A FRAMEWORK FOR THE SUSTAINABLE COMPETITIVE ADVANTAGE OF FOUNDRIES IN SOUTH AFRICA

by

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Exact wording of the title of the thesis as appearing on the electronic copy submitted for examination:

A framework for the sustainable competitive advantage of foundries in South Africa

I declare that the above thesis is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the thesis to originality checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other higher education institution.

(The thesis will not be examined unless this statement has been submitted)

27 October 2022

SIGNATURE DATE

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ABSTRACT

This study empirically examined the micro and macro-economic circumstances contributing to the closure of foundries within the borders of South Africa. The primary objective was to develop a framework for a sustainable competitive advantage of the industry, as a blueprint for strategy formulation, in the hope of enhancing firms' competitiveness and sustainability, while at the same time preventing further closures within the industry. The foundry industry has lost over 42% of the total number of firms between 2003 and 2020, significantly reducing the industry's contribution to economic development and employment creation. The paucity of research that examines the drivers of sustainable competitiveness and provides recommendations on how these can be incorporated into the provision of strategic direction for the industry, makes this study a lynchpin for future research on sustainable competitiveness beyond the foundry industry. Sustainable competitive advantage is seen as the overarching attribute that provides firms with the capabilities to perform better than their competition.

The study identified from the extant literature various micro and macro drivers of sustainable competitiveness. These drivers were subsequently tested through the application of a sequential explanatory mixed-methods approach, which used quantitative research during the first phase of the data-collection process, followed by qualitative research in the second phase. During the first phase (quantitative), 108 managers and non-managers participated by completing a SurveyMonkey® questionnaire while the second phase (qualitative) solicited input from 12 interview participants, who included owners and top management.

The study confirmed the importance of the drivers identified in the literature in respect of the South African context, and further identified investment in plant infrastructure, employee skills development, ability to innovate and product quality as the most critical micro drivers while government incentives, localisation, energy costs and the availability of substitutes were identified as the most critical macro drivers of the sustainable competitiveness of foundry companies. Furthermore, the study identified competitiveness approaches and strategies relevant to the industry. A sustainable competitive advantage

framework for the foundry industry is a significant contribution, as no such framework is in place. This provides an opportunity for academics, management, and champions of the foundry industry to use the framework as a basis for creating sustainable competitive advantage in the ailing industry.

Key terms: Sustainable competitive advantage; Micro drivers; Macro drivers; Framework; Foundry industry; Metal casting; Competitiveness; Strategy; Economic drivers; Local content; Ferrous foundry; Non-ferrous foundry; Sequential explanatory; Mixed methods.

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LIST OF ABBREVIATIONS

Abbreviation	Meaning	Abbreviation	Meaning
3D	Three Dimensional	MEFC	Middle East Foundry Cluster
4IR	Fourth Industrial Revolution	MEIBC	Metal and Engineering Industries Bargaining Council
AFC	African Foundry Cluster	MS	Microsoft
AFS	The American Foundry Society	NAFTAFC	North American Free Trade Area Foundry Cluster
APFC	Asia Pacific Foundry Cluster	NDP	National Development Plan
ASTM	America Society for Testing and Materials	NFTN	National Foundry Technology Network
BBBEE	Broad Based Black Economic Empowerment	NPC	National Planning Commission
BRICS	Brazil, Russia, India, China and South Africa	NTI	National Tooling Initiative
CBV	Capability Based View	OECD	Organisation for Economic Co-operation and Development
CCA	Canonical Correlation Analysis	OEM	Original Equipment Manufacturer
CEO	Chief Executive Officer	PESTLE	Political, Economic, Socio-cultural, Technological, Legal and Ecological
CIPC	The Companies and Intellectual Property Commission	POPI	Protection of Personal Information
CSIR	Council for Scientific and Industrial Research	qual	Qualitative (not prioritised)
CSR	Corporate Social Responsibility	QUAN	Quantitative (Prioritised)
DTI	The Department of Trade and Industry	RBV	Resource Based View
DTIC	The Department of Trade and Industry and Competition	RV	Relational View
ECEFC	Eastern and Central Europe Foundry Cluster	SA	South Africa
EIA	Environmental Impact Assessment	SABS	South African Bureau of Standards
EIUGSA	Energy Intensive Users Group of Southern Africa	SAIF	South African Institute of Foundrymen
EUFC	European Union Foundry Cluster	SCA	Sustainable Competitive Advantage
GDP	Gross Domestic Product	SPSS	Statistical Package for Social Sciences
GLM	General Linear Model	TACT	Trustworthiness, Auditability, Credibility and Transferability
HRM	Human Resources Management	UJ	University of Johannesburg
IoT	Internet of Things	Unisa	University of South Africa
IP	Intellectual Property	USA	United States of America
ISO	International Organisation for Standardisation	Vamcosa	Valve and Actuator Manufacturers Association of South Africa
IT	Information Technology	VRIN	Valuable, Rare, Inimitability and Non-substitutability
KBV	Knowledge Based View	WFO	World Foundry Organisation
LAFC	Latin American Foundry Cluster		
LCR	Local Content Regulations		
MBV	Market Based View		

