|---|---|---|
| Tonnes | 15 800 | 14 300 | 9 100 | 8 500 | 14 000 |

**Source: Adapted from Madzivhandila (2015) and Modern Casting (2018)**

Based on statistics in Table 1-3 above, it can be concluded that copper-based alloys production reduced by 11 percent from 2007 to 2017.

**Table 1-4: Estimated total tonnages produced by SA Foundries**

| Year | 2007 | 2012 | 2013 | 2014 | 2017 |
|---|---|---|---|---|---|
| Tonnes | 660 400 | 416 500 | 375 240 | 380 300 | 443 000 |

**Source: Adapted from Madzivhandila (2015) and Modern Casting (2018)**

Looking at total annual production from 2007 to 2017, it can be concluded that there has been a 33 percent decrease in production over the years.

The total number of foundries has also been declining over the years. According to CSIR (2020), there are a total of 123 foundries in South Africa. This figure is, however, a far cry from the 450 foundries that existed in the country in the early 1980s (Allix, 2014). From the year 2003, more than 100 foundries closed shop (Mbanjwa, 2015). Figure 1-4 below shows a decline trend in total number of foundries in SA over a period of four decades.

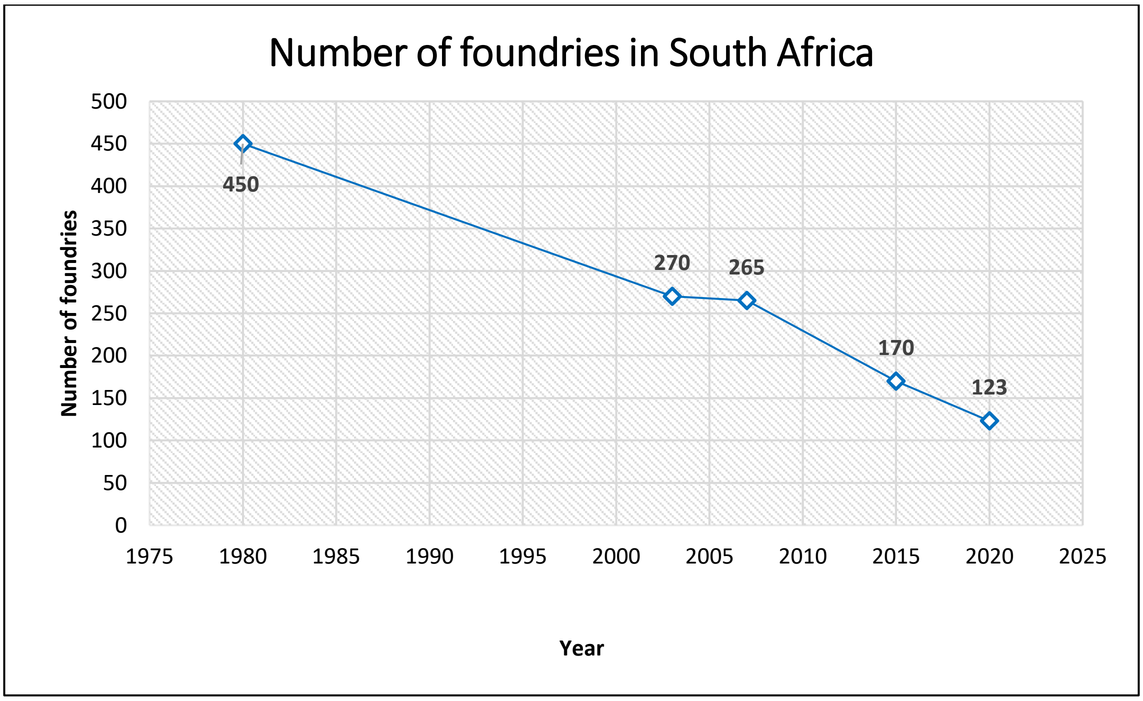


**Figure 1-4: Total number of foundries in South Africa**

**Source: Adapted from Madzivhandila (2015) and CSIR (2020)**

An analysis of Figure 1-4 above demonstrates that there has been a 73 percent decline in the total number of foundries in South Africa over the past four decades. Table 1-5 below paints a more elaborate picture of the decrease in South African foundries based on type of foundry.

**Table 1-5: Types of foundries in South Africa**

| Foundry Type | No. of foundries in 2003 | No. of foundries in 2007 | No. of foundries in 2014 | 2014 vs 2007 change in % |
|---|---|---|---|---|
| Ferrous (Iron and steel) | 110 | 110 | 86 | -22% |
| Non- Ferrous metal grades (Zinc, Brass, Aluminium) Sand moulding, Gravity diecasting, Low Pressure diecasting | 117 | 119 | 57 | -52% |
| High Pressure Die Casters | 36 | 32 | 27 | -16% |
| Investment Castings | 7 | 4 | 4 | 0% |
| Total number of Foundries | 270 | 265 | 170 | -36% |

**Source: Davies (2015:5)**

### 1.1.2.1 Contribution of SA Foundry industry to employment

The industry also boasts of 10 250 direct employees, and an estimated 4 000 indirect employees (Madzivhandila, 2015). Indirect employees are individuals who add value to foundry products through activities like machining, sub-assembly, and final assembly. Most foundries in South Africa are privately owned small businesses employing less than 50 employees (Jardine, 2015).

#### 1.1.2.2 Distribution of SA foundries accroding to geographical location

The bulk of foundries in South Africa are in Gauteng province, which boasts 84 foundries, followed by KwaZulu-Natal which hosts 16 foundries. The Western Cape is in third place with 10 foundries, followed by the Eastern Cape and the Free State, with each having 4 foundries. Northern Cape province has 3 foundries, while Mpumalanga province and Northwest provinces each hosting 1 foundry (CSIR, 2020). Figure 1-5 below shows the number of foundries in each province of South Africa.

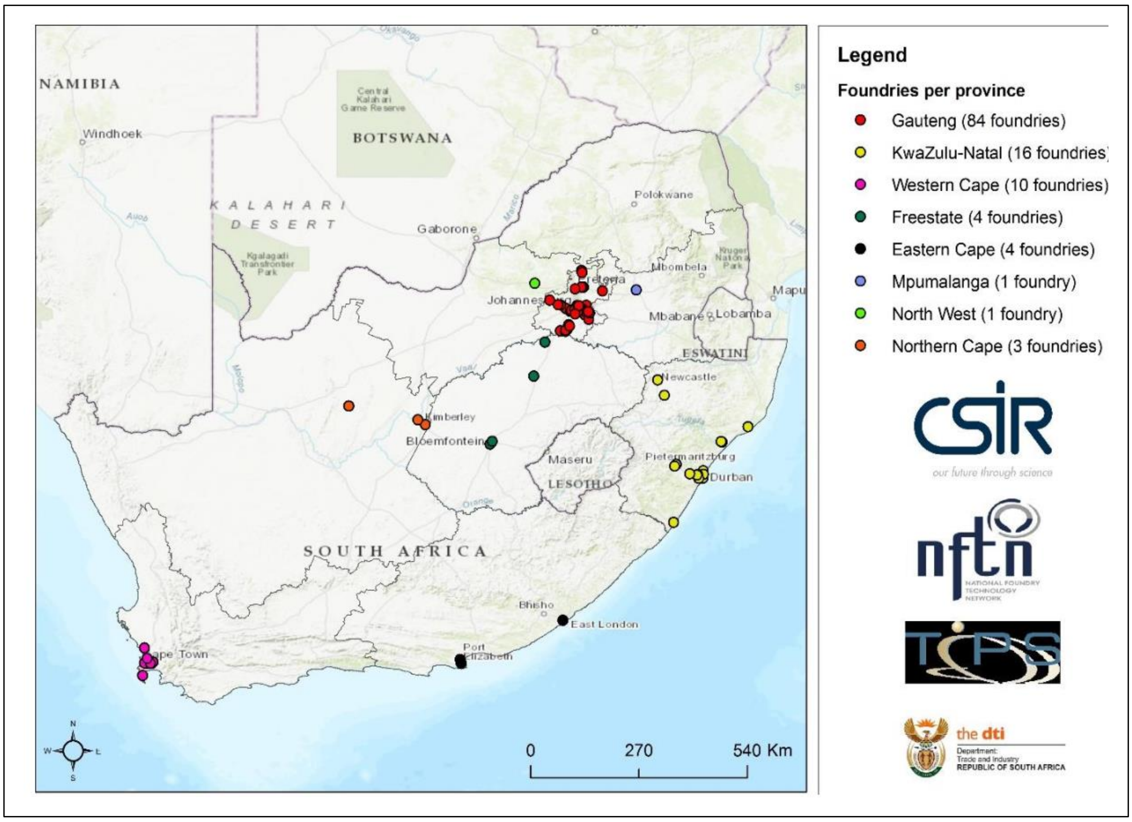


**Figure 1-5: Distribution of South African foundries according to province**

**Source: Adapted from CSIR (2020:18)**

#### 1.1.2.3 Markets served by the South Africa foundry industry

According to Madzivhandila (2015), the South African foundry industry serves six sectors namely: mining, automotive, manufacturing, railways, agriculture and infrastructure. The mining industry constitutes about 32 percent of the work done by foundries in South Africa, followed by the automotive industry which contributes about twenty-five percent of the work done by foundries. Manufacturing sector also contributes substantially to work done by foundries in South Africa. Figure 1-5 below shows the distribution of work perfomed by foundries in South Africa.

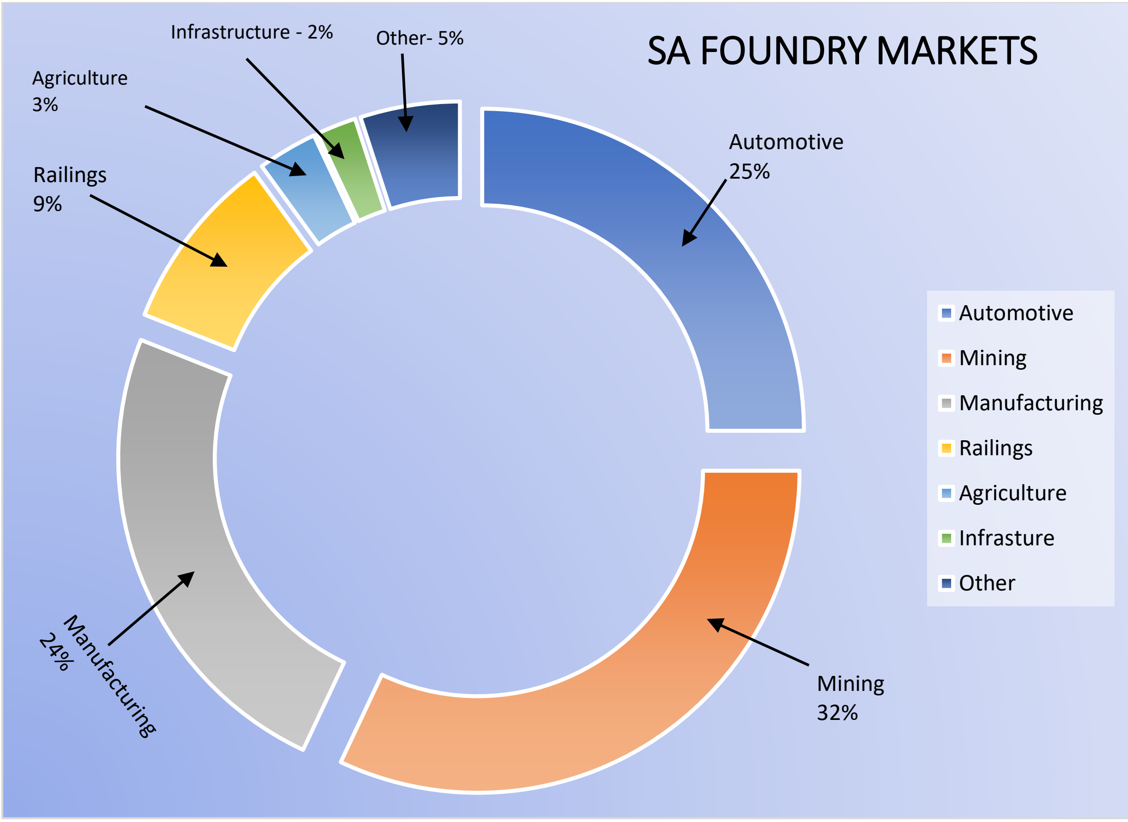


**Figure 1-6: Markets served by South African foundries.**

**Source: Adapted from Madzivhandila (2015)**

## 1.2 DEFINITIONS OF A FOUNDRY AND A CASTING

Since this study focuses on SME foundries, it is imperative that two main definitions of a foundry and a casting be provided from the onset. Beeley (2001) and Deshpande (2016) define a foundry as "…a factory where metal castings are manufactured from ferrous or non-ferrous metals, including copper, brass, bronze, aluminium, zinc, lead, nickel, and all their various alloys".

Bichi, Raymond, Ma'aji, and Abutu (2020:1), define a metal casting as "…a shape obtained by pouring liquid metal into a mould or cavity and allowing it to solidify and thus to take the form of the cavity".

Castings are manufactured in a single step from liquid metal without intermediate mechanical working procedures like forging or rolling. Beeley (2001) further adds that the simplicity of producing castings has served to spur and stimulate the growth of a wide range of industries.

## 1.3 METAL BENEFICIATION VALUE CHAIN

According to Lundall, Maree and Godfrey (2008), there are four main stages in the metal beneficiation process namely mining, milling, engineering & machining and machine building. Figure 1-7 below summarises the functions of each of the four stages as explained by Lundall, Maree and Godfrey (2008).

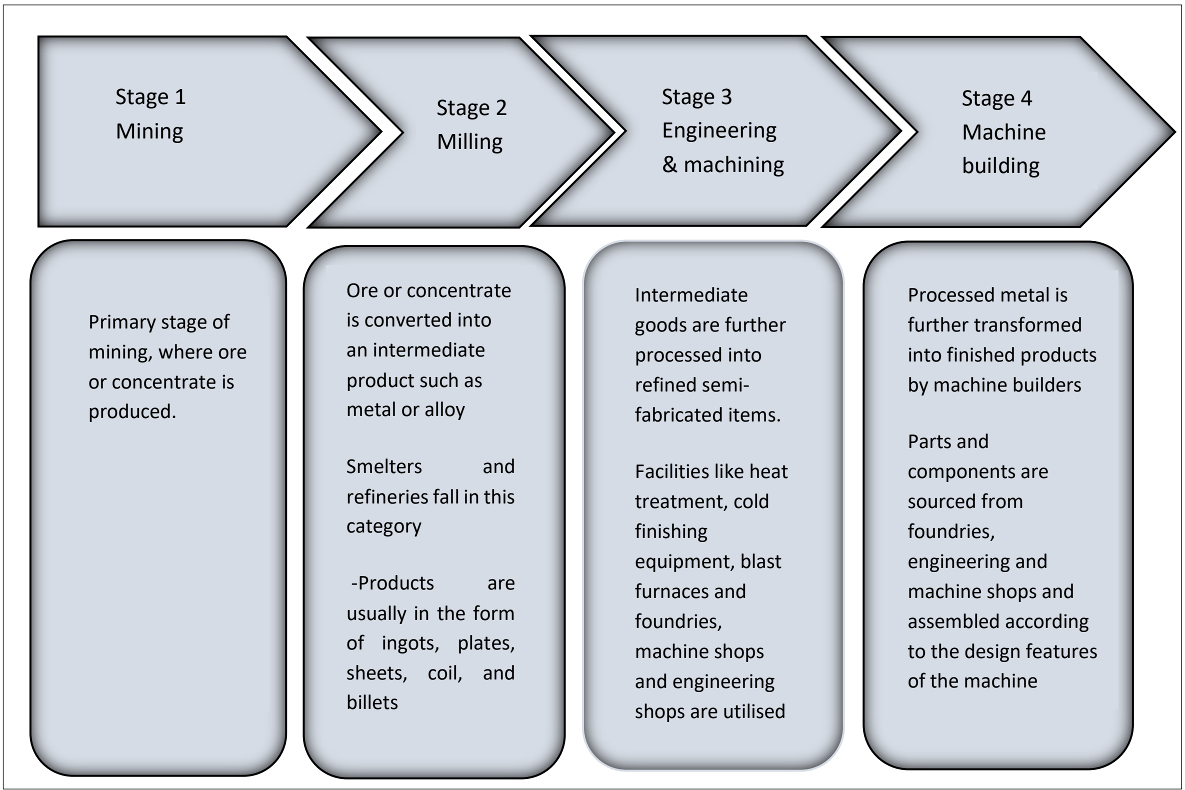


**Figure 1-7: Metal beneficiation value chain**
**Source: Own development, Mutero, 2021.**

From Figure 1-7 above, it can be concluded that foundries fall in the third stage of metal beneficiation which is engineering and machining. It can also be concluded from the diagram above, that foundries do not work in isolation, but heavily rely on smelters and metal refiners for raw materials, apart from metal recycling industries such as scrap yards. Foundries also act as suppliers to industries such as engineering and machine shops, maintenance shops and assembly lines. Their products are predominantly used as spares for machine building in the final stage of the metal beneficiation process.

## 1.4 TYPICAL FOUNDRY PROCESS FLOW DIAGRAM

According to the European Commission (2005), there are several stages involved during production of a casting. Figure 1-8 below shows typical stages involved in a foundry process.

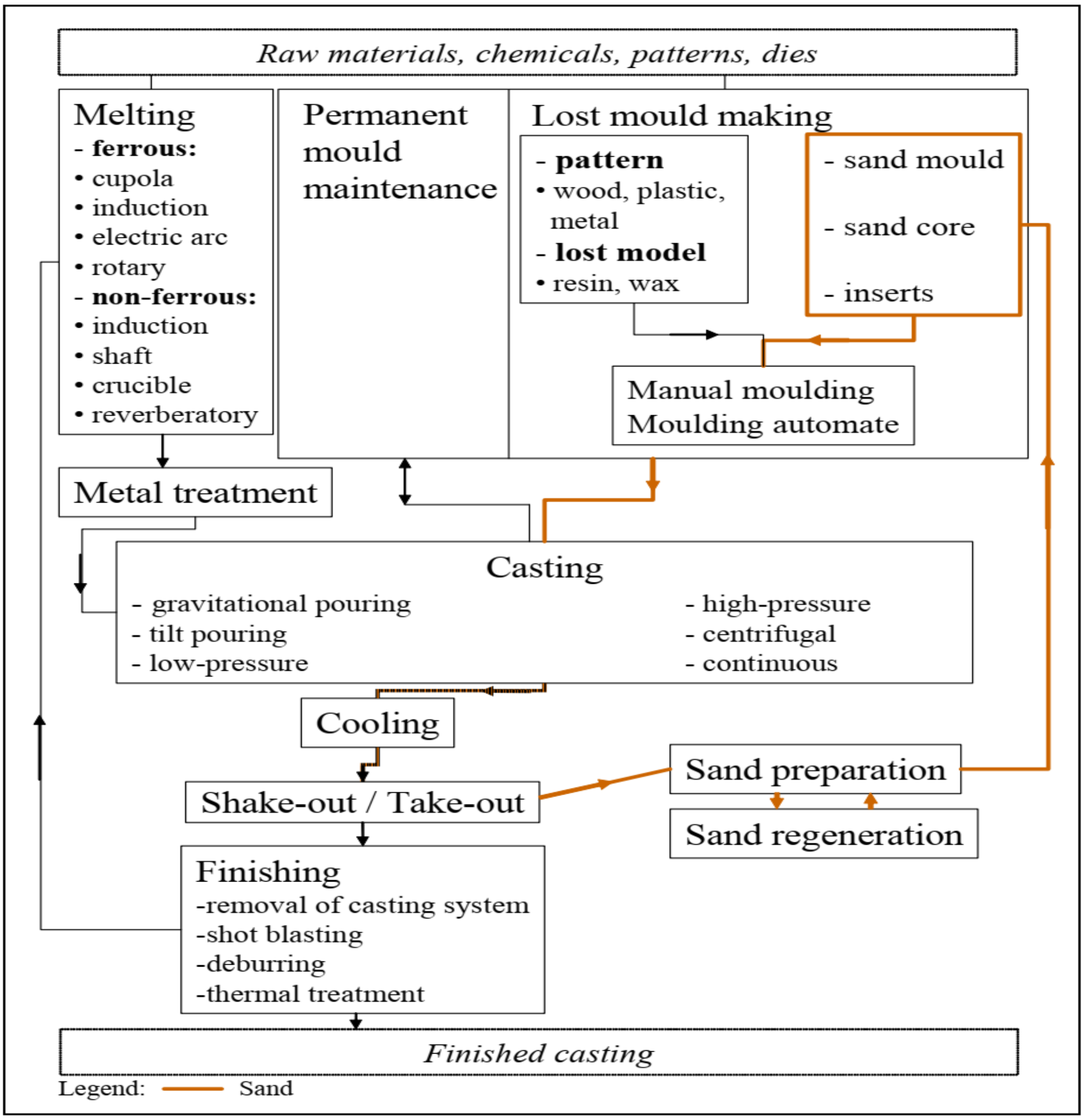


**Figure 1-8: Foundry process flow diagram**
**Source: Adapted from European Commission (2005: iii).**

Figure 1-8 above shows that there are eight main stages involved in a foundry operation. These stages are raw materials selection, pattern making, melting, moulding, metal treatment, casting, and finishing. Under melting, a foundry can produce ferrous metals or non-ferrous metals or both. As for the moulding process, a foundry can use permanent moulds or dispensable moulds or both. A foundry may reclaim sand or dispose of used sand after moulds are cast.

## 1.5 RESEARCH FOCUS

This study was conducted in South Africa, across eight provinces. South Africa has got nine provinces in total and the only province which does not have a single foundry is Limpopo. However, about 66 percent of the foundries in South Africa are in Gauteng province. This is significant with regards the centrality and growth potential of this province. The study was also limited to SME foundries. Foundries are generally classified as belonging to the manufacturing sector. Schedule 1 of the National Small Enterprise Act, 1996 (Act No. 102 of 1996) was used to select foundries that qualified as an SME. According to the Act, for an enterprise in the manufacturing sector to qualify as an SME, it must meet the following criteria: the organisation's annual turnover should be R170 million or less, total number of employees in the organisation should not exceed 250.

## 1.6 PROBLEM STATEMENT

The South African foundry industry has been facing several challenges, some of which seriously threaten their viability and longevity (CSIR, 2020). This industry sector has also witnessed an unprecedented number of foundry closures in the past three decades. According to Allix (2014), there were about 450 foundries in South Africa in the 1980s and slightly over 200 in 2003. CSIR (2020), however, reports that by year 2020, the total number of foundries in the country had gone down to 123. An analysis of this status shows that there has been a 73% decline in the total number of foundries operating in the country over the past four decades. Modern Casting (2018) confirms this decline, amplifying the recognition that the total foundry production output has been decreasing over the years. SA

Foundry output decreased by 33% between 2007 and 2017 (Modern Casting, 2018; Madzivhandila, 2015). This unsettling trend could have far-reaching consequences to the nation, as the foundry industry has been classified as one of the cornerstones in the manufacturing sector. This is backed by Alix (2014), who suggests that about 80% of manufactured products have got castings in them that are essentially produced by foundries. Industry experts view metal casting as the mother industry feeding other manufacturing sectors with spares and components for their plants and products respectively (Ravi, 2016). The production of castings in foundries also makes a significant contribution to the economy, both at the national and global level (Soinski, Kordas and Skurka, 2016). The foundry industry has also been hailed as key to re-industrialisation of South Africa (Krieg, 2017). In essence, the foundry industry which employs melting and pouring of metal as a means of producing castings services the transport industry, mining, aerospace, agriculture, railways, shipping, chemical petrochemical, food processing, steel, cement industries and other plants (Ravi, 2016; Madzivhandila, 2015).

Existing research has not answered one main question, which is what it takes to successfully run a foundry in South Africa. The few studies which have been conducted on South African foundries prior to this research, and the few publications available discuss challenges or concentrate on the technical and operations aspects of the foundry industry. The available literature on South African foundries also suggests generic solutions for both SME and large foundries. Existing literature on South African foundries may be summarised as follows: (El Mohamadi, 2012; Joseph, Banganayi, and Oyombo, 2017; Nyembwe, Makhatha, Banganayi, and Nyembwe, 2018; Madzivhandila, 2018; Sithole, Nyembwe, and Olubambi, 2019) discuss foundry waste sand management. (Rasmeni and Pan, 2014; Rasmeni and Pan, 2017; Mageza, Mulaba-Bafubiandi, and Banganayi, 2018) discuss energy efficiency in foundries. (Krieg and Cunningham, 2014.; Madzivhandila, 2015; Rustomjee, Kaziboni, and Steuart, 2018) gave status reports on South African foundry industry. (SAIF, 2014; Mbanjwa, 2015; Jardine, 2015) investigated challenges faced by South African foundries. Mulaba-Bafubiandi, Mageza, and Varachia (2017) discuss localisation of castings consumed by state owned enterprises, while Mpanza and Nyembwe

(2014) investigated improvement of operating methods in foundries. Allix (2014) discusses high cost of scrap metal used by foundries, Mkansi Nel and Marnewick (2018) investigated training opportunities in foundries, and lastly CSIR (2020) investigated environmental compliance of South African foundries. Clearly there is a gap in knowledge as none of the available literature discuss foundry success factors. This research adds to knowledge by providing an informed, research and practice-based understanding of success factors required to run an SME foundry in South Africa. Recommendations suggested in this study are also specifically tailor-made for SME foundries in South Africa.

Thirdly, although literature suggests numerous success factors required to effectively run an SME in general, the same factors may not be applicable in South Africa or to the foundry industry. Lampadarios (2016) suggests that success factors for SMEs cannot be generalised as they vary, depending on industry type and geographical location. This study clearly identifies success factors applicable to the South African context and the foundry industry specifically. This is a novel contribution to knowledge as it is the first study focusing on SME foundries in South Africa

This research therefore addresses this question by investigating success factors that could lead to a thriving South African SME foundry. This study proposes a theoretical framework wherein the relationships between variables are tested to respond to the research question as outlined.

## 1.7 RESEARCH OBJECTIVES

The main aim of the study is to critically analyse the factors which contribute to the success of a South African SME foundry and develop a conceptual framework.

In support of the main aim, the following objectives are designed to:

- Identify the entrepreneur's individual characteristics required to successfully run an SME foundry in South Africa.
- Examine non-individual characteristics of an SME foundry in South Africa required for it to be successful.

- Investigate operational factors which must be observed by a SME foundry in South Africa to be successful.
- Explore intervention strategies which could be implemented, in a bid to make South African SME foundries sustainable.
- Develop a model which outlines the success factors required for a South African SME foundry to thrive and be effective on the market.

## 1.8 RESEARCH QUESTIONS

The main research question of the study is: What success factors should be considered for South African SME foundries to thrive on the market?

The main research question is amplified and complemented by the following sub-questions.

- What entrepreneur's individual characteristics are required to successfully run an SME foundry in South Africa?
- What non-individual characteristics of an SME foundry in South Africa are required for it to be successful?
- What operational factors must be observed by a SME foundry in South Africa for it to be successful?
- Which intervention strategies should be implemented in making South African SME foundries sustainable?
- What model could be designed and developed to outline the success factors required for a South African SME foundry to effectively thrive on the market?

## 1.9 CONCEPTUAL MODEL DEVELOPMENT

Literature review in chapter 2 verifies forty-six possible success factors which should be observed for South African foundries to succeed. The success factors are summarised in a proposed conceptual framework shown in Figure 1-9 on the next page. The conceptual framework proposed and subject to testing, is a modification of one proposed by Nikolic et al. (2015), which shows that entrepreneur’s individual characteristics, internal non-individual characteristics and external non-individual characteristics of an SME play a big role in successful running of an SME foundry. Since the foundry environment is highly technical, this study adds the operations approach aspect to the framework. This study therefore posits that the four firm characteristics, when mediated by intervention measures, can lead to successful running of an SME foundry in South Africa as shown in the figure below.

The following hypotheses are also postulated:

***H1*** ⇒ there is a positive relationship between entrepreneur’s individual characteristics and intervention measures.

***H2*** ⇒ there is a positive relationship between internal non-individual characteristics of an SME foundry and intervention measures.

***H3*** ⇒ there is a positive relationship between external non-individual characteristics of an SME foundry and intervention measures.

***H4*** ⇒ there is a positive relationship between operations approach of an SME foundry in South Africa and intervention measures.

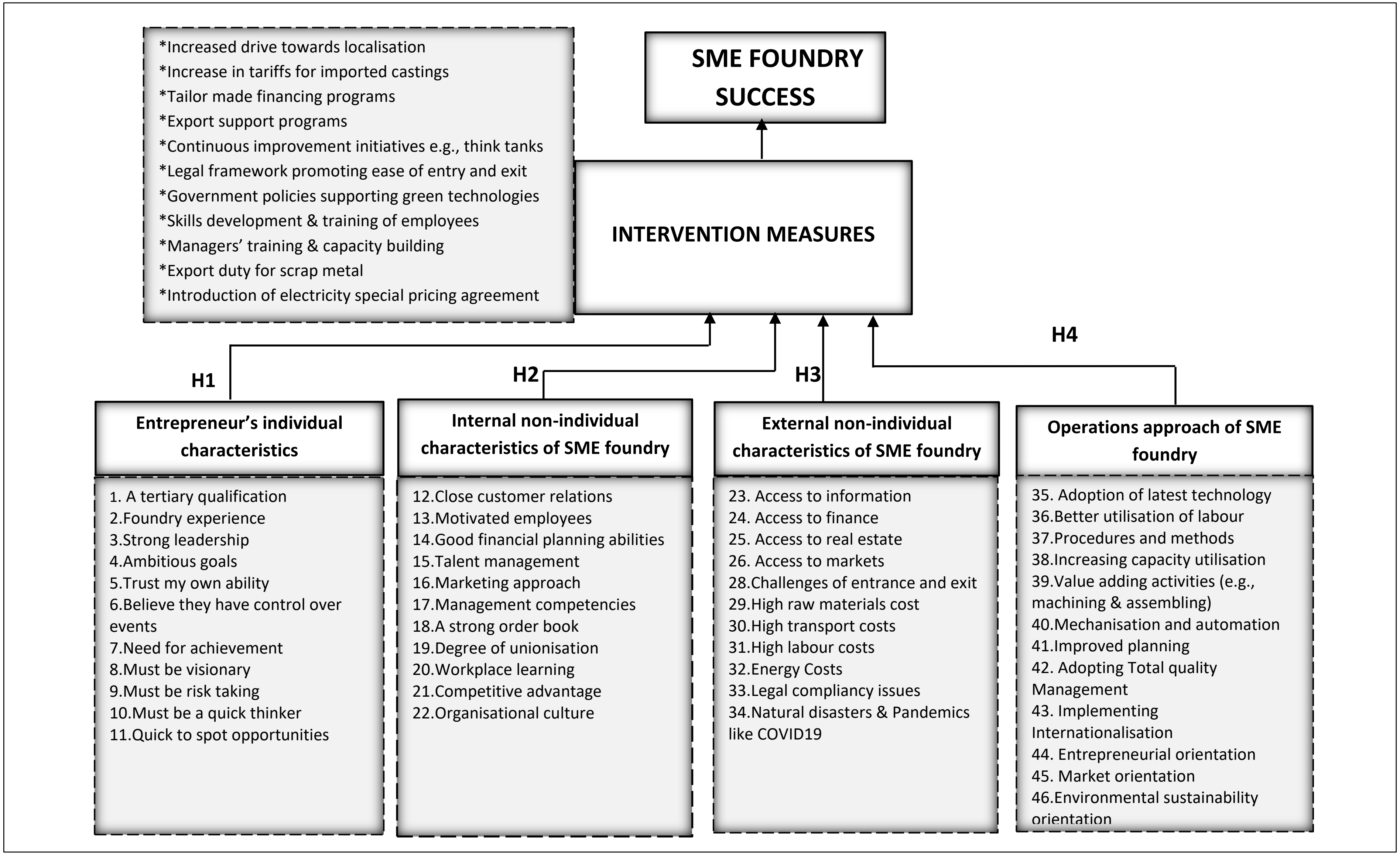


**Figure 1-9: Conceptual model of success factors required to run an SME foundry in South Africa**
**Source: Developed by author**

## 1.10 SIGNIFICANCE OF THE STUDY

This study benefits the foundry industry in the following ways:

1. This study generates and develops a model for foundry stakeholders, which informs them on how to successfully run an SME foundry.

2. Implementation of the model by foundry owners and management could ensure the smooth running of their enterprises.

3. Government, through National Foundry Technology Network (NFTN) gains a better understanding of how to assist foundries in their development programmes, following the guidelines developed in the framework presented in this thesis.

4. The study contributes to the preservation of the industry which is fast threatened by a host of complexities.

5. Lastly, since there are no known similar studies on South African foundries, the findings of this research lay the foundation for future studies in this niche.

## 1.11 OUTLINE OF THE STUDY

The dissertation is structured in seven chapters. The initial chapter presents the background to the study, overview, and the research focus. Other aspects covered in the first chapter include delineating the research problem, objectives, and questions, as well as its contribution to new knowledge.

Chapter two evaluates scholarly articles related to the research problem. A literature review on the success factors of SMEs in general. Frameworks from other scholars on what it takes to successfully run an SME are reviewed

Chapter three focusses on challenges faced by foundries is undertaken. The author proposes a conceptual framework to be tested in Chapter 5 as the basis for successfully running an SME foundry in SA.

Chapter four establishes the research methodology, where a comprehensive research design is outlined. Under research design, aspects such as research strategy, sampling design, data collection methods and data analysis are outlined.

Chapter five presents results from both quantitative and qualitative responses.

Chapter six discusses findings of the study. This chapter further interprets the findings from the two data sets. A model which outlines success factors required to effectively run an SME foundry and their relationships thereof is initially outlined.

Chapter seven presents a summary of findings, recommendations, and conclusion of the study. The chapter also revisits the research objectives to establish the extent to which these have been achieved. Figure 1-9 below shows a schematic illustration of the outline of the study.

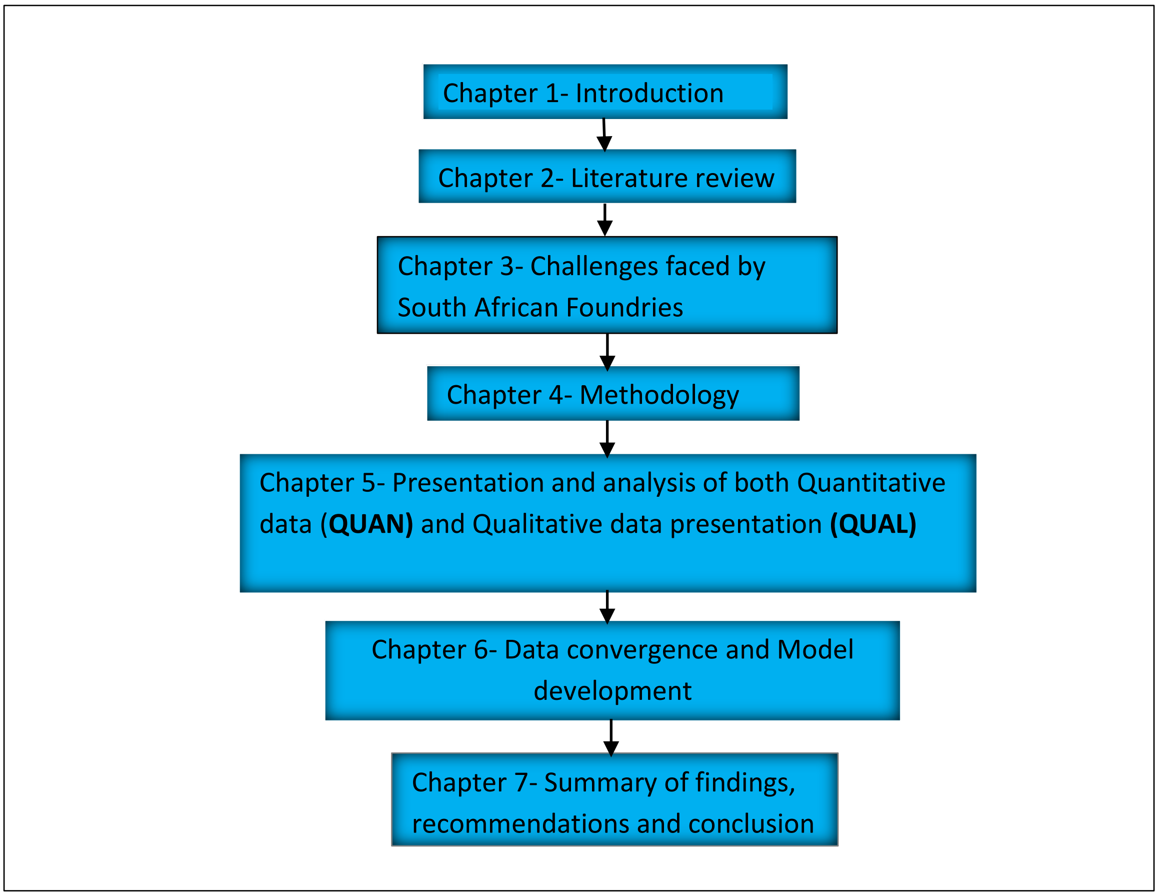


**Figure 1-9: Thesis outline**
**Source: Constructed by the author**

## 1.12 CHAPTER SUMMARY

This chapter outlined the focus of the study. The background of the study was given and a definition, as well as positioning of a foundry in the metal beneficiation value chain was provided. The justification and the gap that the study fills were also explained. The scope of the study, problem statement, research objectives and questions were stated. The next chapter reviews related literature on the research problem.

# CHAPTER TWO - LITERATURE REVIEW

## 2.0 INTRODUCTION

SMEs play a critical role in development of many economies the world over as they create employment, wealth and set the stage for future growth (Amoah and Amoah, 2018; Obi, Ibidunni, Tolulope, Olokundun, Amaihian, Borishade, and Fred, 2018; Madanchian and Taherdoost, 2019; Erdin and Ozkaya, 2020). The performance of the SME sector has a significant bearing on the overall performance of the nation (Ombongi and Long, 2018; Eniola and Entebang, 2015; Cant and Wiid, 2016). In the same vein, Kljucnikov, Belás, Kozubíková and Paseková (2016) suggest that SMEs contribute to a nation's macroeconomic indicators such as GDP, added value and income of state budget. Belás, Vojtovič and Ključnikov (2016) also argue that SMEs contribute immensely to economic development through increasing supply of goods and services on the market, as well as promoting competition on the market.

The total number of SMEs worldwide is estimated to be s in the region between 420 and 510 million. Of the total number of SMEs, the majority are informal enterprises. A large portion of these informal enterprises is located and operational in developing nations (ILO, 2015). These enterprises also account for about 45% of total employment and contribute about 33% of GDP in developing economies (World Bank Report, 2015). In South Africa, small businesses contribute about 55% of formal employment, while 40% of employment is attributed to large companies (TIPS, 2017). SMEs are also highly heterogeneous in nature (Ingirige and Wedawatta, 2018). Consequently, business practices in SMEs vary according to industry and enterprise size (Virglerova, Khan, Martinkute-Kauliene, and Kovács, 2020; Kato and Charoenrat, 2018). Despite the positive contribution made by SMEs the world over, these businesses face diverse challenges which have prompted academic interest and research on them, as well as government interventions to save this sector. One of the biggest challenges faced by SMEs relates to early closures as over 80% of these firms collapse soon after commencement in South Africa due to various reasons (Mathu and Tlare, 2017). There is therefore a need to understand those factors necessary for SMEs to operate successfully.

This chapter assesses the conceptual frameworks suggested in literature as those required for the successful running of an SME. Various definitions of an SME are proffered, although the definition given by The South African National Small Business Act, No. 102 of 1996 remains the kernel used in this study. Various success factors of SMEs in general are discussed in this chapter. Challenges and success factors of SME foundries in South Africa are equally explored in this chapter. Lastly some SME intervention measures that could be garnered for the success of SMEs are evaluated in the chapter.

## 2.1 REVIEW OF CONCEPTUAL FRAMEWORKS PROPOSED IN LITERATURE

Although several studies have been carried out over the past few decades to establish a theory or universally accepted conceptual framework that summarises all success factors for SMEs, researchers have not reached consensus in that regard. This is partly because success factors are dependent on the business environment, particularly industry type and country under assessment. The business environment itself is ever-changing and dynamic, hence making it difficult to establish a universally acceptable conceptual framework. As a result of this challenge, literature strives to answer the question of what it takes to successfully run an SME using a wide range of success factors and several conceptual frameworks (Lampadarios, Kyriakidou, Smith, 2017). Knowledge on success factors required to operate an SME is more fragmented than cumulatively convergent (Sadeghi, 2018; Dobbs and Hamilton, 2007). Some of the studies which were carried out in the past, and which corroborate the claim made by Dobbs and Hamilton (2007) are shown in Table 2-1.

**Table 2-1: Summary of conceptual frameworks from literature**

| Author | Country | Proposed framework for SME success | Identified factors |
|---|---|---|---|
| Ghosh, Liang, Meng, and Chan (2001) | Singapore | Internal factors | (i) Management team attributes such as commitment to visioned, support, and unity of purpose.<br>(ii) Presence of capable, strong, and visionary leadership.<br>(iii) Adoption of the correct strategic approach.<br>(iv) The firms' ability to identify and focus their efforts on relevant market related issues.<br>(v) A firm's ability to advance and sustain capability.<br>(vi) Ability to develop and sustain good customer relationships |
| Al-Mahrouq and Mah (2010) | Jordan | (i)Management of technology and technical procedures<br>(ii) Firm structure,<br>(iii) Financial structure of the firm,<br>(iv) Marketing strategies and productivity<br>(v) Human resource structure of the firm | (i) Fairly recent technology of equipments, use of engineering planning systems of production operation, involvement in research and development projects, observing operating procedures & methods and high level of technology such as automation<br>(ii) Evaluation of the organisation during the start-up stage through techniques such as a clear feasibility study. Monitoring and evaluation of process efficiency of operations at the firm and the organisational structure of the firm<br>(iii) Sources of finance utilised at start-up stage, managerial funds of the firm<br>(iv) Marketing research and methods of promoting firm products and location of the firm with respect to the market.<br>(v) low level of employee turnover |
| Radzi et al. (2017) | Malaysia | Internal factors of SME | Entrepreneurial competency and Technology usage |
| Nyoni and Bonga (2018) | Zimbabwe | (i)Enterprise factors<br>(ii)Environmental &<br>(iii) Entrepreneurial factors | (i) Technology, marketing, and management skills<br>(ii) Social networks, government &financial support<br>(iii) Gender, Age of entrepreneur, Education level and Availability of capital. |

| | | | |
|---|---|---|---|
| Sadeghi (2018) | Iran | External factors | Policies and regulations, technological factors, and entrepreneur's characteristics |
| Al-Tit, Omri, Euchi (2019) | Saudi Arabia | (i) Individual factors<br>(ii) Firm characteristics<br>(iii) Management factors<br>(iv) Level of business support received<br>(v) Availability of Capital<br>(vii) Business environment | (i) Owner or manager attributes such as age, level of education, business skills, work experience, input from professional advisors, as well as personal financial needs of the owner or manager such as life- style improvement<br>(ii) Size of business, their networks, firm innovation capacity, competitive advantages of the firm (iii) Management commitment and support, infrastructure available to the business , HRM approach and practices, Organisational culture, Conducive work environment, level of internal communication, IT and Corporate Social Responsibility.<br>(iv) Level of support received by the business from government, family, and friends, as well as financial support<br>(v) Social, human, and financial capital<br>(vi) Economic, legal, ecological, technical factors, and socio-cultural factors |
| Khan and Adel (2019) | Afghanistan | (i) Internal factors<br>(ii) External factors | (i) Management approach, adoption of latest technology, Strategies for marketing of products, Skilled labour, Structure and Size of business<br>(ii) Role of government, Education syllabus and SME access to information, Access to finance, Loyal customers, Level of competition from foreign firms. |
| Khan et al. (2021) | Pakistan | (i) Internal factors<br>(ii) External factors | (i)Self-confidence, risk taking propensity, Need for achievement<br>(ii) Socio-cultural factors, Economic factors |

**Source: Compiled by author**

Nikolić, Dhamo, Schulte and Mihajlović (2015) also conducted a study in Saudi Arabia, where they investigated the causes of SME failures and classified the causes of failure as entrepreneurs' individual factors and non-individual factors. The non-individual factors were further divided into internal and external factors. Figure 2-1 below shows the framework as suggested by Nikolic et al. (2015).

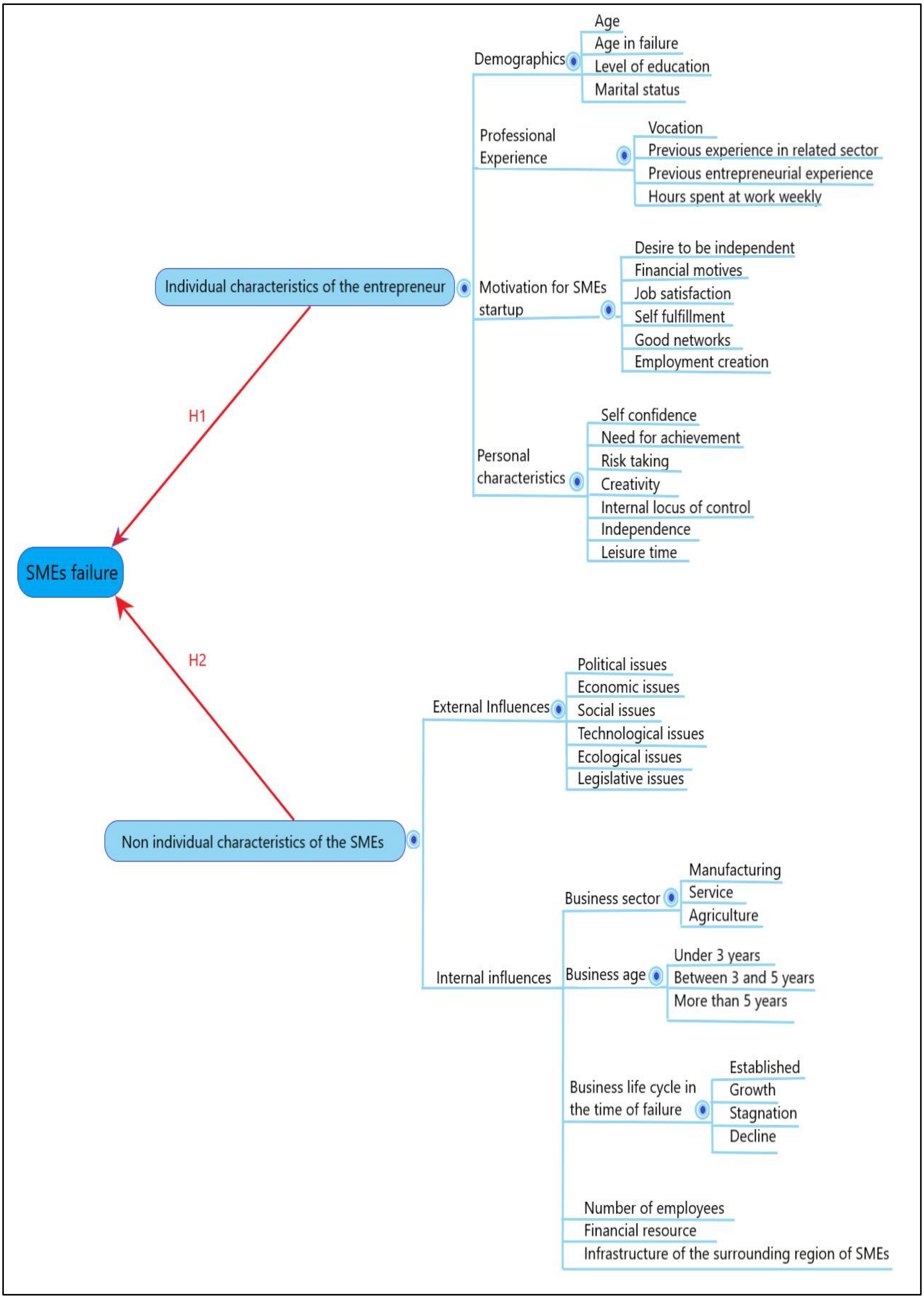


**Figure 2-1: Conceptual framework of factors leading to the failure of SMEs**

**Source: Adapted from Nikolic et al. (2015:184)**

The framework above further divides individual characteristics of the entrepreneur into demographics, personal experience, motivation for starting the business and personal characteristics. Internal factors include business sector, business age, number of employees and financial resources of the business. External influences cover factors such as prevailing political, economic, social, technological, ecological, and legislative issues. This framework is similar to the one proposed by Lampadarios, Kyriakidou, and Smith (2017). There are several other researchers who have also used a similar framework to investigate factors required to successfully operate an SME (Krasniqi et al., 2008; Kader et al., 2009; Alfaadhel, 2010; Ooghe and De Prijcker, 2008; Karpak and Topcu, 2011). Figure 2-2 below shows the framework proposed by Lampadarios (2017).

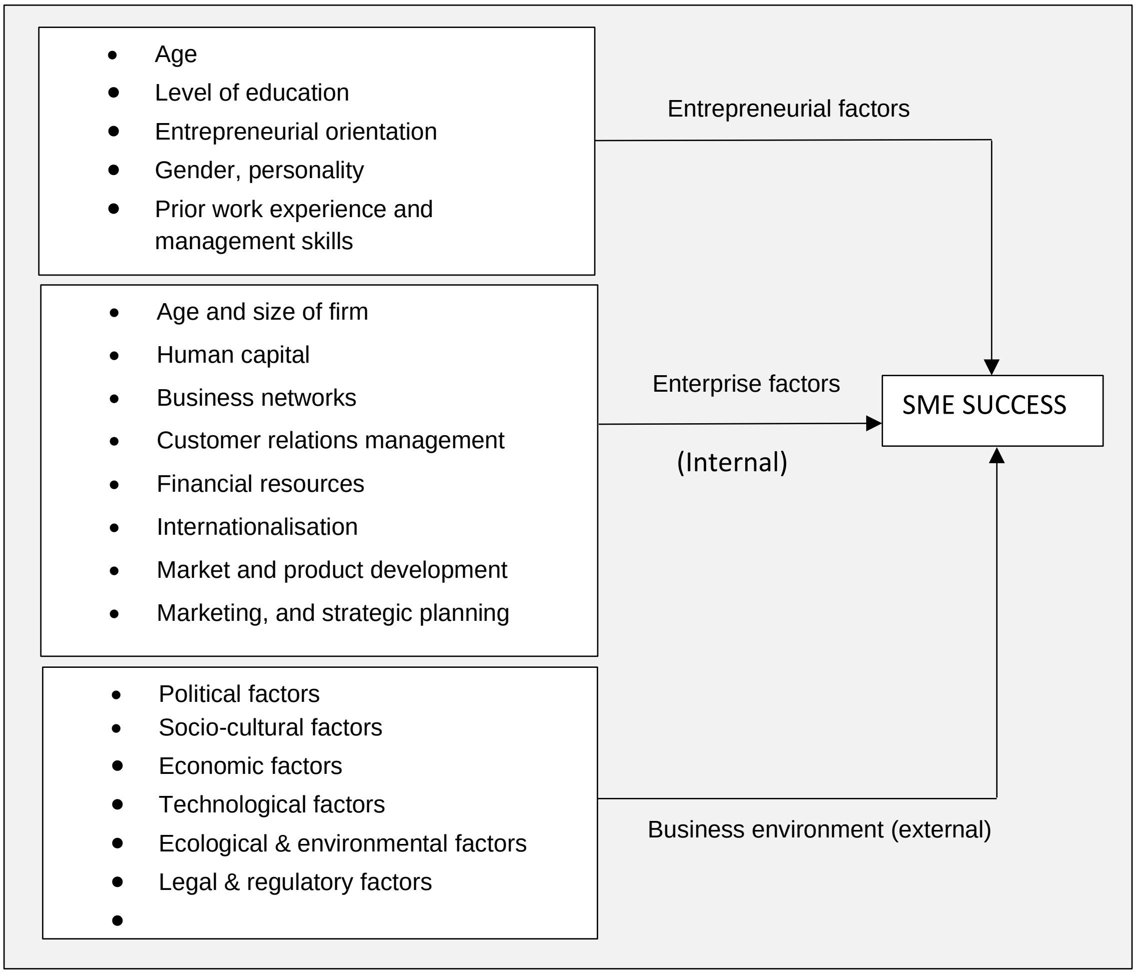


**Figure 2-2 Conceptual framework of SME success factors**

**Source: Adapted from Lampadarios et al. (2017)**

This study appropriates the frameworks suggested by Lampadarios et al. (2017) and Nikolic et al. (2015) above and fuses them to classify, as well as develop the framework of success factors required to effectively run an SME foundry in South Africa. For this study, success factors are grouped under four categories, namely entrepreneur's individual characteristics, internal non-individual characteristics, external non-individual characteristics, and operational factors of the foundry. In addition to success factors, the study suggests intervention measures which could be implemented to make the South African foundry industry successful.

The rest of the chapter proffers diverse definitions of an SME, and identifies the characteristics thereof as suggested in literature. Literature outlining success factors of SMEs in general is scanned to specifically address the challenges and success factors for SMEs established as foundries in the South African context.

## 2.2 DEFINITION OF BUSINESS SUCCESS

There is no universal definition of business success in literature, as success may be measured based on the different attributes of a firm. Some researchers assess business success using the lens of performance of a firm (Kozielski, 2019). Radzi, Nor, and Ali (2017) however, argue that it is complicated to measure business success in terms of firm performance in so far as this has multi-dimensional facets. Marom and Lussier (2014) define business success as a firm's ability to produce satisfactory outcomes and actions. Cesinger, Gundolf, and Géraudel (2018) perceive success in terms of sales growth while Angel, Jenkins, and Stephens (2018) define business success in terms of personal fulfilment, relationships in the workplace, individual financial reward, and impact on community. Fisher, Merlot, and Johnson (2018) define business success in terms of firm age, number of employees, turnover, and rate of growth. Islam, Khan, Obaidullah, and Alam (2011) suggest that there are two ways of defining business success: using financial or non-financial measures; alternatively using short term or long-term success measures. Schmidpeter & Weidinger (2014), however, contend that business success may be measured using indices such as profits, return on investment, number of employees, happiness, longevity, and corporate reputation to name a few. In support of Schmidpeter and Weidinger (2014), Sandberg (2003) define SME success in terms of their ability to survive, grow and contribute to employment creation and poverty alleviation. Other researchers also argue that it is difficult to measure SMEs in financial terms, as many small businesses do not have formal means of reporting their financial performance (Riquelme and Watson, 2002; Ramli, Zain, Razik and Yaacob, 2017). Not to be outdone, Koufteros, Verghese, and Lucianetti (2014) argue that financial data may be misleading in that it is based on historical trends and fluctuations that cannot be used to predict future performance of a firm. This study, however, used the ability to operate an enduring and long-lasting business to define business success. Since most of the foundries investigated in this study are private firms, any attempt at measuring business success using indices such as firm perfomance and financial indicators proved dauting task as firm owners were not keen to divulge such information.

## 2.3 DEFINITION OF AN SME

Nikolić, Dhamo, Schulte, and Mihajlović (2015:175) suggest that the European Commission first coined the term SME and define it as "…any entity engaged in an economic activity irrespective of its legal form". However, there is no universal definition of an SME which can be used by all economies, statistical agencies or researchers, as different international institutions, industries, and countries have got different definitions (ILO, 2015; Lampadarios, Kyriakidou and Smith, 2017). SMEs can be defined through quantitative and qualitative indicators, although quantitative indicators are predominantly used (Kaczmarek, Byczkowska, and Czyrka, 2020). Examples of quantitative indicators include annual profits and number of workers. On the other hand, qualitative characteristics include ownership structure, characteristics of management, legal form of firm, as well as positioning of the firm on the market (Kaczmarek, Byczkowska, and Czyrka, 2020). Berisha and Pula (2015) thus advocate for use of both qualitative and quantitative indicators in defining an SME. International Labour Organisation (ILO, 2015) suggests that definitions of SMEs are usually based on an organisation's number of employees, annual turn-over or organisation's value of assets. Pratt and Virani (2015) further add that definitions of SMEs could include factors like economic sector under which enterprise falls, as well as ownership and control issues. Dar, Ahmed and Raziq (2017) also advocate for coherence, visibility, and stability in the definition of an SME in any nation to avoid market failure. Other factors to consider when defining an SME include applicability and appropriateness of size and attributes. The definition should also be established after analysing market failures and practical constraints, as well as the fact that the definition should be developed in light of the attainment of the national objective without losing the international perspective. Lastly, the definition should provide a stable framework which does not require major changes in future. This essentially means such a definition should be elaborate to facilitate proper application and extraneous ramifications (Dar, Ahmed, and Raziq, 2017). Advantages of a clear definition SME, as stated by Dar, Ahmed, and Raziq (2017) include:

- Relevant data could be collected consistently and efficiently.
- Competing markets become easily comparable and overall performance is enhanced.
- Regulation and administrative measures can be implemented easily.

Berisha and Pula (2015) argue that a good definition of an SME enables assessment of economic performance within a country, across sectors and inter-states. These scholars further argue that with a clear definition of an SME, policymakers can measure their contribution to employment, GDP, imposition of tax and other regulations, as well as other macro-economic indicators. Furthermore, a clear definition of an SME helps to inform decision making with regards SME support programmes.

### European Commission definition of an SME

The European Commission defines an SME as an organisation with 250 or less employees, as well as an annual turnover which does not exceed €50 million. Table 2-2 below shows an exhaustive definition of an SME, and its subcategories, as defined by the European Commission (European Commission, 2005).

**Table 2-2: European Union definition of an SME**

| Enterprise category | Headcount: Annual Work Unit | Annual Turnover | Annual balance sheet total |
|---|---|---|---|
| Medium-sized | 250 | €50 million | €43 million |
| Small | 50 | €10 million | €10 million |
| Micro | 10 | €2million | €2 million |

**Source: Adapted from European Commission (2005:14)**

The European Commission's definition of an SME takes into consideration three factors: staff headcount, annual turnover, and annual balance sheet total (European Commission, 2020). Although it is mandatory to meet the staff headcount requirement, an enterprise is only required to meet either annual turnover or annual balance sheet total to be recognised as an SME. The European Commission further divides organisations in the SME category as either micro, small, or medium-sized enterprises.

**International Labour Organisation (ILO) definition of an SME**

The International Labour Organisation (ILO) also defines an SME as an organisation with less than 250 employees. The ILO, however, defines micro-enterprises as those with a maximum of 10 employees, while small enterprises have got between 10 and 100 employees, and medium-sized enterprises have got 100 to 250 employees.

**South African definition of an SME**

The South African National Small Business Act, No. 102 of 1996 defines SMEs in terms of the number of employees, total annual turnover, and total gross asset value. Table 2-3 below shows a comprehensive list of how SMEs are defined by this Act.

**Table 2-3: Definition of SMEs according to industry type**

| SCHEDULE | | | |
|---|---|---|---|
| ***The new National Small Enterprise Act threshholds for defining enterprises size classes by sector, using two proxies*** | | | |
| **Column 1** | **Column 2** | **Column 3** | **Column 4** |
| Sectors or sub-sectors in accordance with the Standard Industrial Classification | Size or class of enterprise | Total full-time equivalent of paid employees | Total annual turnover |
| Agriculture | Medium | 250 | 35.0 million |
| | Small | 50 | 17.0 million |
| | Micro | 10 | 7.0 million |
| Mining and Quarrying | Medium | 250 | 210.0 million |
| | Small | 50 | 50.0 million |
| | Micro | 10 | 15.0 million |
| Manufacturing | Medium | 250 | 170.0 million |
| | Small | 50 | 50.0 million |
| | Micro | 10 | 10.0 million |
| Electricity, Gas and Water | Medium | 250 | 180.0 million |
| | Small | 50 | 60.0 million |
| | Micro | 10 | 10.0 million |
| Construction | Medium | 250 | 170.0 million |
| | Small | 50 | 75.0 million |
| | Micro | 10 | 10.0 million |
| Retail, motor trade and repair services | Medium | 250 | 80.0 million |
| | Small | 50 | 25.0 million |
| | Micro | 10 | 7.5 million |
| Wholesale | Medium | 250 | 220.0 million |
| | Small | 50 | 80.0 million |
| | Micro | 10 | 20.0 million |
| Catering, Accommodation and other Trade | Medium | 250 | 40.0 million |
| | Small | 50 | 15.0 million |
| | Micro | 10 | 5.0 million |
| Transport, Storage and Communications | Medium | 250 | 140.0 million |
| | Small | 50 | 45.0 million |
| | Micro | 10 | 7.5 million |
| Finance and Business Services | Medium | 250 | 85.0 million |
| | Small | 50 | 35.0 million |
| | Micro | 10 | 7.5 million |
| Community, Social and Personal services | Medium | 250 | 70.0 million |
| | Small | 50 | 22.0 million |
| | Micro | 10 | 5.0 million |

**Source: Adapted from The South African National Small Business Act, No. 102 of 1996, page 20.**

Since the research is limited to SME foundries in South Africa, the definition of an SME as given by the South African National Small Business Act, No. 102 of 1996 is adopted for this study. South African foundries fall under the manufacturing sector category. As such, any foundry with 250 employees and below and an annual turnover of 170 million South African rands and below qualifies as an SME in this classification matrix. The researcher did not have access to individual foundries' financial records, hence the criteria of number of employees in each organisation was used to select foundries that fit the category of SMEs.

## 2.4 CHARACTERISTICS OF SMEs

### 2.4.1 SME contribution to job creation

SMEs play a key role with regards economic development, especially in developing nations (Arshad et al., 2020; Manzoor, Wei and Sahito, 2021; Zafar and Mustafa, 2017). Beck, Demirguc-Kunt, and Levine (2005), contend that although the SME sector size is positively correlated to economic growth, there is no proof of causality. Informal SMEs in developing nations have been confirmed as contributing about 48 percent of total labour and 37 percent of GDP. Formal SMEs in developing nations contribute about 45 percent of employment and about 33 percent to GDP. Kumar (2017) claims that SMEs make up 90 percent of the private sector in developing nations, of which 30 to 37 percent are women-owned. In developed nations, formal SMEs contribute about 67 percent of total employment in the manufacturing sector and about 49 percent to the GDP. SMEs also contribute to a higher net job creation than large firms. ILO (2015), however, argues that it is not entirely correct to assume that SMEs are synonymous with entrepreneurship and job creation because SMEs are highly heterogeneous, and therefore should be differentiated by sub-segments to establish which sectors are better engaged in entrepreneurial activities and job creation. It is therefore important to establish net job creation capacity of SMEs in Africa, as ignoring this indicator tends to over-estimate their role in creating new jobs. Figure 2-3 below shows SME contribution to employment growth for low, middle, and high-income countries.

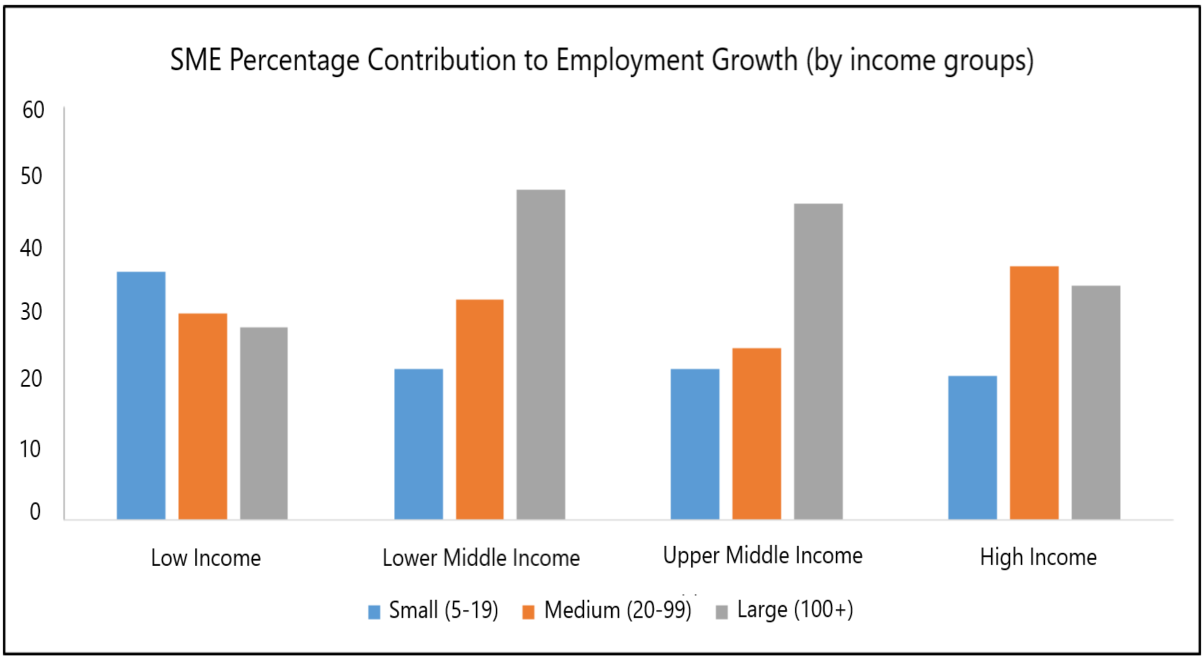


**Figure 2-3: SME Percentage contribution to employment growth by income groups Source: Adapted from Kumar (2017:12)**

SMEs tend to be less resilient during times of economic downturns (Eggers, 2020; Doern, 2017). This is because they do not have adequate internal resources to absorb effects of economic downturns such as recessions (Amamou, Gereben, and Wolski, 2022). Eggers (2020) also adds that the liability of small SMEs also makes them more susceptible to outside shocks caused by crises such as the recent COVID-19 pandemic. This means that the claim that small firms are 'job creators', without taking into consideration net job creation is an assumption that the closure of small enterprises is insignificant (Page and Soderbom, 2015). Net employment creation or destruction may be defined as the change in employment from one year to the next for a specific category of businesses, where a positive change is referred to as net employment creation while a negative change is referred to as net employment destruction (European Commission, 2015).

### 2.4.2 Relationship between firm age and net job creation

Fledgling and small enterprises have the highest employment growth rates and high contributions to employment, as they have high entrepreneurial activity (ILO, 2015). Ayagari, Demirguc-Kunt and Maskimovic (2011) claim that small enterprises that have been operating for less than 2 years create a high number of jobs. In concert with Ayagari et al. (2011), other researchers claim that there is an inverse relationship between firm age and both gross and net job creation (Ochieng and Park, 2017; Esaku, 2020).

Young firms are, however, more responsive to economic shocks than older firms (Konings and Yergabulova, 2021). This implies that young firms create more jobs when the economy is performing well but create less opportunities during challenging times. The responsiveness of young firms is also reportedly weaker in regions whose banking sector is unfriendly lending to small business. When compared to small firms operating in areas where access to capital is much easier, firms operating in areas where access to capital is challenging are half as responsive. This implies that easing of access to capital requirements for young firms could also increase their responsiveness to trends and fluctuations in business conditions, as well as improving job creation. Policies that promote an enabling environment for start-ups and young firms could also potentially improve job creation opportunities (Muathe and Otieno, 2022; Adelino and Robinson, 2017).

### 2.4.3 Relationship between number of employees and net job creation

According to Ayagari, Demirguc-Kunt and Maskimovic (2014), over 50 percent of total net employment creation is traceable to enterprises employing between 5 and 99 employees for most countries. These small firms with less than 100 employees and young enterprises that have been operating for less than 2 years create a high number of jobs. The enterprises with an average of less than 19 employees have been major players in job creation in Africa (ILO, 2015; Page and Soderbom, 2015). Davis, Haltiwanger, and Schuh (2019) concur with ILO (2015) in claiming that micro enterprises contribute more to job creation than larger SMEs. According to EU (2015), 92 per cent of all net employment creation in Europe is attributed to SMEs which have been operating for 5 to 9 years, while SMEs which have been operating for more than 10 years accounted for most job destruction. Figure 2-4 below gives a general overview of SME contribution to employment by firm size and income groups.

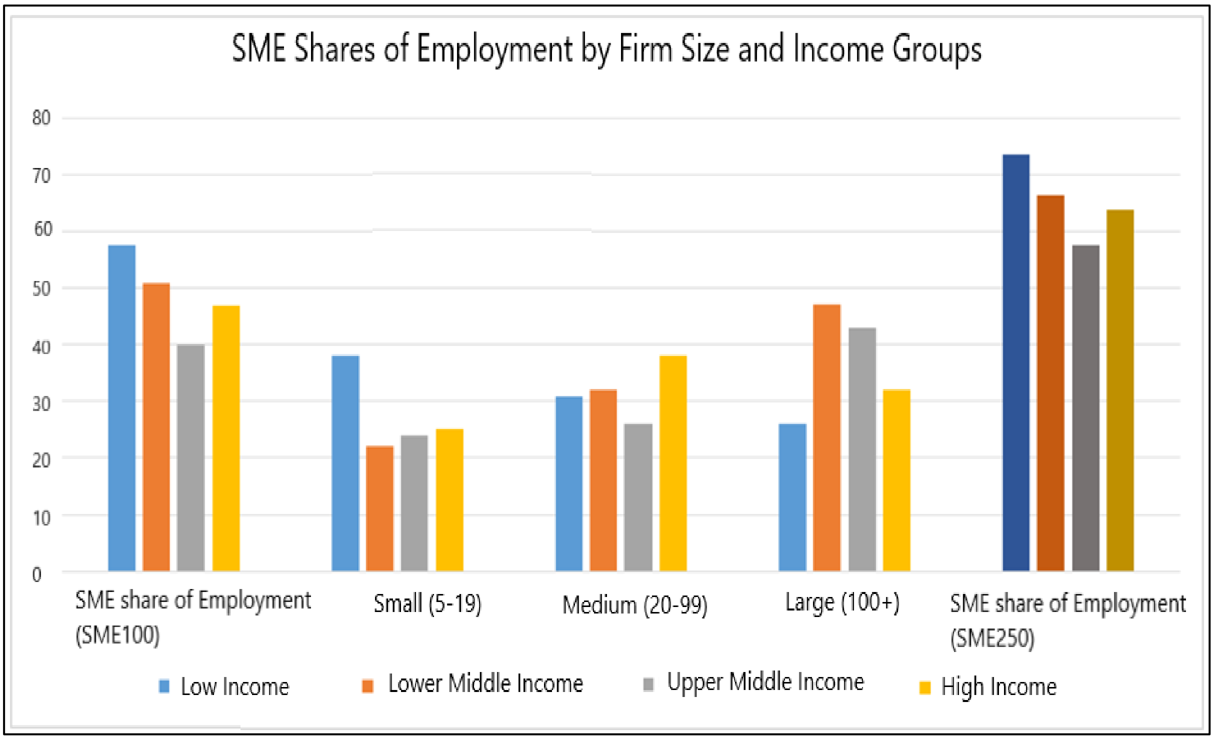


**Figure 2-4: SME shares of employment by firm size and income groups**
**Source: Adapted from Kumar (2017:11)**

The number of informal, micro, small and medium enterprises (MSMEs) in less developed nations stands at a staggering range of 365 – 445 million. An estimated 30 million of these organisations are formalised SMEs employing 5 -250 people (Page and Soderbom, 2015). It is also estimated that about 90 percent of workers falling in this MSME category work- for either unregistered firms or formal businesses with less than 5 employees (McKinsey, 2011) as cited by Page and Soderbom (2015).

### 2.4.4 Entry density of SMEs

ILO (2015) suggests that although employment share and net job creation are relatively uniform for both low and high-income countries, there is a marked difference when it comes to entry density. Ayagari, Demirguc-Kunt and Maskimovic (2011) defined entry density as, "… the number of newly registered limited liability companies per 1000 people of working age". Figure 2-5 below shows SME entry density according to income groups.