CHAPTER 1: INTRODUCTION - OVERVIEW OF THE STUDY

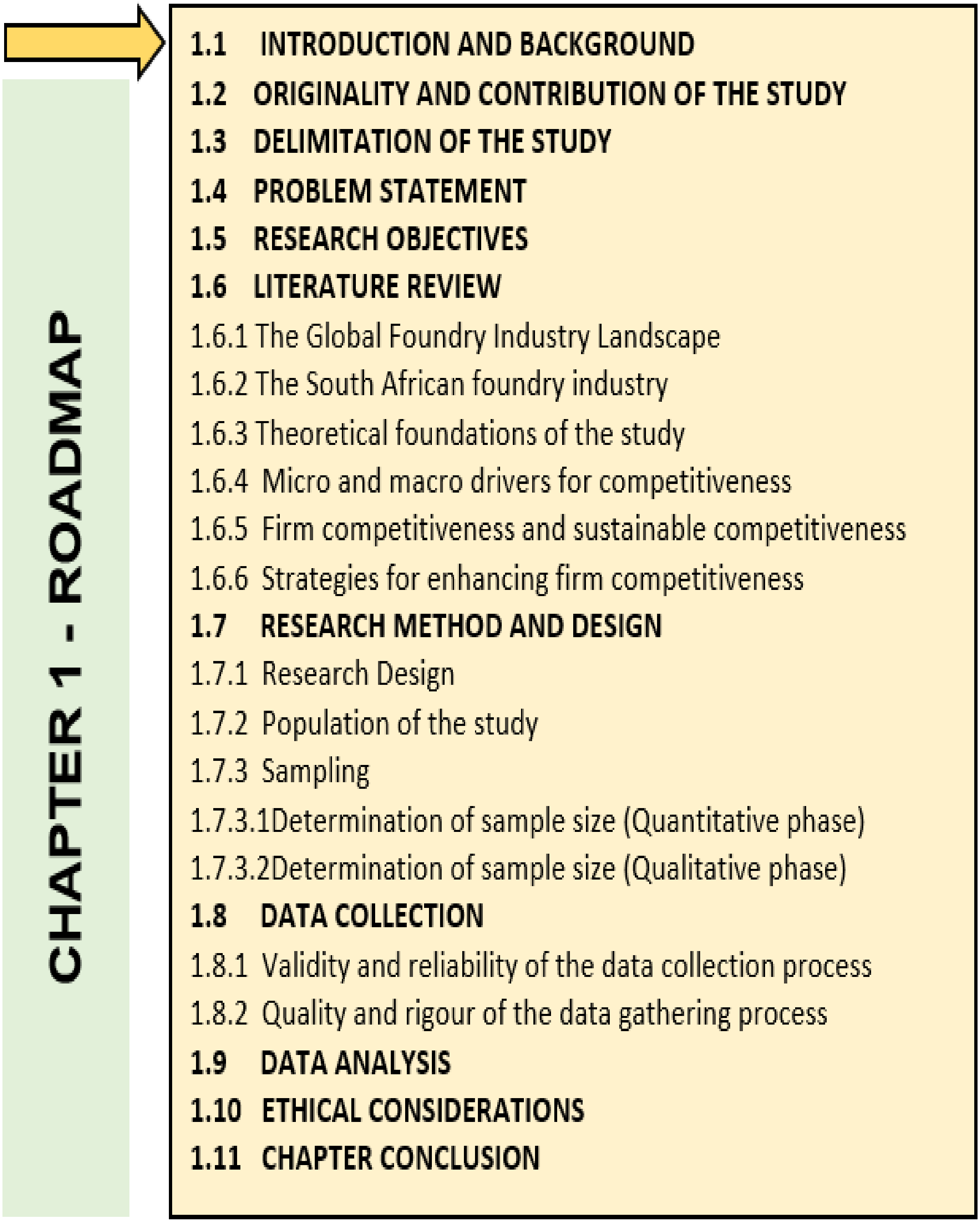

Figure 1.1: Illustration of layout for Chapter 1

Source: Author's own compilation (2022)

1.1 INTRODUCTION AND BACKGROUND

The concept of globalisation has brought about several benefits for many economies and yet, it has also presented both sustainability and competitiveness challenges to others, particularly in the developing world (Makasi & Govender, 2015; Tolmay & Venter, 2017; Jayasundara *et al*., 2020). The ability of companies to respond to the effects of globalisation depends on their ability to adapt and respond to challenges of global competition (Oudhia, 2015). The metal casting foundry industry has not been spared from the impact of these challenges, as indicated by the fluctuations in the number of casting products (casting volumes) the industry has manufactured over the past two decades (Nyembwe, Banganayi & Kilongozi, 2016) (see table 2.1). Although global casting volumes increased from 79.7 million metric tonnes in 2004 (Modern Casting Report, 2005) to 109.8 million metric tonnes in 2017 (Modern Casting Report, 2018), this number also dropped to 105.5 million metric tonnes in 2020.

Metal casting foundries in South Africa are closing down because of macro and micro-economic circumstances (National Foundry Technology Network [NFTN], 2015; The Department of Trade and Industry [the DTI], 2015, {from 2019 known as the Department of Trade, Industry and Competition [the DTIC]}; The South African Institute of Foundries [SAIF], 2015). Available data shows that the total number of foundries, in the top 37 casting manufacturing countries, dropped on average from 46 906 in 2009 (Modern Casting Report, 2010) to 45 253 in 2020 (Modern Casting Report, 2021), signifying a 3.52% drop in operational plants. However, contrary to the global foundry industry, South Africa experienced significant closures.

According to Davies (2015), and Lochner, Kellerman, Adams, Abed and Taylor (2020), South Africa has seen the closure of more than 90 foundries between 2003 and 2020. SAIF (2015) and the DTI (2015) assert that, a major contributing factor to the closure of foundry companies has been their lack of competitiveness which is exacerbated by the micro and macro-economic challenges pertinent to South Africa, which the industry is exposed to (the DTI, 2015; Davies, 2015; Jardine, 2015a; Mkansi, Nel & Marnewick, 2018; Nyakabawo, 2017; Lochner *et al*., 2020). Miskinis (2021) points out that the need for foundry companies to transform is even more critical now, as the failure to adapt to changes might impact negatively on their ability to survive.

The NFTN is a "key industry support initiative" which is set up and funded by the DTI to *"facilitate the development of a globally competitive foundry industry"* in South Africa (NFTN, 2015), while in its mission statement, SAIF seeks *"to improve the competitiveness of the South African Metal Casting Industry, generating sustainable growth and employment opportunities in the manufacturing sector"* (SAIF, 2015). As quoted by MechChem Africa (2021:1), Ramagaga, a technical advisor to the NFTN asserts that this initiative plays a key role in revitalising the foundry industry in South Africa, through initiatives that encourage foundry companies to "produce high quality castings that can compete on a global scale whilst promoting employment".