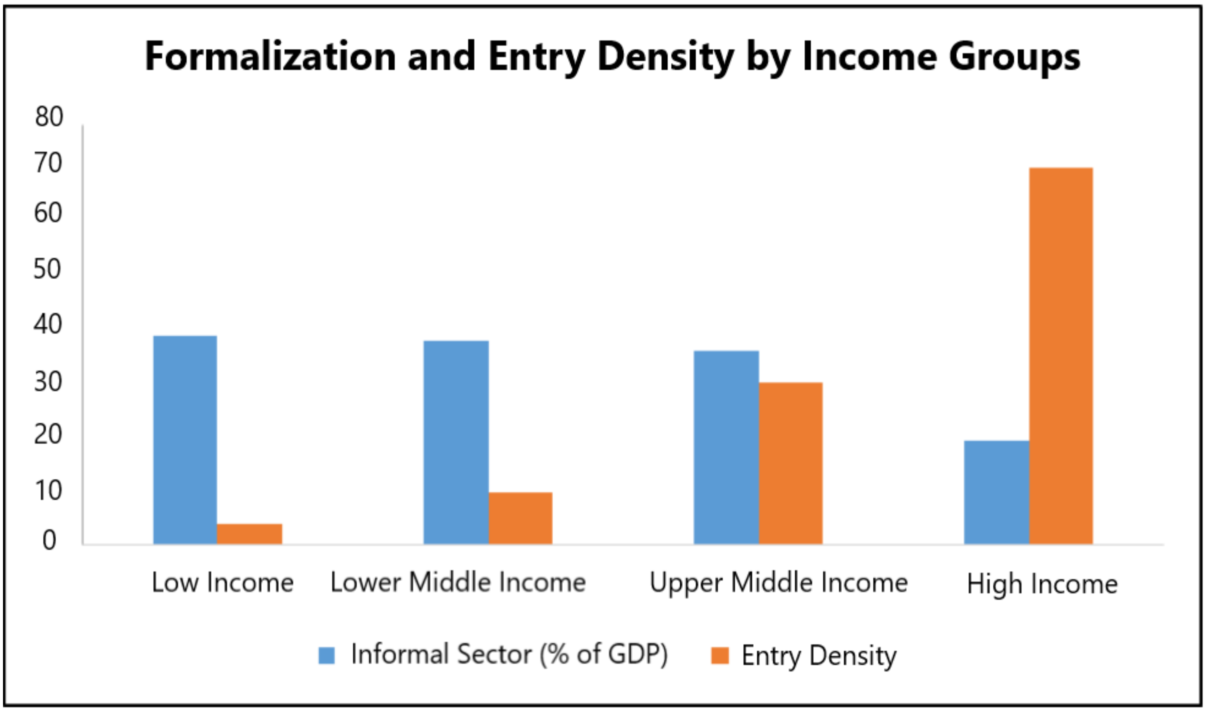


**Figure 2-5: Formalization and entry density by income groups**
**Source: Adapted from Kumar (2017:10)**

Kumar (2017) adds that SME entry density in low-income countries is in the range of 0.4, while for high income countries it is in the region of 64. This implies that entry density increases with escalation in income. The graph illustrates that formalisation of SMEs is higher for higher income group countries. MSME entry density for Arab economies is also higher than that of many developing nations with countries like Jordan and Tunisia registering entry densities of 25 and 56 respectively (Stepanyan, Abajyan, Ndoye, and Alnasaa, 2019). Entry density is a good measure of the level of entrepreneurship and dynamism in an economy, as it shows a higher covariation with income level. This indicates that there is a need for policy makers to focus on to entry density more than the number of jobs created by SMEs per se (ILO, 2015).

### 2.4.5 Growth patterns of SMEs

Williams (2016) claims that micro enterprises form the seedbed of start-ups. Most enterprises commence as micro or small enterprises, and less than 9 percent grow to employ more than 10 employees. In developing nations, there is a huge fraction of informal small firms that do not grow and indeed very few small and medium sized enterprises grow into larger organisations (Fafchamps and Woodruff, 2016). Small, women-owned SMEs, as well as SMEs operating in specific sectors such as agriculture or fragile states have got a high probability of constraints to growth and survival. Low capital market development also has got a negative effect on firm growth (Kumar, 2017). The very few micro enterprises which grow to become large enterprises are also known as transformational entrepreneurs, graduate enterprises, or gazelles (Bijaoui, 2017). Gazelles contribute anything between 19 to 54 percent of job creation and generate wealth for others beyond the owner's individual subsistence needs (Shoar, 2010). Palalic (2017) conducted a study in Bosnia and Herzegovina and concluded that one of the distinct characteristics in gazelles was entrepreneurial leadership. This entrepreneurial leadership in turn had a positive effect on firm performance. Focusing of these high growth SMEs therefore enhances the agenda of creating more and better jobs (Kumar, 2017).

ILO (2015) further reports that micro enterprises within the informal economy of developing countries contain both dynamic enterprises with potential to expand and necessity-driven enterprises. Assefa and Cheru (2018) claim that there are internal and external influences hampering growth of SMEs. Internal factors include management capacities, risk-taking ability, marketing skills, innovation, technological capacity, entrepreneurial characteristics such as growth-orientation and networking ability. External factors include legal and regulatory frameworks, access to external funding and human resource capabilities (Bouazza, Ardjouman, and Abada, 2015). Other factors include power, transportation and telecommunications infrastructure, poor quality of services, business regulation, political instability, unreliable supplies, and frequent disruptions (Page and Soderbom, 2015; ILO, 2015; Sriyani, 2020). SMEs constraints to growth are, however, reported to ease as nations grow richer. This is because it becomes easier for firms to enter and exit in the markets in developed nations. For richer nations, the probability of access to finance and electricity are high, hence increasing opportunities for SMEs and incentivising them to formalise their operations (Kumar, 2017).

### 2.4.6 Formalisation of SMEs

Kumar (2017) reports that there is a high proportion of informal SMEs in developing countries. By extension, Steel (2017) explains that some micro entrepreneurs are unable to comply with the unfriendly legal, regulatory, and bureaucratic business atmosphere in their countries, hence end up opting to operate outside the legal and formal requirements and avoiding registration costs. Williams and Shahid (2016) equally support the notion made by Steel (2017), by suggesting that many entrepreneurs are not willing to formalise their businesses due to the disproportions between formal and informal institutions. Examples include collated laws and regulations, the customs, morals, and codes of conduct of the informal institutions. In the same vein, Williams and Shahid (2016) conducted a study in Ukraine and concluded that young, less educated, and lower-income earning entrepreneurs are not generally inclined to formalisation. Herbane (2019) conducted a study in the United Kingdom and concluded that factors such as firm location, entrepreneur’s networks, the influence of external challenge events, and business owner’s attitudes towards the prevention of crises greatly influence formalisation activities of an SME.

This is not to suggest that informal SMEs do not have challenges of their own. Fjose, Grünfeld, and Green (2010) aver that informal SMEs growth prospects are hampered by limited access to formal credit facilities and limited capacity to expand beyond the local market. Other challenges faced by informal SMEs include less developed entrepreneurial skills, poor networks, poor management skills, unfavourable location of business premises, inadequate technological infrastructure, inability to operate latest technology, unfriendly legislation towards this sector, ambiguous regulatory frameworks that govern this sector. To counter these challenges, there is a need for governments to develop effective policies, as well as legal and regulatory frameworks that are designed to support the informal sector. Registration and formalisation processes for SMEs should be simplified. Lastly, favourable financial infrastructure to support informal SMEs also needs to be established (Nohoua, 2021; Matsongoni and Mutambara, 2018).

Governments and social partners are, however, interested in formalising SMEs, as informality is often associated with low productivity, unfair competition, uncomfortable employee working conditions and a poor tax base (ILO, 2015). Distinguin, Rugemintwari and Tacneng (2016) also propose that it is imperative for governments to improve business environment in their countries, as a weak institutional environment leads to an increase in interconnectedness between formal and informal sectors. SMEs also end up losing out on the benefits of formalisation in such a situation. Some of these losses include loss of market share due to unfair competition, increased expenses incurred while paying taxes, rentals, and costs of formalisation. SMEs encountering competition from informal firms also have got limited access to loans, as compared to their counterparts not faced with such competition. This result is more visible in smaller firms, as benefits of formalisation like access to loans from banks increase with firm size. Figure 2-6 below shows distribution of formal SMEs by region.

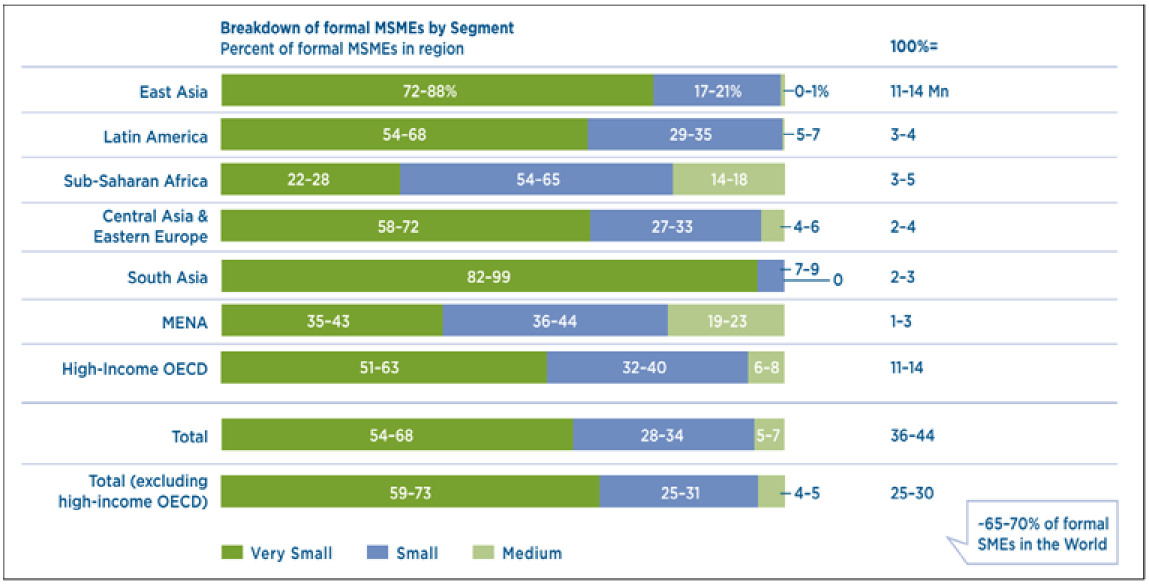


**Figure 2-6: Breakdown of formal SMEs by segment**
**Adapted from Kumar (2017)**

It can be observed from Figure 2-6 above that in Sub-Saharan Africa, only 22 to 28 percent of formalised MSMEs very small enterprises, while 54 to 65 percent of formal MSMEs are small enterprises. A different picture is, however, observed when one looks at East and South Asian regions as over 80 percent of formalised MSMEs are very small businesses. Results from the two Asian regions are even better than those of Eastern Europe, Latin America, MENA, Central Asia and OECD countries. This seems to suggest that it is much easier to formalise businesses in South and East Asia compared to other parts of the world regardless of size of firm. Furthermore, the table apparently suggests that it is difficult for very small firms in Sub-Saharan Africa to formalise.

### 2.4.7 Challenges faced by workers in SMEs

Research shows that SMEs provide jobs that are of lower quality than those in larger enterprises (Radic, 2020). Consequently, start-ups and young firms attract employees who place greater value on autonomy, challenging jobs, and innovation. This contrasts with employees in established firms who value factors like remuneration, job security and fringe benefits (Block, Fisch and Van Praag, 2018). Abisuga-Oyekunle, Patra, and Muchie (2020), however, argue that the industry sector under which an SME operates has a greater effect on quality of employment than the size of the firm. Quality of employment takes into account seven aspects, namely ethics of employment, employee safety, remuneration of employees, benefits offered by the organisation to employees, number of working hours per day and balancing work and personal life. The other four dimensions include training and skills development, security of employment, social dialogue, in addition to workplace relationships and employee motivation (ILO, 2015). Figure 2-7 below shows SME wage compensation according to continent. The wages are computed from total annual labour costs divided by the number of full- time permanent employees.

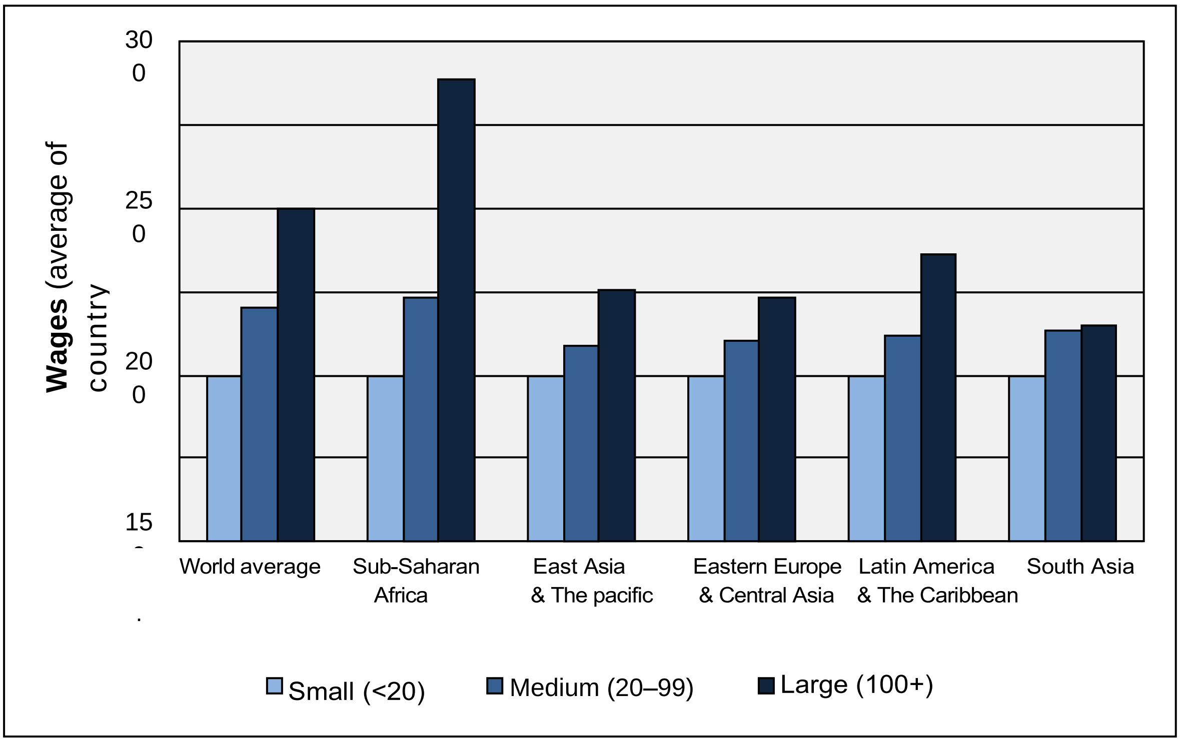


**Figure 2-7: SME wage compensation according to continent.**

**Source: Adapted from ILO (2015:14)**

The diagram above shows that large firms generally pay more than small and medium enterprises. The difference in wages paid by large firms compared to small and medium enterprises is, however, more pronounced in Sub-Saharan Africa than the rest of the world. The difference between wage rates paid by large firms as compared to small firms, for similar jobs can be as high as 35 percent in developed countries (Brown et al., 1990) as cited by Page and Soderbom (2015). In developing nations, the wage differential can be as high as 50 percent (Mazumdar,1999; Page and Soderbom, 2015). Large firms also offer fringe benefits such as medical and pension insurance, as well as secure employment. Wage rates in small firms generally remain behind those of large firms, even after growth. Page and Soderbom (2015) claim that on average, a worker in a firm employing about 100 people earns about 80 percent more than workers doing a similar job in a 5-worker enterprise. This wage gap is attributed to factors like skills difference, as larger firms employ more educated and better experienced workers than do small firms. Quak and Flynn (2019), however, add that if governments wish to intervene in SME development programmes in their countries, they need to employ more comprehensive strategies focused on enhancing industry specific infrastructure development, financing, as well as training and mentoring programs. This approach would ensure creation of higher quality jobs in SMEs.

### 2.4.8 SWOT analysis of SMEs

**Table 2-4: SWOT analysis of SMEs**

| **STRENGTHS** | **WEAKNESSES** |
|---|---|
| • Ability to innovate (Dar, Ahmed, and Raziq, 2017)<br>• Unique skills (Dar, Ahmed, and Raziq, 2017)<br>• Good network (Dar, Ahmed, and Raziq, 2017)<br>• Quick communication (Dar, Ahmed, and Raziq, 2017)<br>• Less bureaucracy (Dar, Ahmed, and Raziq, 2017)<br>• Close external and internal contacts (Dar, Ahmed, and Raziq, 2017)<br>• Easily adapt to market and trend flow (Dar, Ahmed, and Raziq, 2017)<br>• Less capital intensity when compared to big businesses (Thamrin, Herlambang, Brylian, Gumawang, and Makmun, 2017) | • Labour intensive (Thamrin et al., 2017)<br>• Short volatile life (Thamrin et al., 2017)<br>• Limited resources (Dar, Ahmed, and Raziq, 2017)<br>• Obsolete equipment (Talukder and Jahan, 2017)<br>• Technology is backdated (Talukder and Jahan, 2017)<br>• Lack of technical skills (Rizos, Behrens, Kafyeke, Hirschnitz-Garbers, and Ioannou, 2015)<br>• Low profit due to small economies of scale (Falker and Hiebl, 2015) |
| **OPPORTUNITIES** | **THREATS** |
| • Subcontracting opportunities (Talukder and Jahan, 2017)<br>• Diversification of products (Alammari, Khalif and Othman, 2016)<br>• Increased marketing (Alammari, Khalif and Othman, 2016)<br>• Niche products (Nure, Bazini, and Madani, 2020) | • Uncertainty of business environment (Analoui and Madhoun, 2017)<br>• Numerous competition (de Guimaraes, Severo, and de Vasconcelos, 2018)<br>• Change in customer taste (Talukder and Jahan, 2017)<br>• High interest rates of bank loans (Talukder and Jahan, 2017)<br>• Inflow of cheap foreign products (Talukder and Jahan, 2017)<br>• Absence of institutional support (Talukder and Jahan, 2017)<br>• Harassment by government employees (Talukder and Jahan, 2017)<br>• Higher risk due to over reliance on suppliers for credit financing (McGuinness, Hogan, and Powell, 2018) |

**Source: Constructed by the researcher**

## 2.5 COMPARISON OF ATTRIBUTES OF SMEs VERSUS LARGE COMPANIES

SMEs lag behind large corporates in terms of human resources management, business, managerial skills, and technology (Alammari, Khalif and Othman, 2016). SMEs, however, quickly achieve profits in comparison to huge corporations which take years to register a net profit on their books, after years of huge capital investment (Alammari, Khalif and Othman, 2016).

### 2.5.1 Qualitative indicators differentiating SMEs from large companies

Berisha and Pula (2015) conducted a study in which they compared SMEs against large companies on aspects like management approach, production, production, research and development and finance. Their findings are summarised in the table below.

**Table 2-5: Comparison of attributes of SMEs and large companies**

| Category | SMEs | Large Companies |
|---|---|---|
| Management | Proprietorship entrepreneurship<br><br>Functions linked to personalities | Manager entrepreneurship<br><br>Division of labour by subject matters |
| Personnel | few university graduates employed<br><br>All round knowledge | High fraction of university graduates<br><br>Specialisation |
| Organisation | Highly personalised contracts | Highly formalised communication |
| Sales | Comparative position not defined and uncertain | Strong comparative position |
| Buyer's Relationship | Unstable | Based on long term contracts |
| Production | Labour intensive | Capital intensive, economies of scale |
| Research and development | Influenced by market trends and intuition | Entrenched |
| Finance | Funding from family,<br><br>Personal funds | Diversified ownership structure<br><br>Anonymous sources of funding |

**Source: Adapted from Berisha and Pula (2015)**

### 2.5.2 Comparison of productivity of SMEs vs large enterprises

Although SMEs are a major job creation engine, their productivity and wages are lower than those of large enterprises (Kumar, 2017). Research also shows that larger enterprises are generally more productive than small enterprises. The table below compares the productivity of small, medium, and large firms across continents. Labour productivity is calculated as total annual sales per full time permanent employee (ILO, 2015).

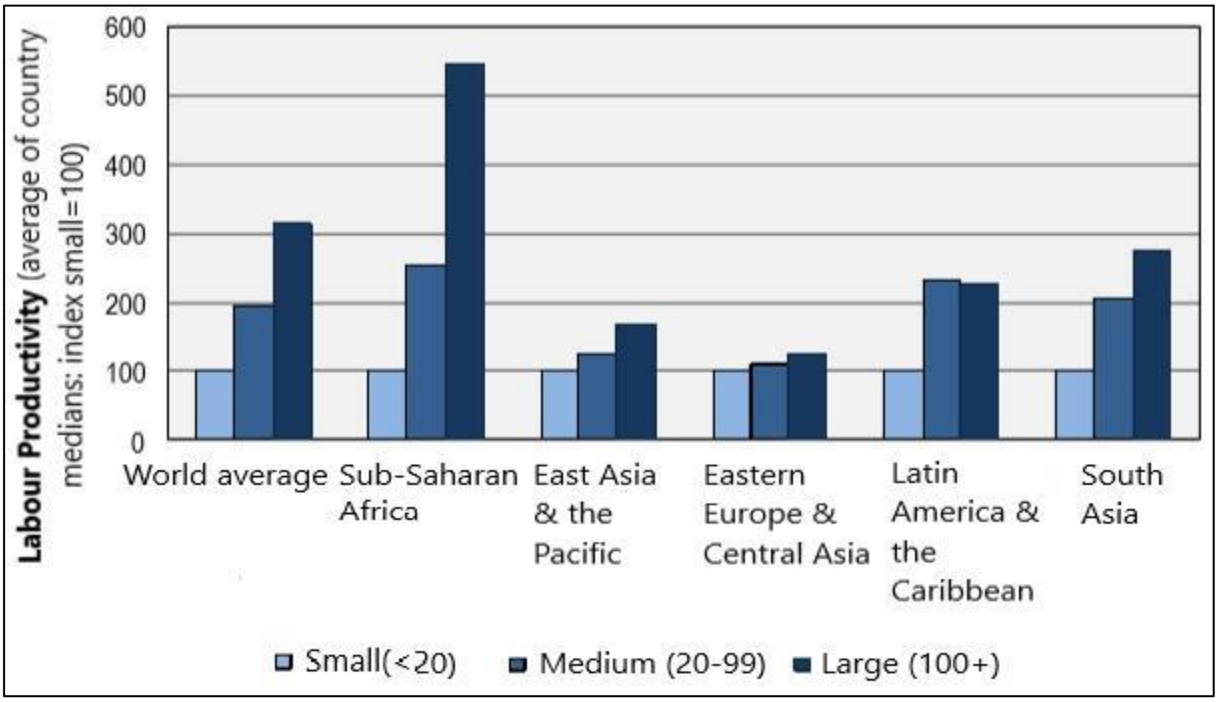


**Figure 2-8: Labour productivity of SMEs.**
**Source: Adapted from ILO (2015:14)**

Total factor productivity can be achieved through three ways, namely, improvements in the quality of human resources, improvement in efficiency of the production process and improvement in the quality of physical capital (ILO, 2015). Improvement in the quality of human resources can be achieved through quality education, training, as well as improved HR management and improved working conditions (ILO, 2015; Asare, Akuffobea, Quaye, Atta-Antwi, 2015). Production process efficiency can be achieved through workplace innovations. Formal banking and mobile commerce technology to make business transactions have also been cited as improving the productivity of a firm (Asare et al., 2015; Chau and Deng, 2018). Quality of physical capital can be improved through technological innovations and upgrades (Unnikrishnan, Iqbal, Singh and Nimkar, 2015; Prasanna et al., 2019).

### 2.5.3 Comparison of business ethics across organisational types

Crane, Matten, Glozer, and Spence (2019) suggest that small businesses have got a different ethics approach when compared to large organisations. The table below shows a comparison of how different organisations embrace ethics, as suggested by Crane et al. (2019).

**Table 2-6: Comparison of business ethics approach by organisational types**

| | **Large corporations** | **Small businesses** | **Civil society** | **Public sector organisations** |
|---|---|---|---|---|
| **Main priorities in addressing ethical issues** | Financial integrity is highly regarded<br><br>Employee and consumer issues are taken seriously | Employee and community issues | Delivery of mission to clients; integrity of tactics; legitimacy and accountability | Rule of law, corruption, conflicts of interest; procedural issues, accountability |
| **Approach to managing ethics** | Formal public relations and or systems based | Informal, personal relationship and trust based | Informal values-based | Formal, bureaucratic, regulated |
| **Responsible or accountable to** | Shareholders and other stakeholders | Owners and family members | Donors and clients | General public, higher level government organisations |
| **Main constraints** | Shareholder influence;<br><br>size and complexity of organisation | Limited time<br>Limited resources | Limited resources and formalised training is scarce | Inertia, lack of transparency |

**Source: Adapted from Crane, Matten, Glozer, and Spence (2019)**

## 2.6 FACTORS LEADING TO SUCCESS OF SMES

### 2.6.1 Entrepreneur's individual characteristics

Several authors have in the past investigated factors which lead to the success of SMEs. Entrepreneurs have got power to influence strategic direction taken by their firms (Pramono, Sondakh, Bernarto, Juliana, and Purwanto, 2021). Factors like motivation, skills, capabilities, and personal characteristics of the entrepreneur has a bearing on performance of an SME (Nikolic et al., 2015). Personality of an entrepreneur is also cited in literature as one factor that ultimately affects performance of an SME (Alam, Nor, Ali, Omar and Wel, 2018; Sarwoko and Nurfarida, 2021). Personality that is deemed consistent throughout the life of an entrepreneur affects their feelings, thought patterns, as well as how an individual adapts to various situations. This study focuses on eleven entrepreneur's individual characteristics which are visionary leadership, strong leadership, ambitious goals, trust in own ability, believing that they have control over events, need for achievement, educational level, risk taking, experience, quick to identify opportunities and quick thinking in validating how personality contributes to SME success.

#### 2.6.1.1 Visionary leadership

Upadhyaya and McCormick (2020) suggest that vision and leadership of an entrepreneur can lead to success of an SME. Visionary leadership also plays a positive role on entrepreneurship and organisational excellence (Hijjawi, 2021; Zainol Daud, Shamsu, Abubakar and Halim, 2018). When combined with learning organisation, visionary leadership has got a positive effect on the innovative behaviour of an organisation (Anshar, 2017). Visionary leadership has also been reported to have an influence on employee performance (Amoah-Mensah and Darkwa, 2020). Putra, Ashoer, Abdullah, Muhtasom, Farida, and Guntur (2019), on the other hand, suggests that the vision must clearly outline what needs to be achieved and the time frame required to meet the specific obligations. Secondly, for the vision to be successful, the entrepreneur must have the energy required for the goal to be realised. Nanus (1992), as cited by Herminingsih and Arijanto (2020) indicates that a visionary leader plays four key roles in an organisation, namely giving direction, being an agent of change, being the spokesperson and being the coach. Visionary leadership is equally affected by factors like communication, creativity, emotional intelligence, organisational climate, and other personality traits (Bunnoiko and Atthirawong, 2017).

### 2.6.1.2 Strong leadership

Leadership is identified in literature as a key factor to the success of an SME (El Toufaili, 2018), since managers can act as catalysts for shaping organisational values and culture (Roscoe, Subramanian, Jabbour, and Chong, 2019). According to Szczepańska-Woszczyna and Kurowska-Pysz (2016), managers can only be able to influence their organisations if they are competent, sincere, reliable and have an ability to balance various interests. Strong leadership is said to directly influence growth and performance patterns of SMEs (Sikalieh, Linge, and Asiimwe, 2016; North, Bergstermann and Hardwig, 2016; Putra et al., 2019). Strong leadership is also required for SMEs wishing to internationalise their business (Ng and Kee, 2017). Ambidextrous leadership has also been cited as being key to enhancement of employee innovative work tendencies (Oluwafemi, Mitchelmore, and Nikolopoulos, 2020). Not to be outdone, Kane et al. (2019) claim that strong leadership is required for firms seeking stability in a turbulent business environment. In support of claims made by Kane et al. (2019), Nichols, Hayden and Trendler (2020), also put forward that strong leaders have got better control over events during changing and uncertain circumstances because they seek information from different sources, admit what they do not know as well as engage external expertise when required. Nor-Aishah, Ahmad and Thurasamy (2020) claim that strong entrepreneurial leadership has got a positive impact on environmentally sustainable performance of an SME.

### 2.6.1.3 Ambitious goals

It has been proven that setting specific and challenging goals can enhance the performance of an organisation (Berberović, Činjarević, and Kožo, 2019; Baron et al., 2016; Frese et al., 2016; Zainol et al., 2018). An effective way of ensuring that these goals are given the attention they deserve is to incorporate them into the organisation’s vision and communicating the vision to the employees (Frese, Hass and Friedrich, 2016). Entrepreneur’s goals have also been reported to have a direct impact on issues like ability to access finance, ease of finding skilled labour and profitability of an SME (Hasan and Almubarak, 2016). Entrepreneurs in successful firms are reported to have a forward-looking perspective and are also proactive and aggressive as they work towards their goal to outperform competitors (Radzi, Nor and Ali, 2017).

#### 2.6.1.4 Trust in own ability

It is well documented that successful entrepreneurs have got faith in their own skills and ability (Wei, Chen, Zhang, and Zhang, 2020; Ramadani et al., 2015). Some authors refer to this quality in entrepreneurs as self-efficacy, which is belief in oneself to be able to handle life's challenges and overcome them with confidence (Karabulut, 2016; Chatterjee and Das, 2015). The concept of self-efficacy was first introduced by Bandura (1977) when he explained the theory of learning. Self-efficacy was defined by Bandura (1977) as "an individual's belief in his or her personal ability to achieve a precise set of tasks". It is also believed that the higher the entrepreneur's level of self-efficacy the higher their performance and the more chances of success of the business (Msimango-Galawe and Mazonde, 2021; Zubair and Khan, 2021). To add a voice to the argument, Werthes et al. (2018) also add that low self- efficacy has got a negative effect on number of entrepreneurial activities. Ahsan et al. (2018) suggest that entrepreneurs can increase self-confidence when they engage mentors who have walked the same path to help them to dispel fear of isolation. Ilieva, Brudermann, and Drakulevski (2018) however claim that overconfidence can lead to an entrepreneur's downfall as it can cause more damage to a business when compared to other decision biases. Ilieva, Brudermann, and Drakulevski (2018) further claim that overconfidence has led to the failure of many young businesses which are less than five years and that acknowledgement of one's imperfections when it comes to judgement is one of the cognitive remedies to overconfidence.

### 2.6.1.5 Belief in control over events

Bahari, Yunus, Jabar, and Yusof (2018) conducted a study on SMEs in Malaysia and discovered that an entrepreneur's internal locus of control is positively related to his firm performance. In a similar study conducted on SMEs in Nigeria, Aliyu, Na-Allah, Bappi and Mohammed (2020) concluded that locus of control has got a significant positive effect on performance of an organisation in as far as profitability, sales growth and customer satisfaction is concerned. Agustina, Gerhana, and Sulaiman (2020) concur with Aliyu et al. (2020) and further explain that individuals who have a strong internal locus of control do not easily give up their preconceived destiny because of external circumstances. Such individuals generally have got a positive and optimistic worldview and this in turn also influences their decision-making process. The idea of internal locus of control was first introduced by Rotter (1966). According to the author, individuals with a high internal locus of control are more alert to information which influences their future behaviour, have high regard for skill or achievement, are proactive in improving their environmental conditions and generally resist efforts to influence them.

### 2.6.1.6 Need for achievement

The idea of the need for achievement was first introduced by McClelland (1961). According to the author, individuals with a strong need for achievement are actively seeking for opportunities where they can attain achievement satisfaction. Such individuals are self-driven to set and reach their own achievement standards, as opposed to being motivated by external rewards offered by the environment. From a business point of view, an SME owners' need for achievement has been identified in literature as contributing positively to SME performance (Aliyu et al., 2020). Need for achievement has also been identified in literature as an important success factor required for development of entrepreneurship (Meshram and Rawani, 2019). According to Azra and Salfiya Ummah (2019), need for achievement also contributes to growth of SMEs.

#### 2.6.1.7 Educational level

Educational level influences development of entrepreneurship (Nyoni and Bonga, 2018; Meshram and Rawani, 2019). It has also been reported that there is a strong and positive correlation between entrepreneur's education level and financial management practices (Karadag, 2017). An entrepreneur's educational level has also been reported encourage both formal and informal interfirm cooperation relationships. For SMEs, such relationships help firms to improve marketing strategies, tap into strategic partners' resources, as well as to overcome the liability of smallness (Martin, Romero, and Wegner, 2019). In a study conducted in Ghana, Salifu et al., (2018) discovered that likelihood of loan repayments increases with the level of education of an entrepreneur. Alene (2020) claims that level of education significantly influences success and performance of women entrepreneurs. In another study conducted on SMEs in the United Kingdom, Hussain, Salia, and Karim (2018) concluded that level of education of an entrepreneur had a positive effect on likelihood of securing a bank loan. Asandimitra and Kautsar (2017) however, argue that educational level does not have a significant effect on business success. Diabate et al. (2019) concur with Asandimitra and Kautsar (2017) by suggesting that an educational level does not contribute significantly to sustainable growth of an SME.

#### 2.6.1.8 Risk taking

Under risk taking, a firm might decide to borrow money to invest in the business, expand operations, venture into new markets, start new projects, improve existing processes or such projects (Block, Colombo, Cumming, and Vismara, 2018). When SMEs take such risks, it enables them develop niche markets, specialise, and ultimately develop a competitive advantage (Kohardinata, Soewarno, and Tjahjadi, 2020). Risk taking is also considered to be a vital component of entrepreneurial orientation, as managers will be spending firm resources on activities whose outcomes are uncertain (Aziz, Hasnain, Awais, Shahzadi, and Afzal, 2017). Not to be outdone, Al Issa (2021) suggests that there is a positive relationship between risk taking and business success. Other authors also described risk taking as an integral contributor to SME growth (Azra and Salfiya, 2019; Games and Rendi; 2019). Lawal, Adegbuyi, Iyiola, Ayoade and Taiwo (2018) claim that there is a direct correlation between competitiveness of an SME and their tendency to taking risks. Calculated risk-taking has also been labelled in literature as a catalyst for firm performance (Egele, Muhammad, and Mutenyo, 2018; Lawal et al., 2018). Purwidianti, Darmawan, and Mujirahayu (2020) conducted a study on Muslim SME owners and discovered that religiosity and level of education had a positive influence on risk taking propensity.

#### 2.6.1.9 Experience

According to Azra and Salfiya Ummah (2019), the owner's experience also contributes to growth of SMEs. In a separate study, Meyer and Klonaridis (2020) conducted a study on female owned SMEs in South Africa and concluded that previous work experience is one of the most important contributors to business growth. Soomro, Abdelwahed and Shah (2019) also concluded that an entrepreneur's prior experience contributes to success of an SME. Hernández-Carrión, Camarero-Izquierdo and Gutiérrez-Cillán (2017) argue that the ability of an entrepreneur to benefit from professional and institutional networks increases as their experience also increases. Muda and Rahman (2016) agree with Hernández-Carrión, Camarero-Izquierdo and Gutiérrez-Cillán (2017) to some extent by suggesting that the SME owner's prior business experience in the sector or related fields is particularly crucial for development of relationships with key stakeholders like suppliers, customers, potential business partners and financial institutions and government. Lafuente, Vaillant, Alvarado, Mora-Esquivel, and Vendrell-Herrero (2021) claim that an entrepreneur's previous exporting experience can significantly increase their chances of exporting goods or services when they start a new business venture. Pruthi and Wright (2019) also comment that previous experience can be useful to transnational entrepreneurs during establishment of new organisations. Entrepreneurial experience is handy when building more diverse teams (Kirschenhofer and Lechner, 2012). Astrachan, Klein, and Smyrnios (2002) as cited by Pitchayadol, Hoonsopon, Chandrachai, and Triukose (2018) postulate that experience in a family business can aid a son to adopt an entrepreneurial spirit, as well as the fact that the number of family members involved in a family business is a key determinant of how much experience the organisation can benefit from the family.

However, Ghardallou, Borgi, and Alkhalifah (2020) point out that for executive jobs like CEOs, there is a possibility of negative correlation between prior experience and post-succession firm performance due to “negative learning transfer”. According to Hamori and Koyuncu (2015), executives who move from one CEO position to another in a different organisation need to “unlearn” most of the knowledge and skills from former organisation to be effective in the new environment. Asandimitra and Kautsar (2017), in a study they conducted in Indonesia on women owned SMEs, concluded that working experience does not have a significant impact on business success. A similar study was conducted on SMEs in Côte d’Ivoire, and it was concluded that an entrepreneur’s work experience does not contribute much to sustainable growth of a business (Diabate et al., 2019).

#### 2.6.1.10 Quick to identify opportunities

Quick identification of opportunities and threats is a trait of entrepreneurs (Omar, 2019). Brown and Barnard (2018) also suggest that quick identification of opportunities can aid an organisation to attain a competitive advantage over competitors. Baron (2006) suggests that entrepreneurs make use of cognitive frameworks gained through experience to identify opportunities. This cognitive framework enables them to establish relationships between ostensibly unconnected events or trends in the market to propose new product or service concepts. According to Baron (2006), entrepreneurs draw inspiration from variations in factors like markets, demographics, technology, and government policies. The quest for radical innovation and information are reported to be pillars of opportunity identification (González, Husted and Aigner, 2017). Opportunity identification may form the foundation for a superior strategy however, it is not the same as devising a winning strategy (Eisenhardt and Bingham, 2017). Stephan, Zbierowski, and Hanard (2020) outline how some entrepreneurs quickly identified opportunities which enabled them to survive during the global COVID-19 pandemic.

#### 2.6.1.11 Quick thinker

In the business world, entrepreneurs are often faced with situations where they need to make quick decisions while at the same time being faced with many opportunities.

The speed of thinking things through and making decisions is said to bring about a firms' competitive advantage over rivals (Rita, Wahyudi and Muharam, 2018). In describing the effects of COVID-19 pandemic, Singh (2020) suggests that tourism business in poorer continents like Asia and Africa will be severely affected to an extent that there will be massive job losses. Stephen et al. (2020) also pointed out agility as one of the most important entrepreneur's individual characteristics which will enable businesses to survive the scourge the global COVID-19 pandemic. However, only quick thinkers will find a way of circumventing this situation.

### 2.6.2 Internal non-individual characteristics

#### 2.6.2.1 Workplace learning

Jacobs and Parks (2009), as cited by Manuti, Pastore, Scardigno, Giancaspro and Morciano (2015) define workplace learning as, "the process that engages individuals in training programmes, education and development courses as well as experiential learning for the purpose of acquiring and/or implementing competences necessary to meet organizational demands". Learning can also occur at individual, group, organisational, and inter-organisational level (Martínez-Martínez, Cegarra-Navarro, and Garcia-Perez, 2022). Workplace learning can take place in a formal or an informal fashion (Ifenthaler, 2018). Under formal learning, employees are subjected generically structured programs which might not meet individual learning needs, while informal workplace learning is normally fashioned according to an employee's learning needs. Both formal and informal learning have got their advantages and disadvantages. For instance, informal learning offers the advantage of linking content being learnt by the employee with personal career development. On the other hand, informal learning poses the danger of employees adopting bad habits and unprofessional behaviour from their colleagues. Formal learning might not meet employees' learning needs and might be outdated, as demand on competence development is always changing (Decius, Schaper and Seifert, 2019). Organisational-learning, when supported by strong management buy-in can pave the way for process improvement opportunities (Matthews, MacCarthy and Braziotis, 2017; Basten and Haamann, 2018). SMEs which embark on deliberate learning are also reported to fare better than those which rely exclusively on experience accumulation when it comes to export market learning (Evangelista and Mac, 2016). Roziq, Reawaroe, and Rosyidi (2021) also suggest that organisations which invest in their human resources development have got superior performance. Table 2-7 below compares the characteristics of formal and informal learning as outlined by (Manuti et al., 2015).

**Table 2-7: Informal and formal learning characteristics**

| **Formal learning characteristics** | **Informal learning characteristics** |
|---|---|
| • A recommended course outline<br>• Learning is deliberately planned for and usually takes place at organised events<br>• An instructor or trainer usually facilitates the learning process<br>• After learning, students are usually awarded some qualification, certificate or credit The external specification of outcomes. | • Learning is incorporated in daily work activities;<br>• Learning is usually triggered by events which occur within the organisation.<br>• Learning process is more informal<br>• Learning process does not follow a clear procedure with clear outcomes.<br>• Learning usually takes place by reflecting on past events- good or bad<br>• Learning also takes place by observing others |

**Source: Adopted from Manuti et al., (2015)**

There is also talk of responsible manager's workplace learning, which is different from the traditional interventional workplace learning. This type of learning exposes employees to continuous learning, and in the process favourably positions the organisation to respond to market changes with agility (Andrianova and Antonacopoulou, 2020). Manuti et al. (2015) suggest that a 'one-size fits-all' tactic to workplace learning will not work, as different industries have got different demands.

Tam and Gray (2016) also made the following observations concerning workplace learning.:

- Timeous learning should be implemented for SMEs whose priority is organisational growth.
- Group learning is more beneficial to SMEs in high-growth phase.
- Individual learning and inter-organisational learning should always be present in any organisation, irrespective of stage the firm is at.
- Mature SMEs benefit more from learning about systemisation and professional development of employees.

#### 2.6.2.2 Close customer relations

Customer relations can directly impact performance, innovativeness, and innovation behaviour, as well as provide a competitive advantage for a firm (Loon and Chik 2019; Irungu and Arasa, 2017; Domi, Capelleras and Musabelliu, 2019). The process of building customer relationships, however, requires thoughtfulness and paying attention to detail (Kodish, 2015). Customer relationship management (CRM) is regarded as one of the best methods of building such relationships (Yadav and Singh, 2018).

Soltani and Navimipour (2016: 667) define CRM as, “the overall process of building and maintaining profitable customer relationships by delivering superior customer value and satisfaction with the goal of improving the business relationships with customers”. Nyadzayo and Khajehzadeh (2016) further add that the effect of customer satisfaction on customer loyalty, achieved through use of CRM quality is more significant when brand image is perceived to be high. Bhat and Darzi (2016) add onto the argument by claiming that resolution of customer complaints, customer knowledge, customer empowerment and customer orientation can increase customer loyalty and increase a firm’s competitive advantage. Nyadzayo and Khajehzadeh (2016) however argue that focussing on customer satisfaction, quality of service and customer value only without incorporating trust and commitment will not necessarily translate into customer loyalty.

A significant percentage of traditional CRM implementations, however, have failed due to system limitations, which include high costs, limited flexibility, and closed source structure (Pitchayadol, Hoonsopon, Chandrachai and Triukose, 2018). Electronic CRM, which is generally referred to as e-CRM has been identified as one method which has registered a high success rate on implementation, as well as to give an organisation maximum return for its e-business investment (Badwan, Shobaki, Naser and Amuna, 2017).

#### 2.6.2.3 Continuous innovation

Gault (2016:619) defines innovation as:

> "… the implementation of a new or significantly changed product or process. A product is a good or a service. Process includes production or delivery, organisation, or marketing processes. A new or significantly changed product is implemented when it is made available to potential users. New or significantly changed processes are implemented when they are brought into actual use in the operation of the institutional unit, including the making of product available to potential users".

Celtekligil and Adiguzel (2019) suggests that the only way for firms to survive the ever-increasing competition in the global economy is to continuously innovate at a more rapid pace than rivals. Nogueira, Fernández-López, Calvo, and Rodeiro-Pazos, (2018) concur with Celtekligil and Adiguzel (2019), by suggesting that some firms regard ability to generate continuous innovation as not only a key success factor, but a prerequisite for survival. Continuous innovation is not only necessary for survival of firms, but for sustainability of careers. The introduction of the fourth industrial revolution also brought about transformation of the nature of jobs and careers in the manufacturing sector, such that innovative employees can shape their job functions to match changing demands (Akkermans and Tims, 2017). Employees in the manufacturing sector who lack the innovative behaviour of job crafting, to alter the scope, responsibilities or working relations may not survive the threat of involuntary technological job loss (Frey and Osborne, 2017; Chin, Jiao, and Jawahar, 2019) . Taques, López, Basso, and Areal (2021) suggest that firms can use innovation as a competitive advantage over rivals. This can be attained either through developing methods and techniques which enable a firm to create new products or services or improving current ones. Some of the motivations for emphasis on continuous innovation include urgency and cost reduction (Näslund, 2016). Pressure to manufacture products with the best attributes as well as to design and manufacture products using the least amount of natural resources are also push factors for firms to innovate (Toivonen, 2015). The highly competitive global business environment is also forcing manufacturing firms to turn to product innovations for survival (Mu, Thomas, Peng, and Di Benedetto, 2017). Firm size and foreign ownership also contribute significantly to the degree of innovation of firms (Divisekera and Nguyen, 2018). Managers of continuously innovative firms are reported to always emphasize on the importance of innovation, continuous change and always motivate their employees with inspiring visions and missions. In a bid to sustain these activities, firms often introduce practices like key performance indicators (KPIs), recognition, rewards, sustainability and long- term view (Näslund, 2016). Innovation can occur at four levels namely process, product, marketing and organisational (Lee, Lee, and Garrett, 2019). Blach, Wieczorek-Kosmala, and Trzęsiok (2020) suggest that the types of innovations adopted by SMEs is dependent on economic development stage and intensity of innovative activity in the country where the firm is located. Developed countries are said to have an enabling environment suitable for innovative activity amongst their SMEs, while firms in less developed countries are always playing catch up. There are several sources of innovation ideas but the most prominent are universities, customers and employees (Demircioglu, Audretsch, and Slaper, 2019).

### Process innovation

Bloch and Bugge (2013:143) define process innovation as follows:

> "A process innovation is the implementation of a method for the production and provision of services and goods, that is new or significantly improved compared to existing processes in your organisation. This may involve significant improvements in for example, equipment and/or skills. This also includes significant improvements in support functions such as IT, accounting and purchasing".

Process innovation relates to production of goods and services in a way which increases eco-efficiency. To improve on their process innovation capabilities, firms also need to improve on their planning and controlling processes (Tarigan, 2018). Some tools for process innovations include waste handling, cleaner production, as well as logistics (Klewitz and Hansen, 2014). Arshad Ali, Mahmood, Ikram, and Ahmad (2020) also encourage firms to develop robust total quality management systems and supply chain management systems for them to improve on their process innovation. The authors further suggest that human resource management, organisational culture, and lean manufacturing, when mediated with total quality management and supply chain management can also be drivers of process improvement. Möldner, Garza-Reyes, and Kumar (2020) investigated the relationship between lean practices and process innovation and concluded that there is a moderate to strong relationship between the two. Gupta, Modgil, and Gunasekaran (2020) also suggest that firms can improve on process innovation through six sigma.

### Product innovation

As defined by Gault (2018:619), "A product innovation is a product, made available to potential users, that is new or significantly changed with respect to its characteristics or intended uses". Product innovations is linked to new developments or improvements of products and services (Klewitz and Hansen, 2014). Product innovation was cited in literature as a determinant of competitive advantage (Falahat, Ramayah, Soto-Acosta, and Lee, 2020). Discernible product innovation and customer innovativeness have also been reported in literature to increase customer willingness to pay (Zhang, Sun, Liu, and Chang, 2020). Firms can benefit from collaborative innovation networks to improve their product or process innovation capabilities. This relationship is more pronounced in firms with higher absorptive capacities, as they can acquire external knowledge easier and faster (Najafi-Tavani et al., 2018). Stucki, Woerter, Arvanitis, Peneder, and Rammer (2018) suggest that a country's policies can affect progress made by its firms on green products and services innovation. On one hand, taxes, and regulations stifle demand for green products hence in the process also inhibiting the propensity for green product innovation. On the other hand, subsidies and voluntary agreements encourage green product innovations. Song, Wang, and Zhang (2020) conducted a study in China and concluded that introduction of research and development tax incentives can be a catalyst for green product innovation. Tools for product innovations include eco-design, life cycle analysis, life cycle costing, packaging, fair trade, and organic products (Klewitz and Hansen, 2014). Muñoz-Pascual, Curado, and Galende (2019) conducted a study on Portuguese SMEs, where they investigated the relationship between triple bottom line and sustainable product innovation performance. Their findings showed that social factors and environmental developments form the foundation for product innovation performance. Organizational learning capability and knowledge sharing formed the social factors component. For that study, organisational learning capability was defined as the relevance placed on organisational learning by organisers, while knowledge sharing was defined as a firm's ability to utilise information from their networks to their advantage or recognise market opportunities. Muñoz-Pascual et al. (2019) also defined environmental dimensions as the manner in which a firm embraces and treats natural resources such as land, air and water quality, energy usage and waste disposal and treatment.

It is however difficult for firms to profit from and maintain their competitive advantages gained through innovative activities for a long time in markets with dysfunctional competition. Dysfunctional markets are generally prevalent in emerging economies. In such markets competitors do not always respect intellectual property rights. To curb this problem, as well as to maximise profits from their product innovation, firms with competitive advantages achieved through innovation activities should concentrate on cost leadership, customer orientation and creative marketing strategies. (Liu and Atuahene-Gima, 2018).

**Organisational innovation**

Organisational innovation capabilities assist firms in maintaining a leadership position on the market. Hwang, Choi, and Shin (2020) claim that organisational innovation acts as a mediator between entrepreneurial competencies and competitive advantages of a firm (Hwang, Choi, and Shin, 2020). Organisational innovation is also said to have a positive effect on marketing performance of an SME (Afriyie, Duo, Appiah, and Musah, 2018). Organisational innovation involves reorganisation of routines and structures within a firm, as well as adoption of new forms of management (Klewitz and Hansen, 2014). Laforet (2016) claims that an entrepreneurial-like culture and an outward focus culture have got positive influence on organisational innovation performance of family-owned businesses. Some tools for organisational innovation include environmental management systems, supply chain management, stakeholder management, organisational structures, sustainability vision, employee development and training as well as health and safety as reported in Laforet (2016). Eidizadeh, Salehzadeh, and Božič and Dimovski (2019) also add that organisational innovation can be enhanced by business intelligence. Business intelligence was defined by Eidizadeh et al. (2017) as the speed at which a business analyses information and makes accurate and intelligent business decisions. A firm may use analytical programmes to convert data to information and from information to useful knowledge which can assist managers to run a business more efficiently and craft strategies that move the organisation forward. Alblooshi, Shamsuzzaman, and Haridy (2020) suggest that several leadership styles had a positive effect on organisational innovation, as they influenced organisational climate, organisational, learning and employee behaviour. Divisekera and Nguyen (2018) claim that collaboration for innovation is very effective at improving all three types of innovation, while human capital is effective at improving product and organisational innovation.

#### 2.6.2.4 Good financial planning abilities

Grozdanovska, Bojkovska and Jankulovski (2017:121), define financial planning as, "…the process of framing objectives, policies, procedures, programs and budgets regarding the financial activities". According to Alisbha and Intishar (2020), financial planning involves cash and profit planning. Financial planning helps an organisation to always have adequate funds for day to day running, helps to maintain a balance between inflow and outflow of cash, as well as ensuring that suppliers are paid on time. Other advantages of financial planning include availability of funds for expansion projects, ensuring stability and profitability of an organisation as well as determining how an organisation will be able to attain strategic goals. Good financial planning, sometimes referred to as financial literacy, entails knowledge of how to manage personal and business finances, as well as an understanding how to access funding from financial services providers (Grozdanovska, Bojkovska and Jankulovski, 2017; Al Breiki and Nobanee, 2019). Bongomin, Ntayi, Munene, and Malinga, (2017) further explains that improving financial literacy of entrepreneurs as well as easing conditions required for them to access finance can lead to development of SMEs in third world countries. Financial literacy has also been reported to be a predictor of access to finance and financial risk approach (Ye and Kulathunga, 2019). García-Pérez-de-Lema, Ruiz-Palomo, and Diéguez-Soto (2021), in a study conducted in Spain concluded that CEOs' financial literacy exerts an impact upon their organisation's technological innovation as they are capable of minimising financial constraints. SMEs often use bank overdraft facilities for working capital purposes. This overdraft facility is often misused due to entrepreneur's lack of financial knowledge and planning (Attard, 2019).

#### 2.6.2.5 Marketing approach

Thabit and Raewf (2018) suggest that marketing is a critical success factor for any business as it links the organisation to its customers. The authors further explain that one of the main modern strategies for achieving customer satisfaction is the marketing mix. This strategy popularly known as the 4Ps, which stands for product, price, place, and promotion. According to Amin (2021), marketing skills contribute immensely to the success of an SME. Nyoni and Bonga (2018) claim that marketing can help an SME to increase customer base on the market. Indonesia (2018) adds to the argument by suggesting that marketing capability immensely contributes to competitive advantage. Marketing also enables producers and consumers to find one another (Cant and Wiid, 2016). Marketing is, however, one of the biggest challenges SMEs face as entrepreneurs generally lack time and funds to invest in market research where they could establish their target market or identify customer trends (Pisicchio and Toaldo, 2021)

Cant and Wiid (2016) describe all traditional marketing tools as promotional effort, with the exception of digital marketing tools. Examples of traditional marketing platforms include magazines, newspapers, business cards, posters, television commercials, brochures, and billboards. Some of the most popularly traditional marketing tools used by SMEs in South Africa include newspapers, flyers, business cards, radio, and posters (Cant and Wiid, 2016). Traditional marketing tools can be grouped into categories such as telemarketing, print media, broadcast media and mail (Seriously Simple Marketing, 2015). According to Cant and Wiid (2016), SMEs are still comfortable with using traditional marketing tools, despite the huge shift by large organisations towards online marketing. Traditional marketing tools are no longer adequate today as organisations now handle big data that needs to be analysed and used for forecasting from sources such as the internet, social media, and direct calls (Todor, 2016). Although it is encouraged to integrate traditional and digital marketing techniques, SMEs struggle to keep up with digital developments because of a lack of knowledge in and about digital marketing (Taiminen and Karjaluoto, 2015). Other challenges faced when implementing digital marketing include unclear objectives set, unclear responsibilities for activities, budget wasted when experimenting with different techniques, challenge of developing value proposition for customers and poor integration between online and offline marketing communications (Chaffey and Ellis-Chadwick, 2019).

#### 2.6.2.6 Management competencies

Management skills are extremely important as they enhance SME performance and development (Veliu and Manxhari, 2017). With sufficient managerial skills, entrepreneurs can fully exploit new opportunities and markets (Bouazza, Ardjouman, and Abada, 2015). Managerial competencies have also been reported to promote employee positive attitudes in the workplace, which in turn promotes engagement (Lara and Salas-Vallina, 2017).

In some SMEs the entrepreneur may assume all the management functions of the enterprise such as marketing, accounting, production, and human resource management. Such weak management structures inhibit entrepreneurs from devising proper strategic plans for the business, as they are tied down to the heavy burden of day-to day challenges of running their business (Bouazza, Ardjouman, and Abada, 2015). IFC (2010) weighs in on the argument by suggesting that SME managers need to be multi-skilled as the nature of their firms does not give them room for specialisation. This is a disadvantage to SMEs as they fail to take advantage of economies of scale in areas such as accounting, market research and business development. Quality of management education is lower for developing countries, as compared to developed countries. Managers of SMEs are reported to have a limited financial literacy which leads to challenges when it comes to effective management of a firm’s finances. Lack of business management skills worsens the difficulty of accessing finances as managers again fail to explore different financing options due to complicated loan application procedures and inability to present required business plans and financial statements.

Lack of support services or high unit costs has been reported to be one of the hindrances preventing entrepreneurs from improving their management skills (Bouazza, Ardjouman, and Abada, 2015). Management competence should lead to organisational competence. Organisational competence on the other hand, when combined with innovation and knowledge management leads to competitive advantage of an organisation over its rivals (Ribeiro, Soares, Jurza and Ziviani, 2018).

#### 2.6.2.7 Competitive advantage

Sigalas, Pekka-Economou, and Georgopoulos (2013:335) define competitive advantage as, "…above industry average manifested exploitation of market opportunities and neutralisation of competitive threats". Yang, Ishtiaq, and Anwar (2018) suggest that a firm's competitive advantage generates superior performance over rivals. This is also applicable for firms which internationalise, as competitive advantage is a determinant of international performance of an SME (Falahat, Ramayah, Soto-Acosta, and Lee, 2020). Srikalimah, Wardana, Ambarwati, Sholihin, Shobirin, Fajariah, and Wibowo (2020) also postulate that gaining competitive advantage leads sustainability of a firm. Sources of competitive advantage, as suggested by Sigalas (2015) include mobility barriers such as barriers to industry entry or exit, market positions as well as distinctive firm resources such as relational, human, financial or physical. For a firm to gain competitive advantage over its rivals, it must combine its resources with core competencies (Radzi, Nor, and Ali, 2017; Kabue and Kilika ,2016). Kabue and Kilika (2016) further add that if a firm does not have the required resources it can develop into a sustainable competitive advantage, it must find means of gaining these resources from other firms.

Literature also suggests other means of attaining competitive advantage. One such example is Obeidat, Obeidat, Alrowwad, Alshurideh, Masadeh, and Abuhashesh (2021), who contend that firms can develop radical and incremental innovations as a means of attaining and sustaining competitive advantage on the market. Jones, Harrison and Felps (2018) claim that adopting a communal sharing relational ethics (CSRE) strategy can prove to be a competitive advantage for an organisation. As stated by Jones, Harrison and Felps (2018) a CSRE strategy can lead to what they term a close relationship capability, which in turn can bring about the following advantages: knowledge sharing, reciprocal coordination, lower transaction costs, moral motivation, and higher quality stakeholders. The above factors can lead to a competitive advantage of a firm. Other sources of sustainable competitive advantages for firms include quality, human resource development, strategic alliances formation, low-cost leadership, outsourcing, focusing on specific segments, developing a learning organisation, building a virtual organisation and knowledge management (Krishnaswamy, 2017).

#### 2.6.2.8 Motivated employees

According to Manivannan and Bhuvaneswari (2020), the motivation of employees can significantly influence their performance and overall success of any business. This is especially so in this modern dispensation where the business environment is turbulent, and firms rely on employees using their full talents. Davies (2019) further adds that when employees' individual needs and habits are not managed properly, this stultifies the growth of a business and in some instances threaten its existence. Kiruja and Mukuru (2018) agree with Davies (2019) as they suggest that an organisation can only achieve its strategic objectives when employee performance level is high. Employee performance level is however a function of ability and motivation (Mukuru, 2018). Campbell and Tawadey (2016) claim that an emotional attachment to an organisation can lead to employee fulfilment, irrespective of other circumstances. An employee's perception of his or her organisation influences their motivation level. An example given by Agyare, Yuhui, Abrokwah, and Agyei (2019) is when an employee perceives their organisation to have a mission, as well as a deep moral commitment to their employees.

Some of the motivating factors include remuneration, material incentives, interesting work, career growth, organisational reputation, professionalism of colleagues, training of personnel, transfer of professional experience and skills within the organisation (Akhmetshin, Morozov, Pavlyuk, Yumashev, Yumasheva, and Gubarkov, 2018.) Pang and Lu (2018) also suggests that working conditions can greatly improve employee motivation, which in turn has an effect, on productivity, service quality and job performance. Kuranchie-Mensah and Amponsah-Tawiah (2016) suggest that remuneration plays a big role in employee motivation. Kuvaas, Buch and Dysvik

(2018), however, warn that financial rewards can introduce a controlling effect which minimises intrinsic motivation and an informing effect which intensifies intrinsic motivation of employees.

#### 2.6.2.9 Organisational culture

Organisational culture has got a strong effect on employee motivation, individual performance of employees, knowledge assets and the overall performance of the organisation (Prouska, Psychogios, and Rexhepi, 2016; Khan and Mashikhi, 2017; Fernandes, 2018; Pathiranage, 2019). Teamwork, which also forms part of an organisation's culture can also positively affect employee performance (Askari, Asghri, Gordji, Asgari, Filipe, and Azar, 2020). In a separate study, teamwork was discovered to have a mediating effect on the relationship between strategic orientation and organizational performance (Otache, 2019). SMEs can also set themselves up for a bright future when they entrench innovation into their organisational culture (Kraśnicka, Głód, and Wronka-Pośpiech, 2018).

According to Halim, Ahmad, Ramayah, and Hanifah, (2014), there are four organisational culture traits which can influence innovation performance of an SME, namely: degree of employee involvement, consistency, firm adaptability, and mission. After conducting a study on family firms, Laforet (2016) discovered that adopting a partenistic and founder culture discourages innovation performance of an SME. However, adopting a flexible, proactive, long term and externally oriented entrepreneurial-like culture promotes firm innovation (Laforet, 2016).

Leitão, Pereira, and Gonçalves (2019) suggest that an organisation which is interested in enhancing its outcomes should incorporate work life balance practices as part of its organisational culture. Apart from enhancing a firm's outcomes, work life balance also yields positive results for employees such as higher satisfaction and reduced inter-role conflict (Cegarra-Leiva, Sánchez-Vidal, and Gabriel Cegarra-Navarro, 2012).

#### 2.6.2.10 Talent management

Talent management has also been identified as one of the success factors required for an SME to thrive (Briganti and Samson, 2019). Employee engagement, commitment and retention can be achieved through talent management (Narayanan, and Rajithakumar, 2018). Talented employees are flexible enough to adapt to changes in the business environment and to tackle day to day challenges, thus enabling their organisation to meet requirements of any business to survive, as well as to gain a competitive advantage over competitors (Ibrahim and Daniel, 2018). Modern businesses, as reported by Mohammed (2016) are now focusing on technical and managerial skills talent management, as they have been proved to enablers of firm competitive advantage. Batra (2017) further adds that entrepreneurs and managers who are embarking on new ventures, as well as those with limited market presence and resources should put more emphasis on employee development for them to capitalise on human resources capabilities. New roles emerging in the workplace, as a result of factors like technology advancement, innovation, increased competition, and globalisation have led to the intensification of war for talented employees amongst organisations (Martins Faraco, 2020). Batra (2017) also suggests that good talent can be hired and retained through tactics like employee motivation, giving employees challenging work, creating an environment which enhances their knowledge and skills, as well as to include them in the growth story of the organisation. Ma, Mayfield, and Mayfield (2018) add onto the argument by suggesting that compensation and culture of the organisation helps to retain talent. Work environment, recognition, promotion, and relationship with others have also been identified as factors which help to retain talent (Ibidunn, 2015). Table 2-8 below shows strategies for attracting, retaining, and managing talent, as suggested by Kaliannan, Abraham and Ponnusamy (2016).

**Table 2-8: Talent management strategies**

| Attracting Talent | Retaining Talent | Managing Talent |
|---|---|---|
| Design a talent management program | Assign talented personnel to correct roles | Build an atmosphere of trust with talented personnel |
| Fair rewarding and recognition of talent | Compensate talent as suppliers | Perceive talent within the organisation as assets |
| Flexible work environment and work culture | Career path planning and succession planning | Take corrective action if necessary |
| Proper training | Right location to attract and retain talent | Allow talent to create and apply knowledge |
| Effective and meaningful appraisal system | Eliminate non-contributing people | Identify own talent before hiring talent |
| Design jobs for talented people | | Performance based talent tool |
| Management needs to pursue a proactive and visionary leadership role | | |
| Adequate research facilities | | |

**Source: Adapted from Kaliannan, Abraham and Ponnusamy (2016)**

### 2.6.2.11 Degree of unionisation of firm

The employer-employee relations in South African industry have not been healthy over the years. Organised workers are reported to have a tendency of shunning participatory and cooperative industrial relations approach for union led agendas, which seek to democratise and transform the workplace. Unions also prefer the confrontational class struggle approach when dealing with employers (Bischoff, Masondo, and Webster, 2018). Webster and Englert (2020) also add that the shift to a neoliberal state after abolishing of apartheid led to fragmentation of workers and eroded their capacity to establish sustainable workplace organisation. This problem is not limited to employer-employee relations only but extends to other industry stakeholders such as government and the community at large. Hirsch (2020) further adds that the National Economic Development and Labour Council (NEDLAC) objectives could easily be met if all stakeholders could easily reach a consensus on matters pertaining to social equity, economic growth, and equal participation opportunities during economic decision-making processes. This challenge finds its roots in government's commitment to opening markets for smooth flowing of goods, services, and capital while the labour market remains constricted. This situation led to lack of cohesion between industry stakeholders.

### 2.6.3 External non-individual characteristics

#### 2.6.3.1 Access to information

Access to external information can enhance a firm's agility, absorptive capacity, and firm performance (Liu and Yang, 2019). Management of information is also considered to be a critical success factor for SMEs (Mabhungu and Van Der Poll (2017). Saastamoinen, Tammi and Reijonen (2018) also suggest that knowledge management techniques such as e-procurement can help to minimise information and communication barriers hindering SMEs from accessing public sector contracts. Social media is another source of information which can help SMEs to improve their customer service and relationships (Bakri, 2017). IT has also been noted to be a vehicle which can enable firms to gain a competitive advantage over its competitors (Xuhua, Elikem, Akaba, and Worwui-Brown, 2019).

SMEs, however, have a challenge accessing relevant information (Sibiya and Kele, 2019). Costa, Soares, and de Sousa (2016) suggest that SMEs are facing difficulties in expanding their operations due to lack of relevant information. Relevant tools, methods, and practices for managing large amounts of information and knowledge are also generally lacking in SMEs (Costa, Soares, and de Sousa, 2016). Agboh (2015) concurs with Costa, Soares, and de Sousa, (2016) by suggesting that SMEs are limited when it comes to adoption of Information and communications technologies (ICTs), which are necessary technologies employed to support, gather, process, distribute and use information. Potential benefits of ICT to an SME include lowering costs, improving productivity and product quality, increasing customer satisfaction, as well as enabling a business to focus on its core business (Agboh, 2015). Cusmano and Koreen (2017) also suggest that government public support can significantly assist SMEs to overcome access to information barriers, thereby enabling them to internationalise and participate in global value chains. This government assistance will alert businesses of external business opportunities, potential external buyers and suppliers, international product standards and international trade strategies. Individual firms can also play their role by taking advantage of interfirm networks to access external information.

#### 2.6.3.2 Access to finance

Ombongi and Long (2018) suggest that access to bank credit exerts a positive effect on overall firm performance, as personal savings and retained earnings are not adequate to move an SME from one phase to another in terms of growth. In support of Ombongi and Long (2018), Oseifuah (2017) suggests that access to finance is crucial for firms during start-up period and when embarking on expansion projects. Dick, Mitter, Feldbauer-Durstmüller, and Pernsteiner (2017) suggest that access to finance plays a key role in the internationalisation bid of an organisation. In a study on Nigerian SMEs, Adegboye and Iweriebor (2018) concluded that access to facilitate the capacity of an organisation to improve on product, process, and organisational innovation. Adegboye and Iweriebor (2018) further suggest that accessing external financing increases the chance of a firm to invest in R&D and to adopt foreign licenced technology. It is essential for nations to develop financial infrastructure which can satisfy the diverse financial needs of SMEs, as this leads to continuous growth and competitiveness of the SMEs (Khan and Anuar, 2018). Figure 2-9 below show financing needs of various firm sizes.

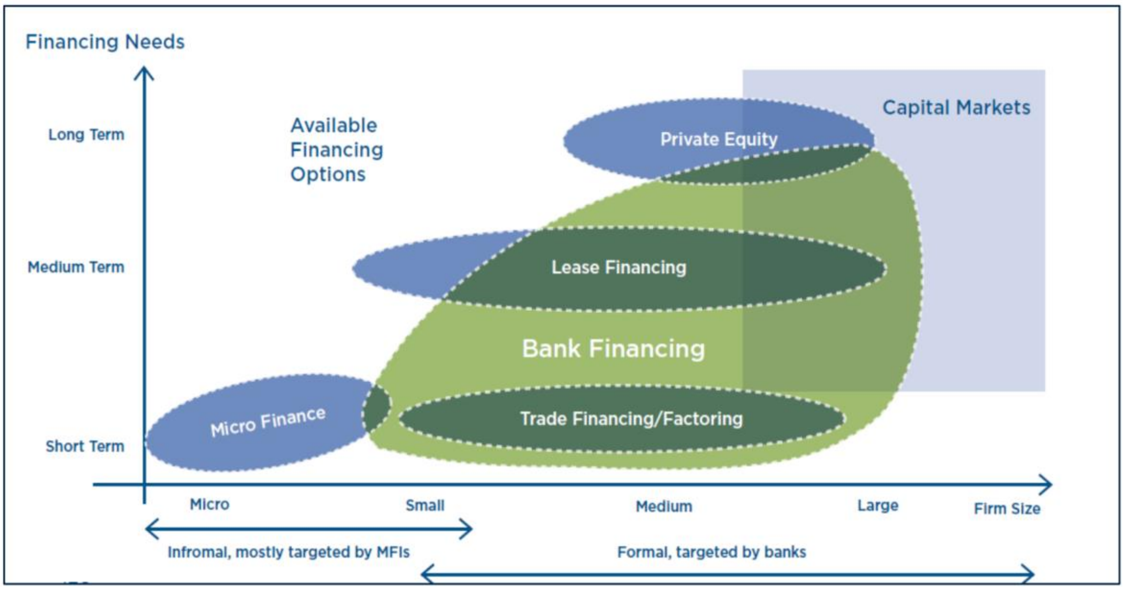


**Figure 2-9: Financing needs of various firm sizes**
**Source: Adapted from IFC (2010:22)**

Access to finance is, however, a challenge for SMEs (Mutambi, 2017). IFC (2010) claims close to 55 percent of registered SMEs in developing nations struggle to access formal loans from financial services providers such as banks. This figure rises to between 65 and 72 percent when micro and informal enterprises are taken into consideration. Small firms in developing nations rely more on internal financing when compared to large firms, as small firms have got one third chance of securing a bank loan than a medium sized firm and less than half chance required by a large firm to secure a bank loan. SME finance gap arises due to a mismatch between supply of financial services and requirements of the firms. Access to finance is hampered by high interest rates, heavy collateral requirements, inexperience with financial intermediaries and corruption (Chowdhury and Alam, 2017; Bouazza, Ardjouman, and Abada, 2015). In certain instances, entrepreneurs are denied credit due to the above requirements, even though their businesses are viable (Bouazza, Ardjouman, and Abada, 2015). Other market failures that inhibit SMEs from accessing finance are insufficient reliable credit information and a weak legal institution (Ayyagari, Demirgüç-Kunt, and Maksimovic, 2017). Kambwale, Chisoro and Karodia (2015) add onto the argument by suggesting that SMEs fail to access funds mainly due to what they term demand side constraints and supply side constraints. Demand side constraints as explained by Kambwale, Chisoro and Karodia (2015) emanate from SMEs internal weaknesses which make them unable to supply financial institutions with the right information required during application of loans. Supply side constraints, on the other hand have more to do with factors inhibiting financial institutions from lending money, such as capital constraints, SMEs lack of collateral, prevailing lending infrastructure in the country, absence of creditors' rights, risk and transactional costs involved when processing loans for SMEs. Fowowe (2017) however, argues that demand side constraints can only be addressed after gaining an understanding of how SMEs in Africa interact with financial markets, while supply side constraints can only be addressed after gaining a thorough understanding of the nature of financial systems in the countries on the continent.

Coleman, Cotei, and Farhat (2016) point out that the tendency of combining personal with business assets by small business owners has got a significant impact on borrowing patterns and access to funding. Factors like SME owners' educational background, ownership structure, work experience, size and value of business assets, sector in which business is operating also have got an effect of business owner's financing preferences (Quartey, Turkson, Abor, and Iddrisu, 2017; Kuruppu and Azeez, 2016). From the financial institution point of view, creditworthiness of business, profile of owner, characteristics of enterprise, geographical location of business, as well as financial performance of enterprise become serious considerations in the loan application process (Thi, 2018). In South Africa, government created challenges such as tax laws, B-BBEE requirements, labour laws, raising growth finance and red tape have also been identified as barriers to access to finance for SMEs (Oseifuah, 2017).

Akinsola and Ikhide (2019), however believe that South Africa should push for diversification of financing alternatives for SMEs through several credit supporting policies. Oseifuah (2017) added that in South Africa, the three main sources of access to finance are banks, venture capital and government. According to SME South Africa (2019), SMEs in South Africa can access funding from the government in the form of full or cost sharing grants, incentives or equity sharing. SMEs usually do not have to repay full or cost sharing grants. They, however, should provide a certain portion of project funding under cost sharing grants. Incentives are a form of a grant where SMEs also do not have to repay the money. They differ from normal grants in that funds are released after the service or asset has been purchased. Equity funding on the other hand implies that the government's funding agency acquires a certain portion of the firm's shareholding in exchange for the funding given. SME South Africa (2019) also listed several financing programs offered by the South African government, some of which are shown in table below.

**Table 2-9: South African Government funding programmes**

| Funding Scheme | Objectives of funding |
|---|---|
| Depart of Trade and Industry (dti) | For enhancement of economic development, black economic empowerment, implementing commercial law, promotion and regulation of international trade, and consumer protection. Some of the dti's financing vehicles include SEDA Technology Programme, Agro-processing Support Schemes (APSS), Support Programme for Industrial Innovation (SPII) and The Aquaculture Development and Enhancement Programme (ADEP) |
| Export Marketing and Investment Assistance (EMIA) | Through this funding, government seeks to assist in developing export markets for South African products and services as well as to attract new foreign direct investment into the country. |
| The Sector Specific Assistance Scheme (SSAS) | This is a refundable cost-sharing grant paid to (non-profit) export councils, joint action groups and industry associations for expenses incurred during supporting of firms to grow the export market for South African goods. The government pays for 80 percent of costs incurred. |
| R&D Tax Incentive | All South African businesses can apply for this incentive scheme, regardless of size, industrial sector of the economy. The requirement is for businesses applying to be involved in meaningful research focused on science and technology relevant to any industrial sector. |
| Black Industrialists Scheme (BIS) | The purpose of this scheme is to accelerate the involvement of black industrialists in the South African economy. The government is also aiming at economic transformation and job creation. Specific areas of interest include vessel building and repair, mineral beneficiation, Oil and gas, clean technology and energy, Aerospace, Rail and automotive components, Industrial Infrastructure, ICT, Agro-processing clothing, Textiles, leather and footwear. This scheme is a cost sharing grant, which will not exceed R50-million. Some of the conditions for awarding of grant facility include black ownership and management control, as well as potential economic benefits and value of the project. |
| Green Fund | The purpose of this funding is to improve South African SMEs energy efficiency and the country's green economic development. Any projects which can bring about significant energy savings or emissions reductions can be funded through the Green Energy Efficiency Fund (GEEF). |
| Growth Fund | The Growth Fund was designed for South African owned SMEs who require funding to grow their operations and create more jobs. Qualifying entities should have been in operation for at least a year, with evidence of |

| | |
|---|---|
| | year-on-year growth and an annual turnover or assets worth over R1-million. Beneficiaries must provide 20 percent of the funding. |
| Technology Innovation Agency (TIA) | Primary aim is to fast-track the rate of commercialisation of viable intellectual property from South African technologies originating from higher education institutions. Funding is capped at R1 million. |
| National Youth Development Agency (NYDA) | The objective is to assist promising young and upcoming entrepreneurs with financial and non-financial business development support. to establish their survivalist businesses. Financing ranges from R1 000 to R200 000. Funding is issued to individuals or youth co-operatives. |
| Industrial Development Corporation (IDC) | The IDC was set up by the South African government to promote economic growth and industrial development. This institution offers loans ranging from R1-million to R1-billion per project. Scope of lending includes start-up businesses, funding for purchase of buildings, machinery and working capital, as well as expansion projects. Businesses must be operating within South African borders. Applying businesses must have a good track record in terms of viability and profitability and have a B-BBEE certificate from an accredited verification agency, where applicable. Industry sectors which will be given higher priority include Green Industries, agricultural value chain, manufacturing, knowledge economy and strategic high impact projects. |
| Technology Venture Capital Fund | Under this scheme equity or debt funding is given to emerging technology-focused businesses. The aim is to convert high-technology South African intellectual property into products which can be sold at the market, as well as to commercialise them. |
| Automotive and Transport Equipment | This funding is meant for automotive and transport equipment manufacturers or assemblers. The objective is to enhance global competitiveness. Funding is in the form of equity. |
| IDC's Strategic Business Unit (SBU) | Funding is for clothing and textiles businesses such as manufacturers of natural or synthetic fabrics, leather goods producers and creators of home décor. |
| Chemical Products and Pharmaceuticals Fund | The objective is to stimulate growth of the manufacturing sector (for chemical, plastics and pharmaceutical products). |
| Machinery and Equipment | The purpose of this fund is to improve the competitiveness of downstream manufacturing of machinery and capital equipment. Evidence that products manufactured have the potential to create new jobs and expand to new markets should be provided. Funding provided under this scheme is a minimum equity investment of R10-million. |
| Small Enterprise Finance Agency (Sefa) | This is an Industrial Development Corporation (IDC) funding scheme which offers debt financing only. Loan amounts do not exceed R5-million. Young entrepreneurs participating in the following sectors will be given first priority: green industries, agricultural value-chain, manufacturing, small mining value chain, tourism, information technology and retail and wholesale of products. |

| | |
|---|---|
| The National Empowerment Fund (NEF) | NEF provides financial and non-financial support to black empowered businesses to promoting a culture of savings and investment among black people. Business loans ranging from R250 000 to R75-million across all industry sectors are issued to businesses for start-ups, expansion, and equity acquisition. There are four funds which fall under NEF umbrella, namely: iMbewu Fund, uMnotho Fund, Rural and Community Development Fund and Strategic Projects Fund |

**Source: Adapted from SME SA (2019)**

### 2.6.3.3 Access to real estate

There are several reasons influencing an SME owner to select a specific location, some of which include personal, community and location specific factors (Rahman and Kabir, 2019). In a study conducted in Indonesia, Barnard, Kritzinger and Krüger, (2011) concluded that factors like location, cost of rentals, employment, levels of inflation, interest rates and green buildings had a positive effect on business performance. Dhewanto, Herliana Lantu and Lawiya (2018) conducted a study on an Indonesian footwear cluster and concluded that location and adequate warehousing of an SME had an effect on its ability to export.

SME owners do not always have the luxury of accessing the most suitable real estate. Bouazza, Ardjouman, and Abada (2015) cite an example of entrepreneurs in Algeria who do not have the luxury of choosing where to locate their firms, but rather establish factories wherever they can find a plot. Bouazza, Ardjouman, and Abada (2015) highlights that the pieces of land they get are usually smaller than their requirements, and in the end forces entrepreneurs to scale back their investment plan and in the process retard SME development in these nations. SMEs fail due to selection of sites to conduct business purely based on convenience, cost, and proximity to owner’s residence reasons, without conducting a thorough analysis of business growth and survival potential in that location. Kambwale, Chisoro and Karodia, (2015) also suggest that SME owners must consider type of business, amount of human traffic in the area, convenience of location, the business’ product, or service differentiation strength in comparison to neighbouring competitors before selecting a site to conduct business.

### 2.6.3.4 Access to markets

Access to markets offer a firm competitive advantage over its competitors (Baxter, 2019). Access to international markets has also been reported to increase a firm's product and process innovation (Cieślik, Qu, and Qu, 2018). Success in entering foreign markets is reported to depend on factors such as products, cultural differences, competitors, company tradition, and venture capital (Lobo, Fernandes, Ferreira, and Ortiz, 2019). Sadly, many SMEs face challenges of accessing markets. Rahman, Uddin and Lodorfos (2017) conducted a study on Bangladesh SMEs' barriers to foreign market entry and discovered that institutional factors such as government baking, political uncertainty, level of research and development investment, legal procedures, language, and cultural differences as the main barriers. Familiarity with markets, products and processes are also challenges SMEs wishing to enter new markets would have to overcome (Jernström, Karvonen, Kässi, Kraslawski, and Hallikas, 2017). Hollender, Zapkau, and Schwens (2017) also cite lack of international experience as hindering SMEs trying to enter foreign markets. Lindsay, Rod and Ashill (2017) suggest that lack of exposure to host country institutions, environmental uncertainties, resource constraints, liabilities of outsiderness, smallness and foreignness also act as barriers to entry in foreign markets. Batzer (2019) suggests that tariffs and other non-tariff barriers such as long and expensive product testing and approval processes, unfriendly import regulations, biased state agency procurement processes and expensive distribution systems are barriers to market entry. Disequilibrium caused by corruption and governance issues also act as barriers to entry (Sartor and Beamish, 2020).

SMEs can improve access to markets through improved long-term corporative arrangements with other SMEs. It is also reported that vertical linkages with more experienced and established organisations can also help to improve access to markets (IFC, 2010; Baxter, 2019). SMEs can also improve their distribution channels by supplying products through original equipment manufacturers or selling customised products to a niche market (Ha, Lee, and Kim, 2016). Distribution channels can also be enhanced through technology, which leads to market intelligence and internal product innovation and ultimately enhancement of efficiency of a business model (Loon and Chik, 2019; Mohapatra and Sahu, 2018). Krishna, Ojha, and Barrett (2017) also add to the argument by suggesting that firms can take advantage of globalisation and IT which have weakened the limitations caused by geographical and political borders. Chetty, Karami, and Martín (2018) point out that knowledge, networks, and capabilities are strong pillars which can aid SMEs to enter foreign markets. Lastly, Jin and Hurd (2018) also add that SMEs can take advantage of digital platforms to ease entry barriers such as resource constraints as well as to build their own networks.

#### 2.6.3.5 Ease of entrance and exit

It is of interest to any entrepreneur wishing to venture into business to be aware of the ease of entry and exit before committing (Elert, Henrekson and Sanders, 2019). This is particularly for multinationals wishing to decide which country to invest in. These multinationals consider the nation of interest's regulatory and institutional factors when it comes to entry and divestment. Melton, Damron, McCarthy, and Rupp (2020) suggests that small businesses and entrepreneurs in general face barriers when entering new markets. These barriers to entry are introduced by incumbent businesses. Porter (2008) explains the five competitive forces which a business could use to shape its strategy, offering that incumbent businesses should always consider the threat of new entrants. Porter further explains that new entrants have a deep desire to gain market share and tend to exert pressure on incumbents through price reductions, costs and investment required to compete. Ultimately, new entrants limit the profit potential of an industry. Incumbents, on the other hand, tend to erect barriers to entry, as a way of protecting their market share. Porter (2008) further outlined seven barriers to entry which are supply side economies of scale, demand side benefits of scale, cost to customer of switching suppliers, capital required to start a business, incumbent advantages, challenges of accessing distribution channels, as well as unfavourable government policies. Sugiyarti and Ardyan (2017) however argue that improving marketing capability can assist new entrants to access markets much easier. In a study conducted in India, Scillitoe and Birasnay (2021) concluded that a culture of innovation and creativity, as well as college preparations, positively affected ease of market entry.

Younger firms also should overcome the liability of newness when entering an industry (Johnson, Dibrell, Inman, and Holcomb, 2018). The term 'liability of newness' was first coined by Arthur Stinchcombe in 1965 to refer to disadvantages of younger firms when compared to older ones (Laursen, Masciarelli and Reichstein, 2016). Some of the disadvantages of new firms are that young firms are generally perceived as likely to default on loan repayments as they are generally managed by inexperienced entrepreneurs, do not have transparent information, do not have a reputation, and must deal with unproven factor and product markets (Nitani and Riding, 2015). Carreira and Silva (2010), as cited by Quacoe, Wen, Quacoe and Dodor (2018) also suggest that liabilities of newness, when coupled with liability of smallness can adversely affect a firm's ability to access finance. Chinta, Cheung and Capar (2015) also listed advantages and disadvantages of liability of newness as shown in table 2-10 below.

**Table 2-10: Advantages and disadvantages of liability of newness**

| Advantages | Disadvantages |
|---|---|
| • Newer businesses can learn from established organisations.<br>• Information sharing and transfer within the organisation is easier.<br>• No bad history and negative learning<br>• Clear lines of communications within the organisation from top to bottom, as well as ease of application and decision making based on received information<br>• Less resistance to change, hence such firms easily adapt to market changes. | • Such firms do not have a list of regular and loyal customers as yet<br>• Employees in such firms are yet to establish a rapport amongst each other.<br>• Employee loyalty is yet to be established.<br>• Firms, growth and development hampered by barriers to entry.<br>• Such firms lack identity hence often rely on imitation to achieve short to medium term success.<br>• Exorbitant start-up costs.<br>• Limited market information.<br>• Limited contacts and number of suppliers and distributors<br>• Lack of organizational legitimacy.<br>• No prior experience.<br>• Credibility of organisation is questionable. |

**Source: Adapted from Chinta et al., (2015)**

Without a proven track record, entrepreneurs in new SMEs find it challenging to access both short-term and long-term financial capital, as their legitimacy is perceived to be questionable (Zhang, Ma, Yang, Lv, and Liu, 2018; Ricard and Aix-Marseille, 2017). Ruffo, Mnisri, Morin-Esteves and Gendron (2018) also claim that SMEs should address legitimacy issues, as a firm's legitimacy is a vital resource which paves the way for access to other resources, hence affects probability of survival of that firm. Ricard and Aix-Marseille (2017) argue that addressing legitimacy issues will help an SME to also address liability of newness challenges. Quacoe et al. (2018) however suggest that risks of liability of newness and smallness can be reduced when firms develop their human resources for them to become profitable and to minimise risks of firm collapse. Zhang and White (2016) urge SMEs to leverage on existing legitimacy, match existing standards of legitimacy, endorsing the institutional setting to change perceptions of what is legitimate.

There has also been a call for easing of regulations when it comes to liquidation or disinvestment from a country (Contractor et al., 2020). This is so because not all entrepreneurs have got intentions of staying in business all their lives (Jakes, 2018). Higher bankruptcy costs act as a deterrent to foreign direct investment in a nation (Zhu, Jia, and Wu, 2019). Firm age and productivity have been confirmed to play a significant role in ease of exit (Aga and Francis, 2017). A study conducted on BRICS nations, however, revealed that South Africa has got the strongest mechanisms for resolving exit matters caused by insolvency.

#### 2.6.3.6 Raw materials costs

Raw materials cost is a key element for successful running of any business (Irmayanti, 2019). Ideally, firms require raw materials costs to be stable, as fluctuating costs leads to SMEs also having erratic selling prices (Prabowo, 2019). Raw material cost is made up of three components, namely order cost, storage cost and stock out cost (Jiraruttrakul et al., 2017). To mitigate ordering and storage costs, businesses can employ the Economic Order Quantity method (Evensen, Demski, Becker and Pidgeon, 2018; Bernhardsson and Johansson, 2017). SMEs can also reduce risk of raw materials losses and expenses by ferrying goods on insured vehicles and utilising business interruption insurance (Adeyele, Osemene and Olubodun, 2017).

Some of the raw materials used in manufacturing are natural resources, which are becoming scarce. Global resource demand and consumption has also significantly increased during the last century. This development has also led to sharp increases in commodity prices during the last few decades (Fellner, Lederer, Scharff and Laner, 2017). In a bid to curb this challenge, the European Union tabled a Raw Materials Initiative to enhance resource efficiency and recycling and ultimately achieve a circular economy. Under the circular economy, the value of products and resources is retained for a prolonged period and generation of waste is kept to a minimum (Mura, Longo and Zanni, 2020; Fellner et al., 2017).

Lastly, firms can build a competitive advantage over rivals by lowering raw materials costs through group purchasing organisations (GPOs). Through GPOs an SME can attain safe liquidity levels and generating income and operate a profitable business

**2.6.3.7 Labour costs**

Mutambi (2017) suggests that African manufacturing firms could be facing challenges of low competitiveness, high capital intensity and low efficiency due to labour costs. Mutambi (2017), further suggests that unit labour costs in Africa are high due to poor productivity. Haleem, Jehangir and Ullah (2019) conducted a study on SMEs in Pakistan and concluded that high labour costs were hindering their growth. SMEs now more than ever feel the pressure of reducing labour costs due to the COVID-19 pandemic (Nyanga and Chindanya, 2020). Although SMEs might be tempted to minimise labour costs, doing so might also have detrimental effects on the business. This is so because compensation of employees can determine the success or failure of SMEs (Mulolli and Islami, 2020). Firstly, talented employees will shun SMEs for better offers from larger firms and secondly motivation and performance of workers in SMEs with poor renumeration are also low (Quacoe et al., 2018). In support of Quacoe et al. (2018), Kusi (2018) also argues that paying of good wages and salaries could form part of an organisation’s retention strategy.

To create a win-win situation for both SME employers and employees, Makhmutov, Kolevid, Kostyaev, Degtyarev, Nikonova, and Akhmetyanova, (2019) suggest that management should strive to attain high labour productivity, as this will enable them to pay higher wages and accordingly achieve high employee motivation required for high-performance work. Golub (1995) as cited by (Duncan, 2019) argues that wage costs and p`1roductivity are important factors to be considered when trying to reduce unit labour costs in labour-intensive manufacturing firms. Unit labour costs in turn improves an organisation's competitiveness.

#### 2.6.3.8 Energy costs

Zhang, Ma, Yang, Lv, and Liu (2018) suggest that it is essential for energy-intensive manufacturing firms to implement continuous- improvement in energy efficiency. The authors also suggest that cleaner production is effective at improving energy efficiency and reduction of energy consumption. In a study conducted by Haraldsson and Johansson (2019) on Swedish aluminium foundries, it was concluded that improvements on energy efficiency lessens CO2 emissions and gives firms a competitive advantage through cost reduction. Pechmann, Schöler and Ernst (2016) suggests that SMEs can realise financial benefits when they adopt partial use of renewable energy from their own power generating infrastructure. Kalantzis and Revoltella (2019) suggest that manufacturing firms can conduct energy audits to establish energy -efficiency opportunities which inform on energy efficiency measures.

Decisions on whether to conduct energy audits are however determined by firm size, industry sector, productivity of firm, capital intensity and national policies on energy. Improvement in energy efficiency of a firm is also dependent on employees and management's knowledge, energy awareness and commitment (Fernando and Hor, 2017). May, Barletta, Stahl and Taisch (2015) also observe that although it is known that reduction in product cost is the main driver for energy efficiency investment in a lot of firms, for SMEs, the main drivers are improved quality, efficiency, and reduced waste. Access to knowledge, organisational culture and industry sector networking are considered to be drivers of work with improved energy efficiency.

Drivers of eco-efficiency can broadly be classified as policy related and culture related (May et al., 2016). Policy related drivers relate to government programs, incentives, and subsidies in support of improvement efforts made by firms. On the other hand, culture related drivers can be encouraged by management's attitude and values toward energy efficiency. Energy efficiency improvement efforts are generally hindered by organisational barriers (Lawrence, Nehler, Andersson, Karlsson, and

Thollander, 2019). May et al. (2016) adds to the argument by suggesting that the main hinderances to adoption of energy and resource efficiency implementation are split incentives, imperfect information, and the principal agent problem. Imperfect information includes lack of information pertaining to energy performance of various technologies, as well as the potential benefits to the organisation. Imperfect information also leads to poor decisions during investment projects (Giraudet, 2020). Split incentives, as described by May et al. (2016) refers to a situation where two people have unequal reward for their actions towards the same goal. This scenario leads to one party taking less interest in the implementation of the energy decisions. The principal agent problem, on the other emerges when there is lack of trust between two parties within an organization, with regards to benefits accrued from investments on energy efficiency improvement projects to be undertaken.

May et al. (2016) also categorize barriers to energy efficiency investments as economic, institutional, and organizational. Examples of economic barriers to energy efficiency investments include hidden costs, risks, limited access to capital and heterogeneity which is brought about by the fact that not all environmental technologies are profitable for all firms. Institutional barriers which are enforced by bigger organisations with mandatory power when it comes to policy formulation, industrial sectors, and associations, as well as the public can also influence energy efficiency investments. Organisational barriers to energy efficiency investments are related to a firm's behavioral factors like attitudes, as well as culture, learning capacity and ability of a firm to interact with universities and research and development institutions.

(Jalo, Johansson, Kanchiralla, and Thollander, 2021) suggest energy efficiency networks as solutions for overcoming barriers to energy efficiency implementation. Lastly, when it comes to policy implementation, things like energy labelling of machinery, compulsory energy audits for big firms and subsidies for SMEs, increasing taxes dedicated to improvement of energy efficiency and industry agreements for long term energy efficiency strategies should be considered.

#### 2.6.3.9 Legal compliancy issues

Mallett et al. (2019) suggest that the relevance and significance of regulations on businesses vary. Consequently, effects of regulations on business are not always direct and predictable. SMEs which, however, comply with regulations can enjoy the benefit of competitive advantage and protection over those which do not comply. Waluyo (2017) suggests that adopting good corporate governance (GCG) can help firms to comply with legal issues such as tax compliance. Sarah (2017) suggests that GCG can help organisations to increase market share, improve competitive advantage, improve business practices, and generally improve sustainability of a business, especially in turbulent times. GCG also has got a positive effect on financial performance of an organisation (Mahrani and Soewarno, 2018).

IFC (2010), however, reported that SMEs generally do not have the means to manoeuvre through challenges of regulatory and bureaucratic procedures. In extending the same observation, Amundsen and Kirya (2022) suggest that there are instances where local government officials take advantage of this SME weakness by using their own discretion to enforce rules. This situation gives local officials multiple opportunities to extort money from SME owners, to allow them to operate without victimisation. This corruption works in two ways as SME owners can also take advantage of a lax system to avoid taxes, environmental laws and conceal certain information (Johnson, Gong, and Wang, 2016). Wang (2016) also adds to the argument by claiming that SMEs which venture into foreign land encounter barriers such as foreign government regulations like labelling, insufficient intellectual property protection, time wasting customs clearance, certification, as well as tariff and non-tariff restrictions. Petkovic, Jager, and Sasic (2016) identify challenges of stiff legal procedures regulating work and business operations as well as high taxes and contributions charged on wages as other factors which can lead to SME failure. Asad, Haider, and Fatima (2018) however argue that weak implementation of labour laws can lead to workers being exploited through insufficient compensation, working long hours without being paid overtime, occupational health and safety hazards, denial of leave days and weak labour representation. Lastly, Salguero-Caparrós, Pardo-Ferreira Martínez-Rojas and Rubio-Romero (2020) Salguero-Caparrós et al. (2020) suggest that management of issues like occupational health and safety should not just be prescriptive in nature and be limited to whistle-blowing when there is noncompliance but should also incorporate a proactive approach of reviewing effects of legal compliance laws on daily performance of SMEs.

Tax compliance is a serious constraint for some SMEs. The establishments struggle with policy uncertainties caused by changing tax rates, export bans and price controls that all act as barriers to investment in the SME sector (IFC,2010). High tax rates are also a major obstacle to SMEs as they reduce firms' internal sources of financing, as well as being a major deterrent to SME formalisation and expansion (Cheong, Lee, and Weissmann, 2020). To support this notion, Nyarku and Oduro (2018) suggest that high tax regimes are major deterrents of SME growth. Although tax plays big a part in the development of economies and SMEs, tax policies should be developed in such a way which encourages SME growth and development (Abd Obaid, Ibrahim, and Mat Udin, 2020). There is also a call for European Union countries to institute fair, simple and neutral tax regimes, as existing SME tax incentives are unnecessarily complex, cannot address SME sector problems and cause confusion when it comes to investment and financing decisions (Bergner, Bräutigam, Evers and Spengel, 2017)

There have also been reports of SME owners avoiding and evading tax (Aladejebi, 2018; Onu, Oats, Kirchler, and Hartmann, 2019). As explained by Mohamad, Zakaria and Hamid (2016), taxes avoidance may be achieved through several legal means such as income postponement and manipulating income tax deduction. Tax evasion, however, is reported to be prevalent in informal businesses, which are not even registered as formal entities. Factors affecting tax compliance behaviour include financial burden resulting from tax owed, cost of compliance, incentives offered for compliance, entrepreneur traits, perceived inequality, perception of risk involved for non-compliance (Machogu and Amayi, 2016). As explained by Machogu and Amayi (2016), it is important for entrepreneurs to receive tax education as tax knowledge helps to create a positive attitude towards tax compliance.

#### 2.6.3.10 Logistics costs

Optimisation of logistics can help a firm to streamline its processes and reduce distribution costs (Riquero et al., 2018). SMEs can also achieve a competitive advantage over rivals when they reduce logistics costs (Kot, Goldbach and

Ślusarczyk, 2018). Logistics costs can also significantly have an impact on an SME's bottom line (Payaro and Papa, 2017).

Talom and Tengeh (2020) suggest that high transport costs reduce the working capital of a firm. A study conducted in Kenya revealed that the poor performance of SMEs can be attributed to high logistics costs (Mageto, Prinsloo and Luke, 2018). Ittmann (2010) conducted a similar study in South Africa and concluded that logistics and supply chain play an important role in a country's economic growth and competitiveness. Ittmann (2010) further argues that South Africa will have to continuously improve its logistics and supply chain management environment for it to stay competitive. South Africa's logistics and transport costs are driven by three factors. The first factor is long distances travelled within the country during transportation of goods. The second is that most economic activities in the country are concentrated in Gauteng province which is right in the centre of the country. The third factor is that South Africa's geographical location disadvantages its industries when competing on the global market- place. When compared with other countries, South Africa's cost of logistics is high (Ittmann, 2010). According to a survey conducted by Stellenbosch University, in conjunction with CSIR and IMPERIAL Logistics, South Africa's cost of logistics as a fraction of the country's GDP in 2008 was 14.7%. In America, cost of logistics as a percentage of GDP for 2008 was 9.4% (Ittmann, 2010). Transport costs have also been cited to hinder export growth efforts of rural firms.

As a solution to the challenge of transport costs that would ultimately increase sustainability, Cunha, Mendonça, Catarino, Costa and Nogueira (2018) suggest that SMEs could adopt collaborative transportation. Logistics outsourcing has also been suggested as another solution for minimising logistics costs (Zhu, Ng, Wang, and Zhao, 2017). Additive manufacturing also provides another opportunity for reducing logistics costs and increasing profits for firms (Attaran, 2017). Moving manufacturing facilities closer to customers and suppliers can reduce logistics costs (Baldea, Edgar, Stanley, and Kiss, 2017). Lastly, RFID technology could also be employed by SMEs to increase the efficiency and productivity of their processes, as well as to significantly reduce logistics costs (Freitas, Maio, Maia, Gomes, Nogueira, Fernandes, and Machado, 2017).

#### 2.6.3.11 Management of natural disasters and pandemics

It is imperative that businesses develop survival mechanisms and resilience before they are faced with hazards associated with natural disasters and pandemics (Thams, Zech, Rempel, and Ayia-Koi, 2020). Businesses may be exposed to complex, chronic, acute, covariate or idiosyncratic events. Complex events may be a product of multiple hazards such as natural disasters, biological and/or man-made causes. On the other hand, chronic events are frequent and can be predictable. Examples of chronic events include floods, drought, extreme heat, or cold and influenza outbreaks. The third type of hazard businesses get exposed to relates to acute events, which are difficult to predict, infrequent but have high impact. Examples of acute events include wildfires, tsunamis, earthquakes, hurricanes, and tornadoes. Covariate events usually affect businesses in a specific geographical location, whereas idiosyncratic events affect specific entities within a community. It is difficult to distinctly tell if the COVID-19 pandemic is a covariate or idiosyncratic event (Helgeson, Fung and Roa-Henriquez, 2020). Although the COVID-19 pandemic is quite recent, its impact on SMEs the world over is unprecedented (Kukanja, Planinc and Sikošek, 2020). In a study conducted in China, it was discovered that many SMEs had challenges of resuming work after lockdown. Some of the challenges were due to lack of capacity to comply with new policy requirements, disrupted supply chain, employees failing to return to work, poor market demand and cash flow issues (Lu,Wu, Peng, and Lu, 2020). SMEs also had limited interactions with customer due to the pandemic (Helgeson, Fung and Roa-Henriquez, 2020).

However, Helgeson, Fung and Roa-Henriquez (2020) claim that the degree of losses incurred, or mitigation thereof depends on SMEs' decision-making capacity. Enterprise risk management is one such strategy SMEs can employ to mitigate effects of natural disasters and pandemics (FEMA, 2019; Raymond, Horton, Zscheischler, Martius, AghaKouchak, Balch, Bowen, Camargo, Hess, Kornhuber, Oppenheimer, Ruane, Wahl and White, 2020; Hurlbert, Krishnaswamy, Johnson, Rodríguez-Morales, and Zommers, 2019). Learning, agency, and flexibility are the three attributes an SME should possess in developing resilience capacity required to withstand disasters. Learning which occurs after occurrence of a disaster enables organisations to make informed decisions the next time a similar event occurs (Tuler, Dow, and Webler, 2017). Agency was defined by Kakavelakis and Edwards (2012: 480) as, "a process encompassing iterative, projective, and practical evaluative dimensions which unfold in relation to the temporal and structural context within which situated learning is embedded." Lastly, flexibility refers to the ease of instituting changes to suit new conditions. Literature also suggests theories for managing crisis which SMEs may employ to mitigate crises caused by natural disasters and pandemics. These theories include readiness theory, theory of complexity and sense making theory. The readiness theory suggests that organisations assign and train emergency officials with definite roles, in preparation for such events. The theory of complexity utilises a behavioural approach to mitigate effects of complications and confusion caused by disasters through collecting information on existing threats. The sense making theory guides organisations to deduce reasonable meanings of occurrences and direct their decision-making process during times of crisis (Al-Dabbagh, 2020). Lastly, in the case of the COVID-19 pandemic, it is recommended that governments intervene by way of cashflow relief, work resumption and demand stimulus to assist SMEs in the essential recovery of their economies (Lu, Wu, Peng, and Lu, 2020).

### 2.6.4 Operational approach of SME

#### 2.6.4.1 Technology

Continuous integration of latest technology has been reported to improve competitiveness of manufacturing organisations (Konstantopoulou, Rizomyliotis, Konstantoulaki, and Badahdah, 2018; Prasanna, Jayasundara, Naradda Gamage, Ekanayake, Rajapakshe, and Abeyrathne, 2019). In addition to a competitive advantage, additive technologies enable firms to increase efficiency, as well as providing opportunities to re-invent and re-engineer their processes, which in the process improves production and productivity and reduces costs (Ombongi and Long, 2018; May et al., 2016). For successful adoption of technologies, SMEs should allocate most of the funds towards development of innovation ideas, research, and development, as well as equipment. The balance of the funds should be allocated to Information Technology adoption. IT costs may include compensation for IT experts or equipping of existing employees in areas such as production, accounting, and communication. Latest technologies can reduce operating costs and improve efficiencies in SME operations (Ombongi and Long, 2018).

Industry 4.0 is one form of technology advancement which promises revolutionise manufacturing industries (Benitez, Ayala, and Frank, 2020). Almada-Lobo (2016) further explains that although there is robust discussion on the topic, nobody can really fathom its impact on manufacturing operations, although there are clear signs that firms which do not embrace it will be forced out of business. Industry 4.0 is also sometimes referred to as the “Fourth Industrial Revolution”, “smart manufacturing”, “industrial internet” or “integrated industry” (Hofmann and Rüsch, 2017:23). Moeuf et al., 2018: 1118) defined Industry 4.0 as, “a new approach for controlling production processes by providing real time syncronisation of flows and enabling the unitary and customized fabrication of products.” Several authors suggest that Industry 4.0 can potentially revolutionalise entire industries through transformation of the ways goods are designed, factory-made, distributed, and paid for (Jassem and Razzak, 2021; Hofmann and Rüsch, 2017). According to (Moeuf, Pellerin, Lamouri, Tamayo-Giraldo, and Barbaray, 2018), industry 4.0 concept is hinged on emerging new technologies which include big data, industry of things, cloud computing, scheduling and virtual reality which are meant to improve dissemination of information in a system. These, in turn, improve real time control of operations. Moeuf, Pellerin, Lamouri, Tamayo-Giraldo, and Barbaray, (2018) bemoans the fact that SMEs have not been able to adopt Industry 4.0 due to lack of resources to invest in research and development, inexperience in managing complex solutions, as well as lack of non-production experts to champion the campaign. (Ing, Lee, Chan, Alipal, and Hamid, 2019) concur with Moeuf, Pellerin, Lamouri, Tamayo-Giraldo, and Barbaray, (2018) by acknowledging that it requires large capital investments and a high level of expertise for any organisation to benefit from Industry 4.0. Consequently, SMEs are reportedly concentrating on the cheapest and the least and least effective technologies such as simulation and cloud computing, while neglecting those promoting sound business transformation such as collaborative robotics, Big Data, CPS and Machine to Machine interfacing (Moeuf, Pellerin, Lamouri, Tamayo-Giraldo, and Barbaray, 2018). Industry 4.0 should be incorporated into an SME’s strategy, as it can enable a firm to customise products, connect with partners, achieve an autonomous process, as well as to syncronise flows (Moeuf, Pellerin, Lamouri, Tamayo-Giraldo, and Barbaray, 2018).

Sadly, some entrepreneurs do not see the need to upgrade their outmoded technology as they deem it to be good enough to service the domestic market. Old machines have got a disadvantage in that they utilise more raw materials for a unit of product manufactured. Unlike old machines, whose settings are handled manually, technologically recent machines have got more precise settings, hence attaining more exact readings, better finishing of products and minimising wastage of raw materials (Talukder and Jahan, 2017). Adoption of latest technology is determined by need, ease of use, as well as capital investments requirements. Pressure from customers is also a push factor for the adoption of technology (Nugroho, Susilo, Fajar, and Rahmawati, 2017).

#### 2.6.4.2 Adopting total quality management

Total Quality Management (TQM) ideology, values, procedures, and practices seek to attain customer satisfaction, productivity, and profitability of manufacturing firms (Shafiq, Lasrado, and Hafeez, 2019). Implementation of TQM has become a strategic survival tool for SMEs and large businesses (Majumdar, 2016). This is because TQM has been reported to enhance firm performance (Hilman, Ali, and Gorondutse, 2019). This is achieved through TQM's critical elements of customer focus, continuous improvement, strategically based and total employee involvement (Pambreni, Khatibi, Azam, and Tham, 2019). When a manufacturing firm combines TQM with total preventative maintenance it achieves the following benefits: reduction in waste and re-work, less total process rejects, reduced maintenance costs, less customer complaints, faster delivery times, reduction in inventory levels, lower overheads, less setup times and lower likelihood of unplanned downtime (Floris, Marongiu, Dessi, and Dettori, 2021). TQM can also aid an SME in expanding into new markets as well as developing well-structured and prescribed strategies and goals (Ismail and Rassokha, 2017). SMEs can also quickly modify product and process design as per customer requirement, as well as to increase productivity when they adopt TQM (Mitra, 2016). Adoption of TQM has also been reported to increase morale and occupational safety of employees (Mayboroda, Mayboroda and Lysak, 2020). SMEs are now under immense pressure to implement TQM due to increased global competition over the years, as well as increased customer awareness and demand for quality (Sahoo and

Yadav, 2018). TQM is supported by six pillars, namely: facilitation of quality management environment, focus on teamwork, use of quality control tools and techniques, customer focus, mutually beneficial supplier relationships, benchmarking, processes improvement and employee involvement (Rubinandhini and Gomathi, 2017). Raßfeld, Behmer, Dürlich, and Jochem (2015), however, argues that quality management does not add direct value to a firm, hence it can only be prudent to attempt to measure success of a quality management system using monetary and non-monetary indicators.

Not all SMEs can meet their TQM obligations due to lack of capacity to attain quality certification and limited capacity to meet customers' specifications (Abdin, 2017). Dilawo and Salimi (2019) also cite inadequate TQM knowledge and awareness, poor data collection methods, poorly defined TQM roles and responsibilities, poor information sharing, temporary workers, overreliance on contract documents, unfavourable business environment, award to lowest bidder tendency, and corruption as some of the hinderances to successful implementation of TQM. Other barriers to implementation of TQM include lack of experience in TQM, lack of top management commitment (Kumar, Verma, Mangla, Mishra, Chowdhary, Sung, and Lai, 2020), lack of objectives and strategies, inadequate resources, and supplier quality management (Isa, Zaroog, Sivabalan, and Raju, 2016). Other challenges of implementing TQM include difficulties associated with changing organisational culture, drawing up clear plans with definite time frames, denunciation of creativity in the name of standardisation as well as the time required before results are realised.

#### 2.6.4.3 Internationalisation

There are several reasons why an SME would want to internationalise, which include to reduce the effect of local competitive pressure, to take advantage of unique knowledge they possess, to follow customers abroad, acquisition of new products or market knowledge, as well as cost reduction achieved through economies of scale (Costa, Soares, and de Sousa, 2016; Holtgrave and Onay, 2017). Falahat et al, (2020) also add that SMEs wishing to internationalise can employ product innovation, market intelligence and competitive pricing as sources of competitive advantage over rivals in host countries. SMEs wishing to internationalise should observe three success factors, namely, developing trust among partners, exerting control, and acquiring knowledge from foreign partners they wish to venture into business with. Governments can also ease the burden on SMEs by offering institutional support in the form of finance and informational resources (Holtgrave and Onay, 2017).

According to Holtgrave and Onay (2017), an SME can enter a foreign market through one of the following three modes, namely: non-equity market entry, cooperative market entry and as a wholly owned subsidiary. Examples of non-equity entry into the market include direct and indirect exporting, distribution, or franchises (Holtgrave and Onay, 2017). Advantages of non-equity entry modes include less demand for resources to invest, as well as offering investors flexibility. The disadvantage of these entry modes, however, is that they do not offer the investors an opportunity to be close to the foreign market (Holtgrave and Onay, 2017). SMEs which chose non-equity entry modes cannot be guaranteed of international performance, as a result of their networks (Stoian, Rialp and Dimitratos, 2017). Exporting through non-equity market entry mode can offer benefits of employment creation to the country wishing to export.

Examples of cooperative market entry include strategic partnerships or joint ventures (Holtgrave and Onay, 2017). Demand for resources commitment is significantly higher in this case than non-equity market mode, although it is shared between partners (Holtgrave and Onay, 2017). Cooperative market entry also offers investors greater market closeness when compared to non-equity market entry.

According to Holtgrave and Onay (2017), wholly owned subsidiaries are affected by a high resource demand and the burden lies on the single owner. SMEs are generally limited with regards international diversification due to the challenge of legitimacy caused by the liability of smallness, liability of foreignness, limited resources, cultural and socio-economic differences, as well as limited foreign market knowledge (Stoian, Rialp and Dimitratos, 2017). SMEs can, however, overcome the challenge of legitimacy associated with liability of smallness and liability of foreignness by conducting their businesses in a similar fashion to how native firms operate. Legitimacy is also reported to offer several advantages to firms. Firstly, legitimacy enables firms to acquire the much-needed social capital and credibility, which in turn enables them to conduct their businesses with relative ease in challenging environments. The second advantage offered by acquiring perceived legitimacy is ease of acquiring resources for sustenance of a business. Thirdly, legitimacy also helps foreign owned firms to withstand the threat of losing market share posed by competing firms (Sui, Baum, and Malhotra, 2019). Table 2-11 below shows advantages and disadvantages of liability of foreignness.

**Table 2-11: Advantages and disadvantages of liability of foreignness**

| Advantages | Disadvantages |
|---|---|
| • Having foreign firms coming to operate businesses in a host country helps that country to attain a certain level of legitimacy and proves that the host country is open for business.<br>• Foreign firms with higher financial muscle than similar firms in the host country are generally held in high esteem.<br>• Foreign firms can always tap into competitive advantages offered by their parent companies to compete against firms in host countries.<br>• Multi-national enterprises can access resources from other countries and use this as a competitive advantage against rivals in host countries<br>• Local customers and suppliers often associate foreignness with superiority. | • Foreign firms usually have the disadvantage of being perceived as outcasts.<br>• Firms which venture into other countries sometimes endure discrimination<br>• People in host country might stereotype foreign nationals conducting business in their country<br>• The host country might have difficult barriers to entry which are meant to protect local firms.<br>• Managing operations from another country attracts certain extra costs.<br>• Operating a business in a different country might attract unforeseen transaction and information expenses.<br>• Assets transferred to foreign countries may not be useful in such territories. |

**Source: Adapted from Chinta, Cheung and Capar (2015)**

These challenges make SMEs less prepared for external challenges such as unpredictable technological, political, and institutional changes in foreign markets. Holtgrave and Onay (2017) also argue that SMEs venturing into developing countries must contend with institutional voids in the form of enactment of laws and regulations, corruption, bureaucracy, and less developed infrastructure. Nisar, Boateng, and Wu

(2018) suggest that organisations wishing to internationalise could face challenges of behavioural and environmental uncertainties as they cannot predict the attitudes and behaviours of individuals in the foreign land in which they would prefer to invest. Lack of human capital has also been cited as one of the major hinderances to internationalisation of SMEs (Dabić, Maley, Dana, Novak, Pellegrini, and Caputo, 2020). This uncertainty not only leads to opportunistic behaviour such as cheating and distortion of information but creates unforeseen market transaction costs and control costs (Nisar, Boateng and Wu, 2018). Due to the challenges mentioned above, SMEs generally rely on their supplier and customer networks to leverage their human, financial and technological resources to successfully manage their foreign activities (Chandra, Paul, and Chavan, 2020; Gancarczyk, Freiling, and Gancarczyk, 2020). Networks also help SMEs to leverage on partners' reputation and accelerate innovation (Lin and Lin, 2016).

Seringhaus and Rosson (2012) suggest that firms need aid in the form of export support programmes for various reasons which include increasing importance of international trade, increasing intensity of competition on the international trade playing field and the need to participate in global trade growth, as well as the need to grow domestic industry. Comi and Resmini (2019) while investigating the effects of export support programmes on internationalisation of SMEs in Italy concluded that firms which received assistance generally displayed higher export tendencies and higher export intensity, as compared to those which did not receive assistance. Micro and small firms which were already exporting reportedly benefited the most from these export support programmes. Catanzaro, Messeghem and Sammut (2019) conducted a separate investigation and concluded that informational support programmes to firms are very effective in enhancing firm performance, while financial support was found to be effective at increasing number of foreign markets only, and not economic performance.

Firms fail to exploit foreign market opportunities due to lack of information, resources, and motivation. Governments, public organisations, and NGOs can be of assistance through export programs, to increase competitive competence of firms wishing to export. Examples of public organisations include a country's Department of Commerce, Trade Council or External Affairs. Non-governmental organisations which could assist with export support programs include export trade associations as well as chambers of commerce (Seringhaus and Rosson, 2012). The table below shows a needs assessment guide for firms wishing to export or expand on their export programmes.

**Table 2-12: Company needs assessment of export support program**

| Export promotions focus and typical initiatives | | | | | |
|---|---|---|---|---|---|
| **Motivational** | **Informational** | **Operational/ Resources** | **Type of export involvement** | **Key questions** | **Company needs** |
| Advertising Local seminars Export weeks/months | | | Non-exporter | Should we even consider exporting | To be made aware of opportunities |
| Seminars Export bulletins/ newsletter | Market reviews/Buyer newsletter Custom market research | Trade missions Financing, Insurance | New exporter | Should we initiate exporting? Which market should we investigate? | To determine feasibility of exporting |
| | Market visits Export seminars/meetings Export newsletter | Trade fairs Trade missions Financing, Insurance | Expanding exporter | Which new market should we enter and how? | To select the most promising market and the best market entry method |
| | Export seminars/meetings Export newsletter | Trade fairs Foreign buyer visit Sales offices Financing, insurance | Continuing exporter | How can we achieve better performance | To improve and fine tune existing operations |

**Source: Adapted from Seringhaus and Rosson (2012:7)**

Belhoste, Bocquet, Favre-Bonté and Bally (2019) suggests that firms can receive export support help in the form of motivational programs, informational programs, operational programs, experiential knowledge, financial programs and well as reduction of red tape and legal barriers. Lastly, the decision on which countries to establish new business ventures can also be determined by psychic distance (Nabi and Zapata, 2018; Yan, Hu, and Liu, 2020; McElwain, Khan and Iftikhar, 2020). The less the psychic distance, the more similar the language, culture, and political system of the hosting country to the firm’s home country (Paul, 2020).

#### 2.6.4.4 Market orientation

Kohli and Jaworski (1990:123) define market orientation as follows:

> "Market orientation is an organisation-wide generation of market intelligence through decision support systems, marketing information systems, marketing research efforts, dissemination of the intelligence across company departments, and organisation-wide responsiveness to the changes taking place in the environment."

There is positive association between market orientation and performance (Puspaningrum, A., 2020). Adopting a market orientation is also reported in literature to improve competitive advantage of a firm (Udriyah, Tham, and Azam, 2019). Another advantage of market orientation is that it enables effective and efficient decision making through fostering of coordinated business intelligence, and distribution of and responsiveness to market information. (Dubihlela and Dhurup, 2015). According to Jansson, Nilsson, Modig and Hed Vall (2017), entrepreneurial orientation and market orientation strategies are extensively discussed in literature. A market-oriented firm's activities are centred on pleasing its customers and its decisions are based on market information. It should satisfy three requirements, namely customer focus, coordination, and planning of marketing for smooth operation of the firm, as well as external focus. According to Dubihlela and Dhurup (2015), factors like need for growth, diversification, wider choice, profitability, increase in market share and intensified competition from rivals are the push factors which encourage enterprises to adopt concepts like market orientation as a way of attaining competitive advantage. Malik and Naeem (2020) point out top management involvement, centralization, and interdepartmental connectedness as considerable predictors of market orientation.

There are also barriers to market orientation which must be considered. These barriers can be split into three categories, namely: external environment, operational environment, and internal environment. Under external environment, barriers emanate from three sources such as technological changes, the state, and the economy. These elements of the external environment are difficult to deal with at an organisational level. Factors constituting the external environment include competition from rivals, market turbulence, advancements in technology, and prevailing economic conditions. Business environment, on the other hand is influenced by innovation and change, which are cornerstones of market orientation. A review of the general economic conditions prevailing in the country through assessment of opportunities and threats in the marketplace, may be a good starting point for firms wishing to adopt market orientation as a strategy. Under economic conditions assessment, one would cover the economic growth rate, national employment level, consumer income, and rate of inflation (Dubihlela and Dhurup, 2015).

#### 2.6.4.5 Entrepreneurial orientation

Entrepreneurial orientation plays a pivotal role in the success of an SME (Lo, Wang, Wah and Ramayah, 2016; Hsiung and Tsai, 2017; Singh, Bhowmick, Eesley and Sindhav, 2019). In the same vein, Octavia, Indrawijaya, Sriayudha, and Hasbullah, (2020) claim that entrepreneurial orientation leads to firm performance. Green entrepreneurial orientation, to be precise, has also been cited to have a positive effect on environmental and financial performance of a firm (Jiang, Chai, Shao, and Feng, 2018). (Jiang et al., 2018). McGee and Peterson (2019) add onto the argument by suggesting that the benefits of influence of entrepreneurial orientation are more apparent as firms mature. Jogaratnam (2017) refers to entrepreneurial orientation as an intangible resource which can aid a business to gain a competitive advantage over its competitors and in the process attain higher performance. Entrepreneurial orientation has also been reported to be a predictor of employee retention within an organisation (Yamin, 2020). When SMEs combine entrepreneurial orientation with market orientation and knowledge management orientation, they increase the chances of achieving cleaner productions, hence achieving an urge over competitors (de Guimaraes, Severo, and de Vasconcelos, 2018). A firm's entrepreneurial orientation has also been reported to be associated with knowledge creation development (Vidic, 2018)

Aziz, Hasnain, Awais, Shahzadi, and Afzal (2017) suggest that entrepreneurial orientation covers issues like risk taking, autonomy, innovativeness, proactiveness and competitive aggressiveness. An entrepreneurially oriented company focuses on identification and exploitation of new markets, as well as being more innovative and proactive. Entrepreneurial orientation (EO) is composed of three parts, namely innovativeness, proactiveness and risk taking (Jansson et al., 2017). Anderson, Kreiser, Kuratko, Hornsby and Eshima (2015: 1583), defined EO as, "…a multidimensional construct consisting of two noninterchangeable dimensions -entrepreneurial behaviour and managerial attitude towards risk". SMEs with social networks as well as those with owners who have got previous entrepreneurial experience are said to benefit more from entrepreneurial and market orientation (Presutti and Odorici, 2019).

#### 2.6.4.6 Value adding activities

Koskela (1992: 17), as cited in da Silva Etges (2018) defines value adding activities and non-value adding activities as "…activity that transforms material and/or information towards that which is required by the customer; non-value-adding activity (also called waste): Activity that takes time, resources or space but does not add value". Cucagna and Goldsmith (2018) suggest that organisations add value when they improve or introduce a new method or product, or introduce a new procedure previously performed by another actor in the chain. Shou, Wang, Wu, and Wang (2020) also add that value addition in manufacturing occurs when an activity maximises customer's value and minimises waste. Adding value to products manufactured is said to increase a firm's competitiveness (Mutambi, 2017). Anyanwu (2018) suggests that adding value to goods before selling them on the market increases revenue and average earnings per unit.

Firms can practice value addition when they shift from pure manufacturing to offering a package of physical products along with advanced services, thereby creating a product-service business. This process is sometimes referred to as servitisation (Ntanos et al., 2018). Servitised manufacturing firms create sophisticated products and services which gives them an edge over competitors and allows them not to compete sorely on cost. Conventional manufacturing firms require resources and technology to run them but servitised firms require more of skills and knowledge. Also, conventional firms focus on making good quality products while servitised manufacturing firms focus on improving value added services for customers and are solution oriented (Ahamed, Inohara and Kamoshida, 2013). In a study conducted in Japan, it was concluded that servitisation contributes to profitability of firms (Shikata, Goto and Gemba, 2019). Servitisation has also been recognised as enabling Chinese firms to realise more value out of their products, as well as to improve international competitiveness (Cui and Liu, 2018).

Lean manufacturing has also been identified in literature as a value addition strategy for manufacturing firms. The value addition is attained through minimisation of wastes such as overproduction, rejects, transportation, idle time, wrong design, energy, and unnecessary movements (Tiwari, Singh, and Srivastava, 2020). Patel and Patange (2017) add to the argument by suggesting that lean manufacturing is a value adding process as it aids firms to continuously improve and make their processes more efficient. This not only helps firms to survive but enables them to run profitably.

Access to ICT technology and infrastructure can boost value added manufacturing in Africa (Parthiban, Qureshi, Bandyopadhyay, and Jaikumar (2021). ICT can aid firms to add value to their process through optimising production planning and inventory control (Apiyo and Kiarie, 2018; Moura, Tomás, and Teixeira, 2018). Investing in ICT has also been reported to increase overall productivity of a firm through increase in productivity of labour (Chege, Wang, and Suntu, 2020).

#### 2.6.4.7 Procedures and methods

Leder, Stern, and Freitag (2022) suggest that work instructions can assist an organisation to attain a competitive advantage over rivals. Rodrigues, Barros, Revoredo, Azevedo, and Leopold, (2015) point out that process models or work instructions provide a simplified view of organisational procedures. These procedures may be in textual instructions form or graphic process model. These models find use during training of new employees, to remind old employees and provide the base for improvement of organisational procedures and policies. Galin (2018) adds that work instructions are drawn for a specific team or department within an organisation and are designed for application of specific procedures. Existence of standardised processes can help to avert delays during production (Hussamadin, Mukkavaara and Jansson, 2020). Palmqvist, Vikingsson, Li, Fast-Berglund, and Lund, (2021) state that for shop-floor workers to follow work instructions, they must be taught beforehand and the instructions themselves must be presented in a simplified manner. That way, work can be standardised, and product quality can be improved. Work instructions should not be written to cover quality issues only, but should also cater for safety risks involved in execution of the procedure (Schorn, 2017)

Rupert and Loving (2017) encourage firms to discard paper-based work instructions and adopt electronic work instructions (EWI) for them to remain competitive on the global market. Disadvantages of paper-based work instructions are that they only cater for flow of information, but do not cater for traceability and cannot provide immediate solutions if operators do not understand a specific step in the procedure. On the other hand, EWIs allows for feedback to come from the floor to the design engineers, as well as real time assistance from engineers and managers to floor operators. EWIs also usually have troubleshooting options to suggest to operators when a problem arises. This helps to reduce downtime in the manufacturing process. Managers can also tell what stage of manufacturing a product is, hence allowing them to arrange for subsequent processes and delivery on time. Zegers, Zogopoulos, and Verhees (2022) add that digital work instructions allow fast delivery of operator instructions on demand. Kardos, Kovács, Pataki, and Váncza (2018) add to the argument by suggesting that procedures are now more dynamic, as products now have shorter life cycles and come in different varieties these days. EWIs provide the solution as they are much easier to maintain and version when compared to paper-based work instructions.

#### 2.6.4.8 Environmental sustainability orientation

Firms which adopt an environmental sustainability orientation have been found to be more sustainable themselves (Ramanathan, He, Black, Ghobadian, and Gallear, 2017). Authorities are convinced that adopting an environmental sustainability orientation leads to superior firm performance (Roxas, Ashill, and Chadee, 2017; Zhang, Rong and Ji, 2019). Environmental sustainability adoption can lead to a firm gaining a competitive advantage over rivals (Walsh and Dodds, 2017). Modern Casting (2018) also claims that it is possible for foundries to shift towards environmental sustainability whilst at the same time improving their bottom line. This is because foundries are by nature recyclers. Some of the ways in which foundries could help improve on sustainability of natural resources include implementation of management systems and metrics which promote sustainability, resource recovery of waste and beneficial reuse.

There is, however, need for firms to continuously review and renew this knowledge for them to fully respond to changes around them and maintain a long-term competitive advantage (Martínez-Martínez, Cegarra-Navarro, Garcia-Perez, and Wensley, 2019). According to Johnson and Schaltegger (2016), sustainability management tools enable SME managers to enforce and coordinate sustainability-oriented strategies and activities throughout the enterprise. Advantages of sustainability management tools include reduction of negative environmental and social impacts, as well as enabling a firm to stay competitive and economically viable.

Customer and stakeholder pressures can trigger SMEs to adopt sustainability programmes (Zhang and Zhu, 2019). It is also reported that governments, donors, and industry stakeholders are putting more emphasis on environmental sustainability in their SME promotion programmes due to increased consumer and private sector awareness of the topic. Consequently, SMEs end up feeling institutional pressure to participate in sustainability practices like recycling or third- party labelling schemes like fair trade and environmentally friendly labels (Jansson et al., 2017). SMEs, however, generally lag in terms of commitment to sustainability due to several reasons ranging from financial resources, organisational structure, management style to production capabilities, implementation constraints, negative attitudes, company culture and lack of understanding of benefits (ILO, 2015). External deficiencies such as inadequate external drivers and rewards, incompatibility of formal management strategies applied in informal setups, as well as internationally designed standards and instruments which are too complex for locally biased SMEs are also discouraging factors. Johnson and Schaltegger, 2016). Howes et al. (2017) postulate that failure to meet intended goals on environmental sustainability goals is often caused by economic development factors which may conflict with environmental goals, lack of political will or capacity, as well as failure to adequately communicate goals to key stakeholders. Ownership and control of firm operations are in the hands of a few individuals for SMEs. For this reason, literature suggests that values, attitudes and knowledge management play a big role in commitment to environmental sustainability practices of SMEs. Even in instances where SME managers and owners generally agree that sustainability issues should be high management priority, it does not necessarily follow that this positive attitude will translate into action, hence the 'attitude- action' or values – action' gap (Jansson et al., 2017). Table

2-13 below shows classification SME attitudes towards sustainability- oriented initiatives (SOI), as suggested by Klewitz and Hansen (2014).

**Table 2-13: Classification of SMEs according to attitudes towards SOIs**

| SME category | Results emanating from position |
|---|---|
| Resistant SMEs | Resistant SMEs disregard sustainability or environmental related issues |
| Reactive SMEs | These SMEs respond to stimuli such as government regulations and external pressures for the sake of complying, although doing so is regarded as additional costs. These firms have limited interaction with external environment. Consequently, such firms attain low-cost improvements at process level or incremental innovations only. |
| Anticipatory SMEs | For these SMEs innovation strategies are usually aligned with future innovation opportunities. This category of SMEs strives to be ahead of regulations. They also have low interaction with external actors. When it comes to innovation, these firms usually only achieve incremental processes and organisation innovation. |
| Innovation based SMEs | These firms are actively pursuing innovative solutions to the social and environmental challenges as a means of attaining competitive advantages over rivals. This category of SMEs has considerable interaction with external actors. Innovation-based SMEs are expected to achieve incremental process, organisational innovations. Radical product innovations are limited for this group of SMEs |
| Sustainability rooted SMEs | These SMEs incorporate environmental, social, and economic variables into their business model, as a way of contributing to sustainable developments of markets and society. This class of SMEs interact extensively with external actors, and they are expected to achieve radical product, process, and organisational innovations. This group of SMEs use their strategies to make long term investments. |

**Source: Adopted from Klewitz and Hansen (2014)**

The two most important variables which will likely influence implementation of multiple sustainability management tools are awareness of the tools and positive perception of relative advantage of tools.

However, Amankwah-Amoah and Syllias (2020) suggests that although many organisational executives believe that implementation of environmental initiatives leads to superior firm performance, this is not always the case. New firms which aggressively pursue such initiatives might face resource constraints and vulnerabilities, and in the process minimise their life chances of survival.

#### 2.6.4.9 Labour productivity

Labour productivity is a determinant of the general performance of an organisation's production system. An increase in labour productivity leads to an increase in production output while at the same time reducing the cost of production and work or services. Competitiveness of products or services of an organisation on the market is also dependent on labour productivity (Bogatyreva, Simonova and Privorotskaya, 2019). Labour productivity is critical for countries whose economies rely heavily on manufacturing for their sustainability and growth (Goel, Agrawal and Sharma, 2017). Mou and Robb (2019) suggests that Real-Time Labour Allocation can help businesses to correct mismatches between labour demand and supply through allocating cross trained employees in real time. OECD (2017) also suggests that individual skills can effectively be utilised in the workplace when internal policies take into consideration job design, work organisation, human resource development, innovation, technology adaptation and employer-employee relations and business-product market strategies.

Labour productivity can be improved by stimulating technical and technological innovations. Where financial resources are strained, incorporating low-cost tools into a system can improve labour productivity. The factors mentioned above can only be effective when firms guard against other sources of losses such as rejects, poor product quality machinery downtime, poor workflow, and motivation of employees to increase labour productivities (Bogatyreva, Simonova and Privorotskaya, 2019). Apart from technical and technological factors, there are other socio-economic factors which affect labour productivity. Alam, Nor, Ali, Omar and Wel (2018) conducted a study on 56 developing nations and concluded that availability of electricity plays a crucial role in increasing labour productivity of a firm. The innovative initiatives of individuals should also not be discounted insignificantly improving labour productivity, as well as the quality of work and products (Bogatyreva, Simonova and Privorotskaya, 2019). Ullah and Malik (2019) conducted a study in Pakistan and observed that health status of employees plays an important role in labour productivity of a firm. Focussing on ex-ante rewarding system which focusses on improving employee competencies and participation has also been identified in literature as a catalyst for labour productivity (Antonietti, Antonioli and Pini, 2017). Firms which utilise permanent contracts of employment tend to enjoy better productivity of workers than those which utilise fixed term contracts of employment. This is due to the reason that employees with fixed term contracts generally receive little employer-funded skills development than permanent employees, hence making them less productive (Wang and Heyes, 2020). In another study, Lannelongue, Gonzalez-Benito and Quiroz (2017) concluded that environmental management positively impacts labour productivity in organisations which requires low capital investments, although this relationship becomes negative in organisations which require high capital investment.

#### 2.6.4.10 Mechanistion and automation

Sobotka and Pacewicz (2017) suggest that operators control machines in the mechanised work and in automation there is no need for an operator, but perhaps a controller to carry out maintenance work. Automation is when machines are designed to carry out repetitive work. Mechanisation and automation can provide several advantages for firms such as increasing work speed, reducing costs, facilitating safer and more comfortable working conditions, allows work to carry on where human abilities are limited. Mechanisation and automation can also improve performance and product quality (Kamaruddin, Mohammad and Mahbub, 2013; Ishi, 2017) and it has been reported to increase labour productivity of a firm in that it reduces the number staff manning equipment and production time, while at the same time increasing product quality and competitiveness. Through mechanisation, firms can also facilitate process consistency and access accurate data and information (Gumede, 2018). Kukartsev, Bashmur, Kukartsev, Tynchenko, Lugovaya, Ogol, and Kukartsev, (2020) conducted a study in Russia and concluded that foundries in that country could improve their efficiencies through mechanisation and automation.

In a foundry set up, adoption of mechanisation and automation is dependent on the need for reproductivity and on the casting series sizes. In this case, jobbing foundries would require the least amount of mechanisation and automation, while foundries which are required to produce a lot of small components would need mechanisation and automation. The larger the series of small castings to be made, the higher the degree of mechanisation and automation to downstream processes like mould assembly, finishing and quality control (Noro and Lazzarin, 2016). Brzeziński and Wrona (2011) propose that an excellent opportunity for mechanisation and automation of the foundry process can be found in automatic moulding machines.

Mechanisation and automation in firms is, however, hampered by heavy capital investments required, as well as lack of suitably qualified experts to operate the plants (Bogatyreva, Simonova and Privorotskaya, 2019). Kamaruddin, Mohammad and Mahbub (2016) also identified availability of technology and maintenance costs as other factors hindering adoption of mechanisation and automation. General fear that mechanising and automating may lead to massive job losses also act as a deterrent to their implementation (Finkin, 2019; Llale, Setati, Mavunda, Ndlovu, Root, and Wembe, 2019). Foster and Wilson (2019) add onto the argument by suggesting that social and regulatory environment, as well as government receptiveness also play a big role in adoption of mechanisation and automation.

#### 2.6.4.11 Increasing capacity utilisation

Capacity utilisation may be loosely defined as the amount of production capacity utilised as a fraction of the maximum available capacity to produce finished goods (Storrie and Voyer, 2019). Capacity utilisation plays a key role in determining contribution of manufacturing firms to the economy of any nation. This role is so important to an extent that when management strives to increase productivity or expand a firm, they must take capacity into consideration (Okujaye, 2018). Isma'eel and Rhima (2019) claim that capacity utilisation has got a positive effect on profitability of a firm. In logistics, increasing capacity utilisation is said to improve energy efficiency, which in turn also helps to improve environmental sustainability (Wehner, 2018)

Ndemezo, Ndikubwimana and Dukunde (2018) conducted a study on the food and beverage industry and identified firm age and material-intensive characteristic of a firm in Malawi as drivers of capacity utilisation. Sai and Zinyemba (2017) conducted a study in Zimbabwe and concluded that introduction of a multi-currency system in the economy brought about liquidity, stabilised prices and significantly reduced hyper-inflation and interest rates. This in turn brought about benefits of increased capacity utilisation, among others. Introduction of non-tax incentives, relaxation of tax administration and tax compliance rules, ensuring availability of affordable raw materials and assisting upcoming firms to acquire suitable technology and upgrade production standards can also help to improve capacity utilisation of a firm (Ndemezo, Ndikubwimana and Dukunde, 2018). Governments and policy makers can also help to boost capacity utilisation in manufacturing organisations by pushing for appreciation in foreign exchange rate, barring unnecessary importation of goods and services and assisting firms to acquire modern equipment and technology at affordable prices as well as to ensure adequate and reliable power supply (Okujaye, 2018). On the technological side, firms are encouraged to adopt additive manufacturing for them to increase capacity utilisation. Additive manufacturing enables firms to overcome tooling and design constraints as well as to allow them to practice efficient manufacturing, even at low volumes (Kellens, Baumers, Gutowski, Flanagan, Lifset and Duflou, 2017). Effective running of machines at optimal speed, improvement of working conditions, effective allocation of resources and creating work shifts are some of the factors which can aid manufacturing firms to increase capacity utilisation (Jadayil, Khraisat and Shakoor, 2017).

Hinderances to capacity utilisation include delays in formal registration of firms and access to finance (Ndiaye, Razak, Nagayev, and Ng, 2018). Lack of working capital, shortage of raw materials, inadequate demand, lack of specialized technology, tax administration and standards have also been identified as hinderances to capacity utilisation (Okujaye, 2018). High interest rates are also reported to discourage borrowing, which in turn also leads to a reduction in the level of investment and capacity utilisation (Kenny, 2019).

#### 2.6.4.12 Improved planning

Advanced production planning can significantly improve plant utilisation in sophisticated manufacturing environments (Hueber, Fischer, Schwingshandl and Schledjewski, 2019). Upasani, Bakshi, Pandhare and Lad (2017) suggest that the use of a combination of sensors and computing infrastructure has widened the platform for many industrial applications. As such, there is a need to move away from conventional maintenance planning methods to using modern technology such as Cyber-Physical Systems and Industrial Internet of Things. Such technologies can help to minimise unexpected downtime, improve efficiency and product quality. Kiran (2019) claims that production planning and control offers benefits not only to a manufacturing firm, but also to consumers, investors, suppliers, community, and nation. The manufacturing firm gets to enjoy the benefits of improved working conditions, competitive wages, job security, improved performance, improved decision making and optimisation of use of resources. Investors can potentially benefit through increased market share, return on investment, goodwill, and security. Customers can benefit through improved quality standards, fast deliveries, increased productivity, and higher knowledge base and sharing. Suppliers can benefit from improved production planning through cooperation, guaranteed orders, and prompt payment from customers. The community can benefit through employment, price satisfaction and social status. Lastly, the government can benefit through taxes and general prosperity of the nation.

Kiran (2019) also suggests that there are six functions of production planning namely, product planning, forecast planning, process planning, equipment planning, materials planning and precast planning focusses on demand forecasts and customer patterns of buying. Process planning focusses on selection of the best tooling, technology, process parameters and work scheduling to meet demand. Equipment planning is when type and number of equipment to do the job, as well as maintenance routines are selected. Under materials specifications, raw materials or inputs, economic order quantities, stores and inventory planning are determined. Lastly, production planning is when issues like job sequencing and machine loading are taken care of. Kiran (2019) further explains that good planning should advise on production level after consulting with sales. Secondly, decisions to produce or purchase should be based on the best economical costs. Thirdly, operational sequence should be influenced by product specifications. Good production planning should also minimise work in progress inventory. Planning should also determine the type of tooling, machinery, as well as material to be used for each product. Lastly, it is a production planning function to determine the best timing and location to perform the functions listed above.

# CHAPTER THREE – FOUNDRY INTERVENTION MEASURES

The purpose of this chapter is to identify intervention measures which should be instituted to enhance success rate of South African SME foundries. However, one can only suggest intervention measures when they have got an understanding of the nature of the problems faced by South African foundries. Therefore, this chapter will discuss current problems being faced by South African foundries and possible intervention measures to make the industry move forward. The challenges which will be discussed in this chapter are shortage of raw materials, waste management, technology challenges, inefficient usage of energy, import leakages, rapidly rising energy costs, low productivity and throughput, inadequate skills development and training, environmental regulations, high transport and logistics costs, limited access to capital, technology developments-to special skills gap, unattractive foundry environment, inability to compete with cheap imports.

## 3.1 SHORTAGE OF SCRAP METAL

According to Chitaka, von Blottniz and Cohen (2019) global demand for scrap metal and the subsequent compensation currently offered makes exporting of scrap metal from South Africa an attractive option for scrap merchants. Morrison (2008) however argues that exporting scrap metal has negatively affected local foundries in two ways. Firstly, local foundries struggle to find good scrap to use as raw materials. The second effect of exporting scrap material is that the price of scrap on the local market has generally been on the rise over the years as demand outpaces supply. This higher price of scrap metal has also been cited as a contributing factor to the decline of the South African foundry industry (Chitaka, von Blottniz and Cohen, 2019). According to Conningarth Economists (2013), as cited by (Chitaka, von Blottniz and Cohen, 2019), during the period of 2007 to 2011, steel scrap metal exports rose by 70 percent, whilst foundry exports dropped by 15 percent. There was also a 30 percent decrease in employment in the foundry industry during the same period (DED, 2013; Chitaka, von Blottniz and Cohen, 2019).

However, Broadbent (2016) suggests that shortage of scrap metal is not entirely caused by exporting of the commodity, but by the fact that steel products have a long life.

Broadbent (2016) also advocates for designing products in such a way that end of line disassembly and recycling are easy. Ease of disassembly encourages scrap metal recycling. The suggestion is that scrap collection facilities should also be improved to increase capacity. When scrap metal is readily available in a country, there is less requirement for processing iron ore into steel, which is an expensive and high energy demand process (Chitaka, von Blottniz and Cohen, 2019). Isheloke et al. (2017) further suggest that recycling a tonne of cans potentially saves up to 3,312 cubic metres of carbon dioxide gas, as well as 3,112 litres of oil or 33,7 kw/hr of electricity.

The South African government appreciates the effects of the problem caused by the export of scrap metal. As an intervention measure, a regulation policy called the Price Preference System (PPS) which is overseen by the International Trade Administration Commission (ITAC) to control export of the commodity was put in place (DED, 2019). The main objectives of this policy are designed to protect the local manufacturing industry, reduce energy consumption and impact on climate caused by primary production of metals, create jobs, as well as reducing value-added imports. The regulation prohibits the export of ferrous and non-ferrous waste and scrap metal unless first offered to a domestic market, for a period and at a price determined by the International Trade Administration Commission of South Africa. This policy also outlines that the quality and quantity of scrap metal intended for export should be accurately stated on applications for export permits, and confirmed by a metallurgical engineer (DED, 2019). ITAC, however, argues that PPS has not been effective in meeting its intended objectives. Consequently, a proposal has been crafted to replace PPS with export duty on ferrous and non-ferrous. Drafts of the Taxation Laws Amendment Bill (TLAB) and draft Tax Administration Laws Amendment Bill (TALAB) have been drawn, covering, among other things, the export duty for scrap metals. The draft TLAB particularly outlines that scrap metal must be sold at an ad-valorem equivalent rate to factor in fluctuations in prices of metals. Table 3-1 below shows the proposed duty structure.

**Table 3-1: Scrap metal ad-valorem duty rate**

| Scrap metal category | Ad-valorem duty rate |
|---|---|
| Stainless steel | 15% |
| Ferrous metals | 20% |
| Aluminium | 15% |

**Source: Adapted from DED (2019)**

There are some concerns raised by key stakeholders which include loopholes in the ad-valorem duty system which enable scrap dealers to under-invoice or under-declare goods. Another concern is that scrap metal dealers could take advantage of trade agreements such as the Southern African Development Community (SADC) and European Free Trade Association agreements where export duties are exempted, hence depriving the country of critical income. Lastly, it is worth mentioning that export restrictions on scrap metal is not unique to South Africa. 14 countries are reported to have instituted these export taxes, some of which include China which is sitting at 40 percent, Russia at 12.5 percent and India which charges 15 percent respectively (Republic of South Africa - The National Treasury, 2019).

## 3.2 WASTE MANAGEMENT

According to IFC (2007), foundries generate a lot of waste during various production stages. During the moulding process, waste from cores and moulds is generated. From the melting process, slag, graphite electrode material and furnace refractory waste are generated. From the fettling process, shot-blast fines and dust from baghouses, dust collectors and scrubbers are generated (Maj, Werrtz and Pieklo, 2017). Spent sand generated from foundries annually is in the region of 250,000 tons for silica sand and 25,000 tons for chromite sand (Nyembwe, Makhatha, Banganayi, and Nyembwe, 2018). The steel making process also generates hazardous elements such as zinc, lead, nickel, cadmium, and chromium. Non-ferrous metals generate dust containing copper, aluminium, lead, tin, and zinc. Melting process also generates waste in the form of an inert, glassy mass composed of a complex chemical, often referred to as slag. Some foundries also utilise water as part of their heat treatment process on castings. This wastewater from heat treatment may require treatment before disposal. In essence, most of this waste material ends up at dumping sites.

Dumping of certain foundry waste such as in dumping of sand, however, adds costs to the foundry process. Taylor (2013) argues that it costs more to dump used foundry sand than to reclaim it. Maj, Werrtz and Pieklo, (2017) however, argue that foundries in Asian countries such as India and China are generally much less affected by environmental regulations such as those in Europe. Foundries in Asia apparently have easy access to foundry waste dumping sites, where they are charged low fees and there is low control. Similarly, foundries in countries like the United Kingdom also enjoy a cost advantage over South African foundries. El Mohammad (2012) reports that it cost foundries in the United Kingdom an estimated $USD 4.10 to dump 1 tonne of sand, whereas foundries in South Africa are charged an average of $USD34 to dump 1 tonne of spent sand. Although some customers now compel their suppliers to adhere to environmental regulations through contract agreement, Asian foundries generally enjoy the advantage of absence of penalties for pollution. As a way of minimising these dumping costs, Nyembwe et al. (2018) suggest that spent foundry sand can be used for cement making and concrete mixing, although caution must be taken when using sand originating from green sand foundries, which might have a high clay content. Iloh, Fanourakis, and Ogra (2019) concur with Nyembwe et al. (2018) by suggesting that about 80 percent of waste foundry sand in South Africa could potentially be used as a substitute for sand in concrete. This alternative could help to conserve the natural resource, minimise soil, water, and air pollution. Energy use is equally reduced, while the cost of disposal is minimised hence making South African foundries more competitive.

## 3.3 TECHNOLOGY CHALLENGES

Due to the advancements in technology, foundries in more developed nations are currently able to monitor what they term machinery health status. This is achieved by introducing the internet of things (IoT) technologies which monitor machine status and generate data in real time to enable managers to plan better. Some of the benefits of such technologies include ability to predict and prevent downtime and breakdowns. When industry 4.0 technologies are integrated with production management factors, they enable factories to perform better as their overall equipment efficiency dramatically improves. Other technologies that foundries in developed countries are adopting and which South African SME foundries could also take advantage of are Rapid Prototyping (RP), Computer Aided Design (CAD), Enterprise Resource

Planning (ERP), Finite Element Analysis (FEA), Supply Chain Management (SCM), and Lean Manufacturing (Nabhani, McKie, and Askari, 2012).

South African foundries, however, face several challenges that inhibit them from also acquiring such technologies. The main hinderance to adoption of latest technologies by SME foundry owners is lack of guarantee on return on investment, which is caused by uncertainty of demand (Andrews and Gikunoo, 2011; Talukder and Jahan, 2017). High cost of finance, low profit margins and scarcity of skilled labour also act as deterrents to the acquisition of new technology by owners. Tedeschi et al. (2017) also add that technical challenges associated with the development and integration of new technology, as well as accompanying security risks, are also some of the hurdles in the adoption of new technologies such as industry 4.0 in manufacturing plants. Old technology however has got adverse effects on product quality, product range and scale of operations of an SME (Talukder and Jahan, 2017). According to Büchner (2019), foundries in general are under pressure to preserve technology leadership as they are continuously required to reduce the weight of their products, particularly in the automotive and machine building industries. Büchner (2019) further adds that the trend towards e-mobility could lead to an overall reduction in cast iron production of about five hundred thousand tonnes per year.