According to Lochner *et al*. (2020), the South African foundry industry currently consists of 123 operational foundry companies, geographically spread across eight provinces. More than 50% of these foundries are located in Gauteng, with more than 65% of these situated in Ekurhuleni, one of six South African metropolitan municipalities in major urban concentrations (Phele, Roberts & Steuart, 2005; Lochner *et al*., 2020). This decline in the number of South African foundries remains a cause for concern, as it demonstrates both the competitiveness and sustainability challenges faced by companies within this industry (NFTN, 2015). Banganayi, Nel, and Nyembwe (2019: 164) posit that "sustainability is the mother of technological and organisational innovations" that drive profitability to the foundry industry. In 2003, the number of foundries in South Africa was 213 (Davies, 2015). According to Lochner *et al*. (2020), Davies (2015), Jardine (2015b) and the DTI (2015), one of the main reasons for the closure of foundries has been their lack of competitiveness against other foundries, particularly foreign competition. In order to understand the concept of competitiveness, it is essential that there is clarity of definitions.

Different scholars and researchers have used various definitions of competitiveness. Siudek and Zawojska (2014) point out that different authors define the term competitiveness differently. According to Porter, Ketels and Delgado (2007:52), competitiveness is defined as "… a company's share of local, regional or global markets for its products". Lee and Karpova (2018:202) define competitiveness as "an ability to achieve a high standard of living through productivity growth in the new global environment, where knowledge becomes a critical factor", while La-Falce, De Muylder and Santos (2020:4) view competitiveness as "a company's ability to increase the industry size, market share and profitability". Kaczmarek (2022:4) defines competitiveness as the "ability to achieve and sustain competitive advantage". The 'divergence' of these definitions make it difficult to understand and measure the aspect of organisation competitiveness, thus promoting the need for studies that enable better comprehension of this concept.

Although the measurement of competitiveness is not easy, various authors agree that measurement should be based on the specific indicators for competitiveness that the researcher selects for the study (World Economic Forum, 2017; Delbari, Ng, Aziz & Ho, 2016; Siudek & Zawojska, 2014; Aiginger, Bärenthaler-Sieber & Vogel, 2013; Arslan & Tatlıdil, 2012). While a number of studies have been conducted on competitiveness within the foundry industry, limited research has focused on sustainable competitive advantage, with Balkyte and Tvaronavičiene (2011) pointing out that there is a need for research that further develops the concept of sustainable competitiveness. According to Nadalipour, Hossein and Khoshkhoo (2018), the subject of firm sustainable competitiveness is of interest to many stakeholders including business owners, managers, politicians, economists and researchers, due to the fact that the idea of companies existing and overcoming challenges is largely attributed to their ability to outcompete their rivals.

This research envisaged reviewing current literature that relates to sustainable competitiveness challenges faced by foundries globally and in South Africa. It introduces the reader to the study by providing the contribution of the study, preliminary literature review, problem statement, research objectives and research methodology, as well as the limitations of the study and the ethical considerations.

1.2 ORIGINALITY AND CONTRIBUTION OF THE STUDY

Wellington (2010, as cited in Baptista *et al*., 2015) points out that the originality of a study may be evident in the design, knowledge synthesis, implications and presentation of the study. Alajami (2020:7) argues "the ultimate goal of scientific research is the production of valuable scientific contribution which is considered original".

The researcher noted that the current state of knowledge on the competitiveness of companies in South Africa has ignored the issue of sustainable competitive advantage (SCA), particularly for the foundry industry, with research being conducted extensively on other industries (Niyimbanira, 2018; Oyewobi, Windapo & Cattell, 2014; Sita, 2019). Research done on the competitiveness of companies in South Africa has paid little attention, if at all, on the sustainability component of competitiveness where micro and macro-economic drivers have been explored, in order to develop a framework that provides direction for the enhancement of SCA (Grainer-Brown & Malekpour, 2019).

This study, therefore, sought to contribute to the existing body of knowledge as well as to both academia and industry, by identifying the micro and macro-economic drivers specific to improving the SCA of foundry companies within the South African context.

1.3 DELIMITATION OF THE STUDY

Delimitations relate to the scope or boundaries of the study that are "consciously set by the researcher so that the study's objectives do not become impossible to achieve" (Theofanidis & Fountouki, 2018:157). According to Akanle, Ademuson and Shittu (2020), delimitations are within the researcher's control and indirectly explain the activities the researcher will exclude from the study.

The motivation behind this study is the development of a framework that could be used as a guideline for foundry companies to enhance their SCA. The study excluded foundry companies not listed on the NFTN database as these were not legally registered to operate in South Africa. During the data collection and data gathering processes, both the respondents and the participants for the two phases were either employees, management, owners or experts within the local foundry industry. These are individuals viewed as having adequate knowledge and expertise of the industry to make valuable contributions to the outcome of this study. Only individuals whose contact details were available on the foundry database were invited to participate in the study.

1.4 PROBLEM STATEMENT

The problem informing this study is that metal casting foundries in South Africa are closing down because of micro and macro-economic circumstances, which negatively impact the competitiveness of the industry (NFTN, 2015; the DTI, 2015; SAIF, 2015). In 2007 alone, a total of 26 metal foundries were closed in South Africa (Mpanza, Nyembwe & Nel, 2013), due to lack of profitability resulting from the lack of competitiveness, among other reasons.

According to the Merchantec Research (2014), the South African foundry industry has been in decline over the past three decades and this has been largely due to growing imports of castings manufactured in Asia and Europe. The number of foundries operating in South Africa dropped from 213 in 2004 (Davies, 2015; Jardine, 2015b) to 123 in 2020 (Lochner *et al*., 2020). Tonnage levels also dropped from a high of 539 000 metric tonnes in 2010 to 443 000 metric tonnes in 2020 (The Modern Casting Staff Report, 2021). This data, however, is not entirely reflective of global trends in casting production, where the volumes have increased from 79 745 million metric tonnes to 105 505 million metric tonnes during the same period.

A study conducted by Büchner (2016:21) revealed that the total volume of foundry products exported from China and India, into Europe, quadrupled in the last 15 years. Hüne and Sprich (2016:34) attribute the improvement in global casting production levels, in part, to the decrease in the number of metal casting plants, as foundries continue to consolidate and become more efficient. The reduction in the number of foundries in South Africa does not seem to exhibit similar increases in the volumes of castings produced (Hüne & Sprich, 2016:34). According to the Merchantec Research (2014), there is an urgent need to investigate the effectiveness of support measures for foundries in South Africa. This is in order to help them retain manufacturing capacity, keep the direct workers (more than 11 300) represented by this industry employed and improve on raw material supply to original equipment manufacturers (OEMs) in the country. Support measures such as government facilitated programs, would also help lower operational costs for the foundries and provide an environment that promotes competitiveness and sustainability (McKie, 2015).

The closure of foundries has a negative effect on the economy as it would result in a drop on its contribution to the gross domestic product [GDP] (Davies, 2015; Viviers, 2016; Mkansi *et al*., 2018), loss of jobs and job opportunities (Mkansi *et al*., 2018; Lochner *et al*., 2020), reduced export opportunities (Phele *et al*., 2005; Prairie Industry Markets, 2020) and loss of expertise as experienced employees leave the industry (Mpanza & Nyembwe, 2014; Mulaba-Bafubiandi *et al*., 2016).

This study sought to investigate the economic factors contributing to the closures of South African foundries and the drivers for competitiveness (SAIF, 2015; NFTN, 2015). The absence of literature on sustainable competitiveness, statistics and information gathering capabilities by the individual foundries (Saarelainen, Piha, Makkonen & Orkas, 2008:289; Cooper, 2014), which are largely medium-sized, family-owned and have operations that are closely guarded within families (Lochner *et al*., 2020), further motivates the need to conduct this study, in order to provide valuable insight into how the sustainable competitiveness of the industry can be enhanced. This study contributes by providing insight on strategies that foundry companies can adopt, in order to enhance competitiveness and stop company closures. The foundry industry is significant to the growth of the South African economy and for employment creation, with more than 80% of OEM products containing castings (Davies, 2015) and other sectors such as agriculture, mining, railways, automotive and infrastructure, all benefiting from a sustainable and competitive foundry industry (SAIF, 2015).

1.5 RESEARCH OBJECTIVES

Table 1.1 provides a summary of the research objectives and sources of data for the study.

Table 1.1: Research objectives and sources of data

	Research Objectives	Sources of data	Platform / Source
Primary Objective	To develop a conceptual framework with micro and macro-economic drivers for the sustainable competitive advantage of foundries in South Africa	Literature Questionnaires Interviews	• Academic and industry sources • SurveyMonkey (online) • Microsoft Teams (online)
Secondary Objectives	To identify, from literature, the micro and macro-economic drivers influencing the sustainable competitiveness of foundries in South Africa	Literature	• Academic and industry sources
	To benchmark the perceptions of stakeholders within the foundry industry on sustainable competitive advantage against the micro and macro-economic drivers identified in literature.	Literature Questionnaires Interviews	• Academic and industry sources • SurveyMonkey (online) • Microsoft Teams (online)
	To make recommendations on strategies to enhance the sustainable competitive advantage for foundries in South Africa.	Literature Questionnaires Interviews	• Academic and industry sources • SurveyMonkey (online) • Microsoft Teams (online)

Source: Author's own compilation (2022)

As indicated in table 1.1, the sources of data that aided the achievement of objectives were extant literature on SCA, questionnaires (data collection instrument for quantitative phase) and interviews (data gathering instrument for qualitative phase). Academic and industry sources were used to gather literature, whilst the questionnaires and interviews were used to solicit additional data using online platforms, SurveyMonkey and Microsoft (MS) Teams (see table 1.1) thereby minimising physical contact with the respondents and participants, in line with the university guidelines regarding data collection during the COVID-19 pandemic (University of South Africa [Unisa], 2020).

1.6 LITERATURE REVIEW

A brief overview of the foundry industry is provided in the introduction and background section of this document. This is followed by a more detailed insight on the global and local foundry landscape and the supply chain within the metal casting (foundries) industry. The foundry industry is an OEM raw material supplier for castings and casting products for construction and general engineering (33%), automotive (30%), mining (25%), energy (5%), agriculture (5%) and other sectors (2%) (Davies, 2015). To this effect, this industry plays a key role in the sustainable growth of the South African economy and warrants the level of attention that this study brings. This section also critically reviews theories relevant to the study in line with competitiveness and sustainable competitive advantage. The next section discusses the global foundry landscape.

1.6.1 The Global Foundry Industry Landscape

A foundry is defined as an "... engineering sub division that deals with the melting of metals and pouring of the molten metals into moulds in order to make castings that can be used to manufacture engineering components" (McKie, 2015; Gupta, 2015:21). The core business of foundries entails "melting of ferrous, non-ferrous metals and alloys, and reshaping them into product shapes very similar to the final product by way of melting and solidifying the metal or alloy in a mould" (European Commission Integrated Pollution and Prevention Control, 2005:2; Chen, Wang & Kuo, 2021).

As indicated in table 1.2, China is ranked first in terms of metal casting production by volume, with 48.7 million metric tonnes, followed by India (11.4 million metric tonnes) and the United States of America (11.3 million metric tonnes) in the second and third positions, respectively. South Africa is ranked 18th, with production volumes of 443 000 metric tonnes (0.9% of the total production volume for China) (Modern Casting Report, 2021).
Despite this ranking, the South African foundry industry contributes directly or indirectly by up to 64.5% to the country's gross domestic product (GDP) (SAIF, 2015:7). The increasing labour costs, escalating costs of energy, shortage of trained workforce and high investment requirements continue to be deterrents to the growth of this industry (Paul, 2013; Oudhia, 2015; IKB *Deutsche Industriebank*, 2015). The Foundry Trade Journal [FTJ] (2018) has attributed the decline in the number of foundries to the recession, increasing foreign competition, technological developments, as well as to the tightening of regulations relating to manufacture, health and safety, and import and export restrictions. Yet, despite this, the global casting production volumes have increased from 79.7 million metric tonnes in 2004 (Modern Casting Report, 2005) to 105.5 million metric

tonnes in 2020 (Modern Casting Report, 2021). The volume of castings from South African foundries has declined over the same period.