## 3.4 ENERGY INEFFICIENCY

The foundry industry is considered to be one of the most energy intensive manufacturing sectors (Scharf et al., 2021; Naim and Mahara, 2018). It is therefore imperative for foundries to improve their overall energy efficiency (Fayomi et al., 2021). Several researchers report that South African foundries have got poor energy efficiencies, most even though they do not give actual figures (Hartzenburg, 2019; Rasmeni and Pan, 2017). A study conducted by Mageza and Maluba-Bafubiandi (2018) on informal rural foundries in South Africa, however, shows that their coke fired furnaces had an efficiency of 3.37 percent. Heat losses, wrong choices of furnace lining materials and poor supply of oxygen to the furnace for combustion were the main contributing factors to the poor energy efficiency and the resultant long melting hours in these foundries.

Energy efficiency of melting furnace may be defined as heat required to melt a particular grade of material as a fraction of actual heat used to melt that grade of metal. The bigger the fraction, the more efficient the furnace is (Mageza and Mulaba-Bafubiandi, 2018). According to Naim and Mahara (2018), improving energy efficiency in an enterprise brings about two advantages, which are direct reduction of energy costs, as well as an increased profitability. Adefemi (2017) also adds that increasing energy efficiency of furnaces in foundries leads to reduction in gas emissions and their subsequent negative impact on the environment.

Literature also provides several methods of improving energy efficiency in foundries. Conducting energy audits is one of the best tools for identification and improvement of energy performance in a foundry (Noro and Lazzarin, 2016). Rasmeni and Pan (2017) suggest Quick E-Scan method as a cheaper option of determining energy efficiency of a foundry. Rasmeni (2017) further suggests four options of improving energy efficiency of foundries. The first recommendation is implementing an energy management system. Implementing an energy management system is a long-term solution which can benefit the foundry in the long run as it approaches energy efficiency on an on-going basis. An energy management system also brings about a structured system to the foundry where responsibilities of monitoring, raising awareness and training on efficient energy usage among employees is allocated to specific personnel. Since managing efficient energy usage is every employee’s responsibility, a firm’s energy management system could also link improvement in energy efficiency to individuals’ key performance indicators. The campaign should clearly demonstrate key areas where energy needs to be improved and visual illustrations such as charts showing how energy is used in various departments should be displayed on an ongoing basis in areas accessible to employees. This can be achieved through introducing metering systems in strategic areas where there is high consumption of energy. Energy usage data is generated with time and feedback given to the whole foundry team on progress made. The second recommendation is improvement of energy efficiency of electric motors in the foundry. Electric motors consume considerable energy in the foundry, and this could be improved through the acquisition of electric motors with improved design, tighter tolerances and manufactured with better materials. Proper installation of electric motors with the right specifications also helps to improve energy efficiencies in a foundry. Rasmeni and Pan

(2017) also recommend switching off equipment which is not in use as a means of increasing energy efficiency in a foundry. This may be achieved by running a campaign to raise awareness on importance of switching off equipment which are not in use. Automated switch off systems may also be installed on equipment where possible. The fourth recommendation is installing sub meters and reducing maximum demand. Sub-metering can help foundries to determine energy consumption for every department. Foundries can monitor and manage better running times of equipment which use a lot of energy when sub-metering is implemented. Foundries also need to monitor maximum demand and minimise this wherever possible. One of the ways of reducing maximum demand is through installing live on-line meters whose alarms will set off once energy demand in that section is high. Where it is not possible to reduce maximum demand, foundries could move demand to different times with cheaper rates, for example moving melting to night shift when electricity costs are lower. Other foundry procedures such as heat treatment could also be performed in the night to reduce maximum demand. There are several other foundry practices which can be implemented to optimise energy usage: sorting and sizing of scrap metal, optimising furnace charge by adding denser metal pieces and proper packing in furnaces to minimise gaps, closing of furnace lids while melting and switching off compressors when these are not in use. Other suggested practices include reduction of rejects, minimising spillages, avoiding melting excess metal. Avoiding prolonged holding molten metal during analysis of metal samples and waiting for moulds also helps to optimise energy usage (Hartzenburg, 2019). Other authors suggest that foundries should start considering switching to other alternative sources of fuel for production of castings (Naim and Mahara, 2018; Sivarupan, Upadhyay, Ali, El Mansori and Dargusch, 2019). Two main factors to consider when switching fuel are calculation of specific energy consumption, derived from production data and utilised fuel data. The second exercise is to calculate savings emanating from the reduction in energy consumption after switching (Naim and Mahara, 2018).

## 3.5 IMPORT LEAKAGES

South African foundries are affected by import leakages which in turn lead to reduced orders and low competitiveness (Madzivhandila, 2015; Hartzenburg, 2019). Talukder and

Jahan (2017) mention that cheap imports from countries like China, India, Taiwan, and Thailand that have flooded the markets are pushing SMEs out of business. This tallies with Krieg and Cunningham (2014) who report that although volumes of castings supplied by smaller tier 2 and tier 3 foundries to the local automotive industry have increased over the years, this is not the same for drive train castings which are still imported in the main. Furthermore, Original Equipment Manufacturers (OEMs) are apparently hesitant to give these foundries long term contracts for future work. Such a situation spells uncertainty for the smaller foundries manufacturing castings for the South African automotive industry. Some of the reasons contributing to the import leakages observed in the automotive industry cited by Krieg and Cunningham (2014) include cost of local castings and security of supply. Automotive components manufactured in South Africa were reported to be 10 to 30 percent more expensive than imported castings. As for security of supply, South Africa is notorious for work stoppages caused by labour unrest and power cuts. This negatively affects the chances of local small automotive foundries securing contracts from OEMs. Thirdly, meetings where OEMs decide on suppliers for certain automotive components are held outside South Africa. This gives local foundries lesser negotiating power and robs them of an opportunity to present a strong case to the OEMs. Rustomjee, Kaziboni, and Steuart (2018) also argue that South African foundries' capabilities have been weakening over the years and this has created room for import leakages as local component manufacturers resort to importing certain castings which cannot be manufactured by local foundries. Further to that, OEMs assume that suppliers are conversant with the standards and specifications of components they supply, as well as the system to which these products belong. This is not necessarily the case with foundries which supply these OEMs. The situation is exacerbated by the fact that the OEMs are reluctant to share certain technical information like specifications and standards with suppliers. This situation makes foundries lag behind on knowledge concerning latest standards and specifications which are supposed to guide them in production processes. OEMs also find it easier and convenient to import ready to fit subsystems, further deepening the problem of import leakages in the foundry industry. This development has also negatively affected competitiveness of downstream metal industries. DTI (2018) also reported that South African foundries find it difficult to penetrate the rail and automotive industry markets due to high costs involved during tooling and product development stages. This gap opens space for imported castings to be brought into the country. This problem is not unique to foundries only as the Department of Trade and Industry also reports that this pattern is evident in many downstream metal industries in the country. This challenge is mainly caused by both legal and illegal imports linked to the illicit economy (DTI, 2018). Figure 3-1 below shows some areas where the South African metal industry experiences import leakages. Some of these industries use castings components in their manufacturing process. Steam turbines, vapour turbines, vacuum pumps, compressors, bulldozers, angle dozers, levellers, electrical transformers, railway locomotives all require casting components during manufacturing process (DTI, 2018).

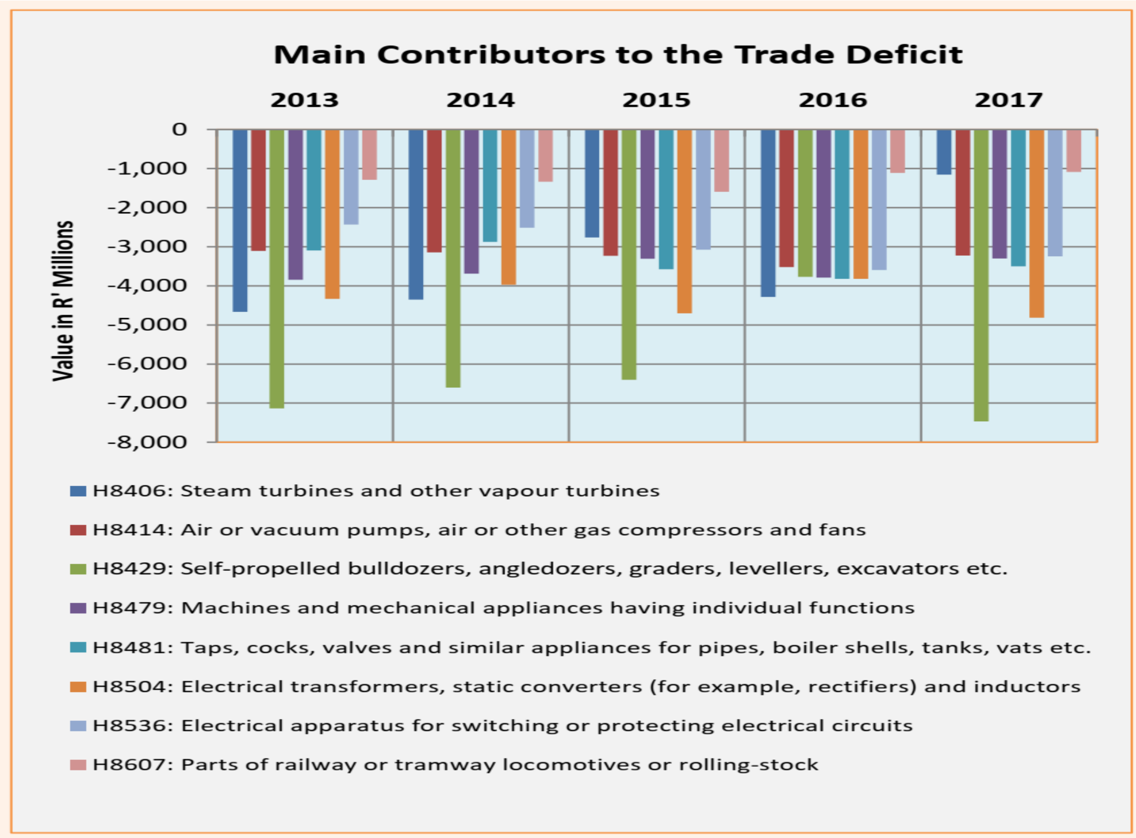


**Figure 3-1: Main contributors to the trade deficit**

**Source: Adapted from DTI (2018:123)**

The South African government recognizes this problem, and as a result formed the National Foundry Technology Network (NFTN) whose main aim is to reduce these import leakages. One of the NFTN's strategies of minimising import leakages is through improving foundries' capabilities through technology acquisition (NFTN, 2015). NFTN's initiatives in curbing the challenge of import leakages is the Competitiveness Improvement Initiative programme (CII). Some of the objectives of this intervention measure are to assist foundries with product development, efficient energy use measures, environmental and waste management requirements and assisting foundries to participate more in the localisation program by supplying designated castings. Through this programme, the Department of Trade and Industry also intends to assist foundries in acquiring the necessary accreditation which OEMs demand from potential suppliers wishing to participate in their supply chains (DTI, 2018).

### 3.6 RAPIDLY RISING ENERGY COSTS

Kaziboni, Rustomnjee and Steuart (2018) report that the South African foundry industry is one of the worst affected industrial subsectors by rising electricity tariffs. This is so because ESKOM has been steadily increasing the price of electricity since early 2000, with a sharp increase observed in 2007 during the global financial crises. According to TIPS (2014), the major cause of increase in electricity price is Eskom's past investment decisions and strategies. TIPS (2014) further suggest that ESKOM's choice of type of technology, timing, and scale of power generating capacity has a huge bearing on price movements. ESKOM could make such sub-economic and unnecessary over-investment decisions because it was backed by the government of the day. In the 1970s and 1980s, ESKOM was allowed to transfer the cost of such poor investment decisions, as electricity was priced below actual cost, while the organisation pursued policies that encouraged an increase in the consumption of electricity. As a result of this situation, ESKOM never bothered to save funds for future infrastructural investment. Figure 3-2 below shows a graphical illustration of ESKOM's price increases over the years against inflation rate, projected to 2022. Inflation rate figures are reported by the Consumer Price Index (CPI).

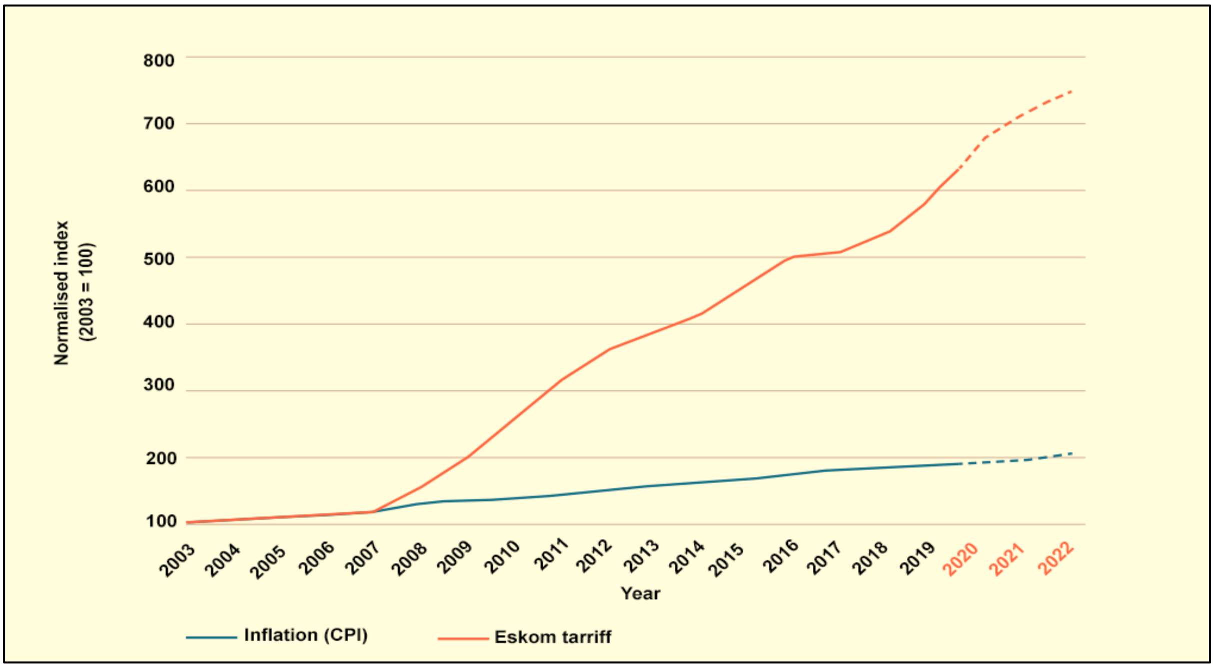


**Figure 3-2: Comparison of ESKOM price increases versus inflation rate**

**Source: Adapted from GreenCape (2020:9)**

The graph above depicts that inflation rate doubled during the period of 2009 to 2020. ESKOM's charges tripled during the same period as they rose by close to 300 percent. GreenCape (2020) further reports that in addition to the 4.1 percent tariff hike approved in 2018, NERSA further approved ESKOM tariff increases of 9.41 percent for 2020, 8.1 percent for 2021 and 5.2 percent for 2022. ESKOM had however applied for 17.1 percent for 2020, 15.4 percent for 2021 and 15.5 percent for 2022.

According to Rasmeni and Pan (2014), foundries rank at the top of energy consumers in the metallurgical industry. The bulk of the energy is consumed in the melting section, accounting for approximately 55% of the electricity used in foundries. Indeed, energy is one of the major cost drivers during production of castings. Foundrymen have also been accused of exhibiting a low level of awareness of energy conservation (Andrews and Gikunoo, 2011). A typical medium to large size foundry in South Africa purchasing electricity from their local municipality could pay up to 30 percent more per kilogram of metal sold than when they purchase electricity directly from ESKOM. When interpreted in monetary terms electricity from local municipality costs a foundry approximately 4 percent of their annual turnover, whereas electricity for the same foundry would only be 2 percent of their total annual turnover if they obtained it directly from ESKOM (Kaziboni, Rustomnjee and Steuart, 2018).

Foundries receiving electricity from local municipalities therefore have got a cost disadvantage and are less competitive in that regard. The inherent municipal pricing anomalies are a result of local government financing arrangement, an inefficiently coordinated and disjointed electricity distribution infrastructure which cannot meet demand and historical poor investment in electricity distribution infrastructure to cater for growth (Khonjelwayo and Nthakheni, 2020; Kaziboni, Rustomnjee and Steuart, 2018).

Foundries have no choice but to contend with acquiring their electricity from municipalities as 46 percent of electricity generated by ESKOM is sold to local municipalities which have been accredited as distribution licence holders at a wholesale price. There are 180 municipalities which are accredited by ESKOM to distribute electricity to their domestic, commercial, and industrial consumers in South Africa. Although municipalities are regulated on electricity tariffs by the National Energy Regulator of South Africa (NERSA), they are reported to be exploiting loopholes in the system in charging consumers more. Electricity tariffs are made up of two components, which are demand charge and energy charge. Demand charge has to do with costs incurred during accessing and operating distribution infrastructure, while energy charge is largely determined by wholesale price charged by ESKOM. The demand charge is difficult for NERSA to regulate, and municipalities take advantage of that to charge consumers more than necessary (Kaziboni, Rustomnjee and Steuart, 2018). Lastly, some of the recommendations proffered to curb this cost of electricity problem include implementation of real-time monitoring and evaluation systems to assess electricity tariffs and the longevity of electricity distribution infrastructure of both municipalities and ESKOM. It has also been suggested that energy intensive sectors should have an electricity special pricing agreement for them to run sustainably. Thirdly, municipalities should look at how to improve their efficiency and competitiveness of electricity supply. Lastly, energy intensive firms can be awarded relocation incentives, while municipalities should be awarded incentives based on how well they maintain their infrastructure (Kaziboni, Rustomnjee and Steuart, 2018).

## 3.7 LOW PRODUCTIVITY AND THROUGHPUT

Mpanza and Nyembwe (2014) suggest that low productivity in South African foundries is caused by five factors: poor management of methods, equipment, people, utilization of resources and lead time. Maj, Werrtz and Pieklo, (2017) also claim that foundry workers work under harsh conditions such as high temperatures, high humidity, dusty conditions, and poor illumination. The same workers also use obsolete equipment and are not provided with adequate protective equipment. Employees working under such harsh challenging conditions cannot have high productivity or produce quality products, which in turn has a bearing on the financial well-being of the foundries. Figure 3-3 below shows a fishbone diagram of the five factors leading to low productivity in South African foundries as suggested by Mpanza and Nywmbwe (2014).

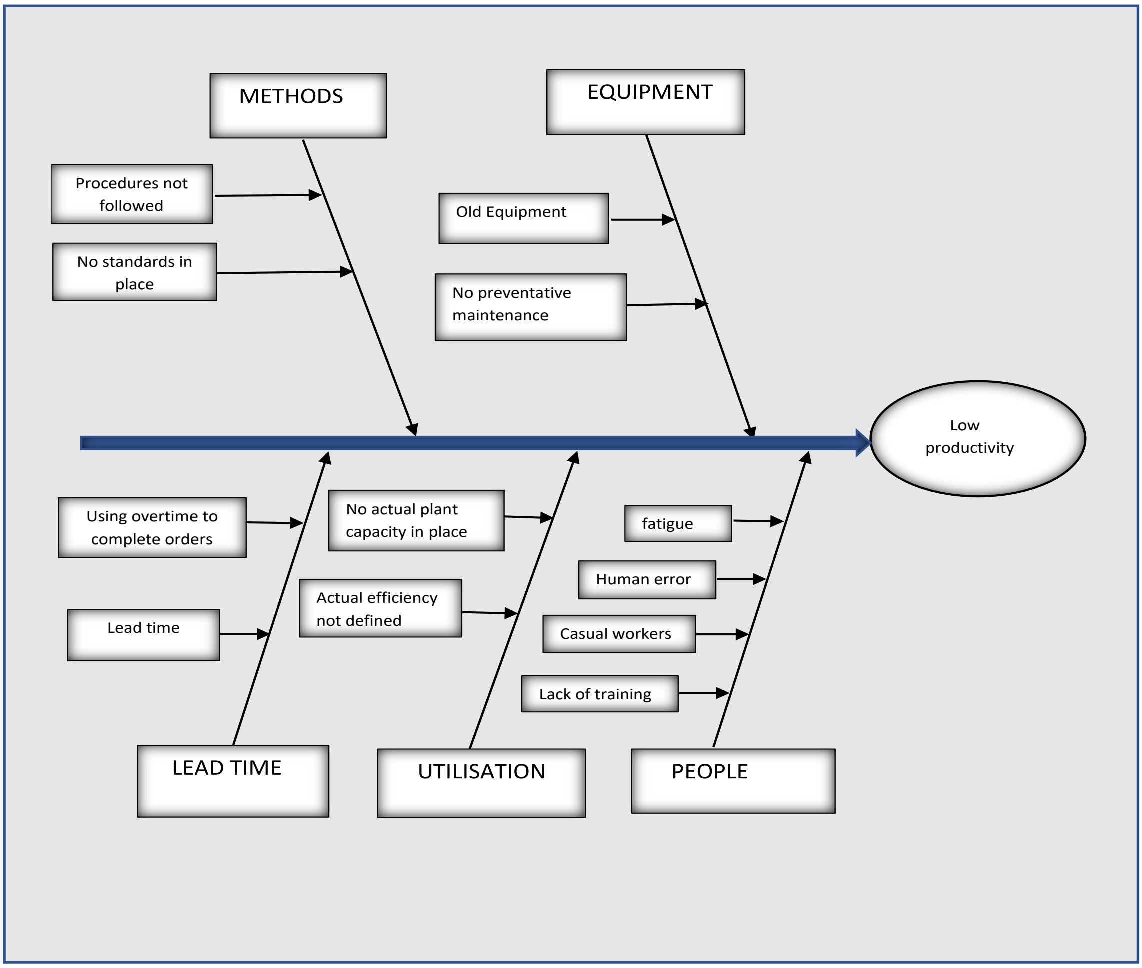


**Figure 3-3: Factors leading to low productivity in South African foundries**
**Source: Adapted from Mpanza and Nyembwe (2014)**

IFC (2010) argues that capacity utilisation can be increased through proper planning, structured approaches and strategic decision-making. Andrews and Gikunoo (2011) concur with Mpanza and Nyembwe's argument by suggesting that lack of documentation for raw materials received affects quality, as consistency of chemical composition and microstructure of final products is compromised. Overreliance on foundrymen's experience and memory inversely affects casting conditions, heat treatment procedures of castings which are supposed to be manufactured according to known procedures and specifications. Other documentation lacking in foundries include procedures for product development, melting and pouring for each grade of metal. Procedures for rejects review, chemical analysis and checking of temperature before pouring have also been reported to be lacking in foundries (Andrews and Gikunoo, 2011). Jardine (2015) also highlight that South African foundries operated fewer days per year when compared to foundries from the other three BRICS nations. Figure 3-4 below shows a comparison of average number of days operated by South African foundries versus number of days operated by foundries from China, India, and Brazil.

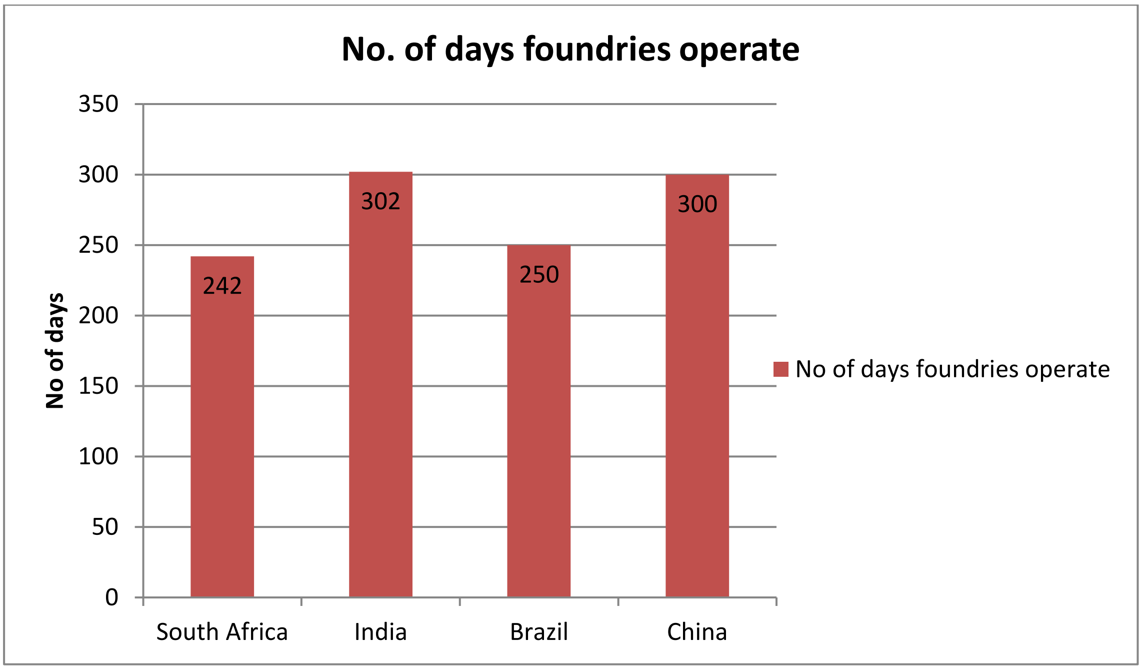


**Figure 3-4: Average number of days worked by foundries from BRICS nations**
**Source: Adapted from Jardine (2015)**

Process knowledge and process improvement initiatives can, however, help foundries to increase their productivity. Process knowledge involves gathering, conceptualisation and analysis of process variables which determine final product characterisation. Process knowledge can help to increase productivity of foundries through reduction of number of defects. Process improvement, on the other hand, helps to improve quality of products from a foundry, as well as to increase competitive advantage. Process improvement is defined as "… the classification and control of the input process parameters to attain the desired output in any given process" (Roshan, 2005:4). Some of the process improvement techniques that foundries could employ include Statistical Quality Control (SQC), Quality Circle, Six Sigma, TQM, Lean manufacturing to name a few (Modi and Desai, 2017; Sithole, Nyembwe & Olubambi, 2019; Solanki, Bhatt, and Pathak, 2020).

### 3.8 INADEQUATE SKILLS DEVELOPMENT AND TRAINING

NFTN (2009) identified a general lack of skilled workers as one of the reasons why South African foundries cannot compete well with foundries from other BRICS nations. Most foundry employees acquired their skills on the job (Jardine. 2015). In some instances, factory owners are left to hire unskilled staff, and need to train them after experienced personnel leave to set up independent factories of their own (Talukder and Jahan, 2017). There is also an acute shortage of skilled workers who can operate Computer Aided Numerically Controlled (CNC) and Computer Aided Design (CAD) technology in developing nations, hence they continue to use conventional lathe, boring, milling, shaping, drilling, and grinding machines (Talukder and Jahan, 2017). This problem is not unique to South Africa. Andrews and Gikunoo (2011) also report that in Ghana, shortage of skills in the foundry extends to areas such as accounting and bookkeeping, skills which enhance the chances of securing support from financial institutions. Foundries in Europe also face the same challenge, as qualified personnel reach retirement age and the changing demographics ultimately lead to intense competition among foundries for the younger generation of qualified personnel (Büchner, 2019).

According to a survey conducted by the NFTN in 2015, lack of skilled workers ranks as the highest challenge among South African foundries (Jardine, 2015). Figure 3-5 below depicts the challenges faced by South African foundries:

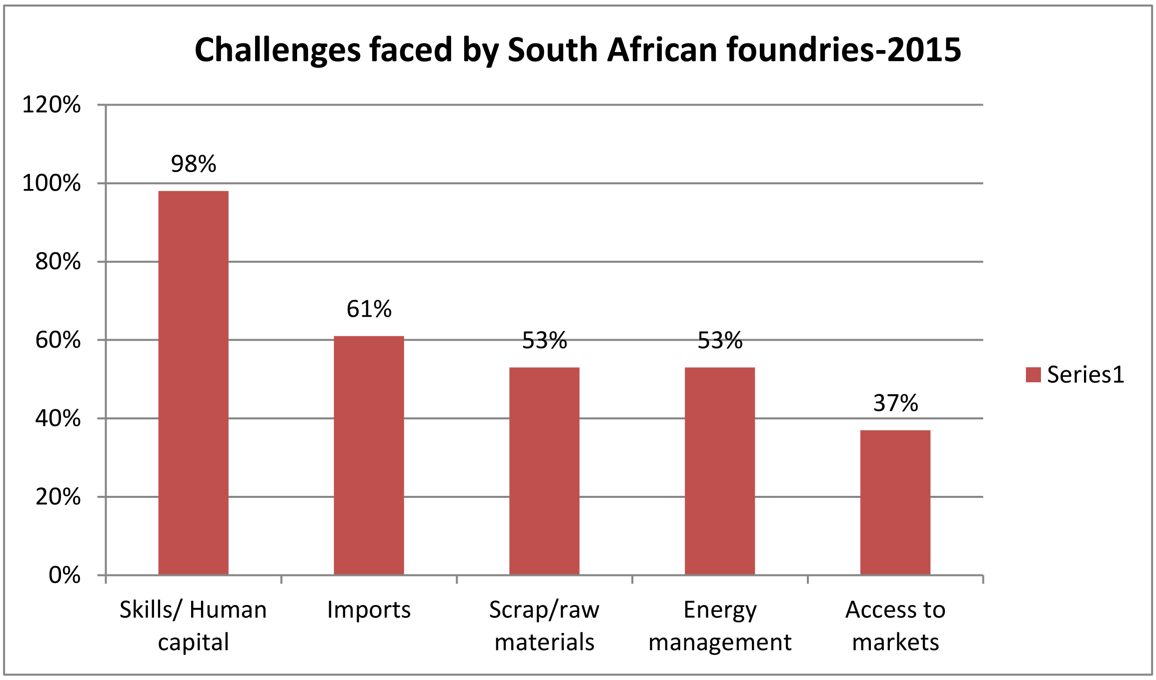


**Figure 3-5: List of challenges faced by South African foundries.**
**Source: Adapted from Jardine (2015:10)**

As can be discerned from Figure 3-5 above, ninety-eight percent of foundry personnel who participated in the survey suggested that skills or human capital was a challenge in the South African foundry industry. Mkansi, Nel and Marnewick (2018) suggest that the low levels of in-service training at local foundries for engineering metallurgy students has led to a shortage of skilled and experienced foundry professionals who could develop the South African foundry industry to compete on the global scale. Mkansi, Nel and Marnewick (2018) further suggest that as an intervention measure, foundries in South Africa should partner with local universities to bridge this skills gap. Government could also assist by funding such programmes, as well as initiating awareness campaigns to bail out the foundry industry. Mulaba-Bafubiandi and Mageza (2016) encourage foundries to support the University of Johannesburg's Metal Casting Technology Station's workplace placement programme that allows students to gain industrial experience before completing their studies. This programme is in line with the Technology Innovation Agency which is funded by the Department of Science and Technology. Figure 3-6 below shows the number of students placed in industry over a seven-year period.

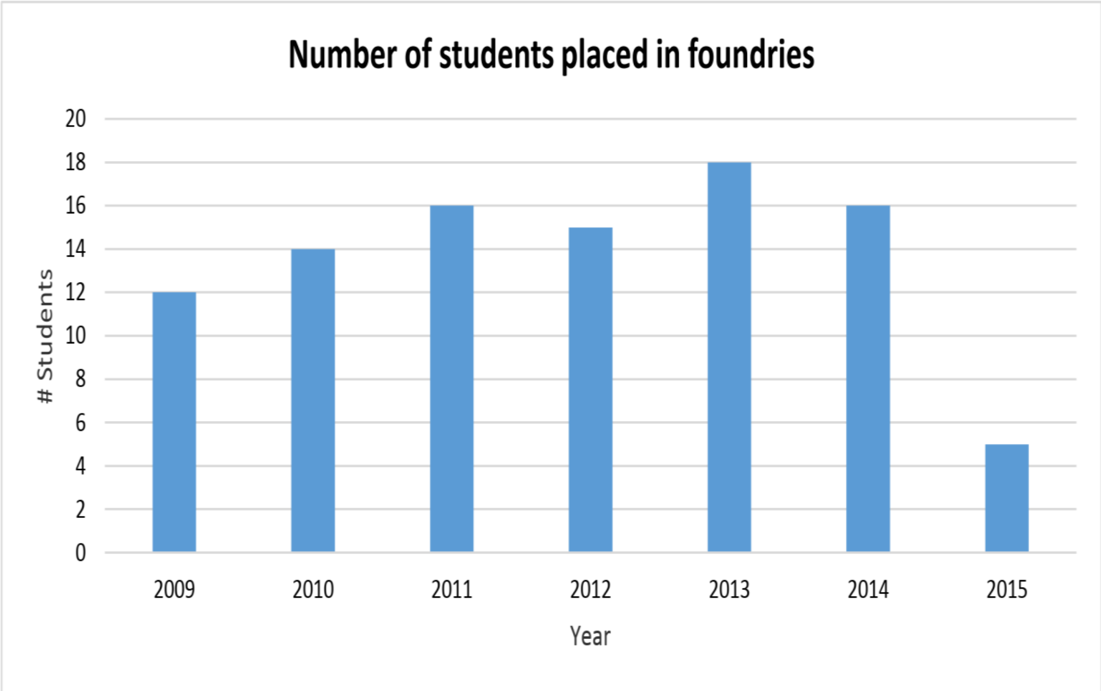


**Figure 3-6: Number of students placed per financial year, 2009 to 2015 Adapted from Mulaba-Bafubiandi and Mageza (2016:5)**

An analysis of Figure 3-6 above reveals that a total of 96 students were placed in industry over a seven year period. 60 percent of the students were retained after completion of the training programme. The placement programme creates a win-win situation for both students and employers. Some of the advantages include talent identification, alleviation of skills shortage, gaining work experience and completion of studies.

Foundry managers also need retraining for them to build capacity in coping with the ever-changing business environment. Assante (2019) suggests that with the advent of industry 4.0, adoption of technologies like machine learning, cloud computing, artificial intelligence and augmented reality has been on the rise. This development has also led to foundry managers and professionals acquiring new skills and competences. This enables them to exploit new business models and opportunities, as well as containing cyber security risks that could arise in the future. Assante (2019) cites an example of the InnoResolve Project Based Learning programme in Europe where foundry managers acquire skills to cope with the changing industrial environment. Managers also learn of good practices and receive case studies of impact of industry 4.0 upon the foundry industry.

## 3.9 COMPLIANCE WITH ENVIRONMENTAL REGULATIONS

According to El Mohamadi (2009), South African foundries are faced with a major problem in the irregular way in which used foundry sand is regulated. The regulations have led to exorbitant costs in disposing used foundry sand. In the past, industry has also cried foul about its lack of opportunity to participate in the drafting of these regulations. An example cited by El Mohamadi (2009) is the cost of disposing used foundry sand in the United Kingdom, which is pegged at $US4.10 per tonne, while in South Africa it costs about $US34.00 per tonne. Jardine (2015) also adds that the cost of compliance with environmental regulations in South Africa can be as high as R5 million, which is exorbitant for small foundries. Jardine (2015) also highlights that South African foundries faced risk of closure if they were found to be non-compliant. Such regulations make local South African foundries unable to compete on the international market, a situation exacerbated by a general unwillingness by industry to unite in resolving the issue.

According to the National Environmental Management Waste Act 59 of 2008:

> "….waste classification" means establishing-
>
> (a) Whether a waste is hazardous based on the nature of its physical, health and environmental properties (hazard classes); and
>
> (b) The degree or severity of hazard posed (hazard categories);
>
> The table below shows classification of foundry waste as stipulated by National Waste Information Regulations in terms of the National Environmental Management Waste Act 59 of 2008."

Tables 3-2 and 3-3 below outline classification of general foundry waste and hazardous foundry waste, respectively.

**Table 3-2: General foundry waste classification**

| LEVEL 1 | LEVEL 2 | | LEVEL 3 | |
|---|---|---|---|---|
| | No | Name | No | Name |
| General Waste | GW17 | Slag | 01<br>02<br>03 | Ferrous metal slag<br>Non-ferrous metal slag<br>Others |
| | GW18 | Mineral waste | 01<br>02<br>03 | Foundry sand<br>Refractory waste<br>Others |
| | GW53 | METALS | 01<br>02 | Ferrous<br>Non-ferrous |

**Source: Adapted from Government Gazette, 2010. National waste information regulations in terms of the national environmental management: waste act, 2008 (act no. 59 of 2008), No. 33384, page 80.**

The table below shows classification of hazardous foundry waste

**Table 3-3: Hazardous foundry waste classification**

| LEVEL 1 | LEVEL 2 | | LEVEL 3 | |
|---|---|---|---|---|
| | | | No | Name |
| Hazardous waste | HW17 | Slag | 01<br>02<br>03 | Ferrous metal slag<br>Non-ferrous metal slag<br>Other |
| | HW18 | Mineral waste | 01<br>02<br>03 | Foundry sand<br>Refractory waste<br>Others |
| | HW20 | Metal scrap | 01 | Contaminated scrap metal waste |

**Source: Government Gazette, 2010. National waste information regulations in terms of the national environmental management: Waste Act, 2008 (Act no. 59 of 2008), No. 33384, page 81.**

Pretorius and Wessels (2018) argue that spent foundry sand is classified as hazardous. Spent sand can only be classified as general waste when tested and proven not to be hazardous. This implies that foundries have got an obligation of ensuring that used foundry sand is disposed of in designated areas, hence adding costs to foundry operations (Mulaba-Bafubiandi, Mageza and Varachia, 2017). To add onto the argument, Joseph, Banganayi and Oyombo (2017) suggest that in as much as South African foundries are interested in installing sand reclamation plants to save costs and minimise the environmental impact of their operations, the cost is prohibitive. There is therefore need for equipment manufacturers to design equipment tailor made for small foundries. Mageza, Mulaba-Bafubiandi, and Banganayi, (2018) also suggest that foundries need assistance in acquiring greener technologies.

Foundries must contend with the National Environment Management: Air Quality Act 39, 2004, whose objectives are as follows:

> "…(2) National norms and standards established in terms of subsection (1) must be aimed at ensuring-
>
> (a) opportunities for public participation in the protection and enhancement of air
>
> (b) public access to air quality information
>
> (c) the prevention of air pollution and degradation of air quality
>
> (d) the reduction of discharges likely to impair air quality, including the reduction
>
> (e) the promotion of efficient and effective air quality management
>
> (f) effective air quality monitoring
>
> (g) regular reporting on air quality; and
>
> (h) compliance with the Republic's obligations in terms of international mandates."

Although the main objectives of the act are pollution avoidance or minimisation, the reduction in generation of greenhouse gases such as Carbon dioxide (CO2), Methane (CH4), Nitrous oxide (N2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), and Sulphur hexafluoride (SF6) among other gases is high priority. The act further states that any individual or entity involved in the emission of gases mentioned above is required to draw, submit, and implement a prevention plan to minimise atmospheric pollution, as described by the minister. The scope of assessment of progress in terms of atmospheric pollution covers the following pollutants in Table 3-4 below.

**Table 3-4: Scope of assessment under National Environment Management: Air Quality Act 39, 2004**

| Criteria pollutants declared in terms of section 9 of AQA | Priority Pollutants declared in terms of section 29 of AQA | Possible Future Pollutants of Concern | |
|---|---|---|---|
| | | National Pollutants | Local Pollutants |
| Sulphur dioxide ($SO_2$); Nitrogen dioxide ($NO_2$); Ozone ($O_3$); Carbon monoxide (CO); Lead (Pb); Particulate matter (PM10); Particulate matter (PM2.5); Benzene ($C_6H_6$). | Carbon dioxide ($CO_2$) Methane ($CH_4$) Nitrous oxide ($N_2O$) Hydrofluorocarbons (HFCs) Perfluorocarbons (PFCs) Sulphur hexafluoride ($SF_6$) | Mercury (Hg); Dioxins; Furans; POPs; Other VOCs; $N_2O$ | Chrome ($Cr6$ +); Fluoride (particulate and gas); Manganese (Mn). Hydrogen Sulphide ($H_2S$) Asbestos Black carbon |

**Source: Adapted from National Environment Management: Air Quality Act 39, 2004**

One of the tools for controlling point source gas emissions and ambient air quality is the Atmospheric Emissions Licence (AEL). Literature shows that the process of acquiring an Atmospheric Emissions Licence is too costly, requiring extraneous administrative work, something that foundries in South Africa cannot afford. What makes it even worse for foundries is the penalty which foundry owners might have to pay if caught without an AEL. Part of the regulation reads:

> "A person guilty of an offence in terms of regulation section 49A (1) (a) read with section 24F of NEMA of these Regulations is liable in the case of a first conviction to a fine not exceeding R5 million or to imprisonment of a period not exceeding five years, and in the case of a second or subsequent conviction to a fine not exceeding R10 million or imprisonment for a period not exceeding 10 years and in respect of both instances to both such fine and such imprisonment."

Foundry owners find themselves between a rock and a hard place as it is costly to acquire an AEL and even costlier to be found without one (Castings SA, 2016).

## 3.10 HIGH TRANSPORT AND LOGISTICS COSTS

Gain Group (2020) described South Africa as a country with a transport intensive economy. The country's Logistics Performance Index (LPI) has been, however, dropping over the years. As of 2018, South Africa was ranked number 33 out of 160 countries surveyed on the World Bank's LPI. This signifies a significant drop, as the country was ranked number 20 out of 167 countries measured in 2016 (World Bank, 2018). Figure 3-7 below shows South Africa’s Logistics Performance Index when compared to other countries.

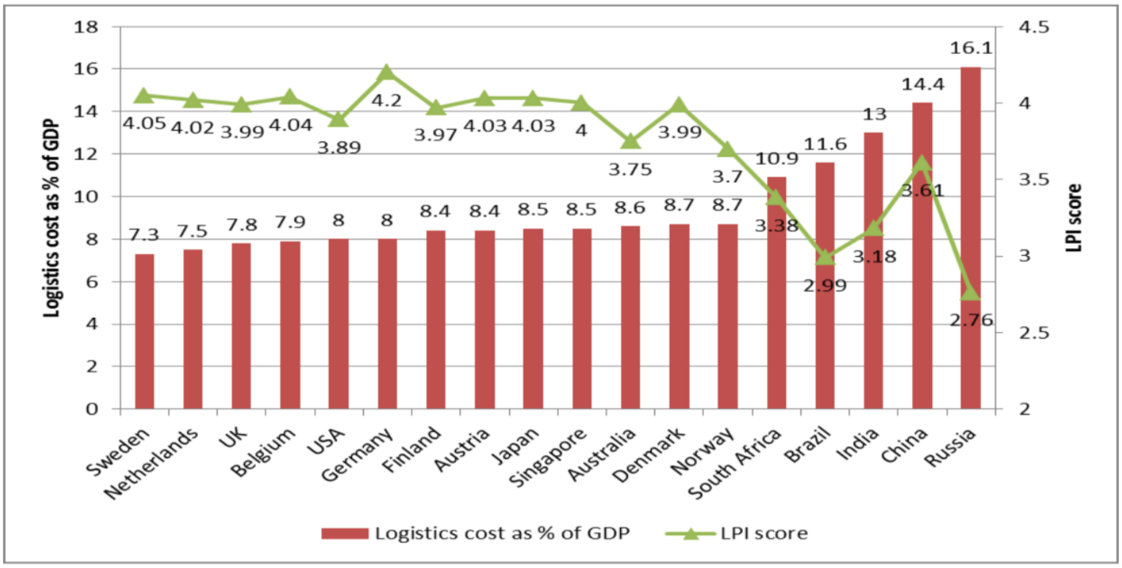


**Figure 3-7: Logistics Performance Indicators of various countries**

**Source: Adapted from Gain Group (2020:10)**

The graph above shows that counties such as USA and European countries have got a much higher LPI score and lower cost of logistics as a percentage of GDP than South Africa. When compared to other BRICS member states, South Africa performs better on the LPI score. As outlined by the Gain Group, there are several reasons why South Africa’s logistics costs are high. Some of the reasons are as follows:

- Bottlenecks in the railway transport system, resulting from lack of adequate infrastructure investment over the years, poor maintenance, theft, and inadequate skills.
- Excess loads emanating from non-native goods also increase transport costs.
- Capacity constraints and operational inefficiencies at the ports
- Labour unrests

According to Ittmann (2010), logistics and supply chain play an important role in a country’s economic growth and competitiveness. Ittmann (2010) further argues that South Africa must continuously improve its logistics and supply chain management environment for it to remain competitive. South Africa’s logistics and transport costs are driven by three factors. The first factor is the country’s geographic spread which results in long distances being travelled within the country during transportation of goods. The second factor is that most economic activities in the country are concentrated in Gauteng province, which is right in the centre of the country (GAIN Group, 2020; Ittmann, 2010). This also applies to the foundry industry where more than 68 percent of the foundries are in Gauteng province (CSIR, 2020). The nearest port to Gauteng province is about 600km (Swanepoel, 2018). The third factor is that South Africa's geographical location disadvantages its industries when competing in the global marketplace (GAIN Group, 2020; Ittmann, 2010). South Africa's Department of Trade and Industry also suggests that competitiveness of downstream metal industries such as foundries is affected by two main factors. The first factor affecting competitiveness of these industries is exorbitant costs of road, rail and port networks. Secondly, inefficiencies in the road, rail and port networks render foundries uncompetitive (DTI, 2018).

Liu (2016) suggests that cost of logistics can be analysed both at a macroeconomic as well as at a microeconomic level. At a macroeconomic level, high costs of logistics limit trade and foreign direct investment in a nation as high logistics costs lead to higher overall trade costs in a country. This also implies that high logistics costs can become a barrier to economic growth of a country. Consequently, countries with higher costs of logistics miss opportunities presented by globalisation. At a micro economic level, high costs of logistics affect a firm's decisions concerning consumer markets to venture into, which suppliers to use and countries to invest in. To illustrate the effects of logistics costs on business, Limao and Venables (2001) suggest that a 10 percent increase in transport costs results in approximately 20 percent reduction in trade volume. If transport costs double, this slows down GDP growth by approximately 0.5 percentage points. Liu (2016) further suggests that the level logistics costs heavily rely on and vary with industry type. Logistics costs become a framing force for logistics intensive industries. Industries such as metal, chemical and food are logistics intensive (Farahani, Asgari & Davarzani, 2009; DTI, 2018; Gain Group, 2020). Closer to home, scrap metal dealers located in coastal regions of South Africa export excess stock due to high logistics costs of transporting scrap inland (Chitaka, von Blottnitz, and Cohen, 2019). Another source of logistics costs which needs to be managed in a foundry is cost of disposing spent foundry sand (Severo, Modolo, Moraes, and Zinani, 2018). Businesses may curb this challenge of logistics costs by implementing logistics management programs. Logistics management includes controlling activities such as inbound and outbound transport, inventory management, warehousing, and fleet management. Logistics management to a lesser extent also includes procurement, scheduling of work and assembly. This implies that logistics management integrates logistics functions with other important functions of a business such as finance, marketing, manufacturing, sales, and information technology (Council of Supply Chain Management Professional, 2020)

## 3.11 LIMITED ACCESS TO CAPITAL

South African foundries need capital injection for investment into new machinery and technology, especially for those foundries which do not qualify for the "IDC Downstream Steel Industry Competitiveness Fund." The South African government can also assist local foundries by providing export finance, just as other countries are providing this to their local manufacturing firms (Jardine, 2015; Mulaba-Bafubiandi, Mageza, and Varachia, 2017; Rustomjee, Kaziboni, and Steuart, 2018). There have been calls for government to relax conditionalities for a foundry to qualify for the IDC Downstream Steel Industry Competitiveness Fund. Some of these conditionalities include a minimum B-BBEE rating of level 4 or higher, as well as meeting set financial thresholds of earnings before interest, taxes, depreciation, and amortization (EBITDA), Net asset value (NAV) and Discounted cash flow (DCF). Rasmeni and Pan (2014) add that high capital investments required to implement projects which increase energy efficiency in industry prevents the implementation of such projects. Limited access to capital equally restricts the scope of work carried out by foundries. As an example, there is a global trend in foundries worldwide to develop increasingly complex metal alloys and deliver fully processed castings. This can only be achieved when significant capital investments have been made in a foundry (Büchner, 2019). South African foundries should receive funding to acquire the technical competencies for the supply to local rail, automotive, electricity generation and mining industries. Some of the funding does not necessarily have to go to foundries directly but could be channelled to research institutions like the CSIR and universities. These institutions would, in turn, work on converting and interpreting international standards into user friendly formats that local manufacturing industries can use to make products which satisfy OEM specifications (Rustomjee et al., 2018).

## 3.12 TECHNOLOGY DEVELOPMENTS-TO SPECIAL SKILLS GAP

Jardine (2015) suggests that there is limited research and development on South African foundries, as well as limited collaboration between R&D institutions and industry. As a result of this hiatus, South African foundries have limited access and understanding of latest technologies. Another challenge highlighted by Jardine (2015) is that original equipment manufacturers demand high standards from foundries but cannot advise foundries on the essential technologies and skills required to manufacture such components. This challenge is not unique to South African foundries, as similar factories in Ghana are equally unable to embrace and adapt to new trends in foundry (Andrews and Gikunoo, 2011). Some work is, however, currently under way in the Metal Casting and Technology Station based at the University of Johannesburg that strives to bridge this technology development skills gap in the foundry industry (Mulaba-Bafubiandi, Mageza and Varachia, 2017).

All intervention measures put in place by the Metal Casting and Technology Station and the NFTN should be synchronised with technological developments in manufacturing industries the world over. Erol, Jäger, Hold, Ott, Sihn (2016) suggest that manufacturing industries are fast embracing the fourth industrial revolution, which is sometimes referred to as industry 4.0. Although industry 4.0 offers many advantages to manufacturing firms, it also comes with its unique challenges. Two of these challenges as reported in literature are heavy financial investments required to acquire new technology and availability of suitably qualified employees to operate the technologies associated with future production systems. Mourtzis (2018) also suggests that under industry 4.0, it is imperative for technical workforce to be equipped with both technical and methodological competencies. Maisiri, Darwish, and Van Dyk (2019) conducted a study on requirements for industry 4.0 in South Africa and concluded that employees of the future shall be required to balance technical and non-technical skills for them to succeed. This is because there are certain indispensable soft skills which cannot be automated. Secondly, with increasing deployment of artificial intelligence in industry, the interaction between man and machine will also increase. For this the viability of such interactivity, soft skills such as critical thinking, innovation, teamwork, creativity, and emotional intelligence shall be required. On the technical skills side digital skills, programming skills and other technological skills will become more relevant. The rapid development and general shorter life cycles of skills set in industry has made it essential for lifelong learning and constant skills upgrading amongst future employees. This means that there is a need for stronger partnerships between industries such as foundries and educational institutions to prepare employees of the future for industry 4.0 requirements. Table 3-5 below shows a catalogue of skills required from future managers and workers in production.

**Table 3-5: Competency requirements for future production**

| | Worker | Manager |
|---|---|---|
| Personal Competencies | • Individuals should perceive and embrace challenges as well as opportunities for personal development. Individuals should also have the tenacity of enduring lifelong learning<br>• A paradigm shift in the way the individual perceives technological developments<br>• A change of perception on the role of technology to human being. Workers of the future should perceive technology as an enabler of productivity and efficiency, as opposed to the viewing technology as a tool for controlling.<br>• Workers of the future should be flexible to accept changing work content, time, and location. This paves the way for agile production | • Managers should perceive and embrace challenges as well as opportunities for personal development. Individuals should also have the tenacity of enduring lifelong learning<br>• A paradigm shift in the way the individual perceives technological developments<br>• Managers of the future should be flexible to accept changing work content, time, and location. This paves the way for agile production.<br>• Managers of the future should shift their approach from a power-driven approach to a value driven approach, for them to effectively manage their teams which will be diverse in nature. |
| Social Competencies | • Workers of the future should understand the relationships between flow of information, possible disruptions as well as potential solutions<br>• Actively seek to build a network of experts who will collaborate to find a solution for challenges<br>• Acquiring problem-solving skills as well a innovation mindset<br>• Working in heterogeneous interdisciplinary and interorganizational teams<br>• Ability to communicate in various languages | • Managers should be able to act as mediators who facilitate social processes throughout their networks<br>• Ability to use social media and other communication platforms for effective and flexible communication |
| Action-related competencies | • Simplification of the Industry 4.0 concept to enable shop floor workers to fully comprehend and embrace it.<br>• Developing an “out of the box” system which enables workers to easily find solutions when faced with complex challenges<br>• Being able to efficiently operate despite the existence of existence of parallel structures | • Strong analytical skills<br>• The ability to find domain-specific and practicable “brown-field” solutions without losing the overall goal<br>• Ability to simplify complex concepts into easy and manageable tasks<br>• Identifying and assigning the right people to perform certain tasks |
| Domain-related competencies | •Being capable to understand the basics of network technologies and data processing<br>• Being able to evaluate whether the subsystems are functioning as expected<br>• Interacting with technological systems through appropriate interfaces<br>• Ability to use specialised software to solve complex challenges<br>• Being able to teach machines | • Being able to see interrelations between the electrical, mechanical and computer components<br>• Developing innovative products and processes and solving related problems in quality<br>• Ability to use specialised software to solve complex challenges<br>• Knowing current software architectures, modelling, and programming techniques<br>• Being able to use statistical methods and data mining techniques<br>• Acquiring new skills such as 3D –printing and Lean principles which enhance production |

**Source: Adapted from (Daling, Schröder, Haberstroh, and Hees, 2018)**

Wolniak, Saniuk, Grabowska, and Gajdzik (2020) conducted a study on the Polish steel sector and concluded that industry 4.0 offers advantages of big data analytics, crucial for decision-making. The foundry industry was also reported to potentially benefit from data mining technology, which is essential for automated decision-making mechanisms in controlling production variables. Another benefit of industry 4.0 for the Polish steel industry was energy efficiency. The new technologies enable production plants to effectively monitor and manage energy consumption. Of course, these new technologies also consume much less energy compared to older technologies. Industry 4.0 also enables manufacturing firms to be part of unified cyber physical system networks where they can identify the best customers, suppliers, and service providers such as logistics companies offering the best services to take their businesses forward. Industry 4.0 technologies can also benefit the steel industry on maintenance as they enable foundries to effectively monitor the condition of machines and production lines through sensors installed in strategic places for the smooth flow and continuity of production. With proper maintenance, breakdowns are also significantly reduced. South African foundries were investigated by Banganayi, Nel and Nyembwe (2019) on the possible benefits of industry 4.0 on green sand moulding processes. The study established that digitisation, smart production, network, smart logistics and cyber physical systems form the building blocks for its integration. Through digitisation, manual information is converted into digital form. In smart production, technologies which integrate the cyber and physical environment come into play. Massive amounts of data generated from various factory components are collected and synchronised in real-time to improve quality production. Smart data comprises information which can be collected and is normally sufficient to warrant action before analytics are performed. An example of smart data generated in a foundry is green sand temperature and humidity readings. Networking is the basis of industrial internet of things (IIOT where information and operational technology converge to improve system integration in capturing, analysing, and communicating important information in real time. This in turn enables industry practitioners to make accurate decisions faster. Smart logistics deal with intelligent methods of executing tasks, as well as planning and control thereof. South African industry may therefore need to convert themselves into what is termed learning factories or teaching factories. In these learning factories, interdisciplinary and multidisciplinary approaches are incorporated for learners to gain the type of skills required in industry 4.0. Mourtzis, Vlachou, Dimitrakopoulos, and Zogopoulos (2018) also add that technologies such as IoT, virtual reality, cloud technology and augmented reality are vital for learning factories, where advanced education is combined with networked ecosystems to develop highly skilled employees who meet the demands of new technologies in the foundry industry. Industry 4.0 principles that could be implemented include melting, moulding, core making, heat treatment, sand reclamation, fettling and quality control. Some of the benefits of incorporating industry 4.0 principles in foundry rope in centralisation of data, informed decision-making, prescriptive analytics, improvement of quality, raw material savings, generation of vital real time information, institutional knowledge, and upskilling of foundry operators (Banganayi, Nel and Nyembwe, 2019).

## 3.13 UNATTRACTIVE FOUNDRY ENVIRONMENT

SAIF (2014) highlights that BRICS countries find it challenging to attract suitably qualified young personnel into the foundry and related industries as they do not have a well-defined career development path. Organisational culture of individual factories hinders foundries from retaining existing employees, as well as luring new recruits, which also include the next generation of foundry owners who are not willing to take over their family businesses (Büchner, 2019; Talukder and Jahan, 2017). Maluwa (2017) conducted research on 262 students studying towards a Bachelor of Technology in Metallurgical Engineering at two universities in Gauteng province of South Africa. The findings show that there is a high proportion of metallurgical engineering technicians and technologists who fall in the generation Y category who have deserted or intend on leaving their core discipline due to the discrepancy between their real experience in the field and what they had imagined the experience would entail while studying. This may be because prospective foundry practitioners only benefit from the NFTN's career path framework for training of interns and postgraduate students (Mulaba-Bafubiandi, Mageza, and Varachia, 2017). Beyond this point prospective foundry practitioners are left on their own to map their career path, hence some of them end up opting to desert their core disciplines. Mining Weekly (2020), however, suggests that for the South African valve and foundry industry to witness more innovation, they must attract and employ more young people. Visser (2017) adds that for foundries to retain young people and create a culture of innovation, they must observe practices such as encouragement, individual consideration, direction, goal setting, role clarity, coaching and development, respect, autonomy, trust, and feedback.

Other factors which make the foundry industry unattractive to young people are health hazards and risk of getting injured or killed associated with foundries. Working in a foundry could impose long term bodily damage, as workers often find themselves having to work long shifts where they lift heavy objects, especially in less developed foundries. More than a quarter of injuries which occur in industry have been attributed to manual handling of materials in the foundry industry (Haldar, Iqbal, Qureshi, and Khanzode, 2021). There have also been reports of foundry employees suffering from musculoskeletal disorders (MSD), which is a result of lifting heavy objects, having to maintain a static posture for long periods of time, working in high places and performing certain repetitive tasks which could have a long-term negative effect on employee health (Douar, 2018; Sharma, Kataria, Suri, and Kant, 2020). There is therefore a need for foundries to incorporate ergonomic principles in their health and safety systems to improve employee productivity, health, and safety. Small scale foundries, however, have got limited knowledge and expertise on ergonomic principles and this limits their application (Haldar, Iqbal, Qureshi, and Khanzode, 2021; Qureshi, Manivannan, Khanzode, and Kulkarni, 2019). Foundry workers are also often exposed to silica dust generated during fettling operations, shakeout, and moulding. Prolonged exposure of foundry employees to high concentrations of such dust leads to lung related diseases such as silicosis, asthma, lung cancer, and breathing-related diseases such as chronic bronchitis emphysema (Sharma et al., 2020). Foundry odour emissions are also highlighted in literature as making the foundry environment a hazardous space. Some of the emissions include phenol, ammonia, trimethylamine. A number of these emissions can be dangerous to humans if they exceed prescribed limits. These emissions are generated in the core shop, shakeout, melting and pouring sections of the foundry (Polvara, Capelli, and Sironi, 2021). The melting section also poses danger to foundry workers as employees are often exposed to noise and heat radiation for prolonged periods of time at these workstations (Racek and Gruszka, 2019). All these factors lead to young employees viewing foundry employment as being hard work, with poor remuneration and not prestigious (Talukder and Jahan, 2017). Some SMEs are also characterized by old machines, small, packed shops, and dirty environment, making working conditions extremely uncomfortable and unhealthy (Talukder and Jahan, 2017).

### 3.14 INABILITY TO COMPETE WITH CHEAP IMPORTS

According to Jardine (2015), many South African foundries are finding it difficult to compete on price with cheap imports from countries like China and India. Talukder and Jahan (2017) also suggest instances where there is generally no standardisation of products and mechanisms put in place to prevent unusual price cuts. Consequently, industry players are forced to also drop their prices to retain customers, hence lowering profit margins and sometimes leading to compromising of quality. Figure 3-8 shows a comparison of the combined cost structures of foundries from BRICS nations.

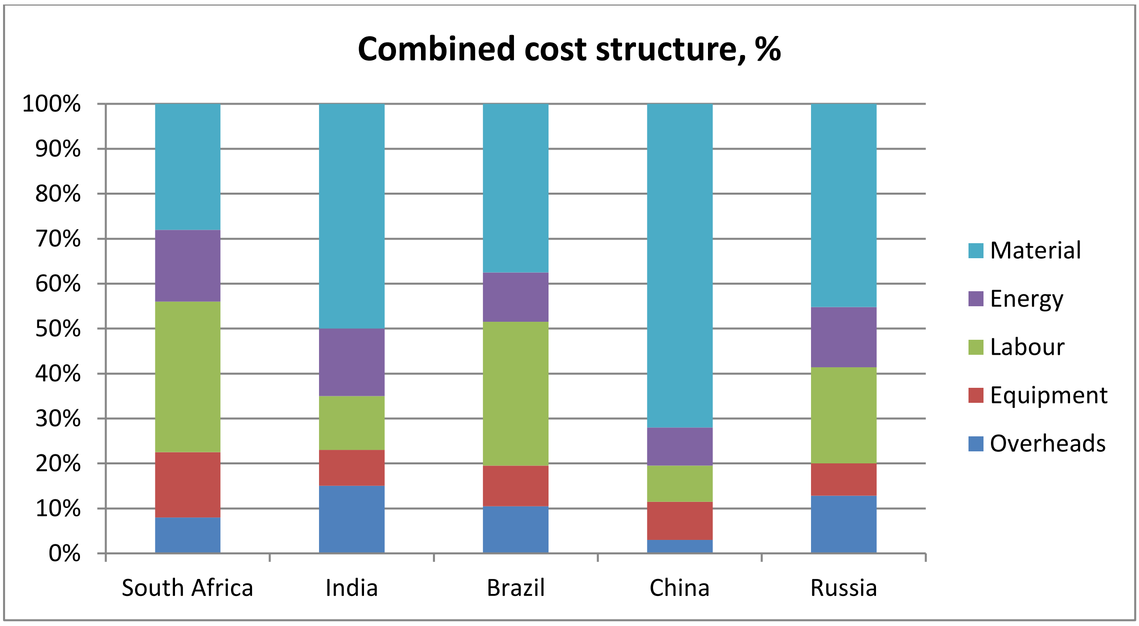


**Figure 3-8: Combined cost structure of foundries from BRICS nations.**
**Source: Adapted from Jardine (2015:24)**

Figure 3-8 above reveals that South African foundries have got a huge advantage over foundries from other BRICS nations in terms of cost of raw materials. South African foundries are also competitive when it comes to general cost of overheads. SAIF (2014), however reports that South African foundries incur higher labour costs, especially personnel with lower qualifications and skills when compared to most foundries from other BRICS nations. A comparison of South Africa and India shows that India enjoys a cost advantage of up to 24% on labour costs. This problem is not unique to South Africa, as automotive foundries in Europe are reported to be also feeling margin pressure as global competition in vehicle manufacture is increasing. An increase in global competition is causing OEMs to put pressure on automotive foundries to supply casting at a cheaper rate, hence reducing these foundries' margins (Büchner, 2019).

As a way of bolstering local manufacturing, the government of South Africa launched the Preferential Procurement Policy Framework Act 5 of 2000: Preferential Procurement Regulation, 2017 (PPPFA). Under this act, the Department of Trade and Industry designates specific products and sectors where state owned enterprises and other government departments are obliged to procure local products. PPPFA is supported by New Growth Path (NGP) and the Industrial Policy Action Plan (IPAP) whose main objectives is job creation (Mulaba-Bafubiandi, Mageza and Varachia, 2017). The department of Trade and Industry also reports that under the localisation program, the South African government aims to achieve 75 percent local content across all public procurement. There is also talk of further extension and tightening of localisation regulations. Government efforts to localise on all public procurement are, however, being hampered by several obstacles. Some of these challenges include red tape in the procurement process, varying interpretations, and application of environmental regulations by municipalities in a manner which threatens sustainability of foundries. High input costs of electricity, raw materials and logistics was also reported to be negatively affecting the localisation program. Lastly, inefficiencies throughout the entire value chain and uneven trading platforms were also cited as hinderances to the government's localisation program (Dti, 2018).

Other quarters are however, calling for government to revise local content regulations in such a way that there is provision for international investment coming into the South African economy, as well as limiting PPPFA designation to products which can be economically and competitively made locally. Localisation program should also take into consideration availability of skills, ability to meet demand at competitive prices and cost to government for supporting and protecting local industry. The relationship between B-BBEE and localisation program also need revision, especially when it comes to recognition and B-BBEE scoring of firms which invest considerably on localisation production and employment. Firms which practice fronting should be heavily penalised as they present imported goods and services as locally made through agency provisions. This agency arrangement raises prices for domestic consumers of goods and services (Kaziboni and Stern, 2020). Taking the above points into consideration, South African foundries need to improve their competitiveness in areas of human capital development, technology, and innovation as well as product and process improvement for them to fully benefit from the localisation program (Mulaba-Bafubiandi, Mageza and Varachia, 2017)

There have also been calls for the introduction of tariffs for cheaply imported goods to protect and promote local industries (SAIF, 2015). This move is, however, not easy as South Africa signed several binding trade agreements. Guei, Mugano and le Roux (2017) give an example of a Trade Development and Cooperation Agreement (TDCA) which South Africa entered with the European Union since 1999. This agreement was meant to create employment, reinforce competitiveness, and contribute to economic growth through bilateral Free Trade Agreement. Guei, Mugano and le Roux (2017) however, claim that the EU-South Africa FTA was only beneficial in as far as improving welfare of South Africans. On the other hand, this arrangement poses revenue loss threats to the government and a trade imbalance. Lechthaler and Mileva (2018), however, argue that although increasing import tariffs may boost local production, exporting firms will most likely suffer, as trading partners whose goods are being charged import tariffs are most likely going to retaliate and trade wars ensue. The authors further argue that imposing import tariffs will lead to consumers suffering as they may end up paying higher prices due to limited choices. Skilled workers, whose expertise are required more in exporting firms may also end up out of work as their demand goes down. On the other hand, unskilled workers in import competing firms end up benefiting the most from price wars.

## 3.15 CHAPTER SUMMARY

This chapter presented fourteen major challenges being faced by South African foundries. Possible intervention strategies to help alleviate these problems were also discussed. The next chapter reviews research methodology employed for this study.

# CHAPTER FOUR - RESEARCH METHODOLOGY

This chapter presents, discusses, and justifies the research methodology used for this study. A detailed account of the research design, sampling and sampling techniques are examined. Other aspects discussed in this chapter include data collection methods and how data is analysed. An acknowledgement of limitations of study and expected contributions to body of knowledge of the study are proffered. The chapter terminates with a summary of these various methods components.

## 4.1 CONVERGENT PARALLEL MIXED METHODS

This study employed convergent parallel mixed methods design to collect both qualitative and quantitative data. Analysis of data was conducted separately, after which a comparison of the quantitative and qualitative findings was done to confirm or disconfirm the results. According to Creswell and Creswell (2018), the basic assumption of the convergent parallel mixed method design is that quantitative data and qualitative data produce different types of information. Creswell and Creswell (2018) also suggest that the key to this design is collection of both forms of data using similar or parallel variables, concepts, or constructs. Figure 4-1 below shows how a study employing convergent parallel mixed methods is conducted. This study was also conducted in the same fashion.

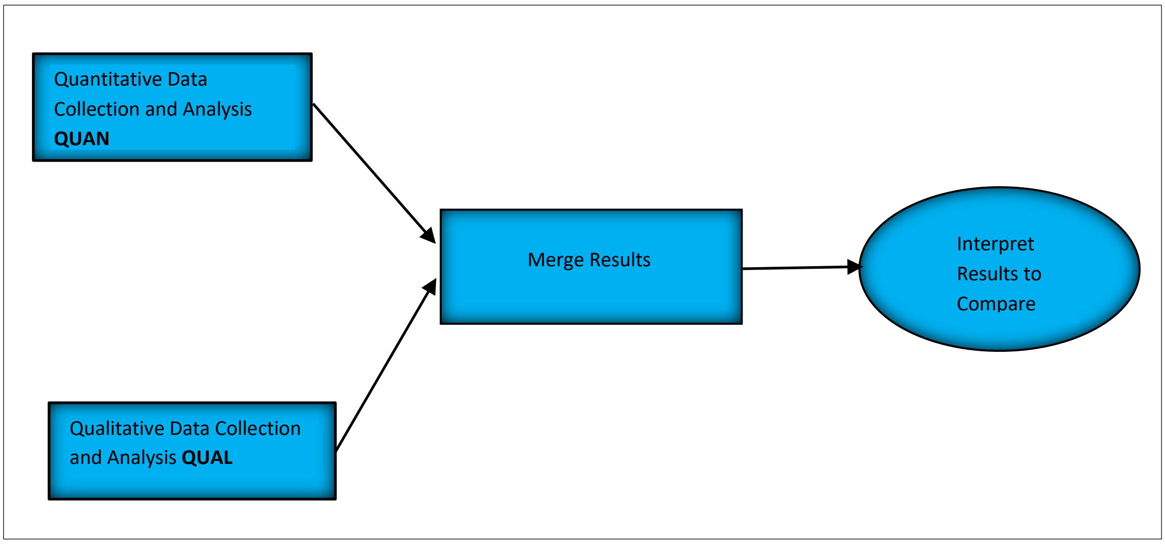


**Fig 4-1: Convergent parallel mixed methods design**
**Source: Adapted from Creswell and Creswell (2018)**

According to Creswell and Creswell (2018), the sample size and data collected from qualitative method is smaller than the data collected from quantitative method. Creswell and Creswell (2018) further explain that collecting qualitative data is designed to obtain extensive information from a small sample. On the other hand, a large N is required for quantitative research to conduct meaningful statistical tests. This study identifies a large sample for quantitative analysis and a small sample of participants for qualitative analysis. The qualitative portion was incorporated to gain an in-depth perspective while the quantitative portion seeks to generalise the study findings.

## 4.2 RESEARCH TYPES

Literature suggests that there are three main types of research, namely: qualitative, quantitative, and mixed methods (Creswell and Creswell, 2018). This segment of the study provides amplification on these versions of research.

### 4.2.1 Qualitative research

Denzin and Lincoln (2011:3), define qualitative research as:

> "…a situated activity that locates the observer in the world. Qualitative research consists of a set of interpretive, material practices that make the world visible. These practices transform the world into a series of representations, including field notes, interviews, conversations, photographs, recordings, and memos to the self. At this level, qualitative research involves an interpretive, naturalistic approach to the world. This means that qualitative researchers study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring them."

Qualitative researchers operate on the conviction that knowledge already exists only yet to be discovered in an ongoing manner as people indulge in and discover the meaning of an activity, experience of phenomenon (Meriam and Tisdell, 2016). Qualitative research utilises participant observation during data collection (Sekaran and Bougie, 2019). Qualitative researchers understand meanings, descriptions, concepts, and characteristics of phenomena as they explore how people make sense of themselves and others in their daily lives (Lune and Berg, 2021). According to McCusker and Gunaydin (2015), qualitative research strives to gain deep understanding of social life issues, adding that qualitative methods measure qualities such as people's experiences and attitudes helping to answer questions concerning the 'what', 'how' or 'why' of a phenomenon. A good starting point for qualitative research is defining general concepts, which change as the research progresses (Sekeran and Bougie, 2019). Qualitative research focusses on concepts and categories, not their occurrences and frequency. The aim of qualitative research is to test theory as opposed to being descriptive, where inferences and generalisations are made. Qualitative methods are also linked to analytic induction (Brannen, 2017). Meriam and Tisdell (2016) add on to the argument by suggesting that qualitative research can best be described by four key characteristics. The first is the fact that qualitative research focusses on process understanding. The second characteristic is that the researcher is the principal tool for data collection and subsequent analysis. The third characteristic is that the process is inductive. The last is that the process is highly deductive, implying that words and pictures are used to depict researcher's findings concerning a phenomenon, as opposed to numbers. Some of the advantages of qualitative research are that it enables the researcher to gain insights on the topic investigated through verbal and non-verbal communication, allows data to be processed immediately, allows the researcher to seek immediate clarification from respondents for accuracy of interpretation and allows the researcher to explore unanticipated responses (Meriam and Tisdell, 2016)

Qualitative research also has got its own limitations, some of which include biases which may be introduced by the human instrument (Meriam and Tisdell, 2016), the research method may lead to a disconnect between research and relationships established between measures and concepts are based on assumptions, hence the dependence of qualitative research on procedures and research instruments leads to a disconnect between research and real life (Bryman and Bell, 2011).

Flick (2018) suggests that decisions to employ qualitative research can be influenced by specific developments in the social worlds studied, research questions posed, as well as limitations of quantitative research. According to Flick (2018), good qualitative research satisfies four variables, namely: appropriateness of methods and theories, appreciation of participants' perceptions and diversity, reflexivity of the researcher, as well as the different approaches and methods available in qualitative research.