Table 1.2: Global Metal Castings Production

Ranking	Country	Total Production (Metric tonnes)
1	China	48,750,000.00
2	India	11,491,810.00
3	United States of America	11,305,302.00
4	Japan	5,275,700.00
5	Germany	4,951,011.00
6	Russia	4,200,000.00
7	Mexico	2,855,650.00
8	Korea	2,380,200.00
9	Turkey	2,314,245.00
10	Brazil	2,288,889.00
-	-	-
18	**South Africa**	**443,000.00**

Source: Modern Casting Report (2021)

1.6.2 The South African foundry industry

Eighty percent (80%) of metals cast by the local foundry industry is ferrous (mostly iron-based), whilst the balance is non-ferrous (not containing appreciable amounts of iron in metal composition) and used mostly in the automotive industry (SAIF, 2015). As shown in table 1.3, between 2003 and 2020 the number of foundries in South Africa decreased from 213 to 123, due to a variety of economic factors.

Paul (2013) argues that the number of foundries in South Africa stood at 450 in the mid-1980s and indicates that, even then, this number was very small compared to other global competitors such as China and India, which had 12000 and 4500 foundries, respectively, in 2003. This study also investigated the economical dynamics that contributed to the closing down of metal casting foundries and, in this quest also established the micro and macro-economic drivers influencing the SCA for the foundry industry in South Africa.

Table 1.3: Number of operational foundries in South Africa

Province	Number of foundries (2003)	Number of foundries (2007)	Number of foundries (2015)	Number of foundries (2020)	Percentage of foundries per province based on 2020 numbers
Source	(SAIF, 2015)	(SAIF, 2015)	(SAIF, 2015)	(Lochner *et al*., 2020)	
Gauteng	110	108	114	84	68.3%
Kwa-Zulu Natal	20	26	20	16	13.0%
Western Cape	26	16	14	10	8.1%
Eastern Cape	16	10	8	4	3.3%
Free State	10	7	5	4	3.3%
North-West	10	9	4	1	0.8%
Northern Cape	6	3	3	3	2.4%
Mpumalanga	15	15	2	1	0.8%
Total	**213**	**194**	**170**	**123****	**100%**

** The total number of foundries (123) excluded foundry companies that were confirmed to be in the processes of finalising the modalities of company closure when the study by Lochner *et al*. (2020) was conducted.

Source: Author's own compilation (2022)

As indicated in table 1.3, 68.3% of the foundries in South Africa are located in Gauteng, 13% in KwaZulu-Natal, 8.1% in the Western Cape, 3.3% in the Eastern Cape, 3.3% in the Free State, 2.4% in the Northern Cape and 0.8% in the North-West and Mpumalanga, respectively. A number of factors have been identified as contributing to the closure of South African foundries. Davies (2015) and SAIF (2015) identify an increase in the import of castings by South African manufacturing companies, high energy costs, lack of skills and development, high cost of compliance to regulations, limited access to capital, low productivity, and high transport and logistics costs as some of the reasons contributing to foundry closures.

The Energy Intensive Users Group of Southern Africa (EIUGSA) (2017) notes that cost drivers for foundries placed electricity at 43.4%, raw material purchases at 29.8%, labour costs at 11.5%, consumables used at 5.3% and fixed costs at 10.0%. Cumulatively, these costs have gone up by 114.4% since 2007. While the government has introduced initiatives such as the National Tooling Initiative (NTI), CSIR and local content policy as measures to try to boost this industry, improve its competitiveness and halt the closures, some of these measures have had little impact on foundry competitiveness (Jardine, 2015b).

Various theoretical approaches have been developed to try to explain the concept and measurement of competitiveness and sustainable competitiveness for organisations. These generally view competitiveness from a micro-economic level as well as from a macro-economic level (Siudek & Zawojska, 2014). These theoretical approaches are discussed as foundations of the study, in the following section.

1.6.3 Theoretical foundations of the study

The conceptual framework which forms the basis of this study is built up on the Competitive Forces Model (Porter, 1990) and the major theories of competitive advantage, which include the Market-Based View, the Capability-Based View (CBV) and the Resource-Based View (Barney, 2001), among others. The relevance of these theories is explained in detail in chapter 3 and summarised in table 3.5.

Foundries face increasing pressures for high performance from different sources and this impacts their ability to compete (Pagone, Salonitis & Jolly, 2018). Pagone *et al*. (2018) identify pressures related to customer service, reliable deliveries, pricing and rising costs as factors impacting on the ability of foundries to compete. Östensson (2017) refers to these drivers as “critical success factors” largely used by companies when evaluating suppliers. Price, reliability of service, quality, flexibility, delivery, trust and innovation are the more crucial drivers for sustainable competitiveness (Östensson, 2017; La-Falce *et al*., 2020).

According to Delbari *et al.* (2016:24), in order to identify the key drivers for competitiveness, four basic theory streams can be used, namely, the market-based view (MBV), capability-based view (CBV), resource-based view (RBV) and the relational view (RV). The MBV considers the position of an organisation in relation to its competitors as a critical factor that determines whether the firm is successful or not. This theory also takes into consideration Porter’s five forces model in establishing the external drivers of competition for a firm (Delbari *et al.,* 2016:24). According to Flynn and Davis (2017:2), the CBV relates to the “capacity of an organisation to deploy its resources using organisational processes, to achieve its goals”. The RBV model, on the other hand, identifies competitiveness with the firm's ability to use its resources to overcome competition (Delbari *et al.,* 2016). This is in line with model proposed by Gelei (2004, as cited in Ivanova, Deliyska & Popova-Terziyska, 2021) which identifies competitiveness as a function of an organisation's core competencies or resources and customer value. The relational view refers to "the ability of the organisation to communicate with or engage its buyers, thereby positively enhancing its competitive ability" (Flynn & Davis, 2017:2).

According to the Deloitte Manufacturing Competitiveness Report (2016), workforce productivity, production costs, the legal and regulatory system, infrastructure and market competitiveness are also drivers that firms should consider in maximising their ability to compete. The drivers identified are discussed extensively in the next section.

1.6.4 Micro and macro drivers for competitiveness

Various sources in literature have identified a number of drivers impacting on the competitiveness of organisations (table 3.8 and table 3.10). Micro drivers relate to the drivers within organisational control (Krajnakova, Navickas & Kontautiene, 2018), while macro drivers are outside the control of organisations (Cepel, Belas, Rozsa & Strnad, 2019). Hussain, Nguyen, V.C., Nguyen, Q.M., Nguyen, H.T. and Nguyen, T.T, (2021) and Marr (2018) identify macro-economic factors as those factors in the external business environment which the firm has little control over, whereas micro-economic factors relate to the factors internal to the organisation which determine its strengths, weaknesses and responses to threats and opportunities.

The micro and macro drivers enhancing SCA are discussed in detail in chapter 3 of this study. The following section discusses the concept of industry competitiveness and sustainable competitiveness.

1.6.5 Firm competitiveness and sustainable competitiveness

Liargovas and Skandalis (2010), Siudek and Zawojska (2014), and Arslan and Tatlidil (2012) agree that competitiveness is still a difficult concept to understand and analyse, as it is measured at different macro and micro-economic levels. Ketels (2016) argues that the many debates, on the definitions of competitiveness, have used Krugman's 1994 definition as the basis for their arguments. These definitions seem to be centred on viewing competitiveness from a "cost/ability to export" perspective, as well as from a "productivity" perspective. The seminal work by Krugman (2014) cautions against "obsession with competition", urging organisations to prioritise performance and the satisfaction of customer requirements. The first perspective views competitiveness as the ability of a company to compete, sell its products and defend its market share based on its cost base, whilst the second views competitiveness as the ability of a company to compete based on the factors of production at its disposal and its ability for value creation. Chikan, Czako, Kiss-Dobronyi and Losonci (2022:2) define competitiveness as "a capability of a firm to sustainably meet customer demand at a profit".

In her seminal work, Hoffmann (2000) points out that despite the extensive research conducted on competitiveness, there are still researchers who fail to distinguish between competitiveness and sustainable competitive advantage. Barney (1991, as cited in Hoffman, 2000:1) mentions that a firm has "sustained competitive advantage when it is implementing a value creating strategy not simultaneously being implemented by any competitors which also find it difficult to duplicate the benefits of such a strategy." McGrath (2013), on the other hand, argues that the concept of SCA does not exist, as companies will always find ways of copying competitor strategies. The author also suggests the existence of "transient competitive advantage", which relates to the temporary nature of competitive advantage that organisations tend to have.

Asante and Adu-Damoah (2018) stress that the failure by businesses to understand the differences between competitive advantage and SCA has resulted in demise of many of these businesses across the globe, with the former being a temporary or short-term advantage. The authors further point out that there is a need for organisations to capitalise on their resources in order to improve performance and attain SCA. Gomes and Romao (2019) define SCA as the use of a company's resources, qualities or skills that are difficult to match or surpass, as well as its ability to give it a long-term advantage over rivals while Wijayanto, Suhadak and Nuzula (2019) define SCA as a situation of positional supremacy where a firm has a successful strategy that is hard to imitate.

1.6.6 Strategies for enhancing firm competitiveness

According to Prasanna, Upulwehera, Senarath, Abeyrathne and Rajapakshe (2021), McGrath (2013) and Yasar (2010), competitive strategies are a catapult to the introduction of tools that can be used by strategists and decision makers to identify competitiveness issues and enhance competitive advantage for their organisations. Porter (1990, as cited in Rao & Soumya, 2007:490) argues that although operational effectiveness is necessary for improved performance, it is not adequate to provide a firm with competitive advantage. Firms with no clearly defined competitive strategy will always be outsmarted by those that do (Porter, 1990). There is a need for foundries in South Africa to define clearly their competitive strategies in order to outsmart both local and foreign competition. Understanding the micro and macro drivers influencing foundry competitiveness is, therefore, key to establishing these strategies.

Different authors identify different strategies necessary to build on the competitiveness of a firm. Rao and Soumya (2007) mention that competitive strategies align a company's vision towards gaining competitive advantage. The authors identify the ability to innovate, use of advanced technology and retaining skilled workforce as strategies that organisations can implement in order to remain competitive. According to Porter's 1980 generic strategies, firms can enhance competitiveness by addressing three key elements, namely, cost leadership, product differentiation and focus strategies (Prasanna *et al.*, 2021; Yasar, 2010). These different strategies are explored comprehensively in chapter 3.

This study makes recommendations on the competitiveness enhancing strategies that South African foundries could adopt, in order to "outsmart" competition. Haseeb, Hussain, Kot, Androniceanu and Jermsittiparsert (2019) recommend future research that explores various challenges that impact on the ability of organisations to attain SCA. Cvetkovski (2015) points to the need for research that guides foundry leadership in developing opportunities that will enhance employment opportunities for future generations and recommends future research on sustainable development within the industry. Bandaranayake and Pushpakumari (2021), and Barros, Gohr, and Morioka (2019) recommend future research on SCA, as well as the formulation of a framework that could be used to measure SCA. This study serves as groundwork in the formulation of such a framework.

The absence of research on the SCA of foundry companies in South Africa also presents a gap in knowledge that is identified in this study. Through a comprehensive review and synthesis of literature, this study sought to identify the drivers for SCA and to determine how these drivers could be adopted for strategy formulation, to enhance the competitiveness of the local industry. The next section provides an overview of the research methodology this study adopted.

1.7 RESEARCH METHOD AND DESIGN

Ngulube (2015:125) points out that the quality of knowledge that emanates from any given study, depends on the methodology that is used. The author further argues that the use of appropriate research methods is crucial in order to "conceptualise" and address the problem identified in the study. It is essential for researchers to "locate their studies in a specific paradigm or theoretical lens" (Doyle, Brady & Byrne, 2009). Hanson, Creswell, Plano-Clark and Creswell (2005, as cited in Doyle *et al*., 2009:176) state that a paradigm signifies a theoretical lens defined by "distinct elements including epistemology (how we know what we know), ontology (nature of reality), axiology (values) and methodology (the process of research)". Khatri (2020:1436), on the other hand, defines a paradigm as "the lens through which a researcher looks at the research topic and examines the methodological aspects of their research work based on certain philosophical foundations".

Piekkari, Welch and Paavilainen (2009, as cited in Ngulube, 2015) argue that the specific methods used in research should conform to the norms of the particular field for which it is being conducted. According to Ngulube (2015), a researcher should question the "appropriateness and adequacy" of the methodology they intend to use and compare it with other methodologies that are available.