Saunders et al. (2019) suggest that qualitative research can be used in instances where there is a lack of theory to explain a phenomenon, hence its inductive nature.

### 4.2.2 Quantitative research

According to Sukamolson (2007:2), “quantitative research is the numerical representation and manipulation of observations for the purpose of describing and explaining the phenomena that those observations reflect.” Opuke (2017) contend that quantitative research methods seek to answer questions about ‘how many’ or ‘how much’ of a phenomenon. Cresswell and Creswell (2018) agree with Opuke (2017) by suggesting that quantitative research, by and large, is associated with the process of enumerative research as it seeks to deduce relationships between variables and a population. Sekeran and Bougie (2019) suggest that in quantitative research, proposed relationships between variables are used to form hypothesis before collecting data. The same hypothesis is tested after data collection. It is clear therefore that in terms of quantitative research, variables provide basis for analysis. Some disadvantages of quantitative research are that the instrument is pre-determined hence less flexible, lacks imaginative input and lacks reflexivity (Sekeran and Bougie, 2019). Other features which characterise quantitative research, as suggested by McCusker and Gunaydin (2015) include enabling the researcher to gain clarity on what they are looking for, allowing all facets of the study to be considered and incorporated in the research design before collection of data commences. Another advantage of quantitative research is that questionnaires and other equipment are utilised to gather numerical data, which can be presented in numerical and statistical form. Quantitative data is also more efficient, allowing the researcher to test hypotheses, although it may exclude contextual detail. Lastly, quantitative research allows the researcher to be detached from the participants and subject matter. McCusker and Gunaydin (2015) also add that quantitative research is cheaper and faster to conduct, finds good use during study of broad and diverse fields where statistics generate relevant data which can be used to establish future trends. Quantitative methods also allow repeated analysis of larger and multiple samples under similar conditions which forms the basis for comparisons formulated and quantifiable information generated from these methods is easily accessible.

### 4.2.3 Mixed methods

Mixed methods research is based on a pragmatic worldview and integrates qualitative and quantitative strands in the same study (Creswell and Creswell, 2018). In utilising mixed methods, the researcher typically simultaneously collects both forms of data, and this is subsequently integrated in interpreting the overall results. Any contradictions or unrelated results are then explained or further examined (Creswell and Creswell, 2018). Some considerations made before undertaking mixed methods include justification for using mixed methods, searching for philosophical approaches, appreciation of several mixed methods designs, evaluation of required skills, examination of project management schedule, ensuring that rigour is ensured throughout (Halcomb and Hickman, 2015). The inclusion of diverse views justifies the adoption of mixed methods in research (Saunders, Lewis, and Thornhill, 2019). Other factors considered in choosing a mixed method design include the way data is used together, timing of data collection process, the level of importance attached to each database, suitability of research design most suitable for field under study and number of people involved in the research (Creswell and Creswell, 2018). The table below shows some models of mixing.

**Table 4-1: Models of mixing**

| Model of Mixing | Definition |
|---|---|
| Integration | Both data sets are collected at the same time, but analysis is conducted separately. Integration of findings is done during the interpretation of results. |
| Connection | One approach is developed from the findings of the other. |
| Embedding | Analysis of one data type is entrenched within the other. Usually, a small portion of qualitative data component is embedded in a predominantly quantitative study. |

**Source: Adapted from Zhang and Creswell (2013)**

**Advantages of mixed methods**

This study uses mixed methods for the following reasons. Utilising the two methods of research afford a thorough understanding of the subject matter under investigation

(Halcomb and Hickman, 2015). Mixed methods also offer the capacity to compare different perspectives drawn from qualitative and quantitative data (Creswell, 2018). Mixed methods assist in establishing an informed understanding of the need for and influence of an intervention programme. Other advantages mixed methods gave to this study include allowing for robust results and conclusions and provision for improved and inclusive conclusions (De Loo & Lowe, 2011).

This is not to imply that mixed methods do not have disadvantages. Some of the disadvantages of mixed methods include the danger of losing depth and flexibility when qualitative data are quantified (Driscoll et al., 2007), laborious and expensive statistical measurement involved often compels researchers to reduce sample sizes or time required to conduct interviews (Driscoll et al., 2007; De Loo & Lowe, 2011) and most researchers are experienced in one research method. As a result, mixed-methods research end up requiring collaboration of many different research experts (Driscoll et al., 2007). To avoid the challenges associated with quantification of qualitative data, the qualitative portion was preserved in its form throughout the research. Secondly, the quantitative questionnaire was conducted online to enable the researcher to collect as many responses as possible in a short space of time.

## 4.3 RESEARCH DESIGN

Sekeran and Bougie (2019) describe a research design as a master plan followed during collection, measurement, and analysis of data in answering the research question. This is reinforced by Mouton (2011:56) who argues that a research design is:

> "…a 'map' or a 'blueprint' of how one intends to conduct research. It is a plan that guides the researcher in the dynamics of data collection, analysis, and interpretation of its findings."

Sekeran and Bougie (2019) further add that a good research design should address research strategies, the extent of researcher interference, units of analysis, study settings, data collection method, sampling design and time horizon. Gorard (2017) suggests that the elements of a design can be combined in several ways to form different designs, of which common examples are longitudinal, cross sectional, and experimental studies. Longitudinal design involves repeated collection of data from a single group of cases and emphasises the time element. Cross sectional design involves collection of data from two or more groups at the same time. Experimental or quasi-experimental design is when two or more groups are investigated, but certain groups receive interventions which other groups do not get. For this study, a cross sectional research design was utilised because it clarifies the prevalence of a problem, phenomenon, or attitude by means of a snapshot of the population. Cross sectional studies offer the advantage of presenting an overall picture of the state of things at the time of the study by taking a snapshot of the population. The results drawn can be used to draw conclusions about a phenomenon applicable to the whole population (Cummings, 2018). The third reason for selecting a cross sectional design is that it only involves single contact with respondents hence significantly bringing down costs of the study. The following section will explain in detail elements which make up a good research design.

## 4.4 NATURE OF STUDY

According to Sekeran and Bougie (2019), research studies may be exploratory, descriptive, or conducted to test hypotheses. The extent to which knowledge about the research topic has developed determines whether studies are exploratory, descriptive or hypothesis testing. Exploratory studies are the least rigorous, followed by descriptive studies which demand rigour and lastly hypothesis testing that demands a high level of rigour (Sekeran and Bougie, 2019). This study was descriptive in nature.

## 4.5 EXTENT OF RESEARCHER INTERFERENCE

In correlational studies, the extent of researcher interference is minimal as compared to cause-and-effect studies where the researcher manipulates certain variables to establish the effects of the changes introduced on the dependent variable under investigation (Sekeran and Bougie, 2019). For this study, there was minimum researcher interference.

## 4.6 STUDY SETTING

Organisational research may be conducted in a non-contrived setting, where events occur in their natural environment or in a contrived setting which is artificial. Correlational studies take place in a non-contrived setting, whereas causal studies are generally conducted in a contrived laboratory setting (Sekeran and Bougie, 2019). This study was conducted in a non-contrived setting, as there was minimal researcher involvement by way of manipulation of variables or influence on organisational activities.

## 4.7 RESEARCH STRATEGIES

There are several strategies from which researchers choose for their investigations. Some of these strategies, as given by Sekeran and Bougie (2019) include experiments, surveys, researcher observations, case studies, grounded theory action research and mixed methods. Experiments find use in deductive research and scientific research, while surveys are used to collect information from or about people, with the aim of describing, comparing, or explaining their knowledge attitudes and behaviour. Observations are conducted in the natural setting of people, after which description, analysis and interpretations are done. Fox et al. (2008) refers to a case study as a means of organising social data to view social reality. In a similar vein, Creswell and Creswell (2018) views a case study as a 'bounded' system, the system being research in terms of time, place or some physical boundaries where it is carried out. Under case studies, a researcher collects information about an event or object, where an object can be an individual, group, or organisation. Through case studies, the researcher strives to understand the problem better through using different angles and employs several methods of collecting data. Clearly, case studies have merits since cases are accompanied by idiographic explanations that focus on an in-depth understanding of a particular case (Monette et al., 2011). Multi-case studies also have such advantages. In addition, Kumar (2011) claims that in a case study, people speak in their voices. The researcher is therefore provided with appropriate information: they do not tell the respondents what to say. While case studies have the above merits and more, Punch (2006) cautions that results from one case study cannot be applied to other case studies. There is also an element of subjectivity due to dependence on the views of a dominant individual or group of individuals in a case study (Monette et al., 2011). Grounded theory involves a methodical set of procedures employed to establish a theory from data collected through induction. Action research as explained by Sekeran and Bougie (2019) is normally undertaken with the intention of planned research in an organisation and is popular with consultants. Mixed methods involve a two-part research where qualitative and quantitative studies are both combined (Sekeran and Bougie, 2019). This study employed mixed methods research strategy.

### 4.8 MEASUREMENT AND MEASURES

According to Sarstedt, Hair, Ringle, Thiele, and Gudergan (2016), any research, regardless of whether it is inductive or deductive, must deal with theoretical models and conceptual variables. Sarstedt et al. (2016), submits that a theoretical model is a set of structural relationships between variables which constitute a theory. On the other hand, conceptual variables are thoughts or ideas about abstract concepts established and measured by researchers. Kline (2015) suggests that there are two broad classes of variables in SEM, namely observed and latent variables. Observed variables, which are also referred to as manifest variables are the researcher's data, for which the researcher has collected scores and entered in a data file. Joreskog and Sörbom (1993) further suggests that observed variables are usually in categorical, ordinal, or continuous form.

Latent variables are hypothetical constructs which are assumed to explain a continuum but cannot be directly observed. All latent variables of SEM are continuous in nature. Sarstedt et al. (2016) agrees with Joreskog and Sörbom (1993) by suggesting that latent variables, also referred to as constructs, are not directly observed, but are usually mathematically inferred from manifest variables observed or directly measured. Item indicators can be in the form of questionnaires which capture respondents' behaviours, attitudes, and perceptions. Manifest variables can also be in the form of secondary variables (Sarstedt et al., 2016).

Two other terms useful for this research are attribute and focal object. The attribute is a general type of property to which the concept refers, such as perception, attitude, or behavioural intention. On the other hand, focal object is an entity to which the property is applied. Examples of focal objects include service, product, prices. In this research, SME owners or managers' perceptions constitute the attribute and variables like talent management, marketing approach, customer relations are examples of the research's focal objects.

## 4.9 UNIT OF ANALYSIS

The unit of analysis is "…the level of aggregation of the data collected during the subsequent data analysis stage" (Sekeran and Bougie, 2019). The unit of analysis should be selected during formulation of research questions, as it has a guiding effect on method of collecting data, establishing sample size and variables. The unit of analysis is usually in the form of individuals, dyads, groups, divisions, industry, or countries. As research questions shift focus from individual across the spectrum to nations, so does the unit of analysis shift from individuals to dyads, groups, organizations, and nations (Sekeran and Bougie, 2019). For this study, the unit of analysis was individuals.

## 4.10 SAMPLING DESIGN

According to the National Foundry Technology Network database, there are a total of 123 operational foundries in South Africa, of which six foundries are large foundries. This implies that there are 117 small to medium scale foundries in South Africa. Population for this study is 117 small to medium enterprise foundries. Sekeran and Bougie (2019) suggest that in some instances, it is impossible to collect data from the whole population, so a researcher can use a sample. A sample can be defined as a subset of the population, whose characteristics are representative of the population. (Brinkerhoff, et al., 2008). Kumar (2011) adds that a sample is a small fraction of the population which is subjected to research enquiry. Studying a sample offers several advantages such as more likelihood of attaining reliable results through minimising chances of fatigue and data collection errors often associated with studying an entire population. Other motivations for studying a sample include time constraints, costs savings, and other logistical constraints. Six other factors considered during deciding sample size, as suggested by Sekeran and Bougie (2019) were: the researcher's desired objectives, the required level of precision, the tolerable risk in predicting the required level of precision, level of variability in the population, existing time and cost constraints, and size of population.

According to Sekeran and Bougie (2019), the two major sampling designs are probability and non-probability sampling. Probability sampling design allows generalizability, while non-probability sampling cannot lead to generalizability. There are several probability sampling methods which can be employed which include simple random sampling, stratified sampling, cluster sampling and purposive sampling. This study employed two probability sampling methods for selecting participants. The first sampling is purposive sampling which was utilised to select potential participants for the qualitative portion of the study.

***Purposive sampling:***

Purposive sampling is reported to improve rigour of a study and trustworthiness of data and results obtained through correct matching of the sample to the aims and objectives of the research (Campbell et al., 2020). Purposive sampling may further be divided into judgemental sampling and quota sampling. Quota sampling cannot be generalised as is done in stratified random sampling (Sekeran and Bougie, 2019). Quota sampling is conducted in such a way that certain groups are well represented in the study through assigning a quota. Sekeran and Bougie (2019) further explain that quota samples are essentially stratified samples, whose subjects were chosen nonrandomly.

Judgemental sampling involves choosing subjects in best position to provide a rich data source, such as knowledgeable opinion leaders. This sampling method is employed to obtain information from specific target groups of people who are in right standing position to give the required information. This target group could possibly be the only ones privileged to have that kind of information or meet a specific standard laid out by the researcher (Sekeran and Bougie, 2019). This study employed judgemental purposive sampling for the qualitative portion of the study. This method was employed with the aim of acquiring rich information from individuals generally regarded as experts in the foundry industry. Guest, Namey, and Chen (2020) encourage researchers to keep interviewing respondents until there is data saturation. Sample size for the qualitative part of the study is 11 participants. Data saturation was observed after interviewing 11 participants.

***Cluster sampling***

This method is the second sampling method which was utilised to select participants for the quantitative portion of the study. This method was employed to gather information from foundry industry stakeholders who occupied supervisory, management and directorship positions in their respective organisations. Individuals who occupied a supervisory role and upwards were deemed by the researcher to be knowledgeable enough to understand the intricate details of their organisation, therefore qualified to respond to the questionnaire. Sekeran and Bougie (2013:268) provide a table to determine sample size for various population sizes. The authors suggest a sample size of 97 for a population of 130. Informed by suggestion given by Sekeran and Bougie (2019), this study attempted to cover the entire population since difference between sample size suggestion and population size is small. This implies that sample size targeted for this study was 117 foundries. The study also covered all eight provinces of South Africa in which the foundries are located.

## 4.11 TIME HORIZON

During research, data may be gathered once over a period of days to months to answer a research question or a researcher might study people or a phenomenon during different times. The former is referred to as one shot or cross- sectional studies, while the later, is referred to as longitudinal studies (Sekeran and Bougie, 2019). This study is a once shot cross sectional type.

## 4.12 DATA COLLECTION METHOD

The process of data collection is crucial. Commenting on this process, Freeman (1998:90) points out that:

> "Collecting data is collecting information that relates to your inquiry, information that you believe will respond to your research question. The data are not the answer to the research question; they are the raw material out of which responses to your question will emerge. …Thus, separating the gathering of information from working with it to find a response is a key part of the structure and discipline of the research process."

Sekeran and Bougie (2019) comment that data collection methods play a critical role in research design, as an appropriate method greatly improves the value of the research study. Data can be collected from primary or secondary sources. Primary data is first-hand information obtained from variables being investigated in the study. Some sources of primary data include individuals, field and lab experiments, interviews conducted face to face, telephonically, computer assisted and via electronic media. Observations which may involve audio and video- taping, as well as motivational techniques like projective testing may be employed as means of gathering primary data. Focus groups, panels of respondents or internet- administered questionnaires also form part of primary data collection methods (Sekeran and Bougie, 2019). Näslund (2016) also outlines advantages and disadvantages of several primary data collection methods, which include interviews, surveys, observations, and motivational techniques. Table 4-2 below shows some advantages and disadvantages of various research methods as given by Näslund (2016).

### Table 4-2: Advantages and disadvantages of various data collection methods

| Research Method | Advantages | Disadvantages |
|---|---|---|
| ***Surveys*** | • Low cost<br>• Suitable to gather sensitive information - confidentiality can be stressed | • This method of enquiry has a poor response rate<br>• non-response from participants may lead to bias<br>• Long questionnaires have a tendency of reducing response rate |
| ***Telephone Interviews*** | • The researcher may conduct numerous interviews within a limited timeframe<br>• Access is easy and call backs are possible | • It is not possible to use visual aids and to perform complex tasks when using this method of enquiry.<br>• This method limits the researcher to verbal communication |
| ***Structured Interviews*** | • All interviewees answer the same questions – responses can be easily compared<br>• Reduced interviewer bias<br>• Statistical techniques can be used to analyse data. | • Flexibility is limited<br>• Responses may be limited by standardised wording format<br>• Set questions may not be relevant during actual interviews |
| ***Unstructured Interviews*** | • Follow up questions may be asked during the interview Interviewer's role is minimal | • Comparability of responses is difficult<br>• Analysis of the results is more difficult |
| ***Semi-Structured Interviews*** | • Method of enquiry is flexible<br>• Responses of key questions can be easily compared | • Bias is increased, as interviewer selects questions. Some difficulty in comparing responses |

**Source: Adapted from Näslund (2016:49)**

Secondary data on the other hand refers to data gathered from already existing sources. Some examples of secondary data include books, periodicals, websites, the internet, media, organisational annual reports, and government publications (Sekeran and Bougie, 2019). One advantage of using secondary data sources is that it saves time and costs of acquiring information. Sekeran and Bougie (2019) however warn that the information needs to be current for it to be relevant, as well as the fact that certain information obtained may not meet the needs of specific settings.

This research utilised primary data which was collected by means of a questionnaire which were administered online for the quantitative part of the study and personally administered for the qualitative part. Online questionnaires offer the advantages of data collection efficiency in as far as time, energy, and costs. Two separate questionnaires were administered, one to cater for the qualitative part of the study and another one to cater for the quantitative part of the study. The questionnaire covering the quantitative portion of the study contained closed questions and the other covering the qualitative portion of the study contained open ended questions. Closed questions offer advantages of aiding respondents in making quick decisions during interviews and aiding the researcher to easily code information obtained for consequent analysis. Open ended questions on the other hand give participants an opportunity to make additional comments which may not have been covered by the questionnaire.

## 4.13 QUESTIONNAIRE DESIGN

The questionnaire as hinted above, is another key research instrument, which can be used in conjunction with the listed research methods above. To overcome some of the challenges associated with using a questionnaire, the instrument was designed in such a way that for closed questions the alternatives are mutually exclusive and collectively exhaustive, categories are not overlapping as well as the categories are exhaustive (Sekeran and Bougie, 2019). The questionnaire was also designed in such a way that negatively worded, double barrelled, recall dependant, leading, loaded and socially desirable questions were avoided. Care was also taken to ensure that questions were simple and short. A funnel approach was also utilised in the sequencing of questions to ensure that the respondents answer questions of a general nature first before specific ones, and that easy questions came before difficult ones, as suggested by Sekeran and Bougie (2019). UKZN ethical requirements were used as a guide during designing and administration of the questionnaire

## 4.14 DATA ANALYSIS

Raw data collected during research comes either in quantitative form or qualitative form. Quantitative data is numerical in nature as is in the form of counts, attitude ratings or readings observed from an instrument. Qualitative data on the other hand involves non-numerical observations such as transcripts generated from interviews, field observations and organisational documents (Cooksey, 2020). Data, however, needs to be analysed in such a way that it makes sense to the reader (Fekete, Jankun-Kelly, Tory, and Xu, 2019).

### 4.14.1 Quantitative data

#### 4.14.1.1 Getting data ready for analysis

For quantitative data, some of the steps involved in data analysis include choice of tools for analysis and justification for those choices, data preparation and coding, data screening, checking for irregular data patterns and transformation. Under data coding, each participant's response was assigned a number to allow them to be entered into a database. After coding, the data was entered into a database. SPSS Data Editor was used to create a data file. Data was then edited to detect omissions and correct illogical, inconsistent, and illegal data received from participants. The last stage of data preparation is data transformation, which is a variation of data coding. Data transformation involves changing the initial numerical symbol of a quantitative value to a different value (Sekeran and Bougie, 2019). Assumptions are then checked to establish if they are fulfilled by specific procedures. If assumptions are not met by procedures used, then the researcher should report how they will rectify the problem. This step is followed by description of demographics of the sample, which in turn is also followed by description of procedures for checking of validity and reliability. Description of results of analysis and how they address hypothesis and research questions then follows (Cooksey, 2020).

#### 4.14.1.2 Feel for data

After data had been prepared, a feel for the data was done to get a visual summary. Descriptive statistics for each variable were also established. Responses to each individual item were checked for spread, as a good spread signifies good variability, hence implying that the proper wording was used to construct the question. According to Sekeran and Bougie (2019), if participants generally tended to respond in the same fashion, it implies that that there is bias in the questionnaire. According to Sekeran and Bougie (2019), getting a feel for the data is an important first step of data analysis.

#### 4.14.1.3 Goodness of data

Under goodness of data tests like reliability and validity tests are conducted.

**Reliability**

According to Sekaran and Bougie (2019) reliability of a measuring instrument can be observed by how consistent it measures the concept under investigation. Heale and Twycross (2015) suggest that it is not possible to calculate an exact level of reliability, however its estimate can be attained through three measures, namely: homogeneity, stability, and equivalence. Table 4-3 below gives a brief description of each of the three attributes.

**Table 4-3: Attributes of reliability**

| Attributes | Description |
|---|---|
| Homogeneity (or internal consistency) | The extent to which all the items on a scale measure one construct |
| Stability | The consistency of results using an instrument with repeated testing |
| Equivalence | Consistency among responses of multiple users of an instrument, or among alternate forms of an instrument |

**Source: Adapted from Heale and Twycross (2015)**

According to Heale and Twycross (2015), stability can be tested using either of two reliability testing methods which are test and re-test or alternate- form. During the test-retest method, a set of participants are given the same instrument more than once and under comparable conditions. Test scores are then collected, statistical comparisons made between participant's scores for each time they took the test. On the other hand, under the alternate-form reliability test, participants are also tested for the same concept more than once, with each subsequent test being different from the previous one. The wording used for each test under alternate form is also different. As given by Heale and Twycross (2015), under alternate- form reliability test, a correlation coefficient of less than 0.3 may be interpreted as a weak correlation. However, a score of 0.3 – 0.5 may be interpreted as being moderate, while a score of more than 0.5 may be interpreted as being a strong correlation. The third attribute of reliability is equivalence, which determines the degree of agreement between two or more observers (Heale and Twycross, 2015).

The Cronbach α score and Composite Reliability Index were used to measure reliability of the research instrument for this study. For comprehensive understanding of this test, please refer to Cronbach (1951) or Miller (1995) for alpha scores. According to Heale and Twycross (2015) Cronbach's α test is the most widely used test to establish reliability of an instrument. Under this test computations are made, and the result will be a number between 0 and 1. A Cronbach's α reliability score of 0.7 and above is deemed to be acceptable. To determine Cronbach Alpha score, SPSS software was utilised. Composite Reliability Index was established using AMOS.

**Validity**

Another factor which was considered during designing of research instrument is validity. Validity measures how well an instrument measures the concept under investigation (Sekaran and Bougie, 2019; Heale and Twycross, 2015). As explained by Heale and Twycross (2015), the researcher should be aware of the types of validity to consider when conducting quantitative research namely content validity, construct validity and criterion validity. Table 4-4 below shows a brief description of each type of validity.

**Table 4-4: Types of validity**

| Type of validity | Description |
|---|---|
| Content validity | This has to do with the extent to which an instrument accurately measures all aspects of a construct |
| Construct validity | The effectiveness of a research instrument in measuring the intended construct |
| Criterion validity | This measures relationship between one research instrument and other instruments used to measure the same variables |

**Adopted from Heale and Twycross (2015)**

### *Content validity*

As suggested by London, Matthews, and Grover (2017), content validity is an instrument used to assess at face value whether an instrument measures the intended concept. Heale and Twycross (2015) suggests that content validity is based on expects opinion of whether an instrument measures intended concept. One of the weaknesses of content validity is that since it is a qualitative measure, statistical precautionary measures cannot be put in place to alert the researcher when anomalies occur in the results. A discrepancy between actual measure of an instrument and researcher's intended measure can have damaging effects to the study (London Matthews and Grover, 2017).

### *Construct validity*

Construct validity may be further divided into convergent validity and discriminant validity (Almanasreh, Moles, and Chen, 2019). The existence of construct validity can be proved through three means, namely: homogeneity, convergence, and theory evidence (London, Matthews, and Grover, 2017). Homogeneity implies that the instrument measures one concept, while convergence is said to be in existence when the instrument measures concepts similar, to those of other instruments. Theory evidence is obtained when behaviour is consistent with theoretical propositions of the concept (Heale and Twycross, 2015).

### *Criterion validity*

Under criterion validity, correlations can be conducted to establish how far different instruments measure the same variable. Three ways in which criterion validity can be measured are convergent validity, divergent validity, and predictive validity (Heale and Twycross, 2015). According to Sekeran and Bougie (2019), convergent validity can be confirmed to be present when scores observed from two different instruments measuring the same concept have got a high correlation. Divergent validity on the other hand proves that there is a poor correlation between an instrument and others measuring dissimilar variables. Lastly, as given by Heale and Twycross (2015), predictive validity shows the ability of the measuring instruments to exhibit high correlations with future concepts. Creswell and Creswell (2018) suggest that potential threats to validity when using convergent approach include unequal sample sizes which might give more prominence to the quantitative side, as compared to the qualitative side. The use of different concepts or variables when conducting qualitative and quantitative research may produce difficult to interpret and confusing results. Thirdly, failure to follow up conclusions derived from diverging scores and themes may render the research strategy of inquiry invalid.

For this study, convergent and discriminant validity were investigated for the quantitative portion of the research. Convergent validity was assessed by examining the factor loadings of the constructs, where values of standardised factor loadings should be greater than 0.5. Discriminant validity on the other hand was tested by assessing inter-construct correlation matrix and Average Variance Extracted (AVE).

As for the qualitative strand of the research, care was taken to ensure internal validity. Triangulation is the most popular method of ensuring internal validity of a research. Triangulation can be achieved through four ways, namely use of multiple methods, multiple sources of data, multiple investigators, and multiple theories to confirm emerging findings. Other methods of ensuring internal validity include, respondent validation, adequate engagement in data collection, reflexivity, and peer review. When respondent validation is used to ensure internal validity, the researcher seeks feedback from some of the interviewees, to avoid misinterpretation of responses given. Under adequate engagement in data collection, data is collected until emerging findings seem to be saturated. Reflexivity deals with the integrity of the qualitative researcher, as they elaborate their biases, dispositions and assumptions regarding the topic being researched. Respondent validation, adequate engagement in data collection were used to take care of internal validity during qualitative data collection. Multiple sources of data were also used to minimise internal validity (Merriam and Tisdell, 2016).

To summarise the actual steps taken during analysis of quantitative data, figure 4-2 below shows a summary of the data analysis process described above.

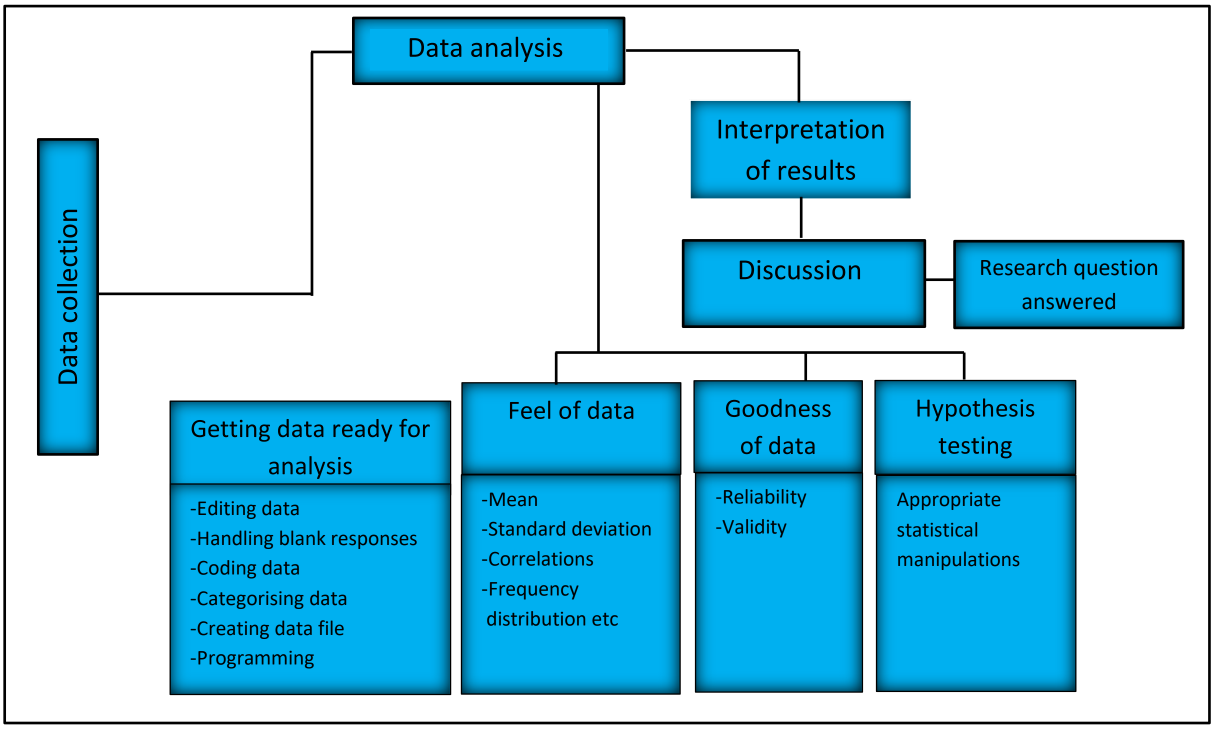


**Figure 4-2: Summary of quantitative data analysis process**
**Source: Adapted from Sekeran and Bougie (2016)**

For this study, the questionnaire was the only tool for collecting primary data from the foundries. Amos software for Structural Equation Modeling was utilised to perform Confirmatory Factor Analysis (CFA) and Path Modeling. CFA was performed to measure reliability, validity, and model fit. Path Modeling, as suggested by Ullman (1996), "allows examination of a set of relationships between one or more independent variables, either continuous or discrete, and one or more dependent variables, either continuous or discrete." Lastly, model fit was also tested during data analysis.

#### 4.14.1.4 Structural Equation Model (SEM)

Lowry and Gaskin (2014) suggest that SEM should be used for confirmatory work. According to Suhr (2006), SEM is a comprehensive statistical approach used to represent, estimate, and test hypothesis about relationships among variables. Sarstedt et al. (2016) describes these variables as measured variables and latent constructs. According to Suhr (2006), SEM seeks to achieve two goals, which are to discover the patterns of correlation or covariance among a set of variables, as well as to explain as much of their variance as possible with the model created. Under SEM, models which are depicted in the form of diagrams are drawn to show relationships between variables, as well as to account for variation and covariation of the measured variables (Suhr, 2006). Several models can be drawn using SEM, some of which include path analysis, confirmatory factor analysis models and latent growth curve models. Some of the advantages offered by SEM as listed by Suhr (2006) include its flexibility and comprehensiveness when compared to traditional methods and its ability to help solve problems of multicollinearity. SEM also allows researchers to specify a model and test it, whereas other methods specify a default method. Through SEM, researchers may be able to analyse both observed and unobserved variables, while traditional methods only allow analysis of measured variables. SEM shows researchers their error, while other traditional methods assume measurement occurs without error. Lastly, SEM allows for multiple tests to evaluate model fit, while traditional methods have got direct significance test to establish group differences. According to Joreskog (1993), as cited by Kline 2015, SEM can be employed for one of three applications namely strictly confirmatory, alternative models and model generation. The table below shows how each application functions, as given by Joreskog (1993) in Kline (2015).

**Table 4-5: Applications of SEM**

| Application | Function |
|---|---|
| Strictly confirmatory | Under this application, the researcher has got a single model that is accepted or rejected, based on the correspondence to the data. This application is however not common |
| Alternative models | This is a scenario where more than one priori model is available. Sufficient theoretical or empirical bases to specify more than one model is required. A model with acceptable correspondence to the data is accepted and the rest discarded |
| Model generation | Under this approach, when a model does not fit the data, it is subsequently modified by the researcher. The modified model is then tested again with the same data. This approach seeks to 'discover' a model with three properties, namely: (1) One which makes sense, (2) Has a fair correspondence to the data and (3) Is fairly parsimonious.<br>The model generation approach is the most common among researchers. |

**Source: Adapted from Joreskog (1993) as cited in Kline (2015)**

Since the primary objective of the research is to come up with a model which outlines the success factors required for a South African SME foundry to thrive and be effective on the market, SEM will give this research the flexibility of specifying a model as well as to test it. SEM will also enable this research to achieve two other goals namely: to discover the patterns of correlation or covariance among a set of variables, as well as to explain as much of their variance as possible with the model created.

#### 4.14.1.5 Bias

In every research, the researcher must take care to minimise bias. A poorly designed questionnaire can lead to biased results (Sekaran and Bougie, 2019). To minimise bias emanating from a poorly designed questionnaire, the researcher must ensure that the questionnaire is properly worded, variables are well categorized, scaled and coded after receiving responses, as well as to ensure that the questionnaire has got a good appearance. As for data collection, Sekaran and Bougie (2019) suggest collection of data from multiple sources and through multiple data collection methods to minimise bias. The questionnaire was properly worded, variables well categorized, scaled, and coded after receiving responses, as well as to ensure that the questionnaire has got a good appearance.

### 4.14.2 Qualitative data analysis

#### 4.14.2.1 Thematic Analysis (TA)

Thematic Analysis (TA) is a method for identifying themes and subsequent analysis of qualitative data to address the research (Maguire and Delahunt, 2017). One of the advantages of TA is that it is theory independent, although it is not atheoratical. This implies that TA may be employed to address a wide range of research questions due to its theoretical independence (Nowell, Norris, White, and Moules, 2017). Since TA may be conducted in any epistemological and ontological base, it is more flexible than other qualitative analysis tools such as interpretive phenomenological analysis (IPA), grounded theory and discourse analysis which can only function within specific theoretical frameworks (Terry, Hayfield, Clarke, and Braun, 2017). TA may be conducted in various ontological frameworks, which in the process will relate to epistemological approaches to data as shown in Table 4-6 below.

**Table 4-6: Ontologies and research questions**

| Type | Definition | What the research question captures |
|---|---|---|
| Realist essentialist | Reality is 'out there' and discoverable through the research process; people's words provide direct access to reality | An understanding that language captures participants' experiences of reality. |
| Critical realist/contextualist | The assumption is that reality exists 'out there'. However, incorporating mediating socio-cultural meanings helps the researcher to access this reality. Responses given during interviews give researcher an idea of participants' interpretation of reality. | An understanding of participants' experiences as lived realities that are produced, and exist, within broader social contexts. |
| Relativist constructionist | There is no external reality discoverable through the research process. Instead, versions of reality are created in and through research. Under this ontology, the researcher focuses on people's words and tries to interpret how these words imply certain realities in the context of the participant's culture. | An understanding that language does not simply mirror a world 'out there' but instead is used to construct realities and taken for granted knowledge can-should! – be queried. |

**Source: Adapted from Terry et al. (2017)**

Under TA, analysis starts with familiarisation which leads to theme development and finally coding, although themes are somewhat partly determined before full analysis, through direction of existing theory and manifested in interview questions. In support of this notion, Guest, MacQueen and Namey (2012) also recommends that interview questions in certain instances form the themes, of which the reason for coding will only be to prove the existence of themes. Kuckartz (2019) further explains that there are three basic ways of developing categories or themes, namely, concept driven, data driven and mixing a concept driven and data development method. Table 4-7 below shows a summary of how categories may be developed.

**Table 4-7: Summary of development of categories**

| Description | Approach |
|---|---|
| Concept driven ('Deductive') | • Categories can be derived from a theory.<br>• Derived from the literature (the current state of research) or<br>• Derived from the research question (e.g., directly related to an interview guide) |
| Data driven ('Inductive') | • Step by step procedure<br>• The method of open coding until saturation occurs.<br>• The continuous organisation and systemisation of the formed codes, and<br>• The development of top-level codes at different levels |
| Mixing a concept driven and data driven development of code | • The starting point here is usually a coding frame with deductively formed codes and<br>• The subsequent inductive coding of all data coded with a specific main category |

**Source: Adapted from Kuckartz (2019)**

This study employed the concept driven approach to generate themes which were directly linked to research questions. For this study, the following steps shown in Figure 4-3 below were taken during analysis of qualitative data.

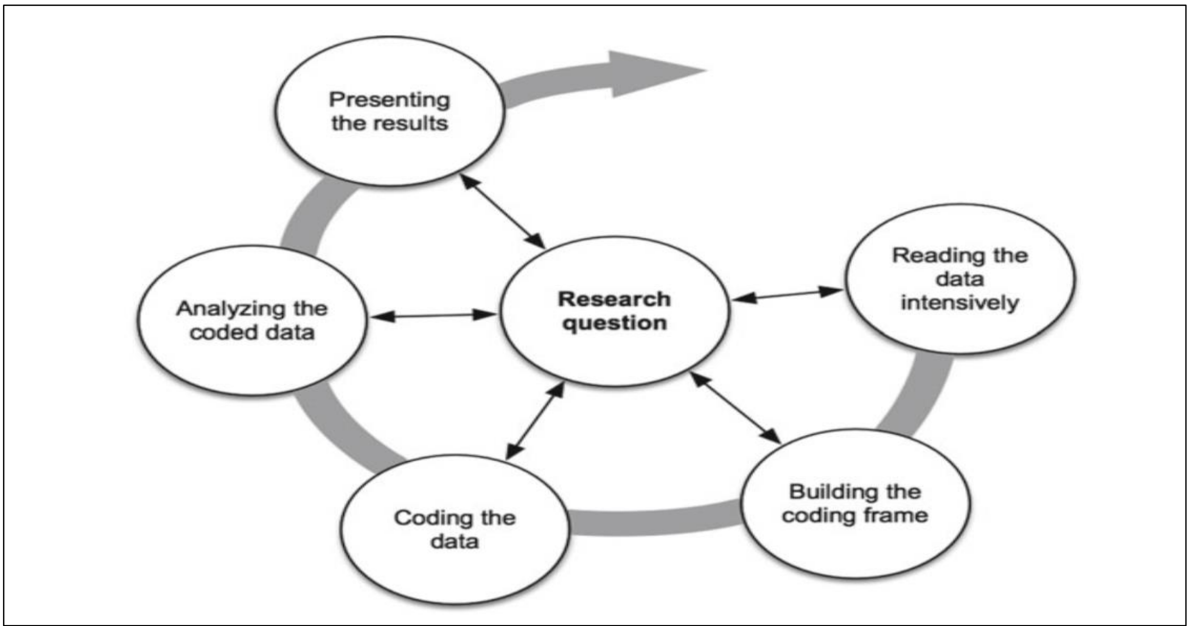


**Figure 4-3: Five steps of qualitative content analysis**
**Adapted from Kuckartz (2019:186)**

### Reading the data intensively

This is the first step carried out during thematic analysis. The main reason for this step is for the researcher to become acquainted with the full data set. The researcher might need to read through the entire data set more than once. As was the case with this study, transcribing of voice recordings also falls under reading of data and this also helps with familiarisation of data. One advantage of familiarization of data set is that it helps the researcher to understand orientation of data, which will be of help when performing other subsequent data analysis steps (Kiger and Varpio, 2020).

### Building the coding frame

A coding framework is where codes generated will be fitted. The coding frame, which is sometimes referred to as coding template acts as a guide during coding process by delineating the codes to be applied (Nowell et al. 2017). Literature also suggests that the coding framework can be deductive, inductive, or reflective (Attride-Stirling 2001; Braun and Clarke 2006; Kiger and Varpio, 2020). An inductive coding framework is anchored on grounded theory hence codes are derived from the data itself. A deductive coding framework is anchored on a specific theory or epistemological position (Attride-Stirling 2001; Braun and Clarke 2006; DeCuir-Gunby et al., 2011). Xu and Zammit (2020) advocate for amalgamation of inductive and deductive coding to produce a balanced and all-inclusive view of the data. For this research, inductive coding was employed, and codes were derived from the data itself. The table below shows how codes and themes were generated for this study.

**Table 4-8: Data coding and theme generation**

| | **Excerpt from conversation** | **Codes Generated** | **Theme(s)** |
|---|---|---|---|
| Researcher | May you please list and explain an entrepreneurs' individual characteristics required for sustainability of the SME foundry in South Africa | | |
| Participant | I think you have got to be able to think outside the box very quickly because things are forever changing in the foundry. You have got to be able to **think and make adjustments quickly**. You also have to be able to **take risk**. If you do not take the risk, you will not be able to achieve anything. | Quick thinker<br>Make adjustments<br>Risk taker | Risk taking and agility |

**Source: Excerpt from interview**

### Coding the data

In this stage the researcher notes down potential data which could be useful. Relationships between data items are also noted down. Codes are then generated in the process. Saldana (2016) defined a code as a word or short phrase which summarises and captures the essence of visual or language-based data. Good codes should be distinct and demarcated in such way that they do not overlap and can fit within the coding framework. (Kiger and Varpio, Greenfield et al., 2017). A good code also describes the qualitative richness of an expression (Boyatzis, 1998) as well as describing most of the data (Joffe, 2012).

## Analysing the data

During data analysis, the researcher searches for themes. Saldana (2016) defines a theme as a pattern which captures vital information concerning the data as it attempts to answer research questions. Joffe (2012) suggests that themes are also inductive or deductive in nature, where inductive themes are derived from data and deductive themes are derived from a theory. Deductive themes offer advantages of imitating, extending, or disproving existing studies. It is, however, common for researchers to employ both inductive and deductive approaches as it enables one to commence a study with preconceived classifications from theories, while at the same time being open to emerging concepts from the study which might add to knowledge (Boyatzis, 1998). Nowell et al. (2017) suggest that searching for themes entails grouping and organising them into fewer, overarching themes. Once candidate themes are identified, they undergo review for the purpose of selective the best representative of the data. Reviewing of themes is conducted for two main reasons. The first reason is to check if the themes encapsulate the core of coded data. The second reason of reviewing the themes is to establish if the themes are applicable and adequately depict the meanings in the complete data set. For this research, the best themes were then selected and informative and engaging names allocated to each theme after reviewing. Xu and Zammit (2020) suggest that with good themes, the researcher can produce an articulate analytic narrative.

## Presenting the results

For this stage emerging data was presented and discussed and compared to literature reviewed in chapter 2. As a way of displaying the rigour of the themes. The researcher's discussion and participants' comments were displayed separately, with quotes from participants represented in italic format for ease of reading. Quotes from participants were chosen based on common occurrence throughout the transcripts, while others were chosen based on bring out a unique point of view which brought about a new learning experience for the researcher (Fereday & Muir-Cochrane, 2006; Xu and Zammit, 2020). Comparing participants' comments with literature reviewed enriches research and enables the researcher to make a compelling argument as they attempt to answer research questions (Creswell, 2009; Yin, 2018; Clarke & Braun, 2014)

The figure below shows a summary of the research design.

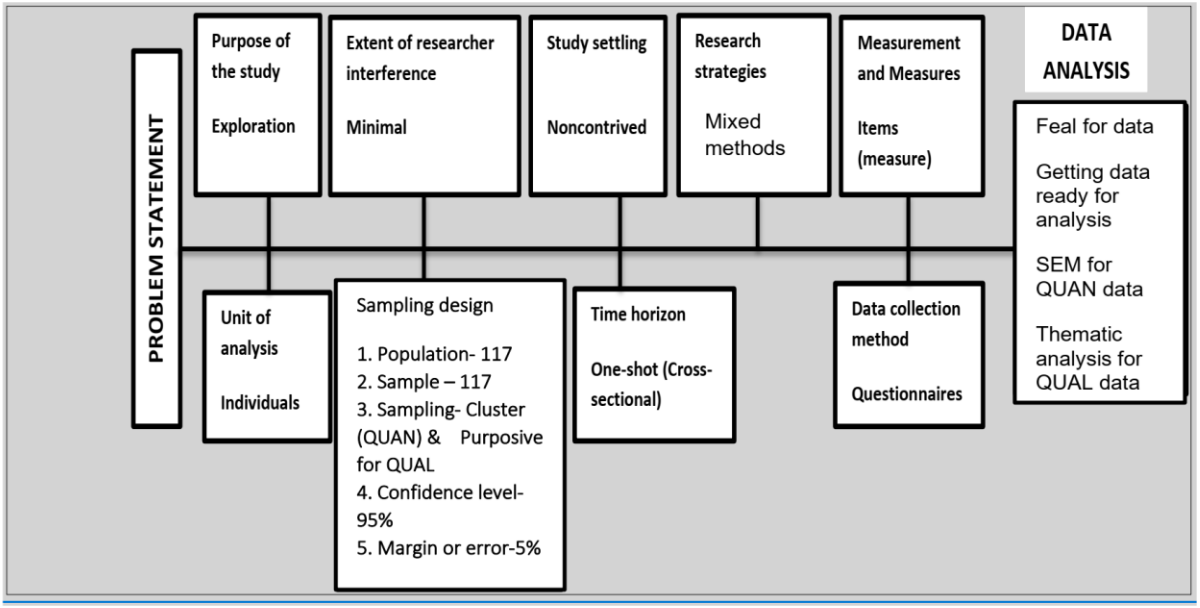


**Figure 4-4: Summary of research design.**

**Source: Adapted from Sekeran and Bougie (2013)**

## 4.15 SUMMARY

This chapter outlined the methodology used for the study. Various research methods were explained, their strengths and weaknesses explored, leading to the selection of mixed methods research for this study. This chapter also provided sufficient detail on the study setting, research strategy employed, measurement and measures and units of analysis used in this study. Population of SME foundries under investigation was identified and sampling techniques utilised were also outlined. The chapter specified data collection methods and procedures for data analysis. Under analysis, tools like thematic analysis and SEM were chosen. Other pertinent aspects like bias, validity and reliability tests were also discussed. Lastly, the chapter outlined the limitations of the study, highlighting specific contributions that it makes to the body of knowledge.

Chapter 5 presents results for both the qualitative and quantitative data.

# CHAPTER FIVE - DATA ANALYSIS AND PRESENTATION OF RESULTS

## 5.1 INTRODUCTION

Data collected during research comes either in quantitative form or qualitative form. Quantitative data is numerical in nature as is in the form of counts, attitude ratings or readings observed from an instrument. Qualitative data, on the other hand, involves non-numerical observations such as transcripts generated from interviews, field observations and organisation documents (Cooksey, 2020). Gitelman (2013) describes data as follows:

> "To be sure, data also depend upon hierarchy. Part of what distinguishes data from the more general category, information, is their discreetness. Each datum is individual, separate, and separable, while still alike in kind to others in its set. It follows that the imagination of data is in some measure always an act of classification, of lumping and splitting, nesting and ranking, though the underlying principles at work can be hard to recover" (Gitelman, 2013:8)

Data, however, needs to be analysed in such a way that it makes sense to the reader (Fekete, Jankun-Kelly, Tory, and Xu, 2019). This notion is supported by Bowker (2005), who postulated that "…raw data is both an oxymoron and a bad idea; to the contrary, data should be cooked with care". This chapter presents and explains results of the study conducted. Separate data analysis of qualitative and quantitative data was also conducted in this chapter.

This study sought to establish the factors required to successfully run an SME foundry in South Africa, proposing in lieu the intervention measures required for such foundries to be sustainable. To reach this objective, the study established the relationships between several variables. For the quantitative part of the study, SPSS version 26 and AMOS version 26 statistical tools were utilised to meet the objectives outlined in Chapter one. Under inferential statistics, confirmatory factor analysis was used to test for reliability and validity of data. Lastly, path modelling for the confirmation of model fit is presented in this chapter.

## 5.2 DESCRIPTIVE STATISTICS

Descriptive statistics is composed of procedures for categorising, summarising, and comparing attributes of sample of data (Cooksey, 2020). This study utilised SPSS version 26 to analyse the sample for the quantitative part of the study. As for the qualitative part of the study, thematic analysis was utilised to analyse the data. Data was collected concurrently during the period between 17 September 2020 and 7 December 2020, for both qualitative and quantitative questionnaires. Due to the COVID-19 global pandemic, time constraints and costs involved in visiting all foundries spread across South Africa, the quantitative questionnaire was administered online using google forms. The qualitative questionnaire was self-administered, and interviews were sparsely conducted either face to face or via zoom meetings.

A total of 400 questionnaires were sent for the quantitative part of the study and 306 responses were received. Three of the quantitative responses were spoilt and could not be used. A 76 percent response rate was therefore achieved for the quantitative part of the study. As for the qualitative part of the study, 11 participants took part in the survey. Respondents in this strand were carefully selected based on their wealth of experience in the foundry industry and are generally regarded in the South African foundry industry as experts. Participants selected were either foundry owners, foundry managers or consultants. The consultants selected also had foundry experience and had been exposed to most of the foundries in South Africa and some abroad.

The table following section presents descriptive statistics of quantitative questionnaire participants. These statistics include gender, race, age distribution, education background, number of years in the foundry industry, as well as the types of foundries and means of production employed in their organisations.

### 5.2.1 Demographics of quantitative and qualitative questionnaires respondents

This section dwells on the demographics of both qualitative and quantitative participants. Hammer (2011) suggests that it is vital for researchers to include demographic information in their results to minimise the risk of “absolutism.”. When absolutism exists, there is a general assumption that a phenomenon of interest is not affected by demographics such as culture, race, and age. Beins (2017) also adds that including demographic information on participant characteristics enables the research to gravitate towards a position of “universalism.” Universalism takes into consideration the possible influence of demographics on results. Other benefits of demographics in a study include catering for generalisability of results and enabling comparisons when studies are replicated. Demographics also allow researchers to synthesise different research as well as analyse secondary data. Lastly, demographics enable researchers to identify universals and disparities within and among populations as well as gaps in body of knowledge (Beins, 2017).

Results of qualitative and quantitative results are presented side by side for ease of reading. Results are displayed either in graphical form or as pie charts. Demographics results clarify the characteristics of the foundries in which the participants worked. Foundries were classified according to metal grades produced, moulding process employed and type of production means.

#### 5.2.1.1 Gender

Figure 5-1 below shows gender distribution of participants.

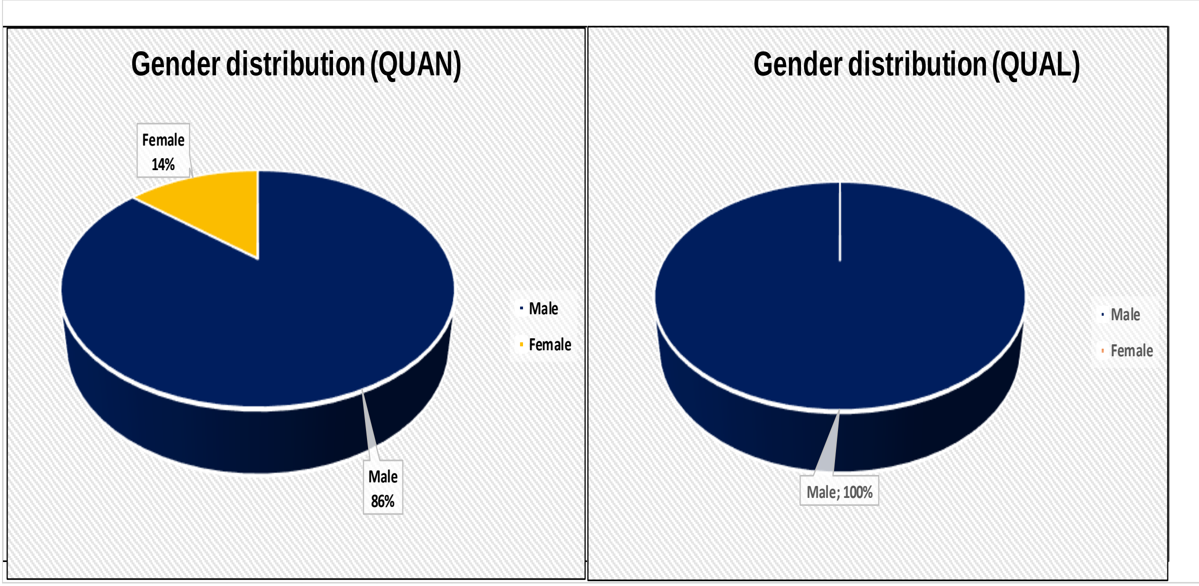


**Figure 5-1: Gender distribution of participants**

**Source: Developed by author**

From Figure 5-1, there is evidence that 86 percent of quantitative questionnaire respondents were male. As for the qualitative questionnaire, 100 percent of the participants were male. This result falls in line with the claim made by Mulaba-Bafubiandi and Mageza (2016) that the South African foundry industry is a male-dominated industry due to the harsh working conditions to which the employees are exposed. This result is not unique to South Africa as a study investigating job satisfaction in Indonesian foundries verified that 94 percent of the participants were male, explaining that, by and large, foundry work is male dominated due to the harsh working conditions and physical strength expected of foundry employees.

#### 5.2.1.2 Age category

Figure 5-2 below shows age distribution of participants for both qualitative and quantitative participants.

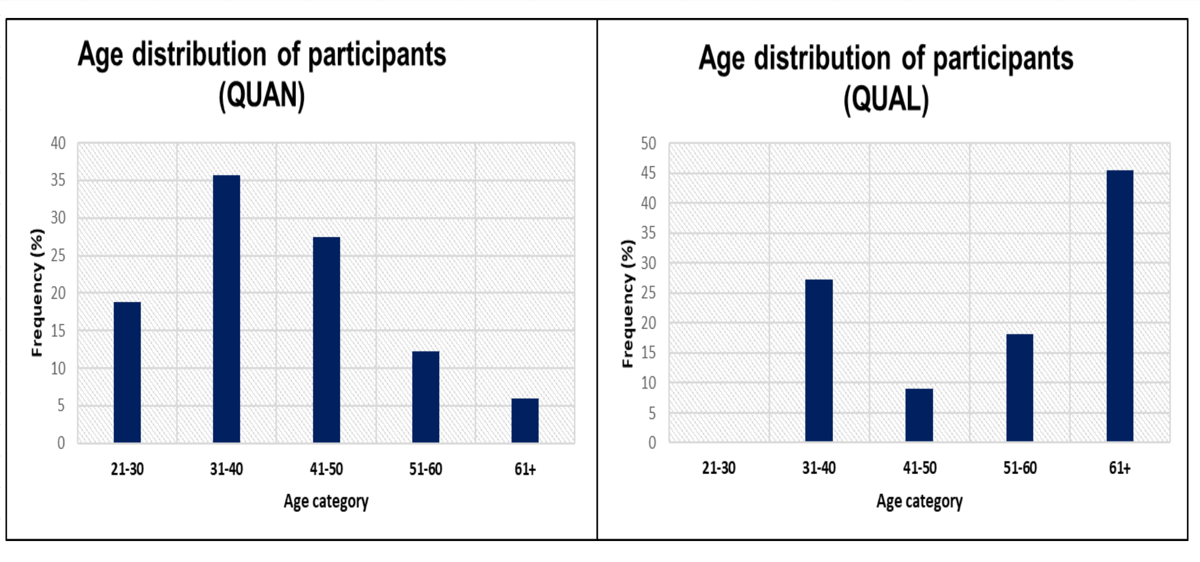


**Figure 5-2: Age distribution of participants**
**Source: Developed by author**

An analysis of age distribution of quantitative questionnaire participants illustrates that 63 percent of the participants were in the 31 to 50 years category. The graph also shows a normal distribution curve, as would be expected in any population. This result corroborates the findings reached by Shittu, Yalwa, and Mohammed (2020) who while investigating occurrences of respiratory and lung complications among foundry workers in Nigeria established that foundries commonly employ males who are predominantly in their most productive age range below 47 years. An analysis of age distribution of qualitative questionnaire participants projects a different picture. Almost 64 percent of the participants were 51 years and above. This may be attributed to the reason that it takes years for one to acquire the necessary experience and education before they can be considered experts in their field of work. Employees who are 60 years and above are generally considered less productive, hence have fewer job opportunities. Employees who are considered experts in their line of work may be asked by their organisations to stay on much longer on part time or consultancy basis, even past their retirement age. This explains why there were more participants above the age of 61 years of age in the qualitative part of the study. Some of the participants in the qualitative part of the study who were above 60 years of age were foundry owners, hence had the privilege of choosing to continue working past their retirement age.

#### 5.2.1.3 Race

Race of participants was also analysed and summarised in Figure 5-3 below.

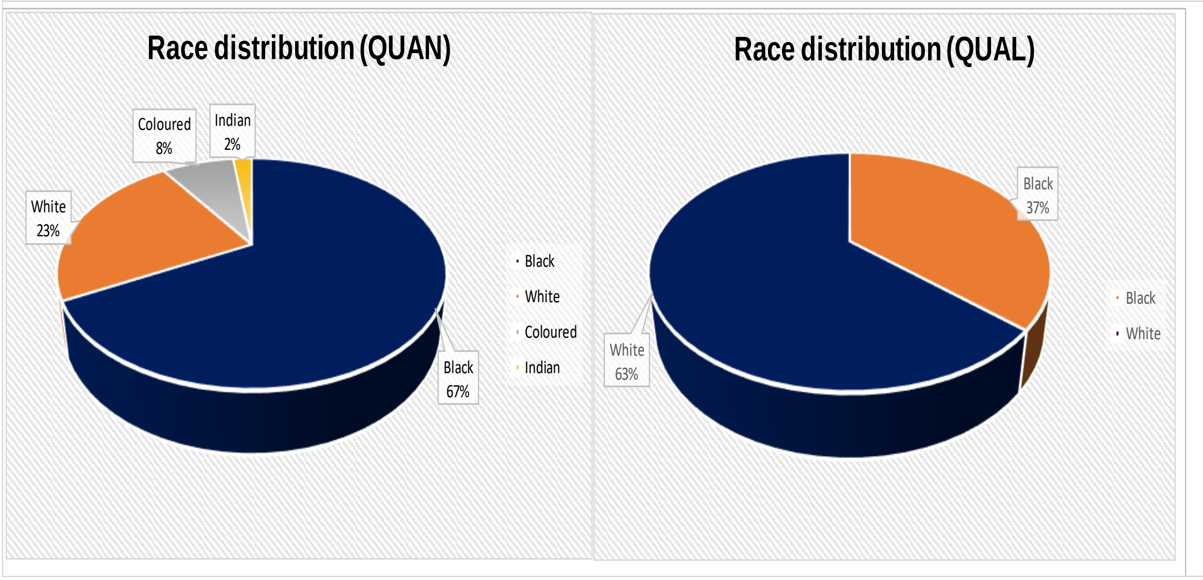


**Figure 5-3: Race distribution of respondents**
**Source: Developed by author**

It can be gleaned from Figure 5-3 above that for quantitative questionnaire respondents, 67 percent of the participants were black, followed by 23 percent who were white. The Coloured and Indian race constituted 8 percent and 2 percent of participants, respectively. This result somewhat follows the pattern of South African population demographics which are 80.7% black, 8.80% coloureds, 7.90% white and 2.60% Indian-Asian (StatsSA, 2019). Based on StatsSA (2019) figures, one would have expected more participants who are of the Coloured race. This discrepancy may be explained by the fact that the Western Cape and Northern Cape provinces which house the bulk of the Coloured community (StatsSA, 2013), have only 13 foundries between them, which equates to about 10 percent of the total number of foundries in

South Africa (CSIR, 2020). As for the qualitative questionnaire, respondents were either black or white. 63 percent of the participants were of the white race and 37 percent were of the black race. Although every effort was made to have a fair representation of all races in the qualitative part of the study, no volunteers were identified to represent the Indian and Coloured races.

#### 5.2.1.4 Educational background of participants

Level of formal education of participants was also investigated and results are summarised and presented in Figure 5-4 below. Educational level was categorised as high school and below, certificate or diploma, Bachelor's- degree and Master's-degree and above. The study sought to establish the general educational level of workers employed in the South African foundry industry.

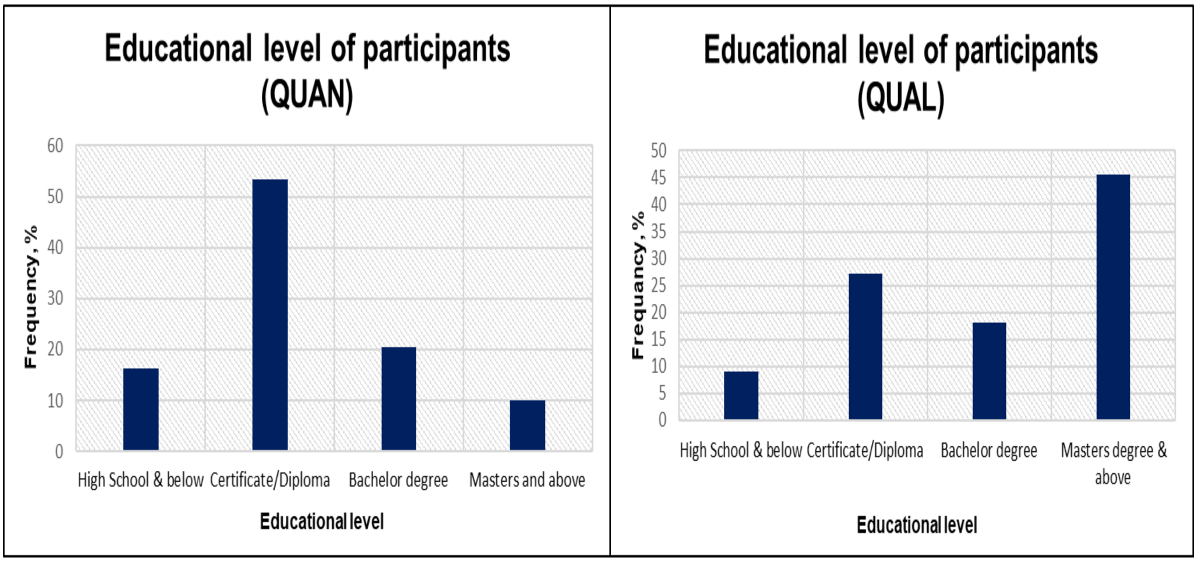


**Figure 5-4: Educational level of participants**

**Source: developed by author**

Starting with quantitative questionnaire respondents, the figure above shows that 53 percent of participants were in possession of a certificate or diploma. This was followed by 20 percent of the participants who were holders of a bachelor's degree. Participants whose educational level was high schooling and below constituted 16 percent of total and lastly participants with a master's degree and above only contributed 10 percent of the total. The graph also shows a normal distribution curve, as would be expected in any population. An analysis of the qualitative questionnaire participants' graph shows a different picture, however. Almost 64 percent of people who participated in the qualitative survey had bachelor's degree and above. This also shows that apart from spending many years in the foundry industry, the foundry experts generally also took their time to increase their expertise through studying for tertiary qualifications.

#### 5.2.1.5 Number of years in the foundry industry

Participants were also classified according to number of years they have been working in the foundry industry. Figure 5-5 below shows a summary of results observed for both qualitative and quantitative investigations of the study.

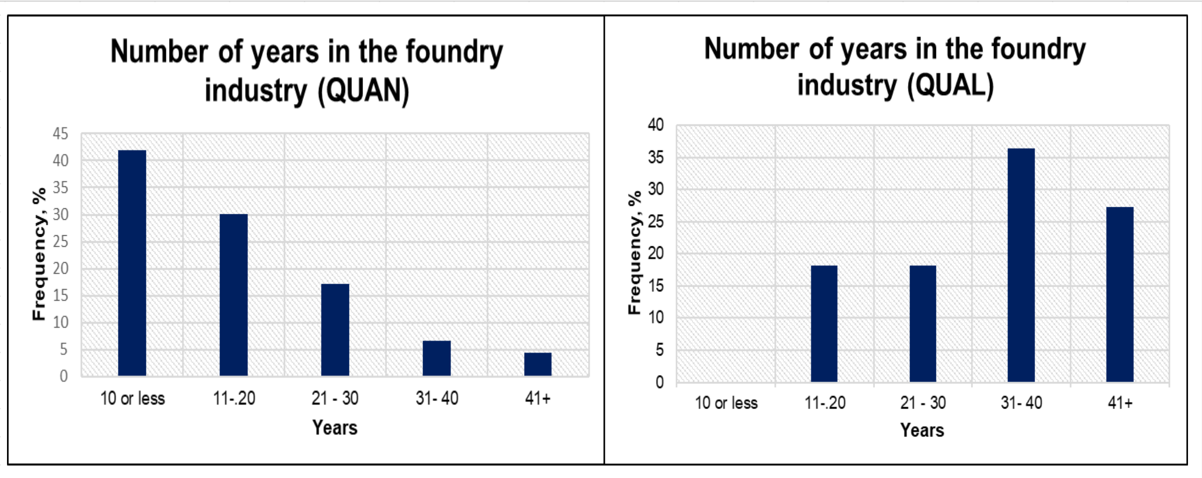


**Figure 5-5: Number of years in the foundry industry**
**Source: Developed by author**

More than 72 percent of participants who responded to the quantitative questionnaire had spent 20 years or less working in the foundry industry. Since the questionnaire was conducted online, the younger generation who are more technologically savvy would have been expected to participate more on such forums. Analysis of results from the qualitative questionnaire ironically show that about 64 percent of participants had 30 years or more working in the foundry industry. This may be attributed to the reason that it generally takes many years for one to study and become an expert in their field of work.

### 5.2.1.6 Job classification

Participants were also classified according to their job roles. Figure 5-6 shows a summary of results depicting some of the various job roles typically found in a foundry. Depending on the size of the factory, a foundry is a place where one would find personnel with different educational backgrounds and fields of expertise. Small foundries generally outsource certain functions as they cannot afford to employ individuals with certain skills. Bigger foundries, in contrast, have got the financial muscle, hence employ individuals with certain specialised skills on a full- time basis.

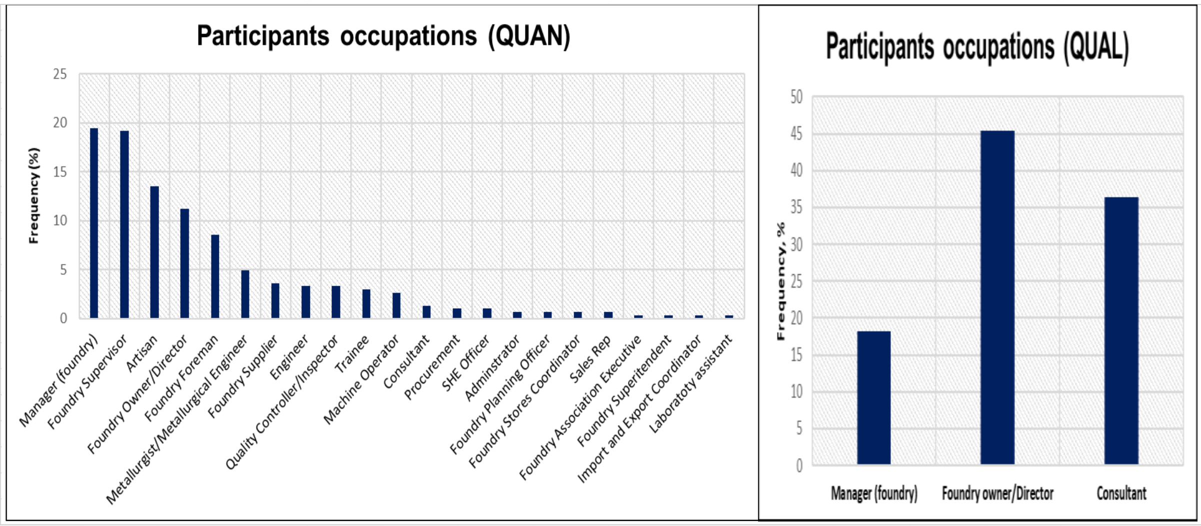


**Figure 5-6: Occupation of participants**

**Source: Developed by author**

Quantitative questionnaire results show that almost 19 percent of participants occupied management positions in the foundry. Another 19 percent of participants were foundry supervisors followed by 13 percent who were artisans. The artisan category consists of electricians, boilermakers, blacksmiths, moulders, patternmakers, fitter and turners, machinists, tool jig and die-makers, laboratory technicians and methoding technicians. Foundry owners constituted about 11 percent of participants, followed by foundry foreman who contributed 8 percent to total number of participants. Qualitative questionnaire results, however, show that slightly over 45 percent of participants were foundry owners or directors, followed by 36 percent who were foundry consultants and lastly 18 percent who were foundry managers. The foundry consultant category comprised academics specialising in foundry work, independent consultants involved in assisting foundries to optimise their processes. Some of the consultants also work together with organisations such as the National Foundry Technology Network (NFTN), South African Institute of Foundrymen (SAIF) and the Metal Casting and Technology Station (MCTS) based at the University of Johannesburg.

#### 5.2.1.7 Foundry classification by metal grades

A foundry can be classified as a ferrous, non-ferrous, or mixed metal foundry. Ferrous foundries produce iron-based metal grades, while non-ferrous metals do not contain iron. Mixed metal foundries produce both ferrous and non-ferrous metals. Typical ferrous metal grades include cast iron, steel, and stainless-steel grades. Non- ferrous metal grades include aluminium, zinc, magnesium base, bronze, and brass grades (Beeley, 2001). The study also sought to establish the type of foundry for which the participants worked, based on metal grades produced. Figure 5-7 below shows a summary of results obtained for both quantitative and qualitative questionnaires.

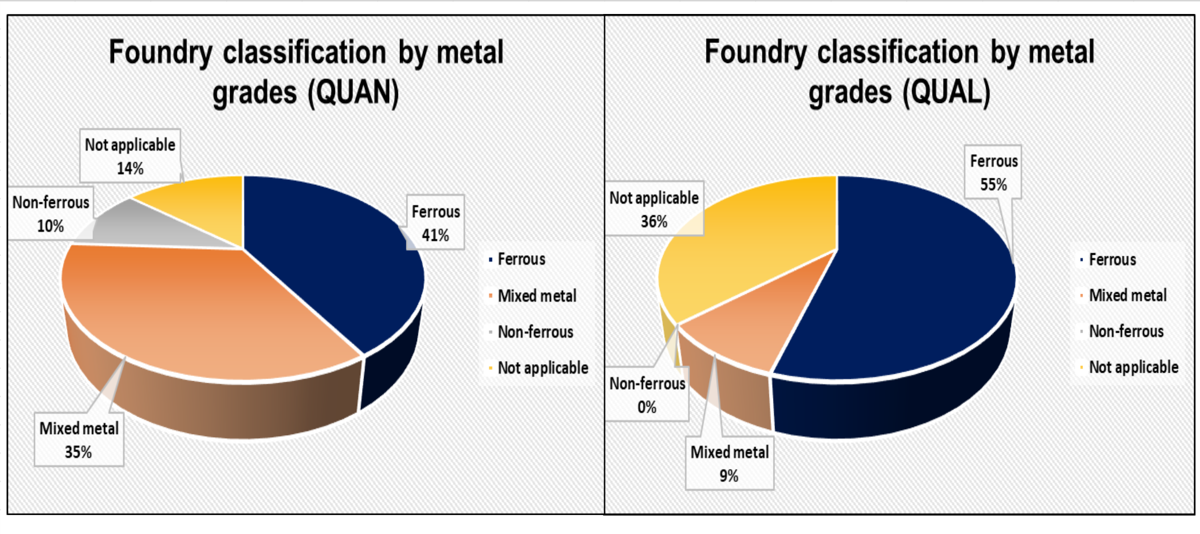


**Figure 5-7: Foundry classification by metal grades**
**Source: developed by author**

From quantitative analysis results, it emerges that 41 percent of respondents worked for a ferrous foundry, followed by 35 percent who were working for a mixed metal foundry. Participants from non-ferrous foundries only constituted about 10 percent of the sample. Lastly, 13 percent of participants were not dealing directly with castings, as some were consultants and foundry suppliers. Qualitative results show that 55 percent of the participants were from ferrous foundries, followed by 36 percent who worked for organisations which did not produce castings. Only 9 percent of the participants were from mixed metal foundries. There was no participant from a non-ferrous foundry in the qualitative survey. The results show that there are not many foundries who produce non-ferrous castings in South Africa. This may be explained by the low demand of non-ferrous castings in the country. Statistics in Chapter One reveal that non ferrous castings produced by South African foundries are less than 15 percent of the total production.

#### 5.2.1.8 Foundry classification based on production means

Participants also gave their foundries' means of production. The main categories for classifying foundries used were jobbing, mass production, mechanised and lastly captive. Captive foundries do not sell castings to other organisations as they exist to provide spare parts for their parent organisation only. The logic behind establishment of captive foundries is to minimise costs of acquiring castings from outside, as well as reducing downtime and loss of production hours. A jobbing foundry on the other hand does not have the ability to mass produce castings. Rather, work is carried out on a project-by-project basis (Ocheri, Mbah, and Mbah, 2017). Figure 5-8 below shows a summary of results obtained.