In reviewing the studies conducted on competitiveness, the researcher noted that whilst a number of studies adopted a mixed methods research methodology, owing to limited literature on the foundry industry (Ettmayr & Lloyd, 2017), there was a substantial number of studies that either adopted wholly qualitative approaches, where interviews were conducted with selected groups of people (Kinyondo & Villanger, 2016) or preferred to undertake quantitative, comparative research between foundries in different countries (Mushemeza, Okiira, Morales & Jose-Herrera, 2017).

The researcher employed a sequential explanatory mixed methods research design in an area where limited research either exclusively adopted quantitative or qualitative methodologies. The researcher also collected original data from the field (industry) through online surveys and online interviews, with the aim of contributing to existing knowledge and publishing the findings and results relating to the SCA of the foundry industry in South Africa.

Creswell, Klassen, Plano-Clark and Smith (2011) mention that mixed methods research can also be referred to as a hybrid, combined or multi-method research. Creswell (2014) identifies three different levels that motivate the adoption of mixed methods research. At a general level, mixed methods research is used to capitalise on the strengths of both quantitative and qualitative research. At a practical level, it is used to spearhead new research and at a procedural level, this type of research is used to provide the researcher with a more complete understanding of the research problem.

Bryman (2012) identifies five justifications for combining both qualitative and quantitative methods which include: i) triangulation, ii) complementarity, iii) development, iv) initiation and v) expansion. Bryman (2007, as cited in Ngulube, 2013:11) also acknowledges that one of the factors contributing to the selection of mixed methods research is the acknowledgement by researchers that constructivism may "… deny the veracity of the very phenomena that objectivism pursues to appreciate". Tashakkori and Teddlie (2003, as cited in Ivankova, Creswell & Stick, 2006) posit that there are about 40 mixed methods research designs that have been mentioned in different literature and Creswell (2003) narrows these to six of the most common designs used, which include three sets of concurrent and sequential designs. This study adopted one of these designs, a sequential explanatory research design.

1.7.1 Research Design

A cross-sectional, sequential explanatory research design was used in this study, with priority being given to the quantitative phase (Wipulanusat, Panuwatwanich, Stewart & Sunkpho, 2020; Creswell & Plano-Clark, 2018; Creswell, 2003).

QUAN ⟶ qual

Hanson, Creswell, Plano-Clark, Petska and Creswell (2005) posit that this design involves prioritising collecting and analysing data from the quantitative methodology phase. In this study, the qualitative data phase was used to supplement the data collected and analysed by quantitative means. According to Ngulube (2013), a large number of researchers, seeking to adopt sequential mixed methods research, have struggled to gain an in-depth understanding of the social phenomenon but focused more on triangulation, where the emphasis has been to establish inconsistencies in the findings made. This study attempted to take a different approach by using the findings of the quantitative stage to build on the qualitative stage of the research (Feilzer, 2010, as cited in Ngulube, 2013:19). Fetters, Curry and Creswell (2013) also point out that with this type of design, the results from the quantitative data collection process inform the qualitative data collection process.

A survey questionnaire technique of a 5-point Likert type scale was used for quantitative data collection. Barua (2013:35) defines a Likert scale as "a psychometric scale commonly used in research, based on survey questionnaires where respondents select their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements, while responding to a particular Likert questionnaire item".

A pilot study was conducted with academic and industry experts to ensure adequate critiquing of the survey instrument was done. This is supported by Cooper and Schindler's (2014) assertion that pre-testing of the questionnaire is the final step to improve survey results and is crucial to ensure that there are no ambiguous questions, content and sequencing problems.

The questionnaires were distributed to foundry employees whose duties involved dealing with foundry customers, suppliers, competitors, and other stakeholders, and therefore, possessed a ‘fair’ understanding of the competitiveness of the operating environment of foundry companies. The distribution of the questionnaires was done using the SurveyMonkey platform, in order to avoid physical contact due to the COVID-19 protocols and in line with the university’s guidelines regarding research data collection during the pandemic (University of South Africa, 2020). The outcome of the survey (quantitative) process provided the researcher with an indication of which additional areas to explore, in order to gain further understanding of the study constructs.

The outcomes from the quantitative phase were used to formulate semi-structured interview questions for use during the qualitative phase data gathering process, with the owners and/or top management of the foundry industry, in an effort to gain more in-depth and strategic insight based on both the literature and quantitative findings (Ettmayr & Lloyd, 2017).

1.7.2 Population of the study

Casteel and Bridier (2021:343) mention that a population “creates boundaries for the scope of a study and provide environmental and context cues for the reader”. The authors also highlight that the target population should be carefully selected to provide adequate data to the study. The population from which the sample for the study was drawn, included all foundries in South Africa whose contact details were in the NFTN database (table 1.4).

Table 1.4: Population of foundries in South Africa

Province	Population of foundries operational in South Africa (2020)	Population of respondents available to distribute questionnaires to. *(Contact details available on foundry database)*
Source	(Lochner *et al*., 2020)	
Gauteng	84	151
Kwa-Zulu Natal	16	24
Western Cape	10	7
Eastern Cape	4	3
Free State	4	8
North-West	1	1
Northern Cape	3	0
Mpumalanga	1	2
Total	**123****	**196**
** The total number of foundries (123) excluded foundry companies that were confirmed to be in the processes of finalising the modalities of company closure when the study by Lochner et al. (2020) was conducted.		

Source: Lochner *et al*. (2020)

1.7.3 Sampling

According to Creswell and Plano-Clark (2018), and Saunders Lewis and Thornhill (2016), sampling is done when it is not feasible to include the entire population and when there are budget constraints to the research. Sampling gives the researcher an opportunity to select potential participants and engage them during the data collection process (Onwuegbuzie & Collins, 2007). The unit of analysis for this study were the different stakeholders, within the foundry industry in South Africa.

The target individuals for the first phase included management and non-management employees who, in their duties, dealt with foundry customers, suppliers and other stakeholders. The researcher believed this group of participants were best placed to provide valuable insight on the study topic. Owners and top management were targeted for the qualitative phase, in order to obtain richer insight into the topic understudy. Registered metal casting foundries in South Africa and those affiliated to SAIF (SAIF, 2015) were used, whilst unregistered foundries were excluded from the research. To this effect, SAIF and the NFTN were used as a “springboard” to initiate contact with the foundries through an available database of foundry companies and contacts.