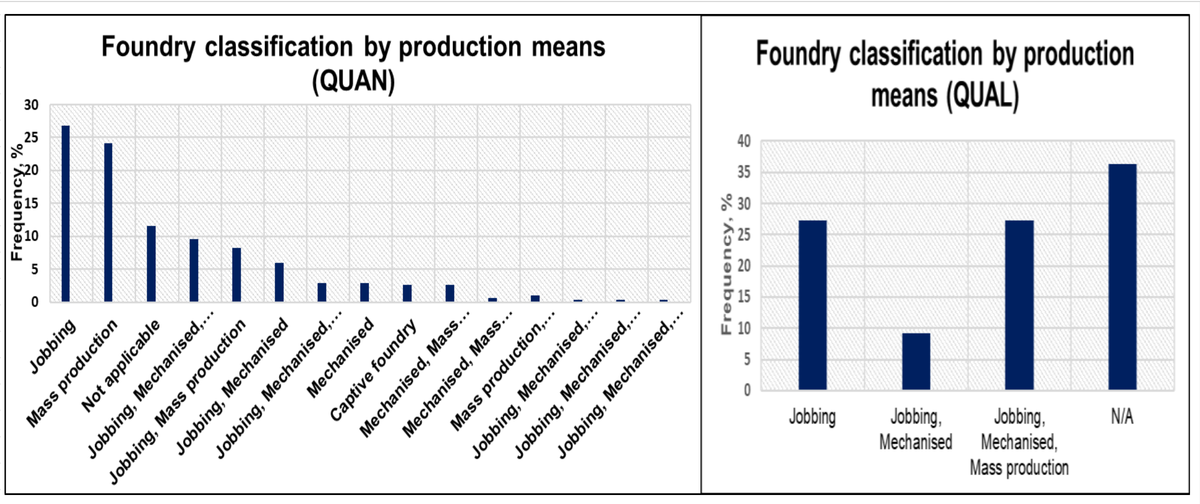


**Figure 5-8: Foundry classification by production means**
**Source: developed by author**

An analysis of Figure 5-8 above shows that for quantitative results 29 percent of participants employed jobbing as a means of production, followed by mass production which was at 24 percent. Only 3 percent of participants were from a fully mechanised foundry, while participants from a captive foundry only constituted about 1.6 percent of the sample. 42 percent of quantitative sample participants were from foundries which employed a combination of two or more production methods. As for the qualitative questionnaire sample 27 percent of participants were from foundries which employed jobbing means of production. Slightly over 36 percent of participants used combinations of jobbing, mass production and mechanised means of production. Lastly, 36 percent of participants in the qualitative part of the study were not producing any castings. From the results above, it may be concluded that South African foundries do not have the luxury of choosing a single means of production, but purposively select a combination of production means as dictated by the workload.

#### 5.2.1.9 Foundry classification based on moulding system

The participants were also asked what moulding systems were employed at their foundries. Five main categories were identified as the main moulding systems which were resin sand, green sand, $CO_2$ system, gravity die-casting and pressure die-casting. Gravity die-casting and pressure die-casting utilises non-expendable moulds, while resin sand moulds, green sand moulds and $CO_2$ sand moulds are expendable moulds. Figure 5-9 below shows a summary of results obtained. Resin sand is depicted as RS on the graph, while green sand is depicted as GS on the graph. CO2 sand system is depicted as $CO_2$ on the graph, while gravity die-casting is depicted as GD. Lastly pressure die-casting is depicted as PD on the graph.

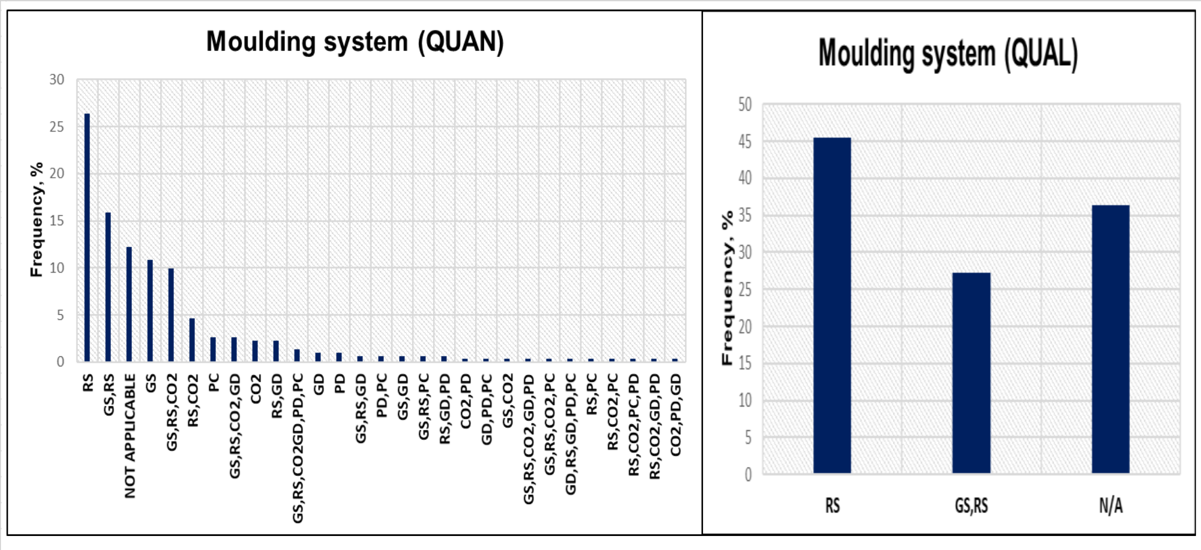


**Figure 5-9: Foundry classification by moulding system**

**Source: developed by author**

An analysis of Figure 5-9 shows that for quantitative questionnaire sample, 31 percent of respondents reported to be using resin bonded sand system only, followed by 17 percent who reported to be using a combination of green sand and resin sand systems. 11 percent of participants reported using green sand system, while only 2 percent of participants reported that they were using $CO_2$ sand system. Less than 2 percent of participants reported using pressure die-casting. Also, less than 2 percent of participants reported using gravity die-casting.

As for the qualitative questionnaire sample, 45 percent of participants reported that they were using resin bonded sand system, while 27 percent reported using a combination of green sand and resin bonded sand systems for their moulding process. About 36 percent of qualitative questionnaire sample worked for organisations which are not involved in making of moulds.

Although there was a considerable number of participants who worked for foundries which employed either resin bonded sand or green sand systems, most participants were from foundries which used more than one moulding system for production. This may be due to different sand systems offering different advantages. For example, green sand is cheap and offers the advantage of enabling foundries to manufacture castings in bulk at a cheaper rate. Normally in foundry if a customer buys castings in bulk, they negotiate cheaper rates which are normally associated with bigger volumes.

Resin bonded sand on the other hand enables foundries to manufacture high integrity castings, to achieve low a rate of defects and good surface finish. Die casting method is usually for aluminium alloy grades and offers foundries advantages of mass production, good dimensional tolerances, and excellent surface finishes. The results apparently confirm the notion that South African SME foundries serve a wide range of customers whose demands and expectations are different, hence the various moulding systems employed.

## 5.3 QUANTITATIVE RESULTS

The table below shows a scale to item results summary for quantitative data collected.

### Table 5-1: Scale to item summary

| Constructs | | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Freq. | % | Freq. | % | Freq. | % | Freq. | % | Freq. | % |
| Entrepreneur's individual characteristics | EIC1 | 13 | 4,3 | 52 | 17,2 | 68 | 22,4 | 94 | 31 | 76 | 25,1 |
| | EIC2 | 7 | 2,3 | 21 | 6,9 | 35 | 11,6 | 97 | 32 | 143 | 47,2 |
| | EIC3 | 4 | 1,3 | 4 | 1,3 | 12 | 4 | 86 | 28,4 | 197 | 65 |
| | EIC4 | 7 | 2,3 | 1 | 0,3 | 9 | 3 | 121 | 39,9 | 165 | 54,5 |
| | EIC5 | 8 | 2,6 | 35 | 11,5 | 46 | 15,2 | 129 | 42,6 | 85 | 28,1 |
| | EIC6 | 5 | 1,7 | 36 | 11,9 | 62 | 20,4 | 135 | 44,6 | 65 | 21,4 |
| | EIC7 | 2 | 0,7 | 1 | 0,3 | 14 | 4,6 | 163 | 53,8 | 123 | 40,6 |
| | EIC8 | 3 | 1 | 3 | 1 | 17 | 5,6 | 114 | 37,6 | 166 | 54,8 |
| | EIC9 | 10 | 3,3 | 28 | 9,2 | 67 | 22,1 | 129 | 42,6 | 69 | 22,8 |
| | EIC10 | 3 | 1 | 14 | 4,6 | 47 | 15,5 | 142 | 46,9 | 97 | 32 |
| | EIC11 | 4 | 1,3 | 6 | 2 | 11 | 3,6 | 129 | 42,6 | 153 | 50,5 |
| Internal Non-Individual Characteristics | INICSME1 | 3 | 1 | 2 | 0,7 | 9 | 3 | 106 | 35 | 183 | 60,3 |
| | INICSME2 | 4 | 1,3 | 2 | 0,7 | 4 | 1,3 | 86 | 28,4 | 207 | 68,3 |
| | INICSME3 | 2 | 0,7 | 5 | 1,6 | 6 | 2 | 93 | 30,7 | 197 | 65 |
| | INICSME4 | 3 | 1 | 8 | 2,6 | 25 | 8,3 | 131 | 43,2 | 136 | 44,9 |
| | INICSME5 | 1 | 0,3 | 4 | 1,3 | 23 | 7,6 | 132 | 43,6 | 143 | 47,2 |
| | INICSME6 | 1 | 0,3 | 3 | 1 | 13 | 4,3 | 119 | 39,3 | 167 | 55,1 |
| | INICSME7 | 2 | 0,7 | 8 | 2,6 | 40 | 13,2 | 132 | 43,6 | 121 | 39,9 |
| | INICSME8 | 17 | 5,6 | 48 | 15,8 | 114 | 37,6 | 99 | 32,7 | 25 | 8,3 |
| | INICSME9 | 3 | 1 | 3 | 1 | 21 | 6,9 | 162 | 53,5 | 114 | 37,6 |
| | INICSME10 | 3 | 1 | 4 | 1,3 | 33 | 10,9 | 151 | 49,8 | 112 | 37 |
| | INICSME11 | 4 | 1,3 | 9 | 3 | 38 | 12,5 | 156 | 51,5 | 96 | 31,7 |
| External Non-individual characteristics | EFS1 | 2 | 0,7 | 4 | 1,3 | 21 | 6,9 | 151 | 49,8 | 125 | 41,3 |
| | EFS2 | 2 | 0,7 | 8 | 2,6 | 29 | 9,6 | 138 | 45,5 | 126 | 41,6 |
| | EFS3 | 11 | 3,6 | 61 | 20,1 | 120 | 39,6 | 76 | 25,1 | 35 | 11,6 |
| | EFS4 | 3 | 1 | 5 | 1,7 | 27 | 8,8 | 143 | 47,2 | 125 | 41,3 |
| | EFS5 | 2 | 0,7 | 7 | 2,3 | 92 | 30,4 | 151 | 49,8 | 51 | 16,8 |
| | EFS6 | 7 | 2,3 | 9 | 3 | 16 | 5,2 | 112 | 37 | 159 | 52,5 |
| | EFS7 | 5 | 1,7 | 8 | 2,6 | 31 | 10,2 | 125 | 41,3 | 134 | 44,2 |
| | EFS8 | 6 | 2 | 17 | 5,6 | 50 | 16,5 | 99 | 32,7 | 131 | 43,2 |
| | EFS9 | 2 | 0,7 | 7 | 2,3 | 18 | 5,9 | 103 | 34 | 173 | 57,1 |
| | EFS10 | 5 | 1,7 | 28 | 9,2 | 47 | 15,5 | 122 | 40,3 | 101 | 33,3 |
| | EFS11 | 5 | 1,6 | 5 | 1,6 | 19 | 6,3 | 95 | 31,4 | 179 | 59,1 |
| Operational Approach | OASF1 | 3 | 1 | 6 | 2 | 16 | 5,2 | 129 | 42,6 | 149 | 49,2 |
| | OASF2 | 2 | 0,7 | 0 | 0 | 12 | 4 | 133 | 43,8 | 156 | 51,5 |
| | OASF3 | 2 | 0,7 | 1 | 0,3 | 10 | 3,3 | 117 | 38,6 | 173 | 57,1 |
| | OASF4 | 1 | 0,3 | 7 | 2,3 | 32 | 10,6 | 144 | 47,5 | 119 | 39,3 |
| | OASF5 | 5 | 1,7 | 7 | 2,3 | 27 | 8,9 | 131 | 43,2 | 133 | 43,9 |
| | OASF6 | 3 | 1 | 10 | 3,3 | 42 | 13,9 | 138 | 45,5 | 110 | 36,3 |
| | OASF7 | 1 | 0,3 | 1 | 0,3 | 6 | 2 | 101 | 33,3 | 194 | 64 |
| | OASF8 | 0 | 0 | 4 | 1,3 | 15 | 5 | 127 | 41,9 | 157 | 51,8 |
| | OASF9 | 1 | 0,3 | 14 | 4,6 | 68 | 22,4 | 131 | 43,3 | 89 | 29,4 |
| | OASF10 | 1 | 0,3 | 7 | 2,3 | 67 | 22,1 | 141 | 46,6 | 87 | 28,7 |
| | OASF11 | 1 | 0,3 | 4 | 1,3 | 53 | 17,5 | 154 | 50,9 | 91 | 30 |
| | OASF12 | 0 | 0 | 13 | 4,3 | 60 | 19,8 | 156 | 51,5 | 74 | 24,4 |
| Intervention Measures | IM1 | 3 | 1 | 9 | 3 | 50 | 16,5 | 132 | 43,5 | 109 | 36 |
| | IM2 | 3 | 1 | 23 | 7,6 | 50 | 16,5 | 95 | 31,3 | 132 | 43,6 |
| | IM3 | 0 | 0 | 12 | 4 | 69 | 22,8 | 139 | 45,9 | 83 | 27,3 |
| | IM4 | 5 | 1,7 | 5 | 1,7 | 34 | 11,2 | 151 | 49,8 | 108 | 35,6 |
| | IM5 | 1 | 0,3 | 5 | 1,7 | 32 | 10,5 | 152 | 50,2 | 113 | 37,3 |
| | IM6 | 2 | 0,7 | 15 | 5 | 73 | 24,1 | 150 | 49,4 | 63 | 20,8 |
| | IM7 | 4 | 1,3 | 22 | 7,3 | 75 | 24,8 | 137 | 45,2 | 65 | 21,4 |
| | IM8 | 1 | 0,3 | 3 | 1 | 12 | 4 | 116 | 38,3 | 171 | 56,4 |
| | IM9 | 1 | 0,3 | 4 | 1,3 | 22 | 7,3 | 136 | 44,9 | 140 | 46,2 |
| | IM10 | 8 | 2,6 | 18 | 5,9 | 60 | 19,8 | 103 | 34 | 114 | 37,7 |
| | IM11 | 2 | 0,7 | 4 | 1,3 | 28 | 9,3 | 121 | 39,9 | 148 | 48,8 |

**EIC= Entrepreneur's individual characteristics; INICSME = Internal non-individual characteristics of SME; EFS= External non-individual characteristics; OASF = Operations Approach of SME foundry; IM= Intervention measures*

### Entrepreneur's individual characteristics

For ease of reading and interpretation, the results in Table 5-3 above were further represented in graphical form as shown below. The first graph shows results on entrepreneur's individual characteristics selected by participants as success factors required to run of an SME foundry in South Africa.

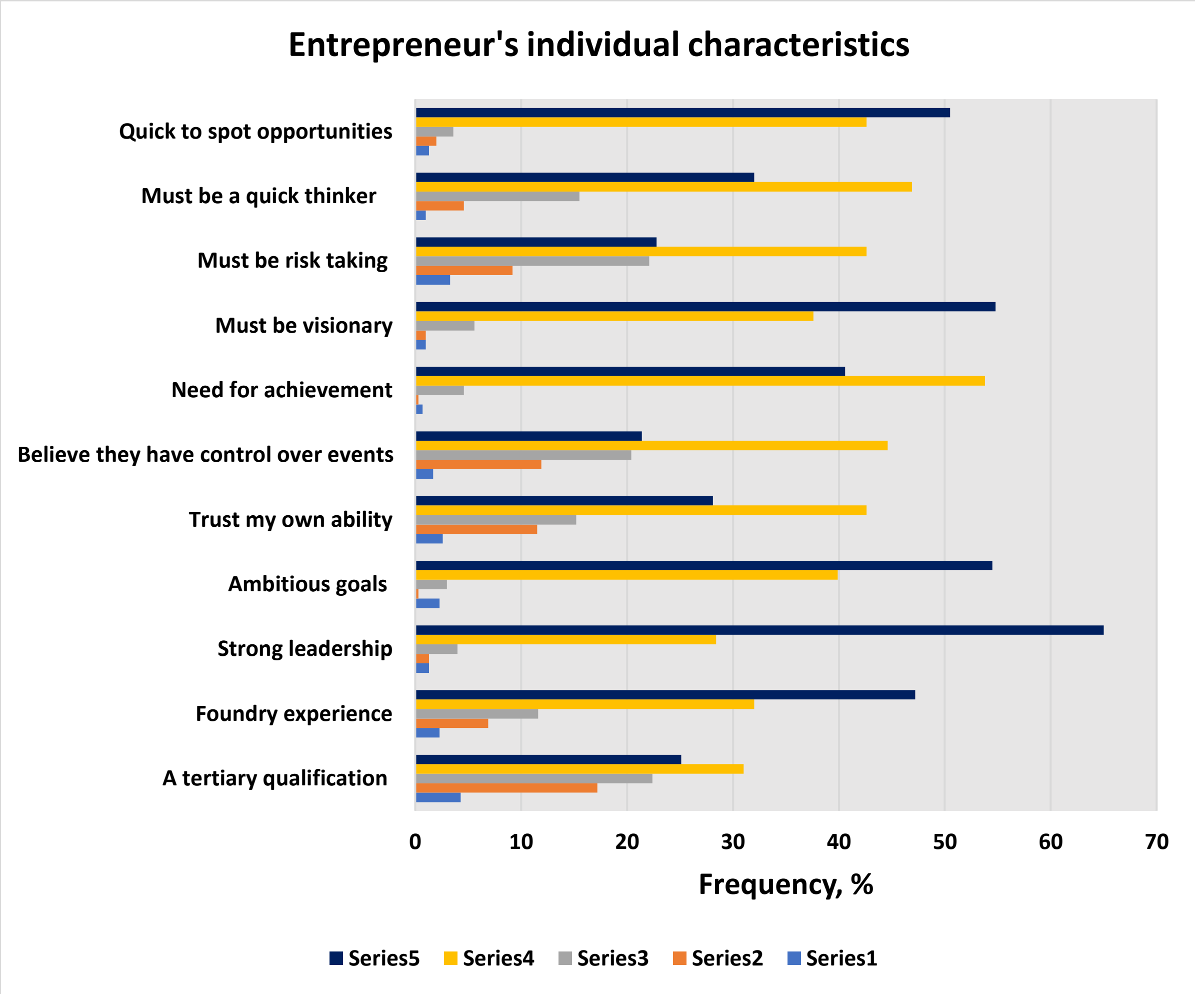


**Figure 5-10: Summary of entrepreneur's individual characteristics results**

**Source: Developed by author**

Generally, most participants agreed that all eleven entrepreneur's individual characteristics were necessary for successful running of an SME foundry in South Africa. There is evidence that 94.4 percent of participants agreed that ambitious goals were necessary for successful running of foundry. The same score was also observed for need for achievement. Strong leadership came in third place with 93.4 percent of participants agreeing that this attribute is necessary for successful running of foundry. About 93.1 percent of participants also agreed that the entrepreneur should be able to spot opportunities for their foundry to be successful.

### Internal non-individual characteristics

Figure 5-11 below shows results for internal non-individual characteristics of an SME foundry required for its successful operation.

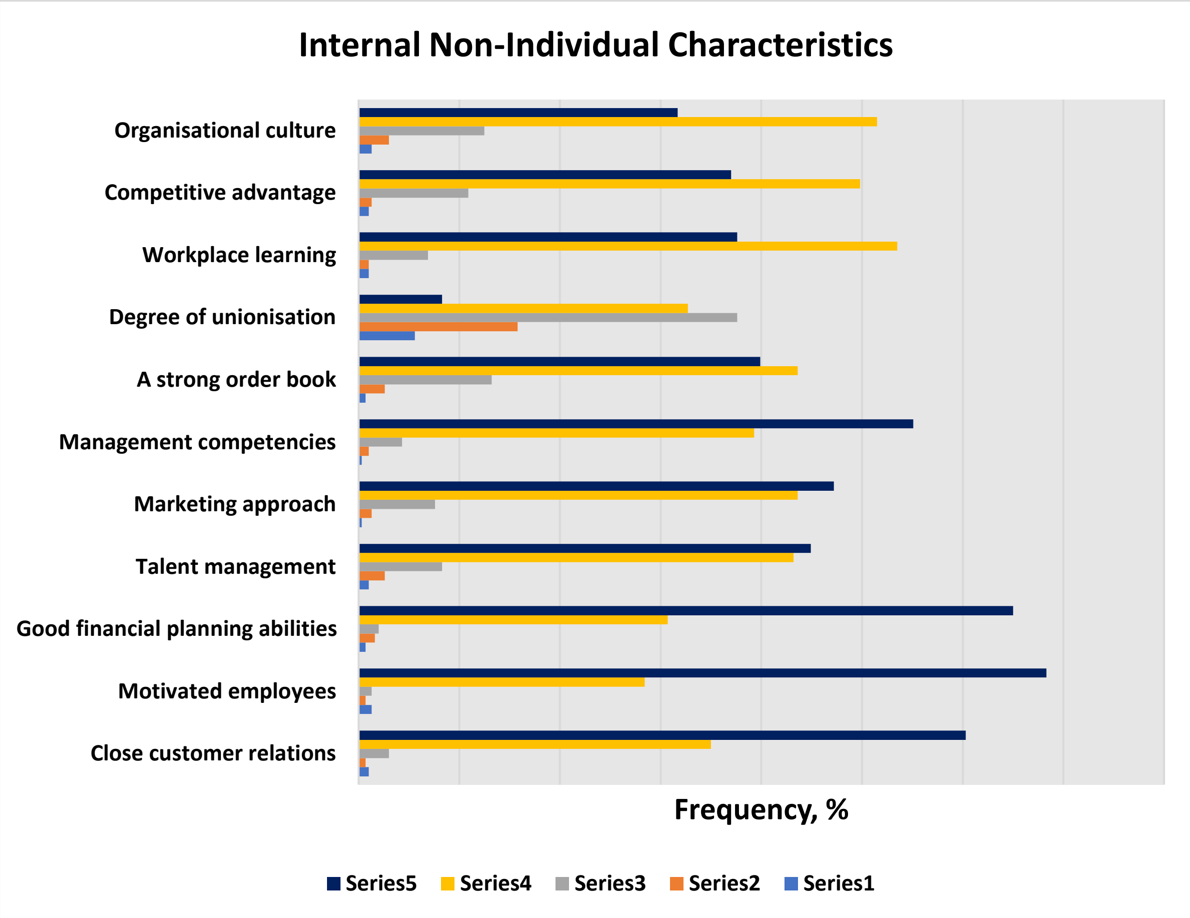


**Figure 5-11: Summary of internal non-individual characteristics results**

**Source: Developed by author**

Motivated employees recorded the highest respondents who agreed that it was a necessity for successful running of an SME at 96.7 percent. This was followed by 95.7 percent who agreed that good financial planning abilities were necessary for successful running of foundry. In third and fourth place was close customer relations and management competencies who recorded 95.3 percent and 94.4 percent respectively. The respondents agreed that most of the internal non-individual characteristics were necessary for successful running of an SME foundry, except for degree of unionisation of a foundry which only received 41 percent agreeing to it.

### External non-individual factors

Figure 5-12 below is a summary of external non individual factors required to successfully run an SME foundry. The participants agreed that most of the external factors listed on the questionnaire could affect the successful running of an SME foundry.

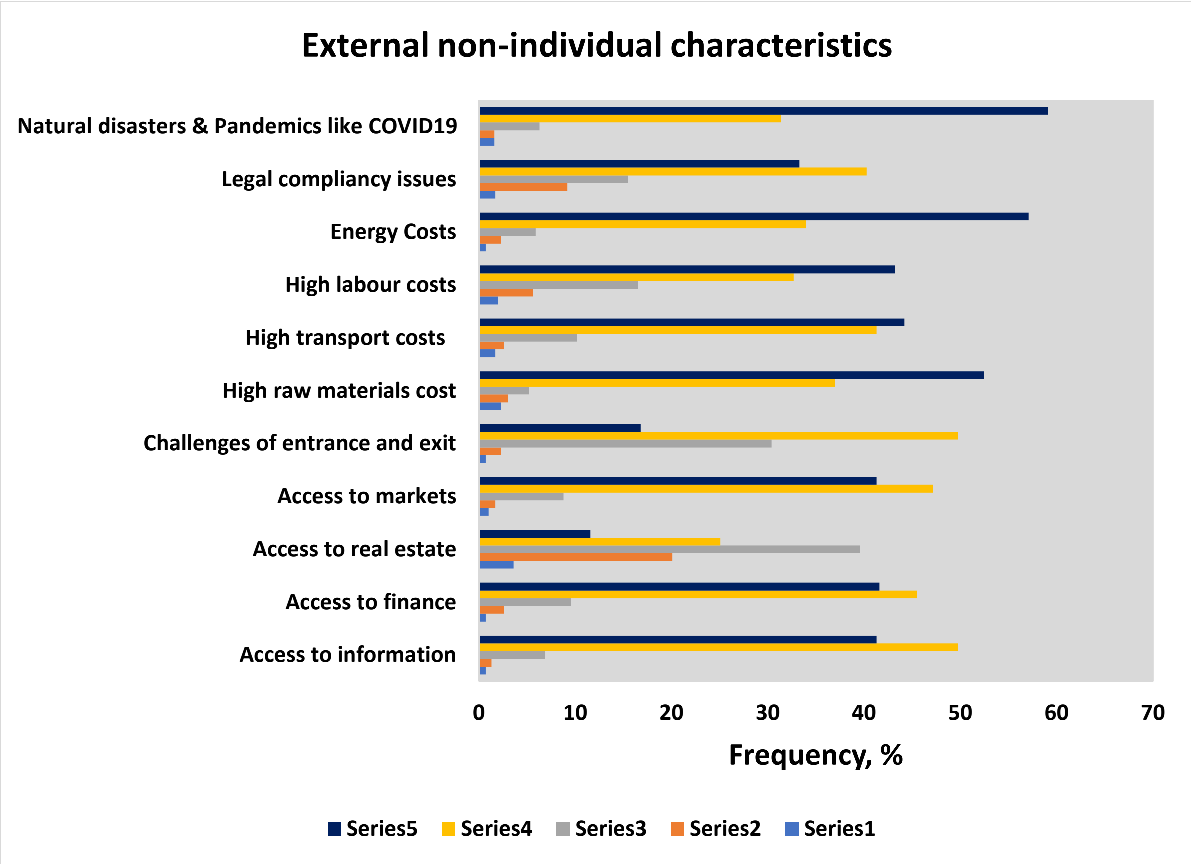


**Figure 5-12: Summary of external non-individual characteristics results**

**Source: Developed by author**

Access to information and cost-efficient energy were ranked highest, at 91.1 percent. About 90.5 percent of participants agreed that foundries needed to put in place contingency plans for natural disasters and pandemics such as COVID-19 for them to be successful. In fourth place was cost efficient raw materials, which had 89.5 percent of respondents agreeing that this factor is necessary for successful running of an SME foundry. Access to finance also received considerable support, with 87.1 percent of participants agreeing that this factor is necessary for successful running of an SME foundry in South Africa. Access to real estate was not rated important for successful running of an SME foundry, as only 36.7 percent agreed that it was an important factor.

### Operational approach of foundry

Figure 5-13 below summarises results on operational factors. The participants generally agreed that all the operational factors suggested in the questionnaire were necessary for successful running of an SME foundry in South Africa.

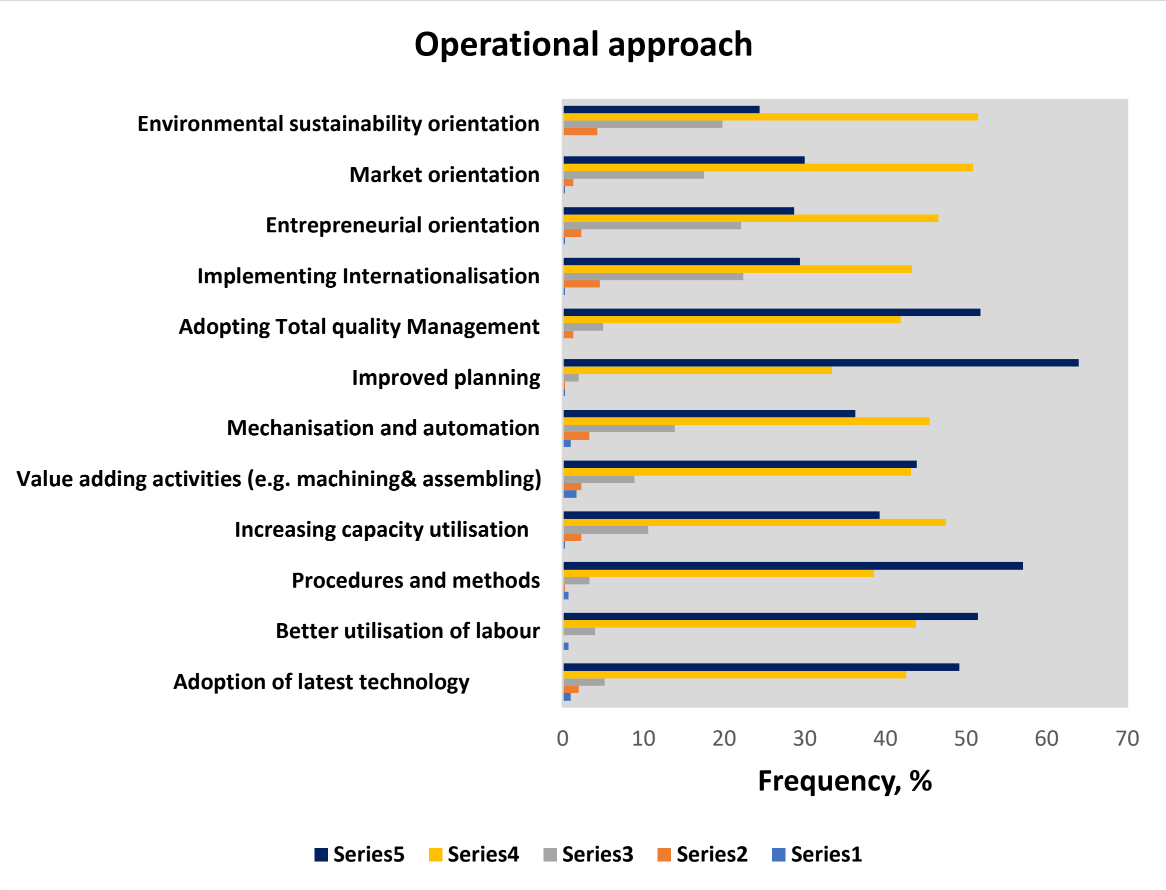


**Figure 5-13: Summary of operational factors results**

**Source: Developed by author**

The figure above shows that 97.4 percent of participants agreed that improved planning was necessary for successful running of a foundry. This was followed by procedures and methods which had 95.7 percent of participants agreeing that it was an important factor. In third place was better utilisation of labour which had 95.3 percent of participants agreeing that it was also an important factor which should be considered for successful running of a foundry. Adopting a Total Quality Management System was also identified as an important operational factor which could lead to success of a foundry. Lastly adoption of latest technology also received 91.8 percent support from the participants.

### Intervention measures

Figure 5-14 below is a summary of results on intervention measures which could be implemented to save the South African foundry industry.

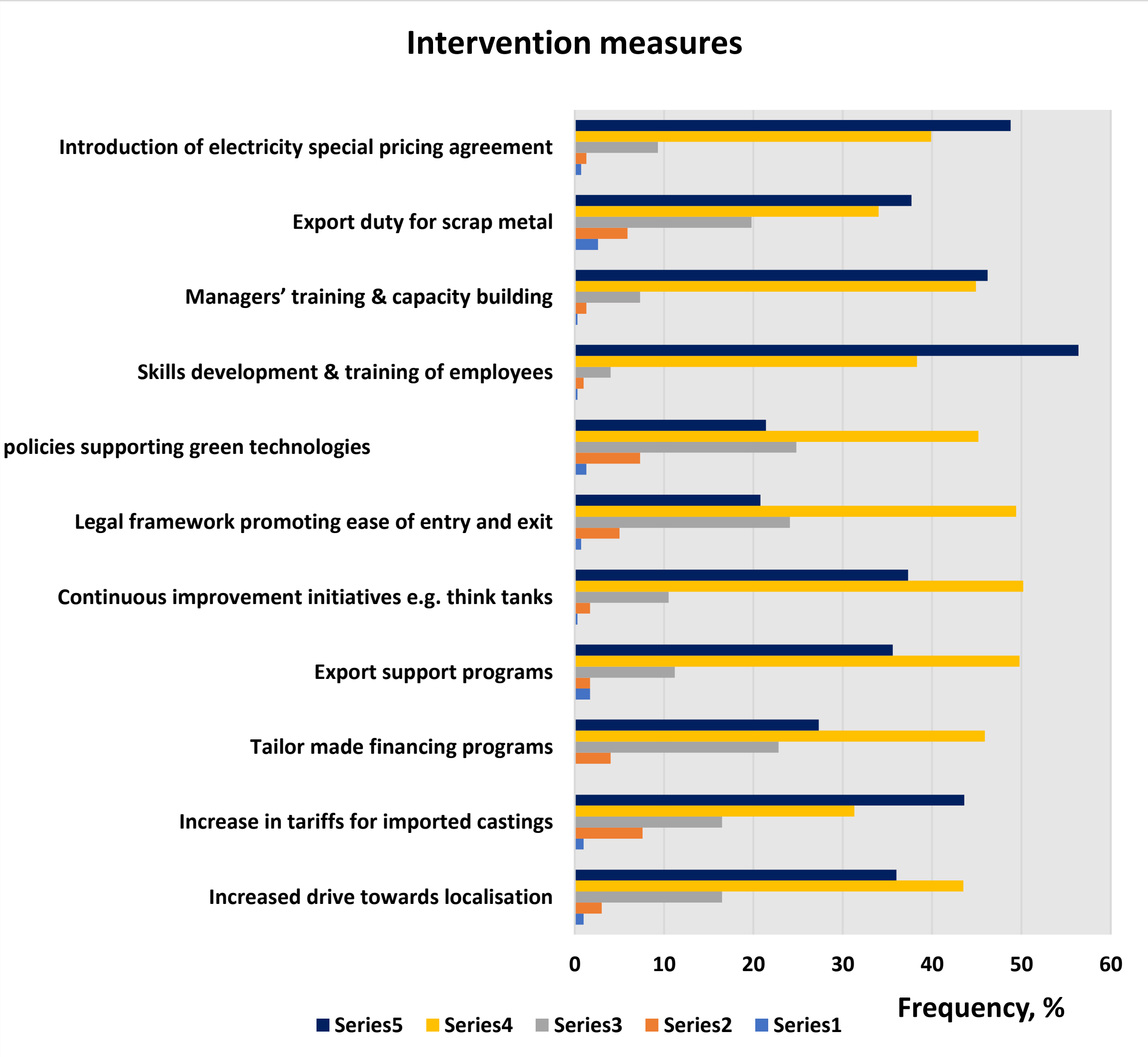


**Figure 5-14: Summary of intervention measures results**

**Source: Developed by author**

The participants generally agreed to all the intervention measures suggested in the questionnaire. Skills development of foundry employees received the most support, with 94.7 percent of participants agreeing that this intervention can make the South

African foundry industry more sustainable. 91.1 percent of participants also agreed that training and capacity building of foundry managers could also help the South African foundry industry to be more sustainable. 88.7 percent of participants also agreed that there was need for an introduction of an electricity special pricing agreement, followed by continuous improvement initiatives at 85.7 percent. Another intervention measure which received considerable support from the participants was export support programmes for South African SME foundries.

## 5.4 INFERENTIAL STATISTICS

Following the generation of descriptive statistics of the data, the inferential statistics discussion follows. Inferential statistics generalise sample findings to the broader population and they are used for informing rigorous statistical decision-making (Wagner, 2010)

**Table 5-2: Accuracy analysis statistics**

| Accuracy Analysis Statistics | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Research Construct | | Descriptive Statistics | | | | Cronbach's Test | | C.R. Value | AVE Value | Factor Loadings |
| | | Mean Value | | Standard Deviation | | Item - total | α value | | | |
| | EIC1 | 3.554 | | 1.164 | | 0.323 | | | | 0.346 |
| | EIC2 | 4.149 | | 1.027 | | 0.488 | | | | 0.465 |
| | EIC3 | 4.545 | | 0.753 | | 0.423 | | | | 0.493 |
| | EIC4 | 4.439 | | 0.778 | | 0.532 | | | | 0.611 |
| | EIC5 | 3.818 | | 1.050 | | 0.445 | | | | 0.434 |
| EIC | EIC6 | 3.723 | 4.105 | 0.985 | 0.890 | 0.485 | 0.800 | 0.814 | 0.382 | 0.493 |
| | EIC7 | 4.333 | | 0.644 | | 0.537 | | | | 0.657 |
| | EIC8 | 4.442 | | 0.734 | | 0.484 | | | | 0.628 |
| | EIC9 | 3.723 | | 1.021 | | 0.454 | | | | 0.522 |
| | EIC10 | 4.043 | | 0.866 | | 0.526 | | | | 0.572 |
| | EIC11 | 4.389 | | 0.768 | | 0.500 | | | | 0.617 |
| | INCS1 | 4.531 | | 0.684 | | 0.440 | | | | 0.518 |
| | INCS2 | 4.617 | | 0.680 | | 0.550 | | | | 0.624 |
| | INCS3 | 4.578 | | 0.681 | | 0.625 | | | | 0.684 |
| | INCS4 | 4.284 | | 0.805 | | 0.570 | | | | 0.637 |
| INCSME | INCS5 | 4.360 | 4.273 | 0.709 | 0.750 | 0.512 | 0.804 | 0.823 | 0.424 | 0.569 |
| | INCS6 | 4.479 | | 0.660 | | 0.587 | | | | 0.655 |
| | INCS7 | 4.195 | | 0.813 | | 0.441 | | | | 0.497 |
| | INCS8 | 3.221 | | 0.997 | | 0.257 | | | | 0.317 |
| | INCS9 | 4.257 | | 0.714 | | 0.434 | | | | 0.504 |
| | INCS10 | 4.205 | | 0.762 | | 0.511 | | | | 0.594 |
| | EFS1 | 4.092 | | 0.821 | | 0.429 | | | | 0.449 |
| | EFS2 | 4.297 | | 0.712 | | 0.388 | | | | 0.391 |
| | EFS3 | 4.248 | | 0.786 | | 0.387 | | | | 0.401 |
| | EFS4 | 3.208 | | 1.010 | | 0.382 | | | | 0.383 |
| | EFS5 | 4.261 | | 0.769 | | 0.418 | | | | 0.411 |
| EFS | EFS6 | 3.799 | 4.118 | 0.765 | 0.850 | 0.332 | 0.800 | 0.807 | 0.354 | 0.360 |
| | EFS7 | 4.343 | | 0.888 | | 0.578 | | | | 0.731 |
| | EFS8 | 4.238 | | 0.863 | | 0.619 | | | | 0.744 |
| | EFS9 | 4.096 | | 0.997 | | 0.493 | | | | 0.614 |
| | EFS10 | 4.446 | | 0.765 | | 0.573 | | | | 0.681 |
| | EFS11 | 3.944 | | 1.003 | | 0.339 | | | | 0.375 |
| | EFS12 | 4.446 | | 0.820 | | 0.434 | | | | 0.495 |
| | OASF1 | 4.370 | | 0.760 | | 0.579 | | | | 0.618 |
| | OASF2 | 4.455 | | 0.639 | | 0.615 | | | | 0.692 |
| | OASF3 | 4.512 | | 0.645 | | 0.602 | | | | 0.689 |
| | OASF4 | 4.231 | | 0.754 | | 0.602 | | | | 0.662 |
| | OASF5 | 4.254 | | 0.841 | | 0.621 | | | | 0.659 |
| OASF | OASF6 | 4.129 | 4.252 | 0.842 | 0.741 | 0.525 | 0.877 | 0.881 | 0.499 | 0.547 |
| | OASF7 | 4.604 | | 0.583 | | 0.540 | | | | 0.610 |
| | OASF8 | 4.442 | | 0.653 | | 0.583 | | | | 0.619 |
| | OASF9 | 3.967 | | 0.857 | | 0.568 | | | | 0.587 |
| | OASF10 | 4.010 | | 0.795 | | 0.583 | | | | 0.609 |
| | OASF11 | 4.089 | | 0.743 | | 0.583 | | | | 0.588 |
| | OASF12 | 3.960 | | 0.784 | | 0.497 | | | | 0.514 |
| | IM1 | 4.106 | | 0.851 | | 0.388 | | | | 0.411 |
| | IM2 | 4.089 | | 0.994 | | 0.428 | | | | 0.408 |
| | IM3 | 3.967 | | 0.813 | | 0.547 | | | | 0.570 |
| | IM4 | 4.162 | | 0.812 | | 0.557 | | | | 0.591 |
| | IM5 | 4.224 | | 0.725 | | 0.494 | | | | 0.608 |
| | IM6 | 3.848 | 4.123 | 0.828 | 0.825 | 0.518 | 0.805 | 0.810 | 0.375 | 0.625 |
| | IM7 | 3.782 | | 0.909 | | 0.423 | | | | 0.488 |
| | IM8 | 4.495 | | 0.655 | | 0.433 | | | | 0.523 |
| | IM9 | 4.353 | | 0.703 | | 0.523 | | | | 0.620 |
| | IM10 | 3.980 | | 1.026 | | 0.447 | | | | 0.476 |
| | IM11 | 4.350 | | 0.757 | | 0.426 | | | | 0.482 |

**Scores: 1 –Strongly Disagree; 2 – Disagree; 3 Neutral;4 – Agree;* 5 – *Strongly Agree.*

*C.R.: Composite Reliability: AVE: Average Variance Extracted.*

*a significance level p<0.05; b significance level p<0.01; c significance level p<0.001*

### 5.4.1 Testing for Reliability

Reliability refers to the degree to which a scale produces consistent results every time if repeated measurements are made under the same conditions on the characteristic (Creswell, 2014). The researcher used Cronbach's alpha (α), item to total values, Composite Reliability (CR) to evaluate the measurement instrument's reliability. The following section provides an overview of the results from these three tests.

#### i. Cronbach's Alpha (α)

In this study, Cronbach's alpha was used to assess internal reliability of the constructs in the measurement scale. Based on the reliability of the variables, the Cronbach Alpha values for each construct were as follows: effects of entrepreneur's individual characteristics = 0.800, internal non-individual characteristics of SME = 0.804, operational approach of SME foundry, external non-individual factors affecting an SME = 0.800 and intervention measures = 0.805.

Therefore, all the constructs were deemed highly reliable since they are above the cut-off value of 0.70 recommended by Hair, Black, Barbin and Anderson (2010). This implies that the survey instrument is reliable to measure all constructs consistently and is free from random error. The Cronbach alpha results are presented in accuracy analysis table, while Appendix: Cronbach Coefficient Alpha's, presents the results of the Cronbach alpha values.

#### ii. Item to total values

Inter-item correlations confirmed statistical agreement among the measured items. As can be seen, item-to-total values ranged from 0.257 to 0.619 and therefore, all values were above the acceptable threshold of 0.300 (often values above 0.2=0.3) endorsed by Dunn, Seaker and Waller (1994).

#### iii. Composite Reliability (CR)

Internal reliability was also evaluated using Composite Reliability (CR). Composite reliability of all the latent variables should be greater than 0.70 (Carmines & Zeller, 1988). The CR for all the latent factors achieved the acceptable range of 0.7 (ranging from 0.807 to 0.881), or above, as recommended by Hair et al. (2010), indicating high reliability for all the constructs (Nusair and Hua, 2010). These values surpassed the estimate criteria used by past literature. A manual calculation for estimating the Composite Reliability (CR) was also conducted in Appendix: Composite Reliability Calculations, and the results are shown below in Table 5-5.

**Table 5-3: Composite reliability (CR)**

| Composite Reliability | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Composite Reliability (CR) | | | |
| | | | Estimate | (∑λYi)² | summation of error terms | | CRη=(Σλyi)2/[(Σλyi)2+(Σεi)] |
| | | | | | έi | ∑έi | CR |
| | <--- | EIC1 | 0.346 | | 0.880 | | |
| | <--- | EIC2 | 0.465 | | 0.784 | | |
| | <--- | EIC3 | 0.493 | | 0.757 | | |
| | <--- | EIC4 | 0.611 | | 0.627 | | |
| | <--- | EIC5 | 0.434 | | 0.812 | | |
| EIC | <--- | EIC6 | 0.493 | 34.082 | 0.757 | 7.810 | 0.814 |
| | <--- | EIC7 | 0.657 | | 0.568 | | |
| | <--- | EIC8 | 0.628 | | 0.606 | | |
| | <--- | EIC9 | 0.522 | | 0.728 | | |
| | <--- | EIC10 | 0.572 | | 0.673 | | |
| | <--- | EIC11 | 0.617 | | 0.619 | | |
| | <--- | INCS1 | 0.518 | | 0.732 | | |
| | <--- | INCS2 | 0.624 | | 0.611 | | |
| | <--- | INCS3 | 0.684 | | 0.532 | | |
| | <--- | INCS4 | 0.637 | | 0.594 | | |
| INCS | <--- | INCS5 | 0.569 | 31.349 | 0.676 | 6.762 | 0.823 |
| | <--- | INCS6 | 0.655 | | 0.571 | | |
| | <--- | INCS7 | 0.497 | | 0.753 | | |
| | <--- | INCS8 | 0.317 | | 0.900 | | |
| | <--- | INCS9 | 0.504 | | 0.746 | | |
| | <--- | INCS10 | 0.594 | | 0.647 | | |
| | <--- | EFS1 | 0.449 | | 0.798 | | |
| | <--- | EFS2 | 0.391 | | 0.847 | | |
| | <--- | EFS3 | 0.401 | | 0.839 | | |
| | <--- | EFS4 | 0.383 | | 0.853 | | |
| | <--- | EFS5 | 0.411 | | 0.831 | | |
| EFS | <--- | EFS6 | 0.36 | 36.421 | 0.870 | 8.725 | 0.807 |
| | <--- | EFS7 | 0.731 | | 0.466 | | |
| | <--- | EFS8 | 0.744 | | 0.446 | | |
| | <--- | EFS9 | 0.614 | | 0.623 | | |
| | <--- | EFS10 | 0.681 | | 0.536 | | |
| | <--- | EFS11 | 0.375 | | 0.859 | | |
| | <--- | EFS12 | 0.495 | | 0.755 | | |
| | <--- | OASF1 | 0.618 | | 0.618 | | |
| | <--- | OASF2 | 0.692 | | 0.521 | | |
| | <--- | OASF3 | 0.689 | | 0.525 | | |
| | <--- | OASF4 | 0.662 | | 0.562 | | |
| | <--- | OASF5 | 0.659 | | 0.566 | | |
| OASF | <--- | OASF6 | 0.547 | 54.671 | 0.701 | 7.412 | 0.881 |
| | <--- | OASF7 | 0.61 | | 0.628 | | |
| | <--- | OASF8 | 0.619 | | 0.617 | | |
| | <--- | OASF9 | 0.587 | | 0.655 | | |
| | <--- | OASF10 | 0.609 | | 0.629 | | |
| | <--- | OASF11 | 0.588 | | 0.654 | | |
| | <--- | OASF12 | 0.514 | | 0.736 | | |
| | <--- | IM1 | 0.411 | | 0.831 | | |
| | <--- | IM2 | 0.408 | | 0.834 | | |
| | <--- | IM3 | 0.57 | | 0.675 | | |
| | <--- | IM4 | 0.591 | | 0.651 | | |
| | <--- | IM5 | 0.608 | | 0.630 | | |
| IM | <--- | IM6 | 0.625 | 33.663 | 0.609 | 7.875 | 0.810 |
| | <--- | IM7 | 0.488 | | 0.762 | | |
| | <--- | IM8 | 0.523 | | 0.726 | | |
| | <--- | IM9 | 0.62 | | 0.616 | | |
| | <--- | IM10 | 0.476 | | 0.773 | | |
| | <--- | IM11 | 0.482 | | 0.768 | | |

**Source: Developed by author**

Yang & Lai (2010) recommend that composite reliability values must exceed 0.7. The internal reliability of each construct for the present study was also assessed through composite reliability test aside from the Cronbach's alpha test. It is calculated using the following formula:

(CR): CRη = (Σλyi)2/[(Σλyi)2+(Σεi)]

Composite Reliability = (square of the summation of the factor loadings)/ {(square of the summation of the factor loadings) + (summation of error variances)}.

**a) Effects of entrepreneur's individual characteristics (EIC)**

$(\Sigma\gamma yi)^2 = (0.346+0.465+0.493+0.611+0.434+0.493+0.657+0.628+0.522+0.572+0.617)^2 =$ **<u>34.082</u>**

$\Sigma\varepsilon i = [(1-0.346)^2+(1-0.465)^2+(1-0.493)^2+(1-0.611)^2+(1-0.434)^2+(1-0.493)^2+$
$(1-0.657)^2+(1-0.628)^2+(1-0.522)^2+(1-0.572)^2+(1-0.617)^2] =$ **<u>7.810</u>**

CR = 34.082 / (34.082+7.810) = **<u>0.814</u>**

**b) Internal non-individual characteristics of SME (INCS)**

$(\Sigma\gamma yi)^2=(0.518+0.624+0.684+0.637+0.569+0.655+0.497+0.317+0.504+0.594)^2=$ **<u>31.349</u>**

$\Sigma\varepsilon i=[(1-0.518)^2+(1-0.624)^2+(1-0.684)^2+(1-0.637)+(1-0.569)^2+(1-0.655)^2+(1-0.497)^2+$
$(1-0.317)^2+(1-0.504)^2+(1-0.594)^2]=$ **<u>6.762</u>**

CR=31.349/(31.349+6.762)= **<u>0.823</u>**

**c) External non-individual factors affecting an SME (EFS)**

$(\Sigma\gamma yi)^2=(0.449+0.391+0.401+0.383+0.411+0.36+0.731+0.744+0.614+0.681+0.375+0.495)^2=$**<u>36.42</u>**

$\Sigma\varepsilon i=[(1-0.449)^2+(1-0.391)^2+(1-0.401)^2+(1-0.383)^2+(1-0.411)^2+(1-0.360)^2+(1-0.731)^2+$
$(1-0.744)^2+(1-0.614)^2+(1-0.681)^2+(1-0.375)^2+(1-0.495)^2]=$ **<u>8.725</u>**

CR= 36.421/(36.421+8.725)= **<u>0.807</u>**

**d) Operational approach of SME foundry (OASF)**

$(\Sigma\gamma yi)^2=(0.618+0.692+0.689+0.662+0.659+0.547+0.61+0.619+0.587+0.609+0.588+0.514)^2=$
**<u>54.671</u>**

$\Sigma\varepsilon i=[(1-0.618)^2+(1-0.692)^2+(1-0.689)^2+(1-0.662)^2+(1-0.659)^2+(1-0.547)^2+(1-0.61)^2+$
$(1-0.619)^2+(1-0.587)^2+(1-0.609)^2+(1-0.588)^2+(1-0.514)^2]=$ **<u>7.412</u>**

CR= 54.671/(54.671+7.412) = **<u>0.881</u>**

**e) Intervention measures (IM)**

$(\Sigma\gamma yi)^2 = (0.411+0.408+0.570+0.591+0.608+0.625+0.488+0.523+0.620+0.476+0.482)^2=$ **<u>33.663</u>**

$\Sigma\varepsilon i=[(1-0.411)^2+(1-0.408)^2+(1-0.57)^2+(1-0.591)^2+(1-0.608)^2+(1-0.625)^2+(1-0.488)^2+$
$(1-0.523)^2+(1-0.62)^2+(1-0.476)^2+(1-0.482)^2]=$ **<u>7.875</u>**

CR= 33.663/(33.663+7.875) = **<u>0.810</u>**

## Table 5-4: Average Variance extracted (AVE)

| Average Variance Extracted | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Estimate | λyi² | ∑λyi² | ԑi | ∑ԑi | ∑λyi² / (∑λyi² + ∑ԑi) |
| EIC | <— | EIC1 | 0.346 | 0.120 | 3.190 | 0.654 | 5.162 | 0.382 |
| | <— | EIC2 | 0.465 | 0.216 | | 0.535 | | |
| | <— | EIC3 | 0.493 | 0.243 | | 0.507 | | |
| | <— | EIC4 | 0.611 | 0.373 | | 0.389 | | |
| | <— | EIC5 | 0.434 | 0.188 | | 0.566 | | |
| | <— | EIC6 | 0.493 | 0.243 | | 0.507 | | |
| | <— | EIC7 | 0.657 | 0.432 | | 0.343 | | |
| | <— | EIC8 | 0.628 | 0.394 | | 0.372 | | |
| | <— | EIC9 | 0.522 | 0.272 | | 0.478 | | |
| | <— | EIC10 | 0.572 | 0.327 | | 0.428 | | |
| | <— | EIC11 | 0.617 | 0.381 | | 0.383 | | |
| INCS | <— | INCS1 | 0.518 | 0.268 | 3.238 | 0.482 | 4.401 | 0.424 |
| | <— | INCS2 | 0.624 | 0.389 | | 0.376 | | |
| | <— | INCS3 | 0.684 | 0.468 | | 0.316 | | |
| | <— | INCS4 | 0.637 | 0.406 | | 0.363 | | |
| | <— | INCS5 | 0.569 | 0.324 | | 0.431 | | |
| | <— | INCS6 | 0.655 | 0.429 | | 0.345 | | |
| | <— | INCS7 | 0.497 | 0.247 | | 0.503 | | |
| | <— | INCS8 | 0.317 | 0.100 | | 0.683 | | |
| | <— | INCS9 | 0.504 | 0.254 | | 0.496 | | |
| | <— | INCS10 | 0.594 | 0.353 | | 0.406 | | |
| EFS | <— | EFS1 | 0.449 | 0.202 | 3.275 | 0.551 | 5.965 | 0.354 |
| | <— | EFS2 | 0.391 | 0.153 | | 0.609 | | |
| | <— | EFS3 | 0.401 | 0.161 | | 0.599 | | |
| | <— | EFS4 | 0.383 | 0.147 | | 0.617 | | |
| | <— | EFS5 | 0.411 | 0.169 | | 0.589 | | |
| | <— | EFS6 | 0.36 | 0.130 | | 0.64 | | |
| | <— | EFS7 | 0.731 | 0.534 | | 0.269 | | |
| | <— | EFS8 | 0.744 | 0.554 | | 0.256 | | |
| | <— | EFS9 | 0.614 | 0.377 | | 0.386 | | |
| | <— | EFS10 | 0.681 | 0.464 | | 0.319 | | |
| | <— | EFS11 | 0.375 | 0.141 | | 0.625 | | |
| | <— | EFS12 | 0.495 | 0.245 | | 0.505 | | |
| OASF | <— | OASF1 | 0.618 | 0.382 | 4.588 | 0.382 | 4.606 | 0.499 |
| | <— | OASF2 | 0.692 | 0.479 | | 0.308 | | |
| | <— | OASF3 | 0.689 | 0.475 | | 0.311 | | |
| | <— | OASF4 | 0.662 | 0.438 | | 0.338 | | |
| | <— | OASF5 | 0.659 | 0.434 | | 0.341 | | |
| | <— | OASF6 | 0.547 | 0.299 | | 0.453 | | |
| | <— | OASF7 | 0.61 | 0.372 | | 0.39 | | |
| | <— | OASF8 | 0.619 | 0.383 | | 0.381 | | |
| | <— | OASF9 | 0.587 | 0.345 | | 0.413 | | |
| | <— | OASF10 | 0.609 | 0.371 | | 0.391 | | |
| | <— | OASF11 | 0.588 | 0.346 | | 0.412 | | |
| | <— | OASF12 | 0.514 | 0.264 | | 0.486 | | |
| IM | <— | IM1 | 0.411 | 0.169 | 3.125 | 0.589 | 5.198 | 0.375 |
| | <— | IM2 | 0.408 | 0.166 | | 0.592 | | |
| | <— | IM3 | 0.57 | 0.325 | | 0.43 | | |
| | <— | IM4 | 0.591 | 0.349 | | 0.409 | | |
| | <— | IM5 | 0.608 | 0.370 | | 0.392 | | |
| | <— | IM6 | 0.625 | 0.391 | | 0.375 | | |
| | <— | IM7 | 0.488 | 0.238 | | 0.512 | | |
| | <— | IM8 | 0.523 | 0.274 | | 0.477 | | |
| | <— | IM9 | 0.62 | 0.384 | | 0.38 | | |
| | <— | IM10 | 0.476 | 0.227 | | 0.524 | | |
| | <— | IM11 | 0.482 | 0.232 | | 0.518 | | |

**Source: Developed by the author**

Average value extracted (AVE) greater than 0.500 indicates that the validity of both the construct and the individual variables is high (Fornell & Larcker, 1981). Other researchers have indicated that an AVE of 0.4 is acceptable (Mohan, Sivakumaran and Sharma, 2013; Floyd & Widaman, 1995). However, guidelines by Pezeshkian and Sadeghi (2015) suggest that the average value extracted should exceed 0.500 for a construct or be below 0.500 if composite reliability is above 0.60. Hair, Anderson, Tatham and Black (2006) previously contended that 0.3 is an acceptable minimum threshold in social sciences. In this study, AVE values range between 0.352 and 0.499, which is within 0.4 marginally acceptable range and CR is between 0.807 to 0.881, therefore convergent validity of all constructs are still adequate.

In this study, of the five AVE and five CR values, all exceeded the corresponding thresholds except the three for AVE, it was found that three construct had a relatively low AVE value below the recommended threshold (EIC=0.382, EFS=0.352, and IM=0.375). A similar study among college students' consumption of credit cards accepted an AVE of 0.380 (Blankson, Spears and Hinson, 2012) and in a retail study, 0.327 (Bagdare and Jain, 2013). Numerous researchers have accepted an AVE of 0.40 (Baporikar 2015; Pezeshkian and Sadeghi, 2015; Magner, Welker and Campbell, 1996). Other scholars have indicated that when AVE is less than 0.500 and composite reliability is above 0.6, then AVE is deemed as acceptable (Huang, Wang, Wu, and Wang, 2013; Fornell & Larcker, 1981). As stated by Hair, Ringle and Sarstedt (2011), weaker indicators are sometimes retained based on their contribution to content validity. In summary, the average variance extracted of external non-individual factors affecting an SME, external non-individual factors affecting an SME, and intervention measures (AVE = 0.3820, 0.352 and 0.375 respectively) are slightly below the suggested threshold. Since the deviation from the threshold is only marginal for one construct, convergent validity can thus be assumed.

To calculate the Average Value Extracted (AVE), the standardised estimates (factor loading) values in the CFA results are used. The following formula was used to calculate Average Variance Extracted:

Vη=Σλyi2/(Σλyi2+Σεi)

AVE = {(summation of the squared of factor loadings)/{(summation of the squared of factor loadings) + (summation of error variances)}

a) **Effects of entrepreneur's individual characteristics (EIC)**

$(\Sigma\gamma yi)^2=(0.346^2+0.465^2+0.493^2+0.611^2+0.434^2+0.493^2+0.657^2+0.628^2+0.522^2+0.572^2+0.617^2)$ = **<u>3.190</u>**

$\Sigma\varepsilon i = [(1-0.346^2)+(1- 0.465^2)+(1-0.493^2)+(1-0.611^2)+(1-0.434^2)+(1-0.493^2)+(1-0.657^2)+(1-0.628^2)+(1-0.522^2)+(1-0.572^2)+(1-0.617^2)]$ = **<u>5.162</u>**

AVE = 3.190/ (3.190+5.162) = **<u>0.382</u>**

b) **Internal non-individual characteristics of SME (INCS)**

$(\Sigma\gamma yi)^2=(0.518^2+0.624^2+0.684^2+0.637^2+0.569^2+0.655^2+0.497^2+0.317^2+0.504^2+0.594^2)$= **<u>3.238</u>**

$\Sigma\varepsilon i=[(1-0.518^2)+(1-0.624^2)+(1-0.684^2)+(1-0.637^2)+(1-0.569^2)+(1-0.655^2)+(1-0.497^2)+(1-0.317^2)+(1-0.504^2)+(1-0.594^2)]$= **<u>4.401</u>**

AVE=3.238/(3.238+4.401)= **0.424**

c) **External non-individual factors affecting an SME (EFS)**

$(\Sigma\gamma yi)^2=(0.449^2+0.391^2+0.401^2+0.383^2+0.411^2+0.360^2+0.731^2+0.744^2+0.614^2+0.681^2+0.375^2+0.495^2)$= **<u>3.275</u>**

$\Sigma\varepsilon i=[(1-0.449^2)+(1-0.391^2)+(1-0.401^2)+(1-0.383^2)+(1-0.411^2)+(1-0.360^2)+(1-0.731^2)+(1-0.744^2)+(1-0.614^2)+(1-0.681^2)+(1-0.375^2)+(1-0.495^2)]$= **<u>5.965</u>**

AVE= 3.275/(3.275+5.695)= **<u>0.354</u>**

d) **Operational approach of SME foundry (OASF)**

$(\Sigma\gamma yi)^2=(0.618^2+0.692^2+0.689^2+0.662^2+0.659^2+0.547^2+0.61^2+0.619^2+0.587^2+0.609^2+0.588^2+0.514^2)$ = **<u>4.588</u>**

$\Sigma\varepsilon i=[(1-0.618^2)+(1-0.692^2)+(1-0.689^2)+(1-0.662^2)+(1-0.659^2)+(1-0.547^2)+(1-0.61^2)+(1-0.619^2)+(1-0.587^2)+(1-0.609^2)+(1-0.588^2)+(1-0.514^2)]$= **<u>4.606</u>**

AVE= 4.588/(4.588+4.606) = **<u>0.499</u>**

e) **Intervention measures (IM)**

$(\Sigma\gamma yi)^2=(0.411^2+0.408^2+0.570^2+0.591^2+0.608^2+0.625^2+0.488^2+0.523^2+0.620^2+0.476^2+0.482^2)$= **<u>3.125</u>**

$\Sigma\varepsilon i=[(1-0.411^2)+(1-0.408^2)+(1-0.57^2)+(1-0.591^2)+(1-0.608^2)+(1-0.625^2)+(1-0.488^2)+(1-0.523^2)+(1-0.62^2)+(1-0.476^2)+(1-0.482^2)]$= **<u>5.198</u>**

AVE= 3.125/(3.125+5.198) = **<u>0.375</u>**

### 5.4.2 Testing for Validity

Validity refers to the extent to which research is accurate (Hair et al., 2010). In this study, validity tests that included convergent and discriminant validity were conducted. The results of the CFA provided evidence of the convergent and discriminant validity of the measurement model (Fornell & Larcker, 1981).

#### 5.4.2.1 Convergent Validity

The convergent validity was assessed by examining the factor loadings of the constructs (Fornell & Larcker, 1981). It was concluded that there was convergent validity based on acceptance criteria of AVE readings. This indicates that the respective constructs converge well on a single construct and are therefore valid (Hair et al., 2010). Thus, convergent validity was established.

#### 5.4.2.2 Discriminant Validity

To test for discriminant validity, the inter-construct correlation matrix and AVE were assessed.

#### 5.4.2.3 Inter-Construct Correlation Matrix

The inter-construct correlation matrix was used to establish distinctiveness or similarity of constructs (Hair et al., 2010). The results indicate that 0.646 is the highest correlation. A result of less than 1.0 for all inter-factor correlation values for paired latent variables implies that there was acceptable discriminant validity in the measurement scales as supported by Hair et al., (2010). As presented in the inter-correlation values for all paired latent variable were lower than 1.0, therefore confirming the existence of discriminant validity.

**Table 5-5: Inter-construct correlations matrix**

| Inter-construct Correlations Matrix | | | | | |
|---|---|---|---|---|---|
| | **EIC** | **INCS** | **EFS** | **OAFS** | **IM** |
| **EIC** | 1 | | | | |
| **INCS** | .639** | 1 | | | |
| **EFS** | .444** | .614** | 1 | | |
| **OAFS** | .407** | .642** | .646** | 1 | |
| **IM** | .411** | .514** | .553** | .621** | 1 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | | |

*EIC=effects of entrepreneur's individual characteristics, INCS=internal non-individual characteristics of SME, OASFS=operational approach of SME foundry, EFS=external non-individual factors affecting an SME, and IM=intervention measures.*

## 5.5 STRUCTURAL EQUATION MODELING

This study used SEM as there are multiple dependent and independent relationships which can only be tested simultaneously with SEM. This section provides a broader perspective and conceptual framework for structural equation modeling approach (SEM). SEM is a structure for the covariances between observed variables, occasionally referred to as covariance structure modeling (Cooper & Schindler, 2011). SEM put together multiple relationships at once, thus giving a technique which differs from a traditional statistical method such as multiple regression, analysis of variance (ANOVA), etc. Therefore, SEM offers a statistical modeling approach of complex relationships that is not possible with any of the other multivariate techniques (Hair et.al, 2010).

As a statistical tool, SEM analyses multivariate data. Apart from offering regression models the method also includes multiple independent and dependent variables as well as hypothetical latent constructs (Savalei, & Bentler, 2010). Once a model has been developed, it must be tested to determine model fit in respect of the data acquired. Goodness of fit indicates how well a specified model reproduces the observed covariance matrix among indicator variables (Hair et al., 2010). SEM uses several measures to determine goodness of fit, the Chi-square value should be lower than <3, the values of goodness-of-fit index (GFI), normed fit index (NFI), comparative fit index (CFI), incremental fit index (IFI) and Tucker-Lewis index (TLI) should be equal to or higher than 0.90 (Byrne, 2010; Kline, 2011; Geiser, 2013) and the root mean square error of approximation (RMSEA) value should be equal to or less than 0.08

(Hair et al., 2010; Hooper, Coughlan and Mullen, 2008). SEM aims at establishing close fit rather than exact fit between hypothetical models and observed data (McIntosh, 2007). The SEM was utilised to investigate the path relationship in the structural model. The measurement model included all the constructs, namely: effects of entrepreneur's individual characteristics, internal non-individual characteristics of SME, external non-individual factors affecting an SME, operational approach of SME foundry and Intervention measures.

### 5.5.1 Model Fit Assessment (Confirmatory Factor Analysis Stage)

After completion of the confirmatory factor analysis procedures, it was observed that all model fit estimates met the acceptable criterion. The Chi-square (CMIN/DF) was 1.542, a figure which falls below the recommended threshold of 3 as suggested by (Chinomona, 2013). Other model fit indices determined include: The comparative fit index (CFI) of 0.973. This figure is above the acceptable threshold of 0.900 as indicated by (Hooper, Coughlan & Mullen, 2008). The goodness of fit index (GFI) was 0.900 which exceeding the acceptable 0.9 level as suggested by (Baumgartner & Homburg, 1996). The relative fit index (RFI) was 0.906 also exceeding recommend value of 0.9 as suggested by McDonald & Ho, (2002). Furthermore, the normed fit index (NFI) was 0. 0.927 surpassing the 0.900 point as endorsed by (Bentler & Bonett, 1980) and the incremental fit index (IFI) was 0.973 also surpassed the 0.9 point as advised by (Bollen, 1989). The Tucker-Lewis Index (TLI) was 0.965, which was above the required 0.900 according to (Hooper, Coughlan, and Mullen, 2008). Lastly, the root mean square error of approximation (RMSEA) fell below the recommended thresholds of 0.08 and 0.05= 0.037. Model fit indicators are presented in Table 4.8 below.

**Table 5-6: Model Fit Assessment CFA Model**

| Model Fit Assessment CFA Model | | |
|---|---|---|
| **Model** | **Outcome** | **Threshold** |
| **NFI** | 0.927 | >9 |
| **RFI** | 0.906 | >9 |
| **IFI** | 0.973 | >9 |
| **TLI** | 0.965 | >9 |
| **CFI** | 0.973 | >9 |
| **GFI** | 0.901 | >9 |
| **RMSEA** | 0.037 | <0,08 |
| **CMIN/DF** | 1.542 | <3 |

*CFA Model: Confirmatory factor analysis model: CMIN/DF: Chi-square: GFI: Goodness of fit index: NFI: Normed Fit index: RFI: Relative Fit Index: IFI: Incremental Fit Index: TLI: Tucker Lewis Index: CFI: Comparative Fit Index. RMSEA: Root Measure Standard Error Approximation*

**CFA Model**

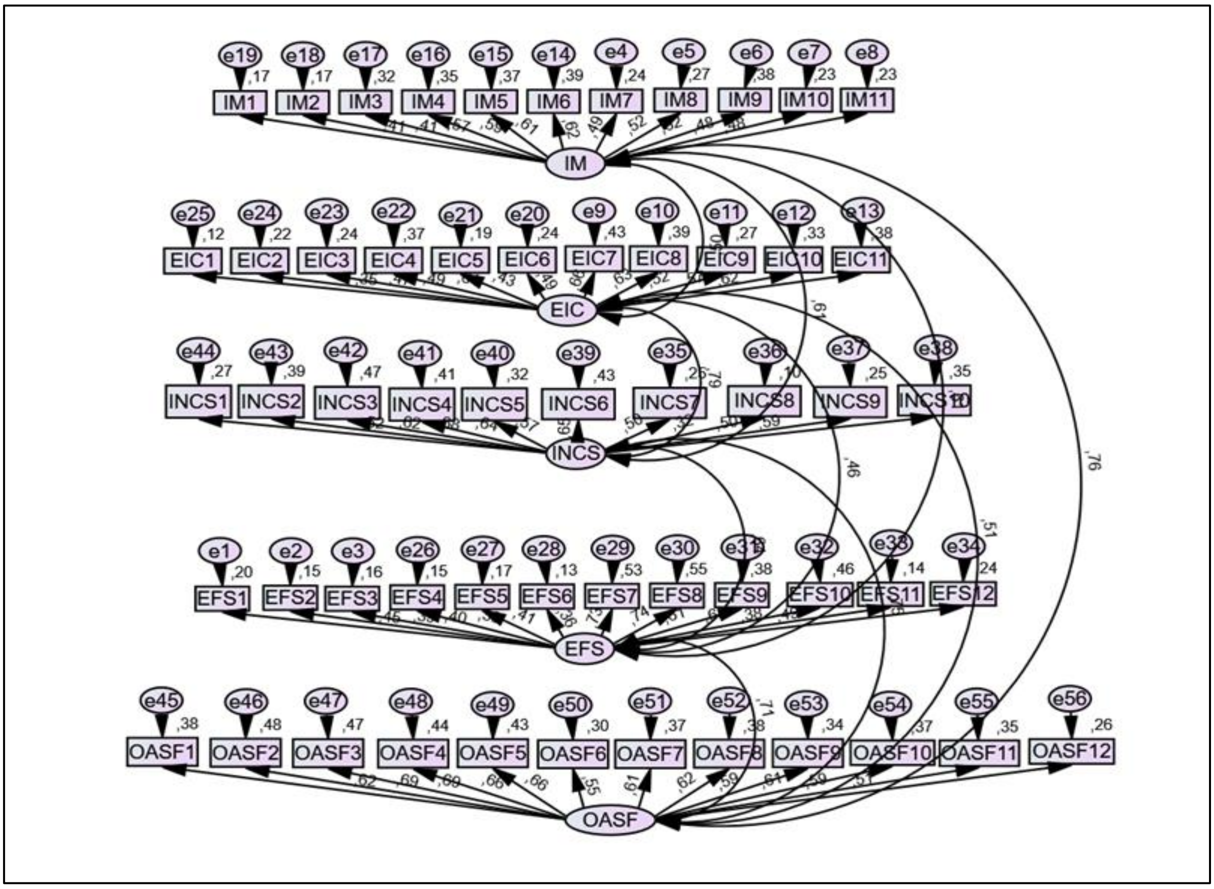


**Figure 5-15: CFA Model**
**Source: Compiled by Researcher (2021)**

*CFA Model: Confirmatory factor analysis model: CMIN/DF: IM: Intervention measures; EIC: INCS: Internal non-individual characteristics of SME; EFS: External non-individual factors affecting an SME; OASF: Operational approach of SME foundry.*

## 5.6 HYPOTHESIS TESTING AND DISCUSSION

This section explores the second stage of structural equation modeling which involves testing the hypothesised relationships. Model fit for the structural model that was tested in which all the indexing shown in table met their required thresholds. Each relationship is discussed, and objectives are assessed to establish whether they were achieved or not. Below is a table presenting a model fit for the structural model.

**Table 5-7: Model Fit Assessment (Structural)**

| **CMIN/DF** | **GFI** | **NFI** | **RFI** | **IFI** | **TLI** | **CFI** | RMSEA |
|---|---|---|---|---|---|---|---|
| **1.413** | **0.900** | 0.928 | 0.905 | 0.967 | 0.963 | 0.967 | 0.032 |

*CMIN/DF: Chi-square; GFI: Goodness of fit index; NFI: Normed Fit index; RFI; Relative Fit Index; IFF Incremental Fit Index; TLI: Tucker Lewis Index; CFI: Comparative Fit Index. RMSEA: Root Measure Standard Error Approximation*

### a. Chi-square (χ2 /DF)

Hair et al. (2010) suggests that the Chi-square ($x^2$) statistical tool can be used to compare the observed and estimated covariance matrices. This tool measures the magnitude of discrepancy between the sample and fit covariance matrices (Hu & Bentler, 1999). The Chi-square test is affected by sample size. A Chi-square value of two or less reflects a good fit. Hair et al suggests that a chi-square value of less than 3 indicates the fitness of the model. For this study chi-square value determined was 1.413, therefore indicating that the model suggested is acceptable

### b. Normed Fit Index (NFI)

The Normed Fit index (NFI) may be used to evaluate the model through comparison of the χ2 value of the model against the χ2 of the null model (Hooper, Coughlan and Mullen, 2008). According to Bentler and Bonnet (1980), NFI readings range between 0 and 1 and the closer the readings get to 1 indicates a good fit. An NFI reading of 0.9 is considered to be an acceptable fit. For this study NFI value determined was 0.928 indicating an acceptable fit.

### c. Relative Fit Index (RFI)

Relative Fit Indices (RFI), which is sometimes referred to incremental fit, includes a factor that represents deviations from a null model. This also explains why these indices are sometimes are sometimes referred to as comparative indices. Ching, Lien, and Chao (2014) suggest that the null model, also called the baseline model, should always have a a very large Chi-square reading. An RFI value which exceeds 0.9 indicates a sign of acceptable fit. For this study, the RFI value of the current study was 0.905, therefore signifying that there is acceptable fit.

**d. Tucker-Lewis Index (TLI)**

The Tucker Lewis Index (TLI) is similar to the NFI. However, TLI is not normed, as it is a comparison of the normed chi-square values for the null and specified model (Hair et al., 2010). TLI attempts to correct for complexity of the model but is somewhat sensitive to a small sample size (Van de Schoot, Lugtig and Hox, 2012). A Tucker-Lewis Index value that meets or exceeds 0.9 implies that the fit is acceptable. As the study has a TLI value of 0.963, this confirms that an acceptable fit exists.

**e. Incremental Fit Index (IFI)**

Miles and Shevlin (2007) indicated that IFI does not measure model adequacy as it only indicates the relative improvement in fit over a statistical model that is likely to be false. An IFI value that meets or exceeds 0.9 suggests that the fit is acceptable. The 0.967 value of the study means that there is acceptable fit as it exceeds the threshold.

**f. Comparative Fit Index (CFI)**

The Comparative Fit Index is a reviewed form of the NFI and executes well even when sample size is small (Hooper, Coughlan, and Mullen, 2008). CFI assumes that all latent variables are uncorrelated and compares the sample covariance matrix with this null model. A CFI value that meets or exceeds 0.9 indicates a good fit. The study's CFI value is 0.967 and this means that there is good fit.

**g. Goodness of Fit Index (GFI)**

The Goodness-of-Fit statistic (GFI) calculates the proportion of variance that is accounted for by the estimated population covariance (Tabachnick and Fidell, 2007). It has also been seen to have an upward bias with large samples (Hooper, Coughlan, and Mullen, 2008). A GFI value that meets or exceeds 0.9 indicates a good fit. The study's GFI value is 0.900 and this means that there is a good fit.

**g. Root Mean Square Error of Approximation (RMSEA)**

RMSEA tells us how well the model fits the populations' covariance matrix (Hooper, Coughlan, and Mullen, 2008). It examines the closeness of fit. The recommended cut-off value is RMSEA < 0.08, better is < 0.05 (Kenny, Kaniskan & McCoach, 2015). If determined RMSEA value is below the range of 0.05-0.08, this is an indicator that there is good model fit. For this study, the determined RMSEA value was 0.032, hence confirming that model fit is acceptable. As demonstrated above, all but one model fit indices confirm that there is a general acceptable fit of the model. The only exception in this case was RFI.

## 5.7 PATH MODELING

The second procedure conducted for this study was Path modeling. The terms Path Modeling and Structural Equation Model are often used interchangeably many studies. During Path Modelling, the researcher aims to connect blocks through use of previous knowledge such as a theory of the subject or phenomenon under study. Under this method, the researcher assumes that each block of variables plays the role of a theoretical concept represents in the form of a latent (unobserved) variable (Sanchez, 2013). The main aim of conducting Path Modelling is to establish and evaluate causal relationships among latent variables (Sanchez, 2013). To achieve this end, multiple regression analysis, path analysis and models are developed to establish the relationship among latent variables (Sanchez, 2013).

The figure below illustrates the structural model which depicts the results of the tested hypothesis of the study's research conceptual model. In the structural model EIC, INCS, EFS, OASF are depicted to have a direct and positive impact intervention measures (IM) on SME foundries. Figure 5-16 depicts the Path model. The rectangles represent the measurement items. The unidirectional arrow signifies the influence of one variable on another and is used to show the causal relationships.

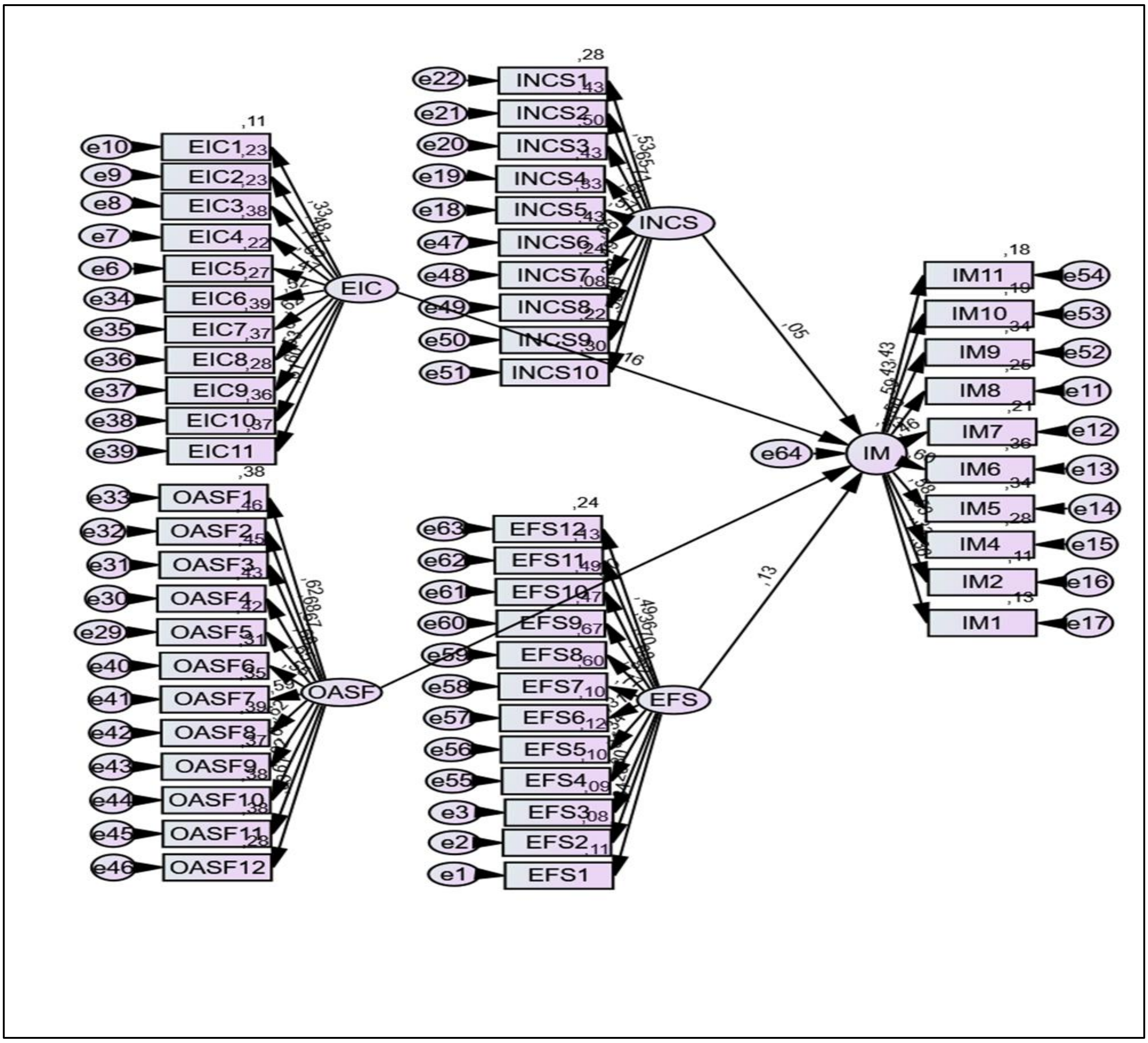


**Figure 5-16: Structural Model**
**Source: Designed by author**

### 5.8 DISCUSSION OF HYPOTHESISED RELATIONSHIPS

This section of the study explored the findings of each Hypothesised relationship. It was hypothesised that entrepreneur’s individual characteristics, internal non-individual characteristics, external non-individual characteristics, and operations approach of an SME foundry all had a positive relationship with intervention measures.

### 5.10.1 EFS has a positive relationship with IM

| Proposed Relationship | | | Factor Loadings | P - Value | Outcome |
|---|---|---|---|---|---|
| IM | ← | **EFS** | 0.131 | 0.036 | Supported and Significant |

The coefficient is 0.131. This confirms that there is a strong relationship between external non-individual factors (EFS) and intervention measures (IM). The p-value is at 0.036 which is below 0.05 or 95% confidence interval.

### 5.10.2 OASF has a positive relationship with IM

| Proposed Relationship | | | Factor Loadings | P – Value | Outcome |
|---|---|---|---|---|---|
| IM | ← | **OASF** | 0.698 | *** | Supported and Significant |

This finding confirms the proposed relationship between operations approach of an SME foundry (OASF) and intervention measures (IM) are positively related, having an estimate factor loading of 0.698. The relationship that exists between these two variables was therefore supported and significant at the p-value level of significance ($p<0.001$) as indicated by a p- value of ***.

### 5.10.3 EIC has a positive relationship with IM

| Proposed Relationship | | | Factor Loadings | P – Value | Outcome |
|---|---|---|---|---|---|
| IM | ← | **EIC** | 0.162 | 0.01 | Supported and Significant |

The research also investigated the relationship between entrepreneur's individual characteristics (EIC) and intervention measures (IM). The outcome of this relationship was that it is supported and significant at the p-value level of significance ($p<0.01$) and an estimate of 0.162.

### 5.10.4 INCS has a positive relationship with IM

| Proposed Relationship | | | Factor Loadings | P – Value | Outcome |
|---|---|---|---|---|---|
| IM | ← | **INCS** | 0.051 | 0.376 | Not supported and Insignificant |

The coefficient is 0.051[c]. This implies that there is a weak relationship between internal non-individual characteristics of an SME foundry (INCS) and intervention measures (IM). The p-value denotes a 0,01-confidence level, which signifies that the hypothesis is not supported and insignificant. This relationship wis not supported as it has an estimate of 0.376 exceeding the thresholds which were $p<0.01$; $p<0.05$; $p<0.1$ respectively. It suggests that INCS is not related to the intervention measures. It was also important to note that of all the relationships, this was the only one that was not significant.

## 5.9 SELECTION OF MOST SUPPORTED ITEM LOADINGS

In the next section, the most supported factor will be selected, based on item loadings in table 5.4. According to Hair, Ringle and Sarstedt (2011) measurements with a loading higher than 0.7 should be accepted. Chin (1998) however argues that the manifest variables with values less than 0.5 should be dropped. This implies that item loadings of 0.5 and 0.6 are still acceptable, for as long as their composite reliability (CR) and average value extracted (AVE) values are within acceptable range. For this study, item loadings whose values were above 0.5 were chosen as being the most supported for the quantitative strand. The selected readings are highlighted in table 5-10 below. The selected factors were also be compared with qualitative results also presented in this chapter.

**Table 5-8: Selection of most supported item loadings**

| Research Construct | | Factor | Factor Loading |
|---|---|---|---|
| EIC | EIC1 | A tertiary qualification | 0,346 |
| | EIC2 | Foundry experience | 0,465 |
| | EIC3 | Strong leadership | 0,493 |
| | EIC4 | Ambitious goals | 0,611 |
| | EIC5 | Trust my own ability | 0,434 |
| | EIC6 | Believe they have control over events | 0,493 |
| | EIC7 | Need for achievement | 0,657 |
| | EIC8 | Must be visionary | 0,628 |
| | EIC9 | Must be risk taking | 0,522 |
| | EIC10 | Must be a quick thinker | 0,572 |
| | EIC11 | Quick to spot opportunities | 0,617 |
| INCSME | INCS1 | Close customer relations | 0,518 |
| | INCS2 | Motivated employees | 0,624 |
| | INCS3 | Good financial planning abilities | 0,684 |
| | INCS4 | Talent management | 0,637 |
| | INCS5 | Marketing approach | 0,569 |
| | INCS6 | Management competencies | 0,655 |
| | INCS7 | A strong order book | 0,497 |
| | INCS8 | Degree of unionisation | 0,317 |
| | INCS9 | Workplace learning | 0,504 |
| | INCS10 | Competitive advantage | 0,594 |
| EFS | EFS1 | Organisational culture | 0,449 |
| | EFS2 | Access to information | 0,391 |
| | EFS3 | Access to finance | 0,401 |
| | EFS4 | Access to real estate | 0,383 |
| | EFS5 | Access to markets | 0,411 |
| | EFS6 | Challenges of entrance and exit | 0,360 |
| | EFS7 | High raw materials cost | 0,731 |
| | EFS8 | High transport costs | 0,744 |
| | EFS9 | High labour costs | 0,614 |
| | EFS10 | Energy Costs | 0,681 |
| | EFS11 | Legal compliancy issues | 0,375 |
| | EFS12 | Natural disasters & Pandemics like COVID19 | 0,495 |
| OASF | OASF1 | Adoption of latest technology | 0,618 |
| | OASF2 | Better utilisation of labour | 0,692 |
| | OASF3 | Procedures and methods | 0,689 |
| | OASF4 | Increasing capacity utilisation | 0,662 |
| | OASF5 | Value adding activities (e.g. machining& assembling) | 0,659 |
| | OASF6 | Mechanisation and automation | 0,547 |
| | OASF7 | Improved planning | 0,610 |
| | OASF8 | Adopting Total quality Management | 0,619 |
| | OASF9 | Implementing Internationalisation | 0,587 |
| | OASF10 | Entrepreneurial orientation | 0,609 |
| | OASF11 | Market orientation | 0,588 |
| | OASF12 | Environmental sustainability orientation | 0,514 |
| IM | IM1 | Increased drive towards localisation | 0,411 |
| | IM2 | Increase in tariffs for imported castings | 0,408 |
| | IM3 | Tailor made financing programs | 0,570 |
| | IM4 | Export support programs | 0,591 |
| | IM5 | Continuous improvement initiatives e.g. think tanks | 0,608 |
| | IM6 | Legal framework promoting ease of entry and exit | 0,625 |
| | IM7 | Government policies supporting green technologies | 0,488 |
| | IM8 | Skills development & training of employees | 0,523 |
| | IM9 | Managers' training & capacity building | 0,620 |
| | IM10 | Export duty for scrap metal | 0,476 |
| | IM11 | Introduction of electricity special pricing agreement | 0,482 |

**Source: Developed by author**

## 5.10 PRESENTATION OF QUALITATIVE RESULTS

The following section presents results from the qualitative segment of this mixed method enquiry. Unlike the quantitative enquiry, where results were presented in statistical form, qualitative results are presented in the form of themes which attempt to answer research questions. As suggested by Braun and Clarke (2006), a theme "captures something important about the data in relation to the research question and represents some level of patterned responses or meaning within the data set." The themes were renamed after coding of data. Table 5-11 below shows a summary of categorised themes as developed by the author.

**Table 5-9 Summary of themes and sub-themes**

| Theme | Sub themes | Total codes |
|---|---|---|
| **Entrepreneur's Individual characteristics** | • Experience and leadership<br>• Skilfulness, goal directed, and visionary.<br>• Good communication and problem-solving skills, and customer relations<br>• Reliable, dependable and self-motivated<br>• Confident, effective listening and conflict resolution<br>• Resilience, integrity and accountability<br>• Risk taking and agile | 6<br>4<br>8<br><br>2<br>3<br>1<br>2 |
| **Internal non-individual characteristics of SME foundry** | • Competence, teamwork, and organisational culture<br>• Access to information and cost-efficient resources<br>• Market orientated and competitive.<br>• Flexible and adaptable<br>• Upskilling<br>• Good customer and supplier relationships<br>• Diversity of customers and system of production | 8<br>6<br>6<br>1<br>3<br>6<br>4 |
| **External non-individual characteristics of SME foundry** | • Legal compliance, social responsibility, and environmental awareness | 18 |
| **Operations approach of SME foundry** | • Right equipment, method, and technology<br>• Knowledge and training<br>• Total Quality Management system<br>• Capacity utilization<br>• Mechanisation and automation | 17<br>18<br>5<br>2<br>9 |
| **Intervention strategies** | • Localisation and increased tariffs for imports<br>• Getting support from various industries and the government<br>• Government financial intervention<br>• Contribution to gross national product for government financial support<br>• Export duty for scrap metal<br>• Special electricity pricing agreement for foundry<br>• Politicisation and unionisation<br>• Upskilling | 17<br>7<br>3<br>2<br><br>6<br>4<br>4<br>3 |

**Source: Developed by author**

### 5.10.1 Entrepreneur's individual characteristics

A total of seven themes were identified under entrepreneur's individual characteristics. These themes are elaborated in the following sections.

#### 5.10.1.1 Experience and leadership

Foundry experience is one of the themes under entrepreneur's individual characteristics required to successfully run an SME foundry in South Africa. The foundry environment is highly technical to the extent that it takes years to acquire foundry experience. This implies that someone without prior foundry experience essentially finds it challenging to start or lead a foundry of their own.

*I have picked up foundry experience, I have picked up strong leadership.*

*Source: Participant 1 response*

An entrepreneur also needs to demonstrate leadership skills for their foundry to be successful. This strong leadership sets the pace and the direction that the business takes.

*They really need to be confident within themselves and that confidence needs to spill over into a leadership role.*

*Source: Participant 5 response*

*They also need to have strategic leadership.*

*Source: Participant 9 response*

*Someone who has strategic leadership*.

*Source: Participant 9 response*

*Leadership, number one, that is very key to set the pace, lead the people and make sure that what you want to be achieved...[is attained]*

*Source: Participant 11 response*

*…The management skills part of it, we are looking at the ability to plan, organise, lead, and control all the resources of the organization.*

*Source: Participant 11 response*

The responses above clearly demonstrate that leadership plays a key role in the successful running of an SME foundry in South Africa. The foundry owner's leadership qualities can inspire employees to work hard at achieving the organisation's goals.  This leadership function can be reinforced by the owner's foundry experience. Prior foundry experience can boost the owner's confidence when making decisions and determining direction in which their firm will take. Prior foundry experience also enables the foundry owner to accumulate social capital required for him or her to access and gainfully interact with key stakeholders such as financial services providers, government officials, suppliers, customers, and employees.

#### 5.10.1.2 Skilful, goal directed, and visionary

The study also established skilful, goal directed and visionary as another theme which falls under an entrepreneur's individual characteristics required to successfully run an SME foundry in South Africa. Firms which set for themselves clear goals and clearly outline the set of activities followed for them to achieve the goals tend to perform well. These firms also benefit in terms of sales growth and customer patronage. Vision also contributes significantly to good performance of an SME organisation.

*They have to be visionary hey!*

*Source: Participant 1 response*

*I always came across [as] having an understanding of the process and what I wanted out of that process and my end goal and then how to communicate that with my people in such a way that I would have them work with me to achieve the end goal.*

*Source: Participant 5 response*

*The owner should have a burning desire to succeed.*

*Source: Participant 6 response*

*Someone must just be a visionary.*

*Source: Participant 4 response*

There is a consistent emphasis on the desire to succeed, couched in terms such as vision and the attendant ability to communicate such vision in some impassioned way such that this becomes a contagious obligation.

#### 5.10.1.3 Good communication and problem-solving skills, and customer relations

The respondents also reported that customer relations help the owner to understand customer requirements and quickly identify changes in market requirements and customer preferences. In line with the finding above, literature also suggests that some of the benefits of close customer relations are improved firm performance, improved innovativeness, and innovation behaviour, as well as offering a competitive advantage for a firm (Loon and Chik 2019; Irungu and Arasa, 2017; Domi, Capelleras and Musabelliu, 2019).

*You have to have good customer relations. You have got to have motivated employees hey.*

*Source: Participant 1 response*

*[One] must have a passion for customer service*

*Source: Participant 6 response*

*To look after their customers.*

*Source: Participant 6 response*

*One of the non-individual characteristics is that one must have a relationship with your customers*

*Source: Participant 2 response*

*Then integrity, it's very important. You need to have integrity, not only with all your employees, but with all the primary stakeholders of the organization. Your customers, the other stakeholders, including the unions and all stuff like that. You must have integrity.*

*Source: Participant 11 response*

*Number one, you have got to have good relationships with your customers.*

*Source: Participant 10 response*

*I think you have got to have very good people skills to keep your staff motivated and to get them to understand what you are trying to achieve and be able to communicate with them to be able to try and teach them. If you are not a very good communicator, I do not think you are going to do well. Communication with staff is key and relationships with your staff is key. You have got to have that good communication and good relationships.*

*Source: Participant 10 response*

Good communication, problem-solving skills, and customer relations are key attributes in the foundry owner. Good communication skills help the foundry owner to clearly paint the picture of what needs to be achieved for the employees. Key components of successful communication are respect for all the participants' opinions, as well attaining closure for every conversation made. With good communication, entrepreneurs can effectively share goals with shareholders and employees, inspire behavioural changes and loyalty from employees and customers, avoid counter-productive activities from labour unions and convince lenders to release funding (Radovic Markovic and Salamzadeh, 2018). Problem-solving skills assist the owner to understand and easily tackle challenges hindering the foundry from operating optimally. The findings are like those of Abdul (2018), who conducted a study in Nigeria and the United Kingdom and concluded that problem solving skills, communication skills and creative thinking play a critical role in increasing sales, maintaining a competitive advantage and general growth of an SME. The participants mostly cited operational challenges as an area where problem solving skills are required the most:

#### 5.10.1.4 Reliable and self-motivated

The respondents also suggested that an entrepreneur should be reliable and self-motivated. In the current literature, Anggadwita, Ramadani, Alamanda, Ratten and Hashani (2017) suggests that an entrepreneur should be honest and trustworthy for them to succeed in business. This trustworthiness is also useful in the establishment of international partnerships for creation and exploitation of business opportunities, as there are cultural differences to be considered (Schreier, Scherrer, Udomkit, and Farrar, 2020). This self-motivation is a result of an individual's need for achievement, as suggested by McClelland (1961). This entrepreneur's self-motivation has also been identified in literature as contributing positively to SME performance (Aliyu et al., 2020). The following vignettes from the respondents capture the essence of entrepreneurs' reliability and self-motivation.

*Management should be perceived or seen to be reliable and dependable by the entire team, it is very important.*

*Source: Participant 11 response*

*Management or the entire team members should be self-motivated. I consider it to be very important.*

*Source: Participant 11 response*

**5.10.1.5 Confident, effective listening and conflict resolution**

The entrepreneur should exude confidence, be an effective listener and be able to resolve conflicts. The result of entrepreneur's self-confidence goes hand in hand with the concept of self-efficacy, as suggested by Bandura (1977) in his theory of learning. Self-efficacy has to do with an individual's confidence in their personal ability to achieve set goals.

*Then the other point is self-confidence. I mean, when you come in, you are discussing or communicating whatever needs be done. People must see confidence radiating from the way in which you communicate with them.*

*Source: Participant 11 response*

*They really need to be confident within themselves and that confidence needs to spill over into a leadership role.*

*Source: Participant 5 response*

There are three techniques for resolving disputes, which are unassisted negotiation, assisted negotiation and adjudication. Unassisted negotiation is the best, as it is least costly and negotiating parties have got all the control over the outcome. Amicable dispute resolution is also very important in business as there is growing evidence suggesting that individuals who reach agreements without the intervention of outsiders like judges and commissioners do indeed stand a better chance of honouring the agreements than those compelled to do so by arbiters. These individuals are also willing to further negotiate, should conditions change from those initially agreed upon (Singer, 2018).

*Conflict resolution is very important. At times we find that in some of the foundries, people quarrel. They and do not agree. Now, the abilities and capabilities of resolving those conflicts determine how the organisation moves forward*

*Source: Participant 11 response*

Good listening skills can also help an entrepreneur to acquire crucial customer feedback. This customer feedback then assists the entrepreneur to market their goods and services better, increase their visibility, benchmark against competitors, as well as improve customer experience and, in the process, attract more customers. Firms can also understand patterns of customer behaviour and improve operations when they listen to customer feedback. A good listener essentially makes one a good communicator. Ineffective communication in a business could be very costly as employees who are not aware of the organisation's culture, objectives, rules will not perform their jobs effectively and work will not run smoothly. In the absence of good communication in a business, there is a tendency of employees wasting resources (Popescu, 2018). The following responses speak to the sentiments identified in the literature review:

*Effective listener. Effective listening is very important. Management must listen to the problems, concerns, or issues from all primary stakeholders.*

*Source: Participant 11 response*

#### 5.10.1.6 Resilience, integrity and accountability

Participants identified resilience, integrity, and accountability as other entrepreneur attributes necessary to successfully run an SME foundry in South Africa. Resilience of an entrepreneur can enable their organisation to adapt and grow in the face of adversities. Some of the factors which determine an entrepreneur's level of resilience include firm and business owner's characteristics, available human and social capital, strategic management approach, relationships with strategic institutions, as well as the attitude adopted in the face of crises (Castro and Zermeño, 2020). Integrity and accountability form part of the building blocks of organisational ethics. Business ethics and corporate social responsibility on the other hand are perceived as key attributes in the success and sustainability of SMEs. As part of their business ethics, SME owners are therefore encouraged to act in good faith during all their business engagements with key stakeholders for the success of their businesses (Turyakira, 2018). The following verbatim statements endorse this assessment:

*The entrepreneur must be self-motivated and be a positive person able to cope with and overcome the many adversities associated with operating an SME business.*

*Source: Participant 8 response*

*…a win-win attitude and accountability are also some of the key things in the foundry. If you closely look at the foundry industry, you will learn that there is cut-throat competition to some extent, particularly for easy or low integrity components which anybody can make. You would actually find out that on the win-win attitude aspect of it, you need to be able to discuss with all the people involved and assume a position where everybody benefits.*

*Source: Participant 11 response*

The statements above clearly show that the entrepreneur should possess a never-say-die attitude, for them to succeed in business. Operating a foundry comes with numerous challenges, which requires entrepreneurs to possess great inner fortitude. The entrepreneur also clearly needs to demonstrate to stakeholders such as suppliers, customers, and employees that they can be trusted. This trust forms the bedrock of sustainable business relationships with key stakeholders such as employees, customers, suppliers, and financial services providers.

#### 5.10.1.7 Risk taking and agility

Agility was also listed as one of the entrepreneur's attributes required to successfully run an SME foundry in South Africa. Agility is the speed with which an organisation responds to rapid changes within the business environment. The foundry industries encounter many changes in the environment; hence it was necessary for foundry owners to show a readiness in making the necessary changes enabling them to meet new demands.

*And boy you have to think very quickly*… o*pportunity comes to pass not to pause. Yes! You grab the opportunity when it comes. Do not dilly dally.*

*Source: Participant 1 response*

*one really needs to be very agile in your approach*

*Source: Participant 2 response*

*I think you have got to be able to think outside the box very quickly because things are forever changing in the foundry. You have got to be able to think quick and make adjustments.*

*Source: Participant 10 response*

The SME foundry owner should also be a calculated risk taker for the enterprise to run successfully. Foundry owners were reported to incur risk when embarking on expansion projects or making significant changes such as determining markets to venture into, determining metal grades to produce or adopting new technologies in their foundries.

*They must have an area of risk taking*

*Source: Participant 1 response*

*You also have to be able to take risk. If you do not take the risk, you will not be able to achieve anything.*

*Source: Participant 10 response*

*…being a very calculated risk taker*

*Source: Participant 2 response*

The responses above clearly show that entrepreneurs should respond quickly to opportunities in business as they usually have a short window period. Agility is also a neccessity when it comes to responding to the ever-changing business environment. Responding to changes in business environment and business opportunities also implies that the entrepreneur might have to incur some risk in the process.

#### 5.10.2 Internal non-individual characteristics of SME foundry

##### 5.10.2.1 Management competence, teamwork, and organisational culture

Competence, teamwork, and organisational culture are some of the themes identified under internal non-individual characteristics required to successfully run an SME foundry in South Africa. Furniss, Curzon and Blandford (2018) define organisational competence as "… the collective competence of the individuals, bringing together their complementary abilities to deliver an outcome that is typically more than the sum of its parts". This competence is necessary for developing an organisation's strategies.

*…and he who employs very good management then makes his organisation competent.*

*Source: Participant 1 response*

*You have got to have somebody who knows how to make castings, and who knows how to make metals go into the foundry and help the guys to do what needs to be done. To make good castings.*

*Source: Participant 1 response*

*I think most definitely having a competent and qualified management team*

*Source: Participant 5 response*

*Another thing I found helpful to win was getting a patternmaker on site. If you do not have a patternmaker on site and the pattern breaks or you want to alter something, it can put a big delay as somebody has go to get it to the patternmaker.*

*Source: Participant 10 response*

*…the other is organizational skills*

*Source: Participant 11 response*

Results from the interview confirm that some respondents were inclined towards the idea that organisational culture plays a pivotal role in determining successful running of an SME foundry in South Africa.

*I would think it's one of the most important things is organisational culture.*

*Source: Participant 4 response*

Teamwork was also mentioned as necessary for the successful running of an SME foundry in South Africa. This supports the suggestion made by Otache (2019) that teamwork has a significant and positive relationship with firm performance, and that it plays a mediating role between the relationship between strategic orientation and organisational performance.

*He has got to build a very good team around him. He has got to be a team player*

*Source: Participant 1 response*

*…the other one is teamwork and team building*

*Source: Participant 11 response*

The statements above clearly show that individual talent is not enough to make a foundry operate successfully. In addition to improving their skills and competencies, managers should also work hard at building strong teams and organisational culture which promotes the goals of the foundry.

#### 5.10.2.2 Market orientation

Market orientation is also one of the themes which emerged during the interviews. Market orientation involves generation of market intelligence through various tools such as marketing information systems. The market intelligence generated enables a firm to understand customer needs and decide on how best to meet them. In the process, adopting a market orientation enables a firm to improve on its operational efficiency and overall performance of the organisation (Dhubihlela and Dhurup, 2015; Buli, 2017).

*Technology has its place, but I think should be determined by the market sector that you are in and the type of product that you need to produce*

*Source: Participant 5 response*

*…To be [as] market oriented*

*Source: Participant 6 response*

*…[One] must be acutely aware of the market drivers in the sector and have the technical and financial ability to effectively market the product.*

*Source: Participant 8 response*

*The SME must be clearly aimed at a market sector that is attainable from a financial and technical aspect… it is important that the entrepreneur has a good idea as to how the market can grow and provision is made in the initial plant design to allow for expansion.*

*Source: Participant 8 response*

*Like I said, you have got to be able to look at the markets and see which ones are the right markets for you, you know… So, we were looking at the market and seeing what the market does and we were changing to suit the market you know.*

*Source: Participant 10 response*

*Then one of the key things is foundries also should be market oriented. What foundries do must be informed by what the customer wants.*

*Source: Participant 11 response*

The responses above emphasise the need for foundry managers to be aware of existing market drivers. As such, major decisions on issues such as investments and type of products to manufacture should be market oriented.

#### 5.10.2.3 Flexible and adaptable

Customer preferences and market demands are always changing; hence firms should be flexible enough to change and adapt to changes happening. Raffaelli, Glynn, and Tushman (2019) argue that flexibility helps overcome the barriers to innovation adaptability. Organisational flexibility and adaptability go hand in hand with organisational agility discussed under entrepreneur's individual characteristics. Participants offered the following insights on flexibility and adaptability:

*You have got to be flexible. The company itself must be able to change to suit the marketplace, like now with this COVID-19 there are a lot of things not being imported. You have got to be able to change and start creating other products if need be. The company has to be flexible in what it is doing.*

*Source: Participant 10*

*Then the other one will be flexibility and adaptability. This is very important. If you look at many foundries, they delayed changing to resins, they stuck on CO2, they stuck on the furan system, which was the first sand system and as a result, that attacked and destroyed their ability to cope with the new dictates of quality and all stuff like that.*

*Source: Participant 11 response*

The vignettes listed above portray a clear picture of the importance of organisational flexibility and adaptability, in light of technological developments and the everchanging business environment.

#### 5.10.2.4 Knowledge, upskilling and training

Knowledge acquisition, skills development and training were also identified by participants as important for successful running of an SME foundry in South Africa. According to the submissions made by the participants, foundries should create an environment where employees are always learning. This does not apply to shopfloor employees only, but to managers as well, as they generally have lower knowledge and training levels as compared to their counterparts in developed countries. Workplace learning can occur on a formal or informal basis. Training was also identified as important in that employees get to understand quality better, work more effectively and keep abreast of technological developments. The responses below demonstrate these perceptions:

*So you have to create an environment and you have to develop people and systems that will give you the least possible rejects*

*Source: Participant 1 response*

*Training of potential people is very important. Knowledge is a major,… I mean you take a guy with a degree or a diploma in Metallurgy in other parts of the world, and they will actually be an inspector on a production line.*

*Source: Participant 1 response*

*Of course. I am totally involved with the American Foundrymen's Society and American Society of Metals because they contribute to my metallurgical wellbeing.*

*Source: Participant 1 response*

*You've got to have skills development within the organisation.*

*Source: Participant 1 response*

*I think process improvement and training definitely have a role, and it's ongoing.*

*Source: Participant 5 response*

*That to me is always a key element and I think if there were more training facilities, which are accessible that would help.*

*Source: Participant 5 response*

*having training facilities that would train individuals within a foundry process and to a given qualification would be fantastic*

*Source: Participant 5 response*

*I think again it comes back to that skills development and training programs that we were talking about a minute ago. That should not necessarily just be for labourers or artisans. It should be structured throughout the operation*

*Source: Participant 5 response*

*people must be trained, and they must work effectively*

*Source: Participant 6 response*

*The people on the floor need training, they should understand various processes, they should understand quality, they should be productive, they should be effective. Those are some of the advantages of training people on the shop floor.*

*Source: Participant 6 response*

*The level of foundry managers, the capability of foundry managers in South Africa is low. If you go to Japan, you go to Europe, you go to America, you will find out that our managers are really of a fairly low level. So, they need education and training*

*Source: Participant 6 response*

*So, it should have a program for human capacity development and it should have people with the right skills set for the different jobs which is from the patternmakers, the moulders, the melters, going across the board*

*Source: Participant 7 responses*

*We need to continuously invest in training*

*Source: Participant 4 response*

*Training for managers is important. We need it, we need it*

Source: *Participant 4 response*

*I believe universities of technology and other universities play a role and the Metal Casting Station at UJ is ideally positioned for that, to really play a role in supporting those types of initiatives, because they link both the research that is done at university and elsewhere with the industry.*

*Source: Participant 2 response*

*Everyone in the foundry industry needs to be computer literate and CAD proficient. We will not have drawings or anything like that in the future. The printed geometry is not going to be something in the future, everybody will get it on his computer or on his mobile phone.*

*Source: Participant 2 response*

*In terms of skills development and training for foundries, I actually think this is one of the most important things in South Africa to be honest. If you look at the kind and quality of apprentices that we have, honestly, they are not there by any means*

*Source: Participant 11 response*

*The skills development, training programmes are very important.*

*Source: Participant 11 response*

*Then the training of foundry managers is very important.*

*Source: Participant 11 response*

*I think there are number of programs which are being put in place on teaching the employees the technical know-why because they know how to make a product*

*Source: Participant 9 response*

*We need to upskill those semi-skilled people that we have, at least take them to college and stuff like that*

*Source: Participant 11 response*

*I see there is a lot of these classes that are around. The problem is you have to take your guys to do training for a week. So, what happens to the foundry for that week?*

*Source: Participant 10 response*

The responses above demonstrate a strong and consistent emphasis on the need for training and upskilling of foundry shopfloor workers and managers if South African foundries are to be competitive on the global market. This competitiveness, resulting from training and upskilling will manifest itself mainly in improved quality of products and higher productivity exhibited by foundry employees.

#### 5.10.2.5 Good customer and supplier relationships

Customers and suppliers play a key role in the successful operations of any business. Accordingly, maintaining good customer and supplier relationships becomes a compelling undertaking. An organisation with good supplier relations can easily communicate their goals and expectations to suppliers so that their collaborations can assist the firm to achieve their objectives. On the other hand, good customer relationships assist a firm to meet customer expectations and, in the process gain customer loyalty.

*You need the whole stakeholder involvement within the supply chain because your supplier needs to understand what your demands are. So, in order for you to at least achieve whatever you need to achieve in terms of customer satisfaction*

*Source: Participant 9 response*

*Another thing is a foundry needs to build good relationships with suppliers. You have got to pay them on time, number one. Number two is you have got to have very good relationships with them*

*Source: Participant 10 response*

*You have got to have good relationships with everybody, your customers, your suppliers, your staff.*

*Source: Participant 10 response*

The vignettes above suggest that every foundry should strive to maintain good relationships with employees, suppliers, and customers. These three categories of people contribute immensely to success of any foundry.

#### 5.10.2.6 Diversity of customers

Overreliance on a single customer or supplier is not good for any business. Such a situation indeed poses risks to any business. If the customer or supplier cannot continue operating their business for whatever reason, this can significantly affect the SME. Power relations are often unfavourable to a business which is over reliant on a single customer or supplier. However, an SME can manage this unhealthy relationship by minimising supplier-buyer information imbalance and constant monitoring, evaluation, as well as further discussion and refining of contracts (Yamoah, 2017).

> *For an SME foundry to be sustainable, you must make 100 percent sure that you are not dependant on one or two major customers. You should have diversification of customers.*
>
> *Source: Participant 6 response*

It is, therefore, wise for SME foundries to actively seek to diversify their customer base, as well as to have more than one supplier for their raw materials and equipment. Having more than one supplier of raw materials on their vendor list can give a foundry higher negotiating power. Having several customers on their order book helps a foundry to concentrate on good paying customers or those willing to accept higher rates for products sold by the foundry.

### 5.10.3 External non-individual characteristics of SME foundry

#### 5.10.3.1 Access to information and cost-efficient resources

Access to information and cost-effective resources were also identified as external, non-individual characteristics of a foundry required to successfully run an SME foundry in South Africa. Access to information enables foundries to make sound decisions on which markets to venture into, which customers to pursue, as well as the most relevant technology to service those customers. The results obtained correspond with literature which suggests that access to information enhances a firm’s agility, capacity, and firm performance (Liu and Yang. 2019). Other literature surveyed also revealed that access to information, through knowledge management techniques such as e-procurement can minimise information and communication barriers, thereby assisting SMEs to better access public sector contracts (Saastamoinen, Tammi and Reijonen, 2018).

> *There is market information, which is very scarce in South Africa, such that you have to do your own market research, build your own data base if you want to run a successful SME and so you can make decisions.*
>
> *Source: Participant 6 response*

> *Well, of course they must have access to information, and I would say you need to belong to the international foundry organisations, like the American foundrymen society, the British Cast Iron and Research, Steel research organisations, you have got to belong to these people, you have got to be up to date with technology.*
>
> *Source: Participant 1 response*

Cost effective use of resources, particularly electricity and labour, are also strong points that were raised by some of the participants. Electricity is a huge cost driver in the foundry industry, hence needs to be managed. Foundry is also a labour-intensive industry, especially for firms with minimum mechanisation and automation. This complements the literature which suggests that it is essential for energy-intensive manufacturing firms to implement continuous improvement programs in energy efficiency (Zhang, Ma, Yang and Liu, 2018). Literature also verifies that foundries which employ energy efficiency improvement programmes have got a competitive advantage over competitors, through cost reduction (Haraldsson and Johansson, 2019). Literature also suggests that African manufacturing firms face challenges of low competitiveness, high capital intensity, poor productivity, and low efficiency due to high unit labour costs (Mutambi, 2017; Haleem, Jehangir and Ullah, 2019). The COVID-19 pandemic has also considerably increased the pressure for firms to reduce their unit labour costs (Nyanga and Chindanya, 2020). The responses below all impress these observations:

> *We have to become more efficient. We have got to get cost reductions in power, and we seriously got to look at our labour situation.*
>
> *Source: Participant 1 response*

> *On the energy side of things, I think if there was a more cost-effective structure in terms of the costing of electricity*
>
> *Source: Participant 5 response*

*I think being selective in your material and product and the market that you want to be in*

*Source: Participant 5 response*

*listen you need to look at your process or find another way of being more cost effective. So, electricity pricing is definitely a major area that needs to be looked at*

Source: *Participant 5 response*

*Raw material costs such as sand and chemicals must be minimised by operating a well-controlled system.*

*Source: Participant 8 response*

It can be concluded from above that the use of cost-effective resources such as electricity and raw materials is important for successful operation of any foundry. Realisation of this goal can become easier when SME foundries have got access to relevant information.

#### 5.10.3.2 Legal compliance, Social responsibility, and Environmental awareness

It is imperative that foundries comply with legal matters if they are to run sustainably. Although there are many legal matters to address, foundries should ensure that they comply with tax and environmental issues. Under environmental legislations, foundries should ensure that they do not pollute the air, ground, and underground water through their activities. The respondents highlighted that it is imperative, although challenging, for foundries to obtain air emissions and waste management licences. It was also reported that critical equipment such as melting, and heat treatment furnaces were supposed to comply with legal requirements for safety and certified by qualified engineers. These results are in line with literature surveyed which suggests that foundries should comply with the National Environment Management: Air Quality Act, 2004 by acquiring an Air Emissions Licence (Castings SA, 2016). Mulaba-Bafubiandi, Mageza and Varachia (2017) also reported that foundries have got an obligation of acquiring waste management permits for dumping and treatment of spent sent. The vignettes below summarise the observations of the respondents on the matters here:

*So, you have to be environmentally on the ball, and you have to be absolutely in touch with all the legalities in terms of the environmental issues.*

*Source: Participant 1 response*

*We must not believe that global warming is not happening. It is happening. There is enough proof out there in the world about global warming.*

*Source: Participant 1 response*

*Legal compliancy, you have got to be. Yeah, if you run a foundry you have got to have an engineer, a certified engineer to check your equipment out and certify them all before you can even push your first button.*

*Source: Participant 1 response*

*In reality the emissions from a modern foundry using induction furnaces have no impact on the elements that are trying to be controlled*

*Source: Participant 5 response*

*I think that for your normal green energy, you need a lot of input costs and infrastructure for the sort of energy demanded by the foundry*

*Source: Participant 5 response*

*It is regulated in terms of clean air, water, gas, safety. If you want to supply anything large into the company, they want to know about your ISO 45 000.*

*Source: Participant 6 response*

*Government's green policies. Think of the policies. The more the green policies the more the difficulties they bring for foundries. Sand dumping, it is not going to assist, it is going to make it more tough.*

*Source: Participant 6 response*

*So, we talk about things like environmental sustainability, you understand? So, these are some of the things, foundries need to look at to continue to be sustainable, because if you want to look at getting big contracts for foundries, these contracts come with clauses. They want to see what you are doing, in terms of environment.*

*Source: Participant 7 responses*

*The main challenge with foundries is I think they are perceived to be non-green type industries, and this is very sad as foundries have got a nasty reputation*

*Source: Participant 2 response*

*Part of the issue is that you have to have certificates of compliance for air emissions, you have got to have all sorts of licences to be able to operate in certain areas and for me most of that is non-essential for an SME. I think there should be absolute cut off for foundries that are not producing let's say less than 100 tonnes per month*

*Source: Participant 2 response*

*A lot of foundries were closed as a result of inability to cope with the emissions*

*Source: Participant 11 response*

*On the environmental issue. We have to comply with the emissions and all stuff like that, which is connected to the legal aspect of operating the foundry.*

*Source: Participant 11 response*

*You need to have the air emissions licence, the waste management licence*

*Source: Participant 11 response*

*The social aspect of it covers other things that the company has to comply with on social responsibility.*

*Source: Participant 11 response*

*The company gets some points from donations and all stuff like that and if foundries that cannot afford to comply with those social responsibilities demands, it means they cannot get some tax rebates*

*Source: Participant 11 response*

*Foundries must be aligning to the dictates or the demands of the environmental compliance*

*Source: Participant 11 response*

*This we can also relate to the government policies on green operations. If you look at the dumping costs, they are very high*

*Source: Participant 11 response*

*This environmental thing is a big story too. Instead of them coming and working with us, they come and try and close us down. Instead of the environmental people coming and saying, 'we need to get to greener and more compliant and so forth, let us see how we can work together to achieve the goal', they come and want to fine you, they want to close you down. The cost of this environmental stuff is big because of all these issues they want to sort out. It comes at a massive cost hey.*

*Source: Participant 11 response*

The responses above suggest that although foundries generally incur expenses during the process of complying with environmental regulations, it is much costlier to be caught by authorities without the required licences.

### 5.10.4 Operations approach of SME foundry

#### 5.10.4.1 Right equipment, technology and methoding

The respondents also pointed out that foundries should ensure that they make use of the right equipment and technology for them to meet their objectives.

*Obviously, you have to look at efficient melting equipment. It is no good operating a foundry with a mains frequency furnace. You need most up to date modern melting equipment*

*Source: Participant 1 response*

*You must have green technologies.*

Source: *Participant 1 response*

*Foundries are becoming extremely IT orientated and employing technologies such as added manufacturing, that's your 3D sand printing*

*Source: Participant 1 response*

*You have to be absolutely up to date with modern technology. You have got to have an automated foundry.*

*Source: Participant 1 response*

*You need to have the right materials for the product that you intend manufacturing.*

*Source: Participant 5 response*

*Technology obviously has got its place Joel. I do not know how easy it is for foundries to migrate in terms of moving from one technology to the other*

*Source: Participant 5 response*

*It's easy to talk about latest technology and then it sounds so highfalutin. The technology in the foundry industry is basically in coatings… there is technology development in coatings.*

*Source: Participant 6 response*

*It is important to focus on technology advancement as much as you can for you to be able to make it in the business*

*Source: Participant 4 response*

*You need to be very efficient and very effective in delivering your product.*

*Source: Participant 4 response*

*You need that financial backing to be able to harness the green technologies and making sure that they are cheap and available to the foundry industry*

*Source: Participant 4 response*

*…the use of technology to try and enhance your efficiencies*

*Source: Participant 2 response*

*…trying to invest in the right technologies that reduce the cost of production… Technology for machinery, be it technology in terms of software programs, either ERP Systems, simulation software and that kind of stuff should be accessible, or the foundry should have, for it to be sustainable.*

*Source: Participant 7 responses*

*The foundry should have also the right equipment for the production, so they should have equipment, or machinery that give them the competitive edge to be able to produce good castings which can compete globally when it comes to price.*

*Source: Participant 7 responses*

*Instead of making use of traditional ways of making patterns, I think, we now need more foundries to move towards the CNC machining of patterns, I think that will save time and it will bring a lot of precision and accuracy in terms of castings that will be made from those patterns. Still around that area, there is also an opportunity that we can have for 3D printing.*

*Source: participant 7 responses*

*Modern green technology must form part of the plant design and ongoing operation.*

*Source: Participant 8 response*

*It is vitally important that the start-up employs the latest technology available for efficient casting production. This will give the SME a technological and cost advantage over the existing competition.*

*Source: Participant 8 response*

*I think, also investment in technology. However, you can invest in specific technology*

*Source: Participant 9 response*

*The technological issue presents opportunities and threats to the foundry*

*Source: Participant 11 response*

*Adoption of the… not necessarily latest technology, at least the kind of technology that can allow you to operate profitably*

*Source: Participant 11 response*

Methoding was also reported to be a very important procedure in the foundry industry. Methoding involves designing and development of metal filling, flow direction and feeding into the main casting, with the aim of producing a defect free product. Methoding also controls rate of cooling of metal, which also determines the microstructure and the mechanical properties of the castings (Rajkumar, Rajini, Alavudeen, Prabhu, Ismail, Mohammad and Al-Lohedan, 2021).

*Methoding, getting the metal into the mould under the correct conditions. That will reduce scrap unbelievably*

*Source: Participant 1 response*

*You have got your procedures and methods there. Metallurgy is not that easy, once you get it right, you have got to follow your processes very constantly.*

*Source: Participant 10 response*

*I think your methoding one thing that has made us very successful, we do not try and skimp on our methods and so forth.*

*Source: Participant 10 response*

The responses above suggest that utilisation of latest technology in foundry offers advantages of process efficiency, reduced number of rejects and optimisation of energy usage. The respondents also highlighted the importance of utilising correct methoding in foundry, which offers advantages of improved yields and reduction of rejects. Utilisation of latest technology and correct methoding can ultimately help to improve profitability of SME foundries in South Africa.

#### 5.10.4.2 Total Quality Management system

Instituting a Total Quality Management System (TQMS) was identified as essential for successful running an SME foundry in South Africa. According to the respondents, TQMS enables an organisation to maintain consistency in the quality of their products. Operations were also reported to run with a degree of predictability when an SME foundry has got TQMS in place. Also, with TQMS, an organisation can institute a preventative maintenance programme hence minimising downtime and maximising capacity utilisation. The results fall in line with literature surveyed, which suggests that Total Quality Management (TQM) ideology, values, procedures, and practices seek to attain customer satisfaction, productivity, and profitability of manufacturing firms (Singh and Ahuja, 2015; Shafiq, Lasrado and Hafeez, 2019). Literature identifies the implementation of Total Quality Management as a strategic survival tool for SMEs and large businesses (Majumdar, 2016). Lastly, Singh and Ahuja (2015) also suggest that when a manufacturing firm combines TQM with total preventative maintenance then it can achieve the following benefits: reduction in waste and re-work, less total process rejects, reduced maintenance costs, less customer complaints, faster delivery times, reduction in inventory levels, lower overheads, less setup times and lower likelihood of unplanned downtime.

*Quality management system in the end would drive the process and once you have that as the system within the foundry, controls and the ability to deliver quality at the end of the day is that much easier,*

*Source: Participant 5 response*

*[There is] need to work within a Quality Management System.*

*Source: Participant 5 response*

*I think the general norm is to run things until they break down and it costs more to fix something that has broken down than to maintain it*

*Source: Participant 9 response*

*The preventative maintenance and Quality Management Systems forms the core of any business that one might need to run.*

*Source: Participant 9 response*

*Quality is also very important. If you do not make very good quality castings your clients are not going to be very happy, and they will not come back… So, making a good quality casting is one of the most important things. If you are not making good quality castings, you are not going to be around for very much longer.*

*Source: Participant 10 response*

*Foundry needs to adopt total quality management system. That is very important.*

*Source: Participant 11 response*

*You need a total quality management system to sort of induce consistency in your operations in other words, you are predetermining how your operation is going to run.*

*Source: Participant 11 response*

The underlying message from the responses above is that Total Quality Management plays a key role in sustainability of foundries. Through Total Quality Management, foundries can predetermine their desired results and keep customers happy.

#### 5.10.4.3 Capacity Utilisation

Capacity utilisation, which was loosely defined in literature as the amount of production capacity utilised as a fraction of the maximum available capacity to produce finished goods, is one of the themes which emerged during the interviews. According to the respondents, some foundries have closed due to lack of capacity utilisation or underutilisation of resources.

*Utilisation of assets is very important*

*Source: Participant 2 response*

*The other thing will be a capacity utilisation. You find out this is one of the killer of many foundries. Serious underutilisation of resources. Foundries [are] operating well below capacity.*

*Source: Participant 11 response*

*Your materials handling must be efficient*

*Source: Participant 6 response*

This observation falls in line with literature which suggests that capacity utilisation can improve energy efficiency of a firm, as well as the profitability of a firm (Wehner, 2018; Ismaéel and Rhima, 2019).

#### 5.10.4.4 Mechanisation and automation

Mechanisation and automation offer several advantages to a manufacturing firm such as a foundry. Some of these advantages, as stated by the respondents include maximum utilisation of plant and machinery, less handling of components in the process, speeding up of processes, reduction in cost of labour, consistent and better quality of product, as well as higher productivity.

*I always used a lot of labour, I mechanised for less handling of moulds.*

*Source: Participant 6 response*

*High labour costs can be overcome by designing the plant for as much mechanisation as possible from the beginning.*

*Source: Participant 8 response*

*It is very important to make sure there is maximum utilisation of plant and machinery as well as labour.*

*Source: Participant 4 response*

*Using new technologies like printing, simulation technologies, automated patternmaking, you have got different types of machining systems that can now…you know 7 axis machines that can produce tools and patterns in virtually no time at all and depending on the customer's demand, it may even be better to have a mould made by robotic machining*

*Source: Participant 2 response*

*…to be able to drill the pattern for the different castings using a robot rather than in fact using an operator.*

Source: *Participant 2 response*

*Foundries have had to move to mechanisation*

*Source: Participant 11 response*

*A lot of foundries are trying to do some machining.*

*Source: Participant 11 response*

*I see a lot of companies are trying to get away from the cost of labour by buying machinery, but the machinery is also expensive and expensive to maintain*

*Source: Participant 10 response*

*We put in an automated mixer that is computerised and calibrated and does not change.*

*Source: Participant 10 response*

*Buying machinery to do certain things is definitely a plus. When we put a continuous mixer and a reclaiming plant, it helped us tremendously. A machine does not arrive late at work because it is not feeling well or it's working a bit slow today because it's tired because it was up all night. I think you have got to try and mechanise, not too much, but definitely you have to put some mechanical plant there*

*Source: Participant 10 response*

The results fall in line with literature which suggests that mechanisation and automation provide the following advantages for firms: increasing work speed, reducing costs, facilitating safer and more comfortable working conditions, allows work to carry on where human abilities are limited, improving performance and product quality, increasing labour productivity, as well as improving process efficiencies (Kamaruddin, Mohammad and Mahbub, 2013; Ishii, 2017; Gumede, 2018; Kukartsev et al., 2020).

### 5.10.5 Intervention strategies

#### 5.10.5.1 Localisation and increased tariffs for imports

The participants suggested that intensifying on the localisation programme as well as introducing tariffs for imported castings could help the local foundry industry to be sustainable. Looking at localisation, state owned enterprises (SOEs) such as Eskom and Transnet were identified by the participants as good sources of work for the local foundry industry as they are heavy consumers of castings. Localisation programme was also reported to help reduce demand for imported castings as well as boosting downstream industries such as powder coating, electroplating, machining, and assembling, where value addition of castings is done. Tariffs for imported castings on the other hand were also reported to be a means for protecting the local foundry industry.

*Increasing tariffs for cheaply imported castings to promote local products*

*Source: Participant 1 response*

*A lot of stuff that we are making now are going to Transnet and I mean, just think if we could have a railway system. If, our railways were efficient and all these massive trucks carting bulk to the docks across the country, well that needs to be considered,*

*Source: Participant 1 response*

*We should be exporting as much as we possibly can*

*Source: Participant 1 response*

*Increasing drive towards localisation could reduce the demand for imported products*

*Source: Participant 5 response*

*By producing more products locally, we could expand not just the foundry sector but other sectors as well which you know is where you get the sort of added value where you are not just producing a casting but the casting as I said would require other processes which in turn uplift the whole economy really*

*Source: Participant 5 response*

*Increased drive towards localisation is a beautiful concept, but it is not reality.*

*Source: Participant 6 response*

*We are looking at things like the localisation programme of the government. Yes, that needs to be enforced for the big contracts and what have you. Designated products* *such as infrastructure products for ESKOM or whatever should be 100 percent local content.*

*Source: Participant 7 responses*

*Increased drive towards localisation only helps in creating the market and for any business to be sustainable, you need a sustainable market*

*Source: Participant 4 response*

*There should be more emphasis on localisation, and we need a lot more on that*

*Source: Participant 4 response*

*for me very important was in fact to have an effective localisation program. The government talks about it now, but the truth of the matter is that they don't have the mechanism to check whether in fact products are being made locally or whether they are simply being imported by local agents*

*Source: Participant 2 response*

*[We need to] have clear localisation programme and even if it needs protection in the form of import tariffs, I would support that in the short and medium term, until we can get the industry on a growth path.*

*Source: Participant 2 response*

*I might suggest maybe just a designation in terms of specific products which can be designated to be manufactured in South Africa only. You don't need imports, you need to manufacture these imported castings locally, as capacity and capability of doing so is available in the country.*

Source: *Participant 9 response*

*The second issue will be on tariffs on cheap imports… foundries in South Africa need support in terms of maybe putting more tariffs on imports and make the castings from local foundries to be competitive.*

*Source: Participant 11 response*

*Imports are just killing this country… Something needs to be done about imports and so forth, taxing and whatever it is just to make a more level playing field you know.*

*Source: Participant 10 response*

*Something needs to be done about imports and so forth, taxing and whatever it is just to make a more level playing field you know.*

*Source: Participant 10 response*

*They do not have environmental and labour standards that we have. So, definitely we need to sort of level the playing field by taxation on and so forth.*

*Source: Participant 10 response*

The results fall in line with recommendations made by Mulaba-Bafubiandi, Mageza and Varachia (2017) that the South African government should extend and refine the Preferential Procurement Policy Framework Act 5 of 2000 (PPPFA). As stated in literature, under this act the Department of Trade and Industry designates specific products and sectors where state owned enterprises and other government departments are obliged to procure local products. Literature surveyed also revealed that there are calls for introduction of tariffs for cheaply imported goods to protect and promote local industries (SAIF, 2015).

#### 5.10.5.2 Government and industry support

There were also calls for support for foundries from government and private sector. This support is in monetary and non-monetary form. As for monetary support, the respondents called on local banks to assist local foundries by easing the conditions to be met when lending money to them. Government departments such as the

Department of Trade and Industry or the Industrial Development Corporation were also called upon to assist more in financing of foundries. The respondents also suggested that administration of funding programmes should be coordinated and handled by one organisation, so that foundry owners do not get confused as to which door to knock on. The government, through the department of trade and industry can offer financial support to the local foundry industry in the form of overseas trips for exhibitions. As for non-monetary support, respondents suggested that organisations like the National Foundry Technology network could assist foundries in areas like acquisition of the ISO certification and technology transfer.

*You know our local banks are scared to go into any venture, where they are not going to make an amount of profit that they expect. So, they don't lend money very easily, believe it. They may advertise 'borrow money', but they don't give away money too easily.*

*Source: Participant 1 response*

*The Department of Trade and Industry in the past financed and supported trips to trade shows and exhibitions and so on which was quite helpful*

*Source: Participant 6 response*

*I think any means of financial support is always welcome in any given situation… it just depends on the conditions attached to it.*

*Source: Participant 7 responses*

*One comes from, let's call it private sector, the banking sector and the other one would come from government sponsored programs.*

*Source: Participant 2 response*

*the government need to ensure that it effectively implements the support from the NFTN. The NFTN is financing things like ISO certification*

*Source: Participant 11 response*

*So, they probably need to make sure that the ISO certifications are implemented by foundry people*

*Source: Participant 11 response*

*The DTI is part of government. It certainly helps us having the DTI giving support to us foundries*

*Source: Participant 10 response*

*As a start-up business, I think government intervention in terms of some sort of a financing scheme would certainly assist*

*Source: Participant 5 response*

*If it's a loan it becomes unattractive for the SME. Looking at the South African context where most of the foundries which are classified as SMEs, the issue around transformation plays a major role in terms of them accessing government funds. So, I think it depends on what level the government assists. However, to answer your question, it will help in terms of boosting foundries in terms of improving and acquiring new technology.*

*Source: Participant 9 response*

*the government sponsored programs should be concentrated in one area, whether it's in the Dti or the IDC or somewhere like that, but for me the whole thing was too diversified*

*Source: Participant 2 response*

*…very low-cost loans from the government to be able to have foundries put in for example solar powered technology*

*Source: Participant 2 response*

The result falls in line with literature reviewed which revealed that South African foundries needed capital injection for investment into new machinery and technology, especially for those which do not qualify for the "IDC Downstream Steel Industry Competitiveness Fund." The South African government can also assist local foundries by providing export finance, just as other countries are providing export finance to their local manufacturing firms (Jardine, 2015; Rustomjee, Kaziboni, and Steuart, 2018). The technology transfer program hosted by the Metals Casting and Technology Station was also cited in literature as being critical for development of the South African foundry industry (Mulaba-Bafubiandi, Mageza and Varachia, 2017).

#### 5.10.5.3 Export duty for scrap metal

Scrap metal is critical for any foundry, as it forms the bulk of what is charged into furnaces. Scrap metal is also significantly cheaper to buy than primary metals such as pig iron and steel billets. As reported in literature, South Africa's scrap metal is much cheaper than in other BRICS nations. Consequently, there is a huge demand for South Africa's scrap metal especially from China. This led to local scrap metal dealers being inclined towards exporting good scrap metal and starving the local industry. Introduction of export duty for scrap metal is also another intervention measure which could be implemented by the South African government to protect the local foundry industry.

*I think duty on export of scrap material in a way, if it makes that material available within the foundry could be a good thing.*

*Source: Participant 5 response*

*Your scrap metal in South Africa is controlled by a few groups and they always hold your export price in front of you although there are movements to try and change that, but they have been trying to change that for the past thirty years and they have not been successful because there are certain very strong families in this industry.*

*Source: Participant 6 response*

*In terms of the legislation and the export of things like scrap [metal]… those things will need to be looked at in terms of trying to find a way of either incentivising scrap [metal] dealers, so that local foundries can also have access to good quality scrap [metal] or just scrap in general.*

*Source: participant 7 responses*

*I support export duty on scrap metal. I think scrap metal is a strategic resource for South Africa and already people are by-passing the system completely because they there are so many people now who buy scrap metal stolen from the railways.*

*Source: Participant 2 response*

*I would say forget the export duty but rather just ban the export of scrap metal*

*Source: Participant 2 response*

*If South African foundries have need for scrap, they just need to make sure that no scrap is going out of the country because they starve us of the raw materials.*

*Source: Participant 2 response*

*[There is a need to] increase export duty on scrap so that at least that will become a deterrent and will probably export less and create enough raw material for the local foundries.*

*Source: Participant 11 response*

The result is in line with the work already being carried out by the International Trade Administration Commission (ITAC) to protect local foundries by prohibiting exporting of ferrous and non-ferrous waste and scrap metal, unless offered to the domestic market, for a period and at a price determined by them (DED, 2019).

**5.10.5.4 Special electricity pricing agreement for foundry**

The respondents were also in agreement of introduction of a special electricity pricing agreement for foundries. Cost of electricity in South Africa was reported by the respondents to be hindering local foundries from being competitive both on the domestic and international markets. Foundries in South Africa purchase their electricity from local municipalities, and not directly from ESKOM. It has been reported that electricity from local municipality costs a foundry an estimate of 4 percent of their annual turnover, whereas electricity costs for the same foundry would only be 2 percent of their total annual turnover if they were obtaining it directly from ESKOM. Foundries receiving electricity from local municipalities therefore have got a cost disadvantage and are less competitive in that regard (Kaziboni, Rustomnjee and Steuart, 2018).

*I do believe that foundries should be offered a special pricing because as I was explaining, the charges, to the foundries is broken into two. One is your Kilowatt hours, which is your consumption and the other one is your demand factor. So, the Kilowatt hour, yes, I understand because that is what you have consumed*

*Source: Participant 5 response*

*definitely the electricity input cost is huge. It is massive and it is getting worse and worse for electricity prices annual increases*

*Source: Participant 5 response*

*Foundries are high consumers of electricity, and the electricity cost is very high vis-a vis imports and stuff like that. The foundries cannot compete, so that is one area where I think the government should actually come in*

*Source: Participant 11 response*

*I think they should look at us and say, 'you are using more electricity for a small business so we will give you a reduced rate per kilowatt hour.' That would definitely help us a lot.*

*Source: Participant 10 response*

The results obtained from the interviews correspond with literature survey results. Rasmeni and Pan (2014) claim that foundries are heavy energy consumers, and that energy is one of the major cost drivers in production of castings. Apart from a special pricing agreement, foundries could also benefit if they were to purchase electricity directly from ESKOM. Purchasing electricity from local municipalities implies paying up to 30 percent more per kilogram of metal sold than if they were to buy directly from ESKOM.

#### 5.10.5.5 Politicisation and Unionisation of foundry

Politicisation and unionisation of foundry were identified by participants as factors hindering successful running of SME foundries in South Africa. There is need for all industry stakeholders to work together in an atmosphere of trust. These stakeholders include employees, employers, unions, and government. The participants argued that it will be difficult to achieve the National Economic Development and Labour Council (NEDLAC) objectives of reaching a consensus on matters pertaining to economic growth, participation in economic decision making and social equity amongst key stakeholders for as long as there is mistrust between themselves. NEDLAC is considered, to be an important forum for social dialogue and participatory policy making. The result is in line with the claim made by Hirsch (2020) that the slow growth in employment registered in South Africa is due to lack of cohesion between government, business, and labour. This challenge finds its roots in government's commitment to opening markets for smooth flow goods and services and capital while the labour market remains constricted. This scenario has led to stakeholders finding themselves at odds with each other.

> *For as long as the public sector view the government as essentially corrupt and the government views the private sector as white monopoly capital, we are never going to have an open approach. The political ideologies need to be taken off the table*
>
> *Source: Participant 2 response*

Respondents also highlighted that the unionisation of South African foundries is posing a real threat to their existence. Unions are said to push for higher salaries for foundry employees, even though the employers are reporting that they cannot sustain such higher salaries. Others also reported that unions were interfering in foundry decision making processes.

*Labour is becoming very expensive in South Africa, more because of the strong drive of the unions.*

*Source: Participant 11 response*

*I find the unions are a problem and if you have good communication with your stuff there should be no need for unions.*

*Source: Participant 10 response*

*I find the unions are very detrimental.*

*Source: Participant 10 response*

This result is in line with literature surveyed, which reports that the confrontational class struggle approach of unions, which is often punctuated by harsh racial overtones has not helped the situation. Organised workers have also over the years shunned the more participatory and cooperative industrial relations approach for union led agendas, which seek to democratise and transform the workplace (Bischoff, Masondo, and Webster, 2018).

#### 5.10.5.6 Upskilling

Introduction of skills development programs was also cited by the respondents as being a helpful intervention measure which can help the local foundries to run successfully, as well as for the South African foundry industry in general to be more sustainable. The National Foundry Technology Network (NFTN) identified skills development as one of the challenges the local foundry industry is facing. As an intervention measure, the NFTN, through the South African Institute of Foundrymen (SAIF) introduced training courses for foundry shop floor workers which are conducted on weekends at the University of Johannesburg (Jardine, 2015). Some participants, however, were of the view that it is costly to send their employees to Johannesburg for training, hence it would be better to have training facilitators visiting foundries and conducting onsite training sessions.

*Skills development and training programs can work*

*Source: participant 7 responses*

*All training is essential and ongoing especially process improvement*

*Source: Participant 8 response*

*I think there are a number of programs which are being put in place on teaching the employees the technical know-why because they know how to make a product*

*Source: Participant 9 response*

*We need to upskill those semi-skilled people that we have, at least take them to college and stuff like that*

*Source: Participant 11 response*

*I see there is a lot of these classes that are around. The problem is you have to take your guys to do training for a week. So, what happens to the foundry for that week?... they would do a lot better if they could do them on site.*

*Source: Participant 11 response*

Foundry employees who receive training gain a better understanding of why they perform certain procedures and tasks in the workplace. Furthermore, employees who have received training are able to work more efficiently and with less mistakes, hence making the organisation more profitable.

## 5.11 SUMMARY OF CHAPTER

This chapter commenced with presenting descriptive statistics for both the qualitative and quantitative data. Descriptive statistics sought to establish characteristics of participants and the type of foundries for which they worked. After descriptive statistics, the chapter also presented inferential statistics for the quantitative data. Structural equation modelling was conducted in a two-part process. The first part was confirmatory factor analysis and then the second was path modelling. In confirmatory factor analysis model fit was checked though assessing whether certain thresholds were met for the various model fit indices that included, the chi-square, CFI, GFI, NFI, RFI, TLI, IFI and the RMSEA. In addition to checking model fit at the confirmatory factor analysis stage standardised regression weights (estimates/ items) generated by the AMOS 26 software were also examined as to whether they met the required threshold of 0.500. The second stage of the structural equation modeling process focused on path model. This is when the path model/ structural modeling was presented in the same way as the conceptual model so that the proposed relationship could be tested. Lastly, the chapter presented the main themes which emerged from the qualitative strand of the research. The following chapter discusses the results in depth, highlighting is the spaces of convergence and divergence in both data strands.

# CHAPTER SIX - DATA CONVERGENCE, ANALYSIS AND MODEL DEVELOPMENT

In this chapter both qualitative and quantitative data presented in Chapter 4 are integrated. The convergent parallel design was employed for mixing of data as it gives equal weight to both methods, allows independent analysis of strands, and only mixes results during the penultimate synthesis. Creswell (2014) suggests that qualitative and quantitative strands may be brought together to provide a robust argument in the stages of interpretation, analysis, data collection or during design. Both qualitative and quantitative data are further analysed through a matrix which enables ease of comparison and interpretation. Table 6-1 below shows the matrix which forms the basis for comparison of the qualitative and quantitative strands of data. Information contained in the matrix below shows a summary of the responses for both qualitative and quantitative data. For quantitative strand, the most supported factors necessary for the successful running of an SME foundry in South Africa were derived from factor loadings in the accuracy analysis presented in Table 4-4. Only factor loadings of 0.5 and above were regarded as relevant as recommended in literature. Hair, Ringle and Sarstedt (2011) suggests that items with a loading higher than 0.7 should be accepted, while Chin (1998) argues that manifest variables with values equal to 0.5 or 0.6 can be accepted, for as long as their composite reliability (CR) and average value extracted (AVE) values are within acceptable range. Factor loadings representing the following five categories were selected: entrepreneur’s individual characteristics, internal non-individual characteristics, external non-individual factors, operational factors, and intervention measures. The highlighted factors shows where there is data convergence in the two strands of data. Discussion of results concentrated on points where the data converged, and results were compared with literature. The chapter also briefly mentions where the data diverged to provide a balanced purview.

**Table 6-1: Matrix for integration of qualitative and quantitative strands**

| VARIABLE | QUANTITATIVE RESULTS | QUALITATIVE RESULTS |
|---|---|---|
| **Entrepreneur's individual characteristics** | EIC4- Ambitious goals<br>EIC7-Need for achievement<br>EIC8-Must be visionary<br>EIC9-Must be risk taking<br>EIC11-Must be a quick thinker<br>EIC12- Quick to spot opportunities | • Experience and leadership<br>• Skilfulness, goal directed, and visionary.<br>• Good communication and problem-solving skills, and customer relations<br>• Reliable, dependable and self-motivated<br>• Confident, effective listening and conflict resolution<br>• Resilience, integrity and accountability<br>• Risk taking and agile |
| **Internal non-individual characteristics** | INCS1-Close customer relations<br>INCS2-Motivated employees<br>INCS3-Good financial planning abilities<br>INCS4-Talent management<br>INCS5-Marketing approach<br>INCS6-Management competencies<br>INCS9-Workplace learning<br>INCS10-Competitive advantage | • Management competence, teamwork, and organisational culture<br>• Market orientated and competitive.<br>• Flexible and adaptable<br>• Upskilling<br>• Good customer and supplier relations<br>• Diversity of customers and system of production |
| **External non-individual characteristics** | EFS7 Raw materials cost<br>EFS8 High transport costs<br>EFS9 Labour costs<br>EFS10 Energy Costs | • Legal compliance issues, social responsibility, and environmental awareness<br>• Access to information and cost-efficient resources (raw materials, labour and energy) |
| **Operational approach of SME** | OASF1-Adoption of latest technology<br>OASF2-Better utilisation of labour<br>OASF3-Procedures and methods<br>OASF4-Increasing capacity utilisation<br>OASF5-Value adding activities (e.g. machining& assembling)<br>OASF6-Mechanisation and automation<br>OASF7-Improved planning<br>OASF8-Adopting Total quality Management<br>OASF9-Implementing Internationalisation<br>OASF10 Entrepreneurial orientation<br>OASF11 Market orientation<br>OASF12 Environmental sustainability orientation | • Right equipment, method, and technology<br>• Knowledge and Training<br>• Total Quality Management<br>• Capacity Utilisation<br>• Mechanisation and automation |
| **Intervention measures** | IM3-Tailor made financing programs<br>IM4- Export support programs<br>IM5-Continuous improvement initiatives e.g. think tanks<br>IM6-Legal framework promoting ease of entry and exit<br>IM8- Skills development & training of employees<br>IM9-Managers' training & capacity building | • Localisation and increased tariffs for imports<br>• Getting support from various industries and the government<br>• Government financial intervention<br>• Contribution to gross national product for government financial support<br>• Export duty for scrap metal<br>• Special electricity pricing agreement for foundry<br>• Politicisation and Unionization<br>Upskilling |

**Source: Developed by the author**

## 6.1 ENTREPRENEUR'S INDIVIDUAL CHARACTERISTICS

### 6.1.1 Ambitious goals

Respondents from both the quantitative and qualitative strand suggested it is imperative for the foundry owner to have ambitious goals for their enterprise to operate successfully. In all, 94.4 percent of participants from the quantitative stand agreed that it is essential for the foundry owner to have ambitious goals for the foundry to be successful. Participants from the qualitative strand also added that it is the responsibility of the owner to set the goals of the foundry, be it financial or otherwise. The respondents also highlighted that after setting of goals, the foundry owner should clearly communicate these goals to their employees and give clear steps on how to achieve them. By doing so, employees get a clear mandate as well as an understanding of the important activities they should undertake, for them to achieve the goals of the organisation. This finding validates literature which suggests that setting specific and challenging goals can enhance performance of an organisation (Baron, Mueller and Wolfe, 2016; Zainol et al., 2018). Entrepreneur's goals have also been reported to have a direct impact on issues like ability to access finance, ease of finding skilled labour and profitability of an SME (Hasan and Almubarak, 2016). Other literature also emphasised the importance of communicating organisational goals to employees (Frese, Hass and Friedrich, 2016).

### 6.1.2 Need for achievement

Need for achievement was identified as another important entrepreneur's individual characteristic required to successfully run an SME foundry in South Africa. From the quantitative strand, 94.4 percent agreed that need for achievement is one of the key attributes which the foundry owner should possess for them to be able to successfully run their foundry. Participants in the qualitative strand added that need for achievement is the driving force which enables the entrepreneur to keep trying even when faced with adversities. In the qualitative strand, need for achievement was referred to as self-motivation. Self- motivation is a result of the need for achievement. Individuals with a strong need for achievement are actively seeking for opportunities where they can attain achievement satisfaction. Individuals with a high need for achievement are self-driven to set and reach their own goals, and usually not motivated by external rewards. The results confirm findings from literature review which suggested that an SME owners' need for achievement contributes positively to SME performance and growth (Azra and Salfiya Ummah, 2019; Aliyu et al., 2020). Need for achievement was also reported in literature as an important success factor required for development of entrepreneurship (Meshram and Rawani, 2019).

### 6.1.3 Risk taking

Risk taking also featured in both qualitative and quantitative strands. The qualitative respondents, however, qualified it as calculated risk taking. In all, 65.4 percent of quantitative questionnaire agreed that the entrepreneur should be a risk taker for them to be able to successfully run their foundry. According to the qualitative survey respondents, foundry owners incur risk when selecting which markets on which to concentrate. As discussed in literature, the foundry industry is considered the foundation of all manufacturing. As such, many manufacturing industries rely on castings produced by foundries for spares or components used to manufacture their products. Foundries, however, find themselves in a dilemma of having to choose which industries to serve. Foundry owners incur some risk as different industries have got different expectations on foundry in as far as service, quality and price are concerned. Secondly, certain metal grades such as stainless-steel demand a higher level of expertise to produce, hence there is some risk involved when selecting which metal grades to produce. The foundry owner should be a calculated risk taker when selecting expansion projects and new technology to adopt. Not all foundry related technology is ideal for every foundry, hence the owner must select the best technology which will give the highest returns on investments. This observation falls in line with claims made by Lawal et al. (2018) that risk-taking can significantly and positively affect SME performance. Other studies supporting the above findings also suggests that risk taking contributes to SME growth (Azra and Salfiya, 2019; Games and Rendi; 2019).

### 6.1.4 Visionary

Participants from both strands agreed that an entrepreneur should be visionary for successful running of an SME foundry in South Africa. A high 92.5 percent of quantitative questionnaire respondents agreed that the owner should be visionary for an SME foundry to be successful. Respondents from the qualitative strand equally observed that vision determines the direction which an organisation takes in the present and the future. The level of success achieved by any organisation was also said to be determined by its vision. In support of the above statement, Khiew, Chen and Shia (2017) suggest that the organisation's vision should guide individual actions of employees, as the employees' activities should contribute to attainment of the company vision. Khiew, Chen and Shia (2017) further state that when an organisation's vision is combined with its mission and values, this forms the basis of creating strategy on how best to serve all stakeholders. For the foundry owner's vision to be effective, they must communicate it well to the employees and ensure that they fully understand. This result corroborates findings from literature, which suggest that vision contributes significantly to good performance of an SME (Zainol et al., 2018). Visionary leadership was also identified as playing a positive role on entrepreneurship and organisational excellence (Hijjawi, 2021; Zainol et al., 2018). Other benefits of visionary leadership identified in literature include encouraging innovative behaviour within the firm and ultimately positively influencing employee performance (Anshar, 2017; Amoah-Mensah and Darkwa, 2020).

### 6.1.5 Agility

Agility was defined and identified as an entrepreneur's individual characteristic mentioned in both strands for successful running of an SME foundry in South Africa. Agility can be defined as "an organisational capability to deal with unexpected changes in the environment via rapid and innovative responses, which help them to take advantage of those changes" (Lu and Ramamurthy, 2011). A very high 78.9 percent of quantitative respondents agreed that the foundry owner should be quick to think and to respond to changes occurring for their foundry to be successful. Some of the changes occurring in the business environment include globalisation, disruptive business models, shifting consumer preferences, new competition, technological advances, and emerging new markets. Of late, the world has witnessed the disruptive global COVID-19 pandemic whose devastating effect negatively cauterised many businesses the world over. Qualitative questionnaire participants also added that inconsistent and nebulous environmental and B-BBEE compliance regulations compel foundries to make changes and only agile organisations could succeed in the end. Agility enables firms not only to adapt to such changes but also to anticipate change. Agility also demands that organisations respond and implement changes in their way of doing things whenever there is a change in the business environment. The speed of thinking things through and making decisions is said to bring about a firms' competitive advantage over rivals (Rita, Wahyudi and Muharam, 2018). This organisational agility can only be achieved if the entrepreneur has got the same mindset. The result therefore falls in line with the suggestion that for an SME foundry to succeed in South Africa, the entrepreneur must be a quick thinker (Singh, 2020).

### 6.1.6 Divergence on entrepreneur's individual characteristics

There was some divergence of views in that respondents in the qualitative strand suggested that the entrepreneur should have foundry experience and strong leadership for an SME foundry in South Africa to run successfully. Other attributes of the entrepreneur required to successfully run an SME foundry were good communication skills, problem-solving skills, good customer relations, reliable, confident, effective listener, resilient, a person of integrity, accountability, and good conflict resolution skills. The entrepreneur's individual characteristics listed above were not supported by the quantitative strand, and this hiatus is critical to note and possibly explore further on the differences in these perceptions.

## 6.2 INTERNAL NON-INDIVIDUAL CHARACTERISTICS

### 6.2.1 Workplace learning

Workplace learning was confirmed in both qualitative and quantitative strands as being very important for successful running of an SME foundry in South Africa. A total of 91.1 percent of quantitative respondents agreed that workplace learning was an important characteristic of an SME foundry required for it to be successful. Respondents from the qualitative strand submitted that a foundry which prioritises workplace learning enjoys benefits of higher productivity as such programs enable employees to be more effective at meeting the organisational objectives. Workplace learning was also reported to help increase foundry manager's capability. This has become more apparent with the rapid technological advancements currently being witnessed and rapidly evolving and short life cycles of skills on the market. Workplace learning can take place in a formal or an informal fashion. The results observed fall in line with literature surveyed, which suggested that organisational-learning, when supported by a strong management buy-in can pave the way for process improvement opportunities (Matthews, MacCarthy and Braziotis, 2017). Workplace learning, particularly responsible manager's workplace learning was also reported in literature as enabling organisations to respond to market changes with agility. Responsible managers workplace learning was identified in literature as being different from traditional interventional workplace learning in that it exposes employees to continuous learning. (Andrianova and Antonacopoulou, 2020).

### 6.2.2 Close customer relations

Close customer relations were reported under both strands as being important internal non-individual characteristics of an SME foundry. There was a significant 95.3 percent of quantitative respondents who agreed that close customer relations were critical for successful running of an SME foundry. The result falls in line with literature survey which showed that good customer relations can directly impact performance, innovativeness, and innovation behaviour, as well as provide a competitive advantage for a firm (Loon and Chik 2019; Irungu and Arasa, 2017; Domi, Capelleras and

Musabelliu, 2019). Good business buyer-supplier relationships can lead to economic and non-economic satisfaction. Economic satisfaction has to do with tangible benefits arising from commercial exchange. Non-economic benefits on the other hand are more inclined towards social elements relating to relationships. Economic satisfaction, when mediated with trust, can result in business commitment (Mpinganjira, Roberts-Lombard, and Svensson, 2017). Literature also suggests that customer engagement, which is a function of customer relations, is essential for building of customer loyalty (Rather and Sharma, 2017).

### 6.2.3 Management competencies

Management competencies was also confirmed in both qualitative and quantitative strands to be an important internal-non individual characteristic required for successful running of an SME foundry. A total of 94.4 percent of quantitative participants agreed that management competencies played a significant role in successful running of an SME foundry in South Africa. Management competencies as described by the qualitative respondents include both soft skills and technical expertise. Soft skills include attributes such as interpersonal, communication, team building and problem-solving skills. The participants further added that since the foundry industry is a highly technical environment, it is imperative that management teams in foundry also have some members with technical expertise in areas such as patternmaking, moulding, melting and metallurgy. There are also other competence areas which could make a management team function at a higher level. Such competence areas include human resources, accounting, sales, and marketing. The results support findings from literature which suggests that management skills play a critical role when it comes to SME performance (Veliu and Manxhari, 2017). Literature also suggests that with sufficient managerial skills, entrepreneurs can fully exploit new opportunities and markets (Bouazza, Ardjouman, and Abada, 2015). Managerial competencies were also reported to promote employee positive attitudes in the workplace, which in turn promotes engagement (Lara and Salas-Vallina, 2017).

### 6.2.4 Competitive advantage

Competitive advantage was also another factor where qualitative and quantitative data converged. Competitive advantage was reported by qualitative strand respondents as giving a foundry an urge over its competitors and as the reason why customers would choose to buy castings from a specific foundry instead of their competition. Qualitative respondents further suggested that competitive advantage became more important with the advent of globalisation. An SME foundry in South Africa not only competes against local competitors but has products from countries like China and India to contend with. Some of the areas where South African SME Foundries can gain competitive advantage over rivals include lower prices, superior quality, short turnaround time, value added activities such as machining, and excellent service. The respondents however revealed that countries like China have gained a competitive advantage over South African foundries through capitalising on economies of scale and price. China and India were reported to have better capacity of mass-producing castings, hence producing them cheaper and faster than South Africa. Technology was also reported to be another source of competitive advantage for Chinese foundries. With the latest technology, Chinese foundries were reported to be able to produce castings cheaper. An analysis of quantitative results reveals that 86.8 percent of respondents agreed that having a competitive advantage over rivals was important for successful running of SME foundries in South Africa. The results verify findings from literature which suggested that a firm’s competitive advantage leads to superior performance (Kaleka and Morgan, 2017; Yang, Ishtiaq, and Anwar, 2018). Literature further suggested that for a firm to gain competitive advantage over its rivals, it must combine its resources with core competencies as well as developing radical and incremental innovations (Radzi, Nor, and Ali, 2017; Kabue and Kilika ,2016; Coccia, 2017).

### 6.2.5 Divergence of internal non-individual characteristics results

There was also some divergence of results between the qualitative and quantitative strands. Results from the quantitative strand suggested that having motivated employees, good financial planning abilities and marketing approach were necessary for successful running of an SME foundry in South Africa. These results, however, were not supported by the qualitative strand. On the other hand, the qualitative strand also suggested that teamwork, organisational culture, having diversity of customers, adopting a market orientation, as well as being flexible and adaptable were important factors required to successfully run an SME foundry. These results, however, were not supported by the quantitative strand.

## 6.3 EXTERNAL NON-INDIVIDUAL FACTORS

### 6.3.1 Energy Costs

Both quantitative and qualitative participants agreed that it is essential for an SME foundry in South Africa to receive energy at affordable costs for it to run successfully. 73.6 percent of people who participated in the quantitative research agreed that an SME foundry needs cost effective energy supply for it to run successfully. Participants in the qualitative strand argued that a foundry uses energy intensive pieces of equipment such as induction, arc, and heat treatment furnaces for their production processes. As such, these pieces of equipment significantly push the electricity consumption much higher than other industries. Currently, the foundries are reported to be receiving their electricity from local municipalities and not directly from ESKOM. Local municipalities were reported in literature to be putting a high mark up when reselling electricity, they buy from ESKOM. Another issue which the qualitative participants suggested as requiring attention was the municipalities' pricing structure. The electricity charges to the foundries were reported to be broken into two parts. The first part is the kilowatt hours, which is the foundry's actual consumption. The second part of the charges is from the demand factor. Participants believed that they were not treated fairly in the way they were charged the demand factor, as firstly it is a huge portion of the electricity bill. Secondly, maximum demand factor charges were reported to be calculated based on the peak demand during the month. Foundries argue that the peak energy demand may only last for a few hours, but the municipalities charge them at the peak rate for the whole month. This kind of charging system was reported to be negatively affecting SME foundries profitability as they are paying based on the highest consumption. The results validate findings from literature, which suggested that a typical medium to large size foundry in South Africa purchasing electricity from their local municipality can pay up to 30 percent more per kilogram of metal sold than when they purchase electricity directly from ESKOM. When evaluated in monetary terms, electricity from local municipality costs foundries an estimate of 4 percent of their annual turnover, whereas electricity costs for the same foundry would only be 2 percent of their total annual turnover if they were obtaining it directly from ESKOM (Kaziboni, Rustomnjee and Steuart, 2018). Foundries receiving electricity from local municipalities therefore have got a cost disadvantage and are less competitive in that regard.

### 6.3.2 Raw materials costs

Affordable raw materials costs were also reported to be essential for successful running of SME foundries in South Africa. This was supported by 85.5 percent of people who participated in the quantitative survey. Scrap metal is one of the mostly used raw materials used in the foundry industry which qualitative respondents suggested required regulation. Scrap metal dealers were reported to be prioritising overseas markets, where they fetch higher returns. Globally, there is a huge demand for scrap metal and local scrap metal dealers are tempted to export their product to countries like China and India. Scrap metal being available locally was also reported to be sold at export rates in some instances. Some participants also highlighted that there was no need to sell locally sourced raw materials such as nickel and aluminium at international market rates, such as the London Metal Exchange rate. Another factor which was reported to be negatively affecting price of raw materials was the fact that there were very few suppliers of certain raw materials such as ferro-alloys in the country, hence buyer negotiating power of foundries was much low. The result supports findings from literature which suggests that raw materials cost is a key element for successful running of any business (Irmayanti, 2019). Literature also suggests that, Ideally, firms require raw materials costs to be stable, as fluctuating costs leads to SMEs also having erratic selling prices (Prabowo, 2019). Fellner et al. (2017) also validate the findings by suggesting that global resource demand and consumption has significantly increased during the last century and this led to a sharp increase in commodity prices during the last few decades.

### 6.3.3 Labour costs

Labour costs were also reported to significantly affect successful running of an SME foundry in South Africa. About 91.1 percent of quantitative strand respondents agreed that foundry require affordable labour rates for them to survive. Qualitative strand participants also complained that labour unions were wreaking havoc in the South African foundry industry by demanding high wage remuneration rates which employers could not afford. This has been worsened by the pressure foundries face of reducing costs due to cheaply imported castings which have substituted local products. Foundry consultants however argued that the fundamental problem was not high labour costs, but poor labour productivity due to outdated equipment. Examples given were melting furnaces in South Africa generally took much longer to melt a tonne of metal. Consequently, this increased the man-hours per tonne index of South African foundries when compared to those of competing countries like China and India. The second example given by respondents was material handling. The use of equipment like cranes and automated equipment can significantly improve materials handling in a foundry. Improving materials handling in areas such as moulding, sand reclamation, fettling and melting can significantly improve labour productivity of a foundry. The results are confirmed by findings from literature which suggest that African manufacturing firms have got high unit labour costs due to poor productivity (Mutambi, 2017). High labour costs were also reported in literature to hinder SME growth (Haleem, Jehangir and Ullah, 2019). Literature also encourages SMEs to focus more on improving labour productivity as opposed to reducing labour costs. That way, they can increase profitability, while at the same time keeping employees motivated, extracting their best performance, and retaining talented employees (Gomes and Kuehn, 2017; Quacoe et al., 2018; Kusi, 2018; Makhmutov et al., 2019).

### 6.3.4 Divergence of External non-individual factors results

There was also divergence of results from the quantitative and qualitative strands. The quantitative strand suggested that transport costs affected successful running of SME foundries in South Africa. This result was however not supported by the qualitative strand. The qualitative strand also suggested that legal compliance issues, social responsibility, environmental awareness, and access to information were important factors to consider for successful running of an SME foundry in South Africa. These results were however not supported by the quantitative strand.

## 6.4 OPERATIONAL APPROACH OF SME

### 6.4.1 Adoption of latest technology

In both the qualitative and quantitative strands, respondents agreed that adoption of latest technology was very important for successful running of an SME foundry in South Africa. 91.8 percent of respondents in the quantitative strand agreed that adoption of latest technology was very important for successful running of an SME foundry in South Africa. Latest technology was reported by qualitative respondents to significantly increase operating efficiencies, improving quality of products, and lowering of operating costs. Some of the examples of technology cited which could significantly improve efficiencies and profitability of SME foundries in South Africa include latest models of induction furnaces, whose melting efficiencies are much higher and modern continuous sand mixers. There are also modern simulation software programs on the market, which foundries could make use of to optimise their yields. Another example given, where technology advancement has made great strides over the years is 3D printing. This technology finds application in foundries during printing of moulds and patterns. This technology was reported by some of the respondents to be key to fast production of moulds and patterns. 3D printing was also reported to enable foundries to achieve higher precision patterns and moulds. This result falls in line with literature surveyed, which reported that latest technology could improve operating efficiencies, minimise pollution, as well reducing overall cost of manufacturing in a foundry. Technology was also reported to improve overall product quality. The results are congruent with literature surveyed, which reported that modern equipment have got more precise settings, hence attaining more precise readings, better finishing of products and minimizing wastage of raw materials (Talukder and Jahan, 2017). Continuous integration of latest technology was also reported in literature to improve competitiveness of manufacturing organisations (Mutambi, 2017; Nugroho et al., 2017).

### 6.4.2 Procedures and methods

Procedure and methods were also cited as critical for successful running of SME foundries in South Africa. Procedures are set process models or work instructions which are drawn for a specific team or department within an organisation, and which outline how specific tasks should be carried out. 95.7 percent of quantitative strand respondents agreed that an SME requires procedures and methods for it to be successful. To add onto the argument, qualitative strand respondents further commented that procedures help to standardise work or products. Procedures were also reported to offer benefits of process optimisation, hence enabling organisations to be in control of running costs. Another benefit of procedures cited by the respondents was assurance of good quality products. Foundry processes were cited to be complex processes with so many variables which could cause rejects if procedures are not put in place. Lastly procedures can aid foundries to be more productive, as employees are well informed on how to carry out certain tasks, and not have to rely on people’s memory or trial and error. Methoding on the other hand also improves casting yields (Aufderheide, 2010). Casting yield is the percentage of metal poured into a mould which is sold to customers. A higher yield also implies higher efficiencies, hence higher profitability of the foundry. If methoding design is not properly done, this results in casting defects developing during volumetric contraction of molten metal during solidification. Some of the casting defects which can occur include shrinkage cavities, porosity, and sink (Choudhari, Narkhede, and Mahajan, 2014; Singh, Khanna, and Sharma, 2019). With the right methoding and simulation software, foundries can also save on energy, labour, and raw materials costs, also increasing their productivity and net profit margin in the process (Kwon and Kwon, 2019; Haldar and Sutradhar, 2021). The result is in line with literature which revealed that methoding and procedures can improve productivity of a foundry (Mpanza and Nyembwe, 2014). Literature also suggests that procedures and methods also find use during training of new employees, to remind old employees, and provide the base for improvement of organisational procedures and policies (Rodrigues et al., 2015). In addition to that, existence of standardized processes and products in the organization are elements that potentially increase competitiveness and aids in accessing international markets (Salazar-Araujo et al., 2020)

### 6.4.3 Increasing capacity utilisation

Increasing capacity utilisation was also mentioned as being important for successful running of SME foundries. Capacity utilisation was defined in literature as the amount of production capacity being utilised, as a fraction of the maximum available capacity to produce finished goods (Storrie and Voyer, 2019). An analysis of quantitative results reveals that 86.8 percent of participants agreed that increasing capacity utilisation in the foundry increases probability of success of an SME foundry in South Africa. Respondents from the qualitative strand also argued that increasing capacity utilisation can improve unit product costs as indices like unit labour costs and fixed costs components which are added during costing can be improved then. Capacity utilisation was reported to be increased by effective running of furnaces and continuous sand mixers. Foundries could increase their melting capacity by staggering of hours or employing shifts. Continuous mixers capacity could be increased by improving process layout through techniques such as process mapping. Cranes and roller tracks could also be used to improve handling of goods. The results above are substantiated by literature which revealed that capacity utilisation plays a key role in improving profitability of a firm (Okujaye, 2018; Isma'eel and Rhima, 2019; Jadayil, Khraisat and Shakoor, 2017).

### 6.4.4 Mechanisation and automation

Participants in both qualitative and quantitative strands agreed that mechanisation and automation of South African foundries is necessary for them to survive. 81.8 percent of quantitative strands respondents agreed that mechanisation and automation could improve chances of success of an SME foundry in South Africa. Participants in the qualitative strand also commented that South African foundries could capitalise on economies of scale through mechanisation and automation, especially for those foundries producing large series of small castings such as automotive foundries. Having economies of scale enables a foundry to sell its castings cheaper than its rivals, hence attaining a price competitive advantage over rivals. Foundries like Auto Industrial and Autocast in South Africa were cited as good examples of automotive foundries which have been successful due to mechanisation and automation. Countries like China were reported to have an urge over South Africa in that regard.

The participants also admitted that not all foundries can be fully automated. Jobbing foundries for example do not produce large series of the same castings. In such cases, the foundries may be partially automated in certain sections of their process. The results corroborate findings from literature which suggest that mechanisation and automation can provide several advantages for firms, such as increasing work speed, labour productivity, reducing costs, facilitating safer and more comfortable working conditions, allowing work to carry on where human abilities are limited, improving process consistency, improving product quality, accessing accurate data and overall improvement in firm performance (Kamaruddin, Mohammad and Mahbub, 2013; Ishii,2017; Gumede 2018).

### 6.4.5 Adopting Total Quality Management

Total Quality Management (TQM) was also highlighted in both strands of data as being crucial for successful running of an SME foundry in South Africa. About 93.7 percent of quantitative respondents agreed to this notion. The qualitative respondents also added that adopting TQM can help South African foundries to be able to compete on quality with imports from overseas. TQM was reported to induce customer confidence, especially for firms with high quality standards such as those in the automotive and aeronautical engineering industries. TQM was also reported by the participants as being a tool for process optimisation. Product quality was also reported to improve when a firm adopted TQM. Lastly, the participants also highlighted that TQM could help a foundry to be more profitable through reduction of rework. The result supports findings from literature review which outlines that manufacturing firms can attain customer satisfaction, higher productivity, and profitability through TQM (Singh and Ahuja, 2015; Shafiq, Lasrado and Hafeez, 2019). TQM, when combined with preventative maintenance was also reported in literature to help manufacturing firms to reduce the following: waste and re-work, total process rejects, maintenance costs, customer complaints, turnaround times, inventory levels, overheads, setup times, and likelihood of unplanned downtime (Singh and Ahuja, 2015). Implementation of Total Quality Management has become a strategic survival tool for SMEs and large businesses (Majumdar, 2016). SMEs can find it easier to expand into international markets when they adopt TQM (Ismail and Rassokha, 2017). Lastly, it was also reported in literature that SMEs can quickly modify product and process design as per customer requirement, as well as to increase productivity when they adopt TQM (Mitra, 2016).

### 6.4.6 Divergence of operations factors results

The quantitative strand suggested that better utilisation of labour, value adding activities such as machining and assembling, improved planning, implementing internationalisation, entrepreneurial orientation, market orientation and environmental sustainability orientation are important for successful running of an SME foundry in South Africa. These results were however, not supported by the qualitative strand. The qualitative strand on the other hand suggested right equipment and knowledge & training as operational factors which are important for successful running of an SME foundry, but these results were not supported by the quantitative strand.

## 6.5 INTERVENTION MEASURES

### 6.5.1 Tailor made financing programs

The first intervention measure which was supported by participants from both the qualitative and quantitative strands was tailor made financing programs for the foundry industry. A total of 73.2 percent of quantitative respondents agreed that it is necessary for foundries to receive tailor made financing programs for them to be sustainable. Foundry was reported by qualitative strand respondents as being a highly capital-intensive industry sector. As such, financing of foundries could help them to run sustainably. One of the fundamental problems which the participants highlighted was that government did not seem to understand the role foundries play in the economy. Some of the financing needs of South African foundries include funding to acquire licences such as the Air Emissions Licence (AEL). Acquisition of new technology was also said to require high capital investments hence foundries require government financing to embark on such programs. The result falls in line with literature surveyed, which suggested that access to finance can have positive effect on overall firm performance (Ombongi and Long, 2018). Access to finance was also mentioned as a necessity for start-ups, when they embark on expansion projects and for their internationalisation bid (Oseifua, 2017; Dick et al., 2017). Other benefits of access to finance identified in literature include improvement on product, process, and organisational innovation. Firms can also invest in R&D and adoption of foreign licenced technology (Adegboye and Iweriebor, 2018). Lastly, literature suggested that it is essential for nations to develop financial infrastructure which can satisfy the diverse financial needs of SMEs, as this leads to continuous growth and competitiveness of the SMEs (Khan and Anuar, 2018).

### 6.5.2 Export support programes

Export support programmes was also another intervention measure suggested by the respondents from both strands which could help to make the local South African foundry industry more sustainable. 85.4 percent of quantitative strand respondents agreed that assistance to export castings would help South African SME foundries to be more sustainable. As reported by respondents in the qualitative strand of the study, the South African government in the past used to assist the local foundries when it came to attending and participating in international exhibitions. This has since stopped, apparently due to funding challenges. Respondents suggested that the government should resume such programmes, as exposing local foundries to the international markets can reveal new business opportunities which can help to expand their market. The result falls in line with literature surveyed which revealed that internationalisation and exporting offers several advantages to firms. These advantages include to reduce the effect of local competitive pressure, to take advantage of unique knowledge they possess, to follow customers abroad, acquisition of new products or market knowledge, as well as to reduce costs by developing scale economies or leveraging resources (Costa, Soares, and de Sousa, 2016; Holtgrave and Onay, 2017). Literature also suggests that exporting has got a direct effect on employment growth (Lafuente, Vaillant and Moreno-Gómez, 2018). Exporting also enables firms to generate foreign currency which is required for importing (South African National Treasury. Economic Policy Division, 2019). Small firms were also reported in literature to increase in competitiveness and improve on productivity when they participate in global value chains through exporting (Boffa, Jansen, and Solleder, 2021).

### 6.5.3 Skills development and training of employees

Skills development programs for foundry employees was suggested in both strands as being an important factor which can play an integral role in successful running of South African foundries. This notion was supported by 94.7 percent of respondents in the quantitative strand of the research. Also, in support of this notion, the qualitative respondents suggested that South African foundrymen's skills were not on par with those of their counterparts in developed countries. There is therefore a need to establish more training programs across the country for foundry employees as this can offer several benefits to the local foundry industry. Some of the benefits of training of employees include increased productivity from trained employees. The respondents also reported that trained employees produced better quality work, as they made less rejects. A foundry which trains its employees therefore has a competitive edge over rivals through superior quality. This result validates literature which suggested that training of employees in the workplace can pave the way for process improvement opportunities (Matthews, MacCarthy and Braziotis, 2017). Literature also suggested that SMEs which embark on deliberate learning and human resource development through training fare better than those which do not (Evangelista and Mac, 2016; Roziq, Reawaroe and Rosyidi, 2021).

### 6.5.4 Divergence of intervention measures results

As with the other results, there was also divergence of intervention measures results. Results from the quantitative strand suggested that continuous improvement initiatives such as think tanks, developing a legal framework, promoting ease of entry and exit and foundry managers' training capacity building were very important for successful running of an SME foundry in South Africa. These results were however not supported by the qualitative strand. On the other hand, the qualitative strand also suggested that driving the localisation program and increasing tariffs for imported castings could help the local foundry industry to be more sustainable. This result, however, was not supported by the quantitative strand. Other suggestions made by the qualitative strand which were not supported by the quantitative strand include export duty for scrap metal, special electricity pricing agreement for foundry, dialogue to minimise politicisation and unionization of foundry.

## 6.6 MODEL DEVELOPMENT

This research also sought to come up with a model which can be used as a guide by all key stakeholders to make the South African SME foundries more sustainable. Based on the results presented in Chapter 4 and the discussion of results in Chapter 5, Figure 6-1 below presents the proposed framework that could be used by decision makers when assisting SME foundries in South Africa. Figure 6-1 is a modification of Figure 3-16, which is the framework proposed at the beginning of the study.

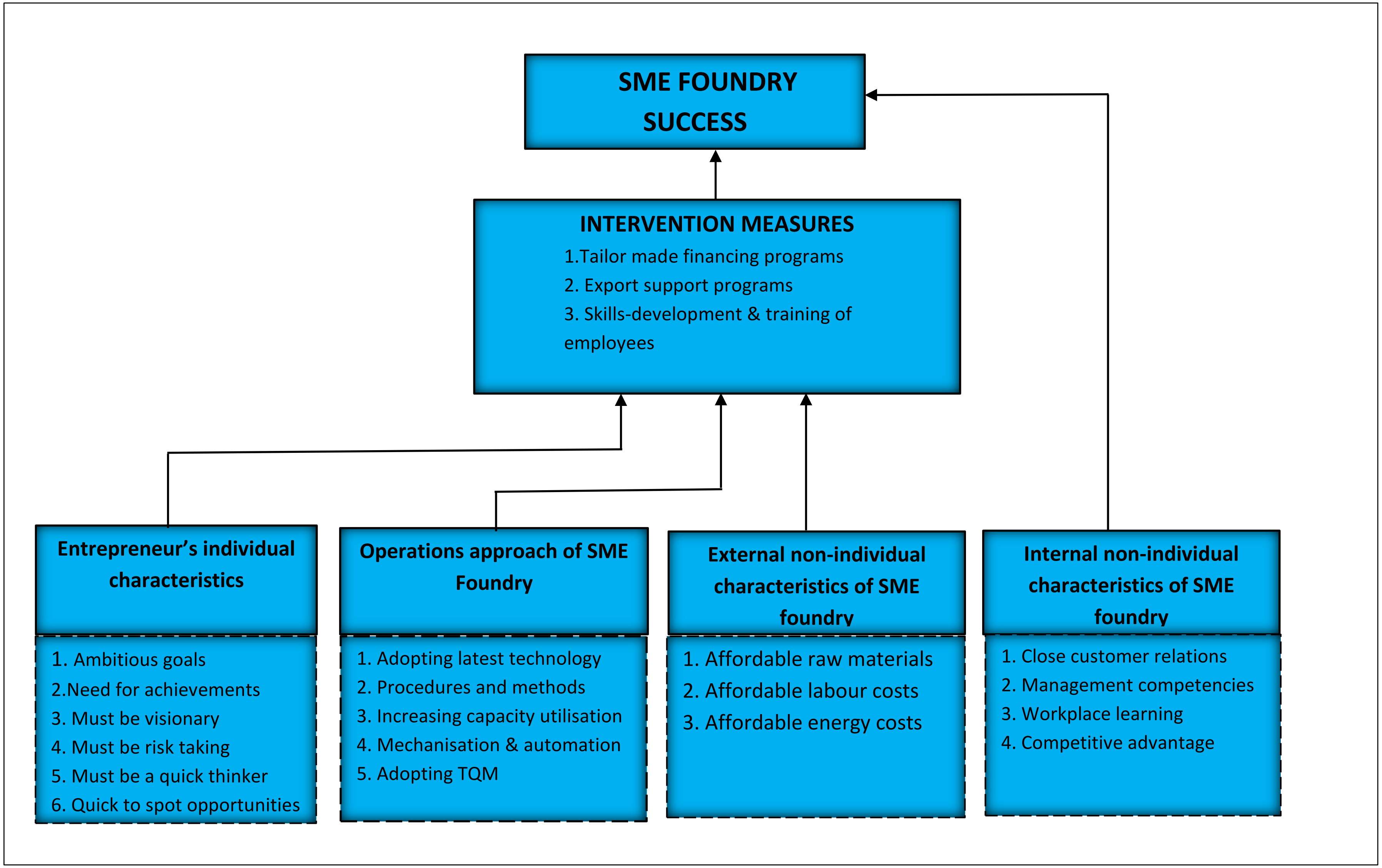


**Figure 6-1: Framework for success factors required to run an SME Foundry in South Africa**

**Source: Developed by author**

Figure 6-1 above shows that the foundry owner's individual characteristics play a big role in success of firm as they influence the kind of intervention measures to be employed at any foundry. The owner's vision for the foundry acts as the compass showing the direction the foundry must take. Vision determines the market segments the foundry will concentrate on. The various metal grades and relevant technology required to produce them is also determined by the vision of the SME owner. This, in turn, informs the number of employees, as well as the relevant skills set required. While vision informs the direction the foundry will take, the foundry owner's energy, which is displayed in the goals they set, their drive to achieve the goals and the risks involved will determine how far the foundry could go. Lastly agility of the foundry, which is influenced by the owner also plays a role in successful running of a foundry. This means that the foundry owner's ability to process any changes in the market, as well as to spot and seize opportunities which come their way is critically important.

Any intervention measures to try and assist foundries should also take into consideration the operational approach of the foundry, particularly technology adoption level of the foundry, procedures and methods, capacity utilisation, level of mechanisation and automation and level of Total Quality Management should also be seriously considered. Adopting relevant and fairly new technology offers advantages of faster production at reduced costs. Newer technologies are generally cleaner, produce higher quality castings and consume less energy. Procedures and methods should also be taken into consideration in the effort to improve foundry operations. Procedures and methods help foundries in attaining consistency of results, saves time and minimise wastage. Any intervention measure to assist a foundry should also look at plant capacity utilisation. This can be combined with level of mechanisation and automation at the foundry. Mechanisation and automation help to improve capacity utilisation of a foundry. Increasing capacity utilisation of a foundry helps to improve unit labour costs as well as to improve average fixed costs. Lastly, any intervention measure to help improve an SME foundry in South Africa should look at how that enterprise's level of adoption of TQM is. With the right approach to TQM, a foundry can improve on rejects generated and, in the process, become more profitable.
As suggested in the model, any intervention measure to assist an SME foundry in South Africa to be more successful should zoom in on three external non-individual

factors which are affordable raw materials, affordable labour costs and affordable energy costs. The most used raw materials in the day to day running of a foundry are alloys, mould coatings, resins, binders, scrap metal, ingots, and fettling consumables. It is imperative that foundries source these consumables from suppliers offering the best prices. As for labour, there is not much that the foundries can do to reduce the rates which they pay employees as there are set agreements between employers and metal industry workers unions specifying how much each job function should be paid per hour. Employers could, however, improve on unit labour costs by improving the foundry's capacity utilisation. Cost of labour can also be improved through training of employees. Trained employees are certainly more productive than untrained employees, and literature has verified this fact.

Lastly, the model also shows that internal non-individual characteristics have got a direct effect on successful running of an SME foundry in South Africa. Foundry owners should ensure that in their firms there are close customer relations, management competencies, workplace learning and possessing a competitive advantage over rivals. The model suggests that every SME foundry in South Africa should ensure that they develop close relations with their customer. With close customer relations, foundries are bound to understand customer needs. Foundry customers do not always understand what metal grades and designs to choose, and which ones meet their specific objectives. A foundry with close customer relations can, however, advise on such issues. Going this extra mile assists in fostering long term relationships with customers. The model also suggests that management competencies should always be taken into considerations. The foundry owner cannot possess all the management competencies required to successfully run a foundry. They can however surround themselves with a team of managers whose skills and competencies complement each other. These competencies are technical and soft skills. Among the technical competencies required in a foundry are metallurgy, moulding, patternmaking, methoding as well as engineering. On the soft skills, management should possess human resources, finance, sales, and marketing competencies. The organisation also should promote workplace learning. This learning might take the form of formal programs or informal programs or both. Learning might also take place on-site or might be conducted off site or both. An SME foundry with a culture of learning will always improve on its efficiencies and in the process become more profitable. Lastly, the foundry should develop a competitive advantage over rivals in the process. This internal characteristic will enable customers to choose to purchase castings from a specific foundry over its rivals. As discussed in literature, there are several sources of competitive advantage. Some of these sources include superior products, faster delivery time, price, good service, superior knowledge.

In as far as intervention measures are concerned, the model suggests that three main strategies which are tailor made financing programmes, export support programmes and skills development and training of employees be considered. There is need to look at tailor made financing programmes which look at specific needs of the foundry industry. Some of these needs include but are not limited to technology acquisition, training, and legal compliance issues. The model also suggests that intervention measures should concentrate on how to upskill foundry employees. Lastly, the model recommends that intervention efforts be concentrated on export support programmes for the South African foundry industry.

## 6.7 CHAPTER SUMMARY

This chapter presented a matrix containing both qualitative and quantitative strands of data. A matrix was used to facilitate ease of comparison and interpretation in using convergent parallel design method. After analysis of the matrix, results demonstrated the most important factors, which fall under entrepreneur’s individual factors, non-individual factors and operational factors which are necessary for successful running of an SME foundry in South Africa. The matrix also verified the most relevant intervention measures that on implementation could help the South African foundry industry become more sustainable. Lastly, a framework model was proposed, which foundry owners and other key stakeholders could use to improve performance of foundries in South Africa. The next chapter provides a comprehensive summary of the findings derived from this study. Recommendations to key stakeholders are proffered in the ultimate segment.

# CHAPTER SEVEN - SUMMARY OF FINDINGS, RECOMMENDATIONS AND CONCLUSION

## 7.1 INTRODUCTION

This chapter presents an overall summary of the study. Under the summary of the study, research objectives and questions are revisited and compared with the findings to establish the extent to which the findings answered the research questions. Recommendations of what needs to be done to make South African SME foundries thrive and for these to succeed on the market are also proffered. Limitations of the study are also outlined in this chapter, as well as suggested areas for further research in this niche.

## 7.2 SUMMARY OF FINDINGS

The study was spurred to achieve five objectives and respond to five research questions. The first objective was to identify entrepreneurs' individual characteristics which are required to successfully run an SME foundry in South Africa. The specific research question was: what entrepreneur's individual characteristics are required to successfully run an SME foundry in South Africa? The main findings for that research question were that it was important for the entrepreneur to possess the following individual characteristics: ambitious goals, need for achievement, vision, risk-taking, quick to spot opportunities and agility.

The second research objective was to identify non-individual characteristics of an SME foundry in South Africa that would ultimately make the enterprise successful. The corresponding research question was: what non-individual characteristics of an SME foundry in South Africa are required for it to be successful? Non-individual characteristics were divided into two, namely, internal non-individual characteristics and external characteristics of the foundry. For internal non-individual characteristics, close customer relations, management competencies, workplace learning, and competitive advantage were identified in both strands and supported as the most important factors required to successfully run an SME foundry in South Africa. As for external factors, cost effective labour, affordable raw materials and energy costs were identified as the most important.

The third objective was to identify operational factors which must be observed by a SME foundry in South Africa for it to be successful. The corresponding research question was: what operational factors must be observed by an SME foundry in South Africa for it to be successful? The study established that adoption of latest technology, procedures, and methods, increasing capacity utilisation, mechanisation, and automation, and adopting total quality management practices were the most important operational factors required to successfully run an SME foundry in South Africa.

The study also sought to establish what intervention strategies could be implemented to make South African SME foundries sustainable. The corresponding research question was: which interventions strategies should be implemented in making South African SME foundries sustainable? The main intervention measures supported by both qualitative and quantitative data were tailor-made financing programmes, skills development and training of foundry employees and export support programmes.

The last objective was to generate and develop a model outlining the success factors required for a South African SME foundry to thrive and be effective on the market. The specific research question was: what model could be generated and developed outlining the success factors required for a South African SME foundry to thrive and be effective on the market? This model that took into consideration the findings stated above was suggested in Figure 6.1 of chapter 6.

## 7.3 CONCLUSIONS

The purpose of this study was to identify and develop a framework for success factors required to run an SME foundry in South Africa. The research was prompted by the fact that South Africa has lost about 71 percent of its foundries in the past four decades. The study identified factors that were categorised as entrepreneur's individual characteristics, internal non-individual characteristics, external non-individual characteristics, and operational factors. The study also identified intervention measures that could be implemented to make South African SME foundries sustainable and thereby avert the possibilities of closing shop as has been the case recently.

A model depicting the relationships between variables was then developed. The model established that an entrepreneur's individual characteristics, external non-individual characteristics and operational approach had a positive and strong relationship with intervention measures. This model also verified that there was a weak relationship between internal non-individual characteristics of an SME foundry and intervention measures. The study further confirmed that internal non-individual characteristics of an SME foundry also had significant influence on the success and sustainability of SME foundries.

Unlike previous studies which only suggested that South African foundries should make certain changes in their operations for them to succeed, this study offers a holistic and comprehensive framework of what needs to be done. Since the foundry environment is highly technical, an operations approach plays a crucial role in the successful running of such enterprises. Whereas this alone is not enough, this study established that there are other internal and external factors that ought to be taken into perspective for the successful operations of such an establishment.

## 7.4 RECOMMENDATIONS

In line with the intervention measures suggested by the participants, the following recommendations are given:

**Financing programmes for technology acquisition**

One of the findings was that foundries require funding for them to be competitive on the global scale, as well being operationally sustainable. This funding should be directed for upgrading equipment and technology acquisition. South African foundries were generally reported to be using old equipment and outdated technologies, leading to inefficiencies, high cost of manufacturing, high consumption of energy and poor quality of products. There is clearly a need for government to focus attention on funding acquisition of latest equipment such as melting furnaces, moulding equipment in the form of continuous sand mixers, sand reclamation plants and simulation software. Where there is a demonstrated need, government could also assist foundries to mechanise and automate. Mechanisation and automation should certainly assist foundries to mass produce small castings that might be required in large quantities at a time. Government funding for mechanisation and automation could also assist foundries to produce castings at a lower cost, thereby aiding them to compete with countries such as China and India.

Another area in which foundries require funding assistance is acquisition of the Atmospheric Emissions Licence (AEL), which falls under the National Environment Management: Air Quality Act 39 of 2004. Engineering News (2019) reported that it was technically challenging and expensive for energy intensive industries to convert to technologies and processes that allow cleaner production. In as much as SME foundries would want to comply with the law, the cost of doing so is quite exorbitant for them. It is therefore recommended that the government also assist foundries with funding in this area. Lastly, acquisition of technologies such as simulation software was reported to be too costly for SME foundries and this also constitutes another area which government funding agencies should consider when foundries apply for finance.

**Skills development and training of foundry employees**

Skills development was one of the strong points that emerged from the interviews. Considerable work has been done by the South African Institute of Foundrymen (SAIF) and the Gauteng Foundry Training Centre (GFTC) in as far as training of foundry personnel is concerned. SAIF trains foundry personnel on subjects such as core making, moulding, melting and metallurgy, fettling, casting design, productivity, and quality assurance. When candidates complete a minimum of 6 out of a possible 8 modules, they are awarded a diploma in foundry technology. This programme is aimed at upskilling shopfloor workers hence entry requirements are not very strict. The DTI introduced this programme with the aim of equipping practising foundrymen with essential theory that generates a better understanding of why they conduct certain procedures at work. The only weakness of the programme is that it is not yet accredited by the Manufacturing, Engineering and Related Services Sector Education and Training Authority (merSETA). This creates a negative perception of the programme with employers. Consequently, taking the course apparently creates further disadvantages where the successful candidates who may wish to use their newly acquired qualification when applying for job opportunities may not be positively recognised as competent and skilled personnel.

The GFTC, on the other hand, offers higher level qualifications where graduates from the college are recognised as fully fledged artisans. The acceptance and admission criteria for GFTC programmes is stricter as only applicants who passed subjects like Mathematics, Physical Sciences and Technical Drawing at matric level are accepted for programmes such as diplomas in melting and metallurgy, pattern making and moulding. To ensure quality of training programmes, the patternmaking and moulding courses are merSETA accredited and plans are in place to get the metallurgy course accredited as well. Students from the GFTC are also assessed by the Quality Council for Trades and Occupations (QCTO). One of the limitations of the GFTC intake is that the institution must first get commitment from industry that they will give the students the required 18 months training and practical experience. The foundries taking on students must be merSETA accredited. At present, only 3 such foundries, namely Auto Industrial, PRIMA Industrial, MIS Engineering are merSETA accredited to train students (Casting SA, 2020). These foundries, however, also have a limitation with regards the number of students they can enrol per year. Without a doubt, there is need to get more foundries merSETA accredited to allow more students to be trained in the country. The GFTC is a joint initiative of several organisations such as the NFTN, Gauteng Department of Economic Development (GDED), SAIF, Ekurhuleni East TVET College (EEC), the Department of Trade, Industry and Competition (DTIC) and CSIR. The college, however, mainly gets funding from the CSIR. There is therefore a need for the private sector to engage in the sponsoring of such needful programmes.

The programmes offered by the GFTC could be extended to other provinces, especially Western Cape and KwaZulu-Natal. In KwaZulu-Natal for example, there is another training centre called Downstream Centre for Aluminium Technology whose stakeholders include Economic Development, Tourism and Environmental Affairs (EDTEA), uMfolozi TVET College, Small Enterprise Development Agency (SEDA) and private sector organisations such as South 32. This centre could be further developed to cater for upskilling and training of foundry employees. As cited by the participants, enhanced qualifications would become so much easier if training of foundry employees was conducted closer to the foundries or on-site. Having satellite training centres similar to the GFTC in KZN and Western Cape provinces could certainly improve the training situation in South African foundries.

Lastly, one of the aims of the National Foundry Technology Network (NFTN) is to develop career path opportunities for artisans graduating from institutions like the GFTC to further their studies at local Universities of Technology if they wish to do so. For this goal to be realised, there is need for a forum where institutions like SAIF, NFTN, GFTC would co-operate and work with universities like Vaal University of Technology, University of Johannesburg in drafting clear study development paths outlining how potential students could commence their studies at lower levels and finish off at university. Universities also need to offer specialised programmes, as opposed to the thinly spread and diluted programmes currently on offer. Specialisation of Universities would also help to produce specialised technocrats who could subsequently add value to the industry.

**Export support programmes**

Exporting of goods can offer advantages of diversification and expansion of market opportunities for the South African foundry industry. The benefits of exporting are more visible when the domestic market shrinks. An example is the Indian foundry industry which is targeting to double its global market share by 2025 through exports (Nag, 2020). The South African Foundry industry could also take advantage of the Sub-Saharan market where most member countries do not have similarly robust foundry sectors. The few countries in Sub-Saharan Africa where there is some activity, in terms of foundry are Ghana, Kenya, Zimbabwe and Zambia. Ghana is reported to have an estimated 50 foundries (Andrews and Gikunoo, 2011). Most Ghanaian foundries, however, are reportedly using outdated technologies such as cupola furnaces that limit a foundry's size and quality of castings, as well as the range of metal grades they can produce (Kissi, Carr and Adu-Boachie, 2018). Kenya is reported to have an estimated 45 foundries (Mose, Wangombe, Nganga and Mbuya, 2019). Zimbabwe has got a total of 19 foundries and its total output is much less than that of South Africa. Zimbabwe's total foundry output is estimated to be around 9 260 tonnes per year (Fashu, 2018). This figure equates to almost 2 percent of South Africa's current output. Information on Zambian foundries is scant, but Foundrymen Association of Zambia (2013) reported that there were only 10 foundries in that country. All this demonstrates that the South African foundry industry could essentially capitalise on the Sub-Saharan African market. There are other countries in the region such as Botswana, Mozambique, and Namibia whose foundry industry is almost non-existent. The same countries, however, have significant mining and manufacturing activities happening in them. This means that these countries require castings to use as spares for their machinery and equipment. The South African Foundry Industry therefore needs to embark on an aggressive marketing strategy that should ultimately capture the Sub-Saharan market.

It is, however, not easy for foundries to drive the export programmes on their own, as considerable resources and expertise are required to do so. The South African government could assist in that regard through departments such as the Department of Trade, Industry and Competition (DTIC). The South African government could assist foundries in various ways. Firstly, the government could assist firms with a needs-assessment of export support programmes as suggested in literature by Seringhaus and Rosson (2012). As part of the needs-assessment, non-exporters are made aware of new opportunities, while new exporters are assisted with determination of the feasibility of exporting. Exporters wishing to expand can be assisted during selection of the most promising market and the safest market entry approach, while continuing exporters can be assisted with ways of improving and refining existing operations. The DTIC is currently running training courses on exporting. One such programme is "Introduction to Exporting Training of the Global Exporter Passport Program (GEEPP). The training covers trade regulations, tariff and non-tariff barriers, insurance methods and techniques, modes of transport, duties and VAT, customs procedures and declaration, foreign currencies, and exchange controls amongst many other curriculum specifications. The intended purpose of the GEEPP is to equip firms intending to export with understanding the export cycle, processes, and logistics. It is also recommended that the DTIC expand its export support programmes for foundries beyond informational ones and to also offer motivational programmes, operational programmes, experiential knowledge, financial programmes and well as reduction of red tape and legal barriers. SAIF could engage the DTIC to engage in training foundry owners on programmes such as GEEPP.

**Localisation programme for designated goods**

Although the South African government signed trade agreements with other nations and cannot outrightly ban imports, nothing stops it from enforcing legislation such as the Preferential Procurement Policy Framework Act 5 of 2000: Preferential Procurement Regulation, 2017 (PPPFA). As indicated in literature, under this Act, the Department of Trade and Industry designates specific products and sectors where state-owned enterprises and other government departments are compelled to procure local products. One of the objectives of the PPPFA is to create jobs through supporting local businesses, particularly those with a good B-BBEE rating. The regulation, however, has a loophole in that the government departments purchasing goods from local businesses do not trace the origin of the goods they are receiving. As an example, if ESKOM purchases castings from a local casting supplier, they often do not check the actual origin of those castings. This might imply that a government department such as ESKOM might be indirectly purchasing castings originating from overseas. That kind of arrangement offsets the objective of the PPPFA as it only enriches a few individuals who are awarded tenders at the expense of local foundries. It is therefore recommended that the government departments also refine the act by putting in place an instrument to check the origin of castings supplied by the local suppliers, so that more preference is given to suppliers sourcing castings from the local foundry industry. Infrastructure recapitalisation and expansion of state-owned enterprises such as ESKOM, TRANSNET could yield massive opportunities for the local foundry industry if implemented well.

**Improved collaboration between key foundry stakeholders**

Currently, it does not look like the foundry industry is benefiting much from research and development going on at local universities. There is therefore need for improved collaboration between key stakeholders such as foundries, universities, SAIF, MCTS and the NFTN. With better collaboration between universities and industry, more research projects could be developed from industry, hence solving real problems and adding value to the foundry industry. An example is the MCTS, which is an initiative of the government Department of Science and Technology (DST). The MCTS is a communal technology hub which is highly underutilised. It is recommended that foundries make more use of the facilities for them to enjoy the benefits of latest foundry technology and state of the art laboratories. One of the MCTS's mandates is to assist foundries with casting design. It would therefore be prudent that the MCTS perform simulations and subsequent methoding designs on behalf of SME foundries at an affordable cost. This function is currently being performed by private service providers who charge exorbitant fees beyond the reach of small foundries.

Also, borrowing ideas from the Indian Institute of Foundrymen (IIF) which in 2011 launched what they termed Vision Plan 2020, the South African foundry industry can also launch such a campaign. The idea behind launching this campaign was to establish India as a leading global supplier of quality castings by the year 2020. IIF also appointed an implementing agency called India Foundry Mission (IFM), which, among other functions, represented all the market players, ensured that all recommendations were implemented and monitored progress made on overall market growth. Consequently, Indian foundries' production grew from 7.4 million tonnes per annum in 2011 to 12 million tons per annum in 2020 (Nag, 2021). This represents 62 percent growth in 10 years. It is also recommended that key stakeholders in the South African foundry sector adopt an intentional approach in restoring the industry, just as was done in India's Vision Plan 2020. The prevailing apathy displayed during foundry related discussions must be traded for increased participation and collaboration among stakeholders. SAIF can play a bigger role of coordinating such projects as well as being the mouthpiece of the industry sector to government.

**Drive to improve Total Quality Management (TQM)**

There is also a need to improve TQM in the foundry industry. Although stakeholders in the foundry industry talk about quality, the expertise and extent of commitment to achieve quality standards which are recognised by international bodies such as the International Organization for Standardization (ISO) is apparently lacking. It is recommended that bodies such as the National Foundry Technology Network, in conjunction with the South African Institute of Foundrymen, scale up programmes assisting foundries in attaining ISO certification. Improving quality standards can yield direct benefits to the foundries by way of improvement in quality of products. There is a need for South African foundries to keep improving on quality until that becomes a competitive advantage. Other benefits of improving on quality include reduction in costs, rejects and breakdowns, as well as faster delivery times. These benefits can have a positive effect on improving unit product costs. Being ISO certified can also help to boost customer confidence in the capabilities of South African SME foundries. This benefit is more evident when firms wish to export their products.

**Competitive energy costs**

There is a need for ESKOM and local municipalities to revise electricity charges for foundry industries. Such industries heavily rely on electricity for their production processes. Since foundries consume a lot of electricity, they qualify to be in the league of the highest paying customers. This also means foundries should be considered for special electricity pricing arrangements. Although South African foundries do not directly contribute a significant portion to the country's GDP, the sector is very strategic in that without castings supplied by the foundry sector, other industries cannot run. In South Africa, industry sectors such as mining, agriculture, automotive industry, petro-chemical, infrastructure, railways, power generation and other manufacturing all rely on foundries for spares. This means that foundry indirectly contributes significantly to the country's GDP. This reason should be good enough to have foundries qualifying for electricity special pricing agreement. Apart from the special pricing agreements, foundries can also improve on their efficiency in energy use. To achieve this goal, foundries can conduct energy audits to establish patterns of energy usage in their factories. Energy audits can also assist foundries to establish where most of the energy is spent, as well as to identify areas where they could save. The NFTN can also assist by bringing in energy experts who could advise foundries on how to optimise energy usage. The NFTN has carried out similar projects in the past, but this has been limited to a few foundries. It is therefore recommended that the NFTN also extends this exercise to the rest of the foundries, particularly SME foundries.

## 7.5 EXPECTED CONTRIBUTION TO KNOWLEDGE

- The findings from the research will enable stakeholders to have a clearer view of the prism of the complex challenges that plague the industry.
- The new conceptual framework drawn up will prove to be useful to practitioners. From the framework, foundry practitioners will be able to design and operate individual 'dashboards' which will allow them to periodically monitor and evaluate threats to existence of their organisations.
- The framework will also provide a useful basis for government or policymakers to evaluate SME foundries which apply for funding.
- Research findings will enable The National Foundry Technology Network to gain more insight on how to assist foundries in the context of training needs.
- Some of the findings from this research will act as building blocks for further research.

## 7.6 LIMITATIONS OF THE STUDY

As with many research projects, this study has some limitations. Firstly, the study provides a general overview of success factors required to successfully run an SME foundry in South Africa. The success factors and intervention measures required are not necessarily the same for foundries located in different geographical locations. Classifying responses according to provinces where the participants work could expose further vital information.

Secondly, the study did not consider the life cycle stages of the SME foundries. Literature suggests that an SME goes through different life cycle stages which are, existence, survival, success, take-off, and maturity (Churchill and Lewis,1983), as cited by Setiaboedi, Sari, and Prihartono (2017). The needs of SME foundries which are in different life cycle stages again are not necessarily the same. This also implies that the success factors for foundries in different life cycle stages are not necessarily the same, thereby clarifying the inherent limitations in the scope of this study.

For this study, the success of a foundry was limited to longevity of a business. There are other measures of business success in the form of financial determinants like sales growth, profitability of an organisation and return on investment. Such measures could also provide more information on what it takes to successfully run an SME foundry in South Africa.

## 7.7 SUGGESTED AREAS FOR FURTHER RESEARCH

Although the study provides considerable and concrete contributions to research knowledge and practice, it exhibits some limitations which could serve as platforms for further studies in the future. Firstly, further studies could compare the needs of foundries in different provinces to establish more precise intervention measures relevant to each province. Correct intervention measures would also imply better chances of success of SME foundries in the specific contexts of operation.

There is also room for further refinement of the needs and hence success factors required to successfully run SME foundries in different life cycle stages as well. As highlighted in section 7.5 above, firms in different life cycle stages have got different needs. Research which brings out such fine details can arm key stakeholders to develop more comprehensive intervention strategies for foundries.

Lastly, investigating success factors of SME foundries in South Africa, using financial measures to define success of the firms could also clarify other relevant information which could be useful to the foundries.

## 7.8 CHAPTER SUMMARY

This chapter discussed the summary of findings of this research. Recommendations which could assist the South African foundry industry, particularly SMEs, were also amplified in this chapter. Limitations of the study were also outlined. Lastly, suggestions for further studies were also made.

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# LIST OF APPENDICES

## APPENDIX A INFORMED CONCENT LETTER 3C

| Informed Consent Letter 3C |
|---|

**UNIVERSITY OF KWAZULU-NATAL**
**GRADUATE SCHOOL OF BUSINESS AND LEADERSHIP**

Dear Respondent,

**DBA Research Project**
**Researcher**: Mr. Joel Mutero (0833555032)
**Supervisor**: Dr B.Z Chummun (031260 8943)
**Research Office**: Ms. P Ximba 031-2603587

I am, JOEL MUTERO, a DBA student, at the Graduate School of Business and Leadership, of the University of Kwa-Zulu Natal. You are invited to participate in a research project entitled **Developing a conceptual framework for sustainability of South African SME foundries**.

The aim of this study is to:

- Determine the factors which would enable SME foundries to be profitable and sustainable
- Establish and recommend strategies which will enable SME foundries to viably run their businesses.

Four key areas will be investigated namely: **Effects of entrepreneur's individual characteristics, non-individual characteristics of the foundry and the foundry's operational approach to sustainability of such enterprises. Lastly, intervention strategies which could be implemented to make SME foundries sustainable will be investigated.**

Through your participation I hope to understand how the factors mentioned above affect sustainability of SME foundries, as well as to establish strategies to be implemented in a bid to ensure smooth running of such operations.

Please note that your participation in this research should be voluntary and you may withdraw from participating in the questionnaire any time you wish, without any negative consequences. Your response will be kept strictly confidential, and a summary of the results will be mailed to you after the data is analysed. This research is purely for academic purposes, as such no rewards will be handed to participants. Thank you very much for your time and cooperation.

If you have any questions or concerns about completing the questionnaire or about participating in this study, you may contact me or my supervisor on the contact details mentioned above.

The survey should take you about 15 minutes to complete.  I hope you will take the time to complete this survey.

Sincerely

Investigator's signature____________________________________ Date _______________

## RESEARCH PARTICIPANT CONSENT FORM

I …………………………………………. voluntarily agree to participate in this research study. I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.

I have been informed about the study entitled: **Developing a conceptual framework for sustainability of South African SME foundries** by Joel Mutero.

I have had the purpose and nature of the study explained to me in writing and I have had the opportunity to ask questions about the study.

I understand that participation involves my answers being collated anonymously for the use of research.

I understand that I will not benefit directly from participating in this research.

I understand that all information I provide for this study will be treated confidentially.

I understand that in any report on the results of this research my identity will remain anonymous.

I understand that if I inform the researcher that myself or someone else is at risk of harm they may have to report this to the relevant authorities - they will discuss this with me first but may be required to report with or without my permission.

I understand that signed consent forms and original survey responses will be retained in data format until the results for the dissertation are released and confirmed.

I understand that under freedom of information legalisation I am entitled to access the information I have provided at any time while it is in storage as specified above.

If I have any further questions/concerns or queries related to the study I understand that I may contact the researcher on joelmutero@yahoo.com or mobile number (+27) 833 555 032

If I have any questions or concerns about my rights as a study participant, or if I am concerned about an aspect of the study or the researcher then I may contact the research supervisor or research office on:

Supervisor: Dr B.Z Chummun (031260 8943)

UKZN Research Office: Ms. P Ximba 031-2603587

______________________ ______________________

Signature of Participant Date

# APPENDIX B QUANTITATIVE COMPONENT QUESTIONNAIRE

**Please mark with an X your answer in spaces provided**

## SECTION ONE: PARTICIPANT'S PERSONAL INFORMATION

1. Gender of participant

| | | | |
|---|---|---|---|
| Male | | Female | |

2. Age of Participant

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ≤20 | | 21-30 | | 31-40 | | 41-50 | | 51-60 | | 61+ | |

3. Race

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| White | | Black | | Coloured | | Indian | | Asian | |

4. Please tick category you fall under

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Foundry Supervisor | | Foundry Foreman | | Foundry Manager | | Foundry Owner | | Other (specify) | |

If you filled in other. Please specify……………………………………………………………………

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| High school & below | | Certificate /Diploma | | Bachelors degree | | Masters deg. &above | | Other technical | |

5. Educational background

If you filled in other technical. Please specify…………………………………………………………

6. Number of years in foundry industry:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ≤10 | | 11-20 | | 21-30 | | 31-40 | | 41+ | |

7. Foundry classification:

| | | | | | |
|---|---|---|---|---|---|
| Ferrous | | Non-Ferrous | | Mixed Metal | |

8. Production means

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Jobbing | | Mechanised | | Mass production | | Captive foundry | |

If more than one, please tick all appropriate boxes

9. Casting process

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Green Sand | | Resin Sand | | $CO_2$ Sand | | Gravity Diecast | | Pressure Diecast | | Precision Casting | |

If more than one, please tick all appropriate boxes

## SECTION TWO: ENTREPRENUER’S INDIVIDUAL CHARACTERISTICS

**Please state to what extent you agree with the following statements. The foundry owner(s) should possess the following attributes, for an SME foundry to be successful:**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. A tertiary qualification | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 2.Foundry experience | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 3.Strong leadership | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 4.Ambitious goals | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 5.Trust my own ability | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 6.Believe they have control over events | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 7.Need for achievement | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 8.Must be visionary | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 9.Must be risk taking | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 10.Must be a quick thinker | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 11.Quick to spot opportunities | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |

## SECTION THREE – INTERNAL NON-INDIVIDUAL CHARACTERISTICS OF SME

**Please state to what extent you agree or disagree with the following statements. The following internal- non individual characteristics play a pivotal role in the successful running of an SME foundry in South Africa:**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 12.Close customer relations | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 13.Motivated employees | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 14.Good financial planning abilities | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 15.Talent management | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 16.Marketing approach | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 17.Management competencies | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 18.A strong order book | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 19.Degree of unionisation | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 20.Workplace learning | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 21.Competitive advantage | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 22.Organisational culture | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |

## SECTION FOUR: EXTERNAL NON-INDIVIDUAL FACTORS AFFECTING AN SME

**The following factors should be present for successful running of an SME foundry in South Africa.**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 23. Access to information | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 24.Access to finance | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 25. Access to real estate | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 26. Access to markets | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |

**The following factors can negatively affect the successful running of an SME foundry**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 28.Challenges of entrance and exit | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 29.High raw materials cost | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 30.High transport costs | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 31.High labour costs | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 32.Energy Costs | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 33.Legal compliancy issues | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 34.Natural disasters & Pandemics like COVID19 | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |

## SECTION FIVE- OPERATIONAL APPROACH OF SME FOUNDRY

**The following operational issues can enhance foundry performance**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 35.Adoption of latest technology | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 36.Better utilisation of labour | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 37.Procedures and methods | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 38.Increasing capacity utilisation | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 39.Value adding activities (e.g. machining& assembling) | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 40.Mechanisation and automation | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 41.Improved planning | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 42. Adopting Total quality Management | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 43. Implementing Internationalisation | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 44. Entrepreneurial orientation | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 45. Market orientation | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 46.Environmental sustainability orientation | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |

## SECTION SIX- INTERVENTION MEASURES

**Implementation of the following possible intervention strategies can help to create an enabling environment for South African SME foundries to run successfully.**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 47.Increased drive towards localisation | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 48.Increase in tariffs for imported castings | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 49.Tailor made financing programs | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 50.Export support programs | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 51.Continuous improvement initiatives e.g. think tanks | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 52.Legal framework promoting ease of entry and exit | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 53.Government policies supporting green technologies | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 54.Skills development & training of employees | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 55.Managers' training & capacity building | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 56.Export duty for scrap metal | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
| 57.Introduction of electricity special pricing agreement | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |

## END OF QUESTIONNAIRE- THANK YOU FOR PARTICIPATING

# APPENDIX C QUALITATIVE COMPONENT QUESTIONNAIRE

## Please mark with an X your answer in spaces provided

## SECTION ONE: PARTICIPANT'S PERSONAL INFORMATION

10. Gender of participant

| Male | | Female | |
|---|---|---|---|

11. Age of Participant

| ≤20 | | 21-30 | | 31-40 | | 41-50 | | 51-60 | | 61+ | |
|---|---|---|---|---|---|---|---|---|---|---|---|

12. Race

| White | | Black | | Coloured | | Indian | | Asian | |
|---|---|---|---|---|---|---|---|---|---|

13. Please tick category you fall under

| Foundry Supervisor | | Foundry Foreman | | Manager (Foundry) | | Foundry (Owner) | | Other | |
|---|---|---|---|---|---|---|---|---|---|

If you filled in other. Please specify…………………………………………………………………….

| High school& below | | Bachelor's degree | | Master's degree | | PhD | | Other technical | |
|---|---|---|---|---|---|---|---|---|---|

14. Educational background:

15. Number of years in foundry industry:

| ≤10 | | 11-20 | | 21-30 | | 31-40 | | 41+ | |
|---|---|---|---|---|---|---|---|---|---|

16. Foundry classification:

| Ferrous | | Non-Ferrous | | Mixed Metal | |
|---|---|---|---|---|---|

17. Production means

| Jobbing | | Mechanised | | Mass production | | Captive foundry | |
|---|---|---|---|---|---|---|---|

If more than one, please tick all appropriate boxes

18. Casting process

| Green Sand | | Resin Sand | | $CO_2$ Sand | | Gravity Diecast | | Pressure Diecast | | Precision Casting | |
|---|---|---|---|---|---|---|---|---|---|---|---|

If more than one, please tick all appropriate boxes

1. Please list and explain an entrepreneur's individual characteristics required for sustainability of the SME foundry in South Africa. Please explain why these factors should be present.

2. Non-individual characteristics of an SME have been reported to affect sustainability of an SME.

   2.1 What internal non-individual characteristics are required for an SME foundry in South Africa to be sustainable? Please explain why these factors should be present.

   2.2 What external non-individual factors should be present for an SME foundry in South Africa to run sustainably. Please explain why these factors should be present.

3. Literature also suggests that operations approach of an SME can also determine its sustainability. In the South African context, what operational factors should an SME foundry incorporate for them to be successful?

4. Please name and explain which of the following intervention strategies could help to create an enabling environment for South Africa SME foundries to be sustainable?
   i. Increased drive towards localisation
   ii. Increasing tariffs for cheaply imported castings to promote local products
   iii. Diversification of financial support for SME foundries
   iv. Elaborate government schemes for financing of foundries
   v. Export support programs for SME foundries
   vi. Process improvement training initiatives
   vii. Legal framework supporting ease of entry and exit
   viii. Government policies supporting green technologies
   ix. Skills development and training programs for foundry employees
   x. Training and capacity building of foundry managers
   xi. Introduce export duty for scrap metal
   xii. Introduction of electricity special pricing agreements for foundries

Please add any other intervention strategies you think might help foundries to be sustainable……………………………………………………………………………………

## END OF QUESTIONNAIRE- THANK YOU FOR PARTICIPATING

# APPENDIX D GATEKEEPER LETTER

**South African Institute of Foundrymen**
*Registered in South Africa as a Non-Profit Organisation Nr: 2009/019884/08 VAT Registration No. 4040109011*
P O Box 14863 ● Wadeville ● 1422 Gauteng ● South Africa
University of Johannesburg ● Metal Casting Technology Station ● Room G101
John Orr Building ● Corner Siemert & Beit Str. ● Doornfontein ● Gauteng ● South Africa
**Tel: Exec Administrator**: +27 (0)11 559 6455 (Marina Biljon) ● e-mail: mbiljon@uj.ac.za
**Tel: Executive Director:** +27 (0)11 559 6468 (Sagren Naicker) ● DNaicker@uj.ac.za
Fax: +27 (0)11 559 6526 ● website: http://www.foundries.org.za

17 September 2017

To whom it may concern:

**Ref: Gatekeeper's letter for Joel Mutero's DBA dissertation**

This letter serves to confirm that the South African Institute of Foundrymen is in support of Mr Joel Mutero's (Zimbabwe Passport number: BN784171) DBA research on South African foundries. Although we will encourage members to participate in Mr Mutero's survey, we fully appreciate, and will notify members that they have a right to accept or decline participation.

We believe Joel's research which will be centered on investigating critical success factors required for a South African SME foundry to succeed falls in line with our mission of improving the competitiveness of the South African Metal Casting Industry, generating sustainable growth and employment opportunities in the manufacturing sector. As such any positive findings from this research could potentially be of benefit to our organisation and our clients.

Yours sincerely,

Janley Kotze-Chairperson

## APPENDIX E CERTIFICATE OF EDITING

Office: 0183892451

FACULTY OF EDUCATION

Cell: 0729116600

Date: 24th October, 2021

**TO WHOM IT MAY CONCERN**

**CERTIFICATE OF EDITING**

**I, Muchativugwa Liberty Hove,** confirm and certify that I have read and edited the entire thesis, **A conceptual framework for success factors required for a South African SME foundry to thrive and be effective on the market,** submitted by **Joel Mutero,** student number **213570623**, in fulfilment of the requirements for the degree of **Doctor of Business Administration (DBA), University of KwaZulu-Natal, Graduate School of Business and Leadership, College of Law and Management Studies.**

**Joel Mutero** was supervised by **Dr Bibi Zaheenah Chumman.**

I hold a PhD in English Language and Literature in English and am qualified to edit such a thesis for cohesion and coherence. The views expressed herein, however, remain those of the researcher/s.

Yours sincerely

[redacted]

**Professor M.L. Hove (PhD, MA, PGDE, PGCE, BA Honours – English)**

# APPENDIX F ETHICAL CLEARANCE LETTER

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

16 August 2022

**Joel Mutero 213570623**
**Graduate School of Business and Leadership**
**Westville Campus**

**Dear J Mutero**

**Protocol Reference Number :** HSS/1270/018D
**Project title:** A conceptual framework for success factors required for a South African SME foundry to thrive and be effective on the market
**Amended title:** A conceptual framework for success factors required for a South African small and medium size foundry

## Approval Notification – Amendment Application

This letter serves to notify you that your application and request for an amendment received on 10 August 2022 has now been approved as follows:

- Change in title

**Any alterations to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form; Title of the Project, Location of the Study must be reviewed and approved through an amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.**

**PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.**

Best wishes for the successful completion of your research protocol.

Yours faithfully

[redacted]

……………………………………………………

**Professor Dipane Hlalele (Chair)**

**/dd**

**Humanities & Social Sciences Research Ethics Committee**
**UKZN Research Ethics Office Westville Campus, Govan Mbeki Building**
**Postal Address:** Private Bag X54001, Durban 4000
**Tel: +27 31 260 8350 / 4557 / 3587**
**Website:** http://research.ukzn.ac.za/Research-Ethics/

Founding Campuses: Edgewood Howard College Medical School Pietermaritzburg Westville

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