A multi-stage sampling technique was used to select the participants in the study, with census sampling being used for the quantitative phase and purposive sampling for the qualitative phase (Onwuegbuzie & Collins, 2007; Creswell & Plano-Clark, 2018). According to Kabir (2018), census sampling is used when all members of the available population are contacted for data collection. All foundry contacts available on the foundry database were contacted and invited to participate.

1.7.3.1 Determination of sample size (Quantitative phase)

According to Onwuegbuzie and Collins (2007), the choice of a sample size in mixed methods research helps the researcher determine to what extent "statistical or analytical" generalisations can be made. Two general methods of determining sample sizes in quantitative studies are discussed, briefly. As proposed by Israel (1992:4), the Raosoft sample size calculator was used to determine the sample size for the quantitative phase of the study.

The sample size was based on the individual contacts available on the foundry industry database, representing foundry companies that are currently operational in South Africa (Lochner *et al*., 2020). At the time of doing the study, the foundry industry database had 196 contacts employed at 95 foundry companies, spread across eight provinces in South Africa. The researcher used the findings from the quantitative phase to develop questions that would be used for the interviews during the qualitative phase so that deeper insights into the study could be obtained.

1.7.3.2 Determination of sample size (Qualitative phase)

As indicated in section 1.7.3, purposive sampling was used to select participants for the qualitative phase. Etikan, Musa and Alkassim (2016) posit that with purposive sampling, participants are selected on the basis of their qualities relative to the study. Mason (2010) points out that although a number of factors impact on the sample size in qualitative studies, researchers should be conscious of the data saturation point. Saunders *et al.* (2016:1894) mention that saturation is used "as a criterion for discontinuing data collection or analysis in qualitative research".

Guest, Bunce and Johnson (2006) assert that researchers should not be preoccupied with the number of interviews conducted, but on the richness and depth of the data gathered. Following this recommendation, data saturation was used as a guide to the sample size for this study. Foundry owners and top management were interviewed during the second phase until the point of data saturation was achieved, then the interview process was terminated (Saunders *et al*. 2016).

1.8 DATA COLLECTION

According to Williams (2007:6), data collection is the precursor to data analysis and enables researchers to test and "build theories". Data collection in the quantitative phase of the study was done using questionnaires with close-ended questions, based on a 5-point Likert scale measurement, and administered using the SurveyMonkey platform. The link to the survey was e-mailed to respondents who agreed to participate. The platform was configured to "hide" the respondent details, to enhance anonymity and confidentiality. This phase was followed by semi-structured interviews, with open-ended questions, where an in-depth exploration of questions emanating from the quantitative phase (Benlamri & Sparer, 2016) of the study were addressed, using MS Teams. The interviews were recorded using the MS Teams built-in function, to allow the researcher to relisten to the interviews prior to the transcription process.

Both the respondents and the participants were contacted telephonically and via e-mail, depending on the contact details available on the database. Arrangements were then be made to explain the purpose of the study, the benefit of participation by the individuals concerned and to obtain consent for participation. On agreeing to participate, appointments were made for the distribution of the research instruments during each of the phases, prior to the data being returned and analysed.

1.8.1 Validity and reliability of the data collection process

In quantitative research, validity relates to the idea of the research instrument "truly measuring that which it was intended to measure", whereas reliability relates to "... the degree to which research results are an accurate representation of the entire study population and are consistent over time" (Zikmund, Quinlan, Griffin & Babin, 2019:307).

Twycross and Shields (2004) define reliability as the consistency and repeatability of the results of a given test.

Validity and reliability was ensured and verified through "referential adequacy and peer debriefing", among other measures (Bryman & Bell, 2007; Scharp & Sanders, 2018:3). The researcher also engaged the research supervisor, co-supervisor and industry experts during the "peer debriefing" process, to enable the elements of validity and reliability pertinent to this study to be discussed and addressed (Shenton, 2004; Anney, 2014; Johnson, Adkins & Chauvin, 2020). Peer scrutiny of the data collection process was also encouraged, to ensure fresh perspectives from colleagues, academics and experts in the field were used to challenge the researcher's assumptions and decisions made in the study (Shenton, 2004; Johnson *et al.*, 2020). The researcher also engaged the research supervisor and co-supervisor in reviewing the process of data collection and analysis, to ensure that this process assisted in addressing the study objectives.

1.8.2 Quality and rigour of the data gathering process

Daniel (2019:118) asserts that the assessment of the quality of qualitative research "to ensure rigour in the findings" is a crucial step if the findings are to contribute to theory and practice. Four dimensions are considered in enhancing the trustworthiness of a qualitative study: credibility, confirmability, transferability and dependability. Stenfors, Kajamaa and Bennett (2020:598) postulate that credibility exists when there is "alignment between theory, data collection, analysis and results, while dependability exists "when there is sufficient information for a different researcher to follow and conduct a similar study". Transferability was enhanced by the use of verbatim quotes from the interviews and thick descriptions in the data analysis (Lemon & Hayes, 2020:608), and confirmability was addressed through peer debriefing sessions, to ensure the questions asked were aligned with the study's objectives. These elements are discussed extensively in chapter 4.

1.9 DATA ANALYSIS

According to Creswell and Plano-Clark (2018), and Ihantola and Kihn (2011:10), data analysis in mixed research should aim at addressing the concept of analytical adequacy. This concept relates to whether the data analysis techniques chosen are adequate and suitable in addressing the research questions of the study. At the data analysis phase, the data collected was transformed to enable the integration and comparison of dissimilar databases, which included the comparison of quantitative scales with qualitative themes as well as the conversion of qualitative themes into scores (Rambaree, 2013; Creswell & Creswell, 2018). This is in line with the views of Caracelli and Greene (1993) and Rutberg and Bouikidis (2018:212) that data analysis in research should be done in a manner that both the quantitative and qualitative data sets are linked, whilst "preserving the words and numbers in each data set".

The Statistical Package for Social Sciences software, version 27 (SPSS) was used to examine the quantitative data sets of the first phase (Creswell, 2014). The data from the quantitative phase was inspected and cleaned, to ensure completion before the analysis is carried out. SPSS was used to calculate descriptive statistics as well as inferential statistics in line with the recommendations by Greasley (2008). In the analysis, the researcher ensured uniform data capturing, coding and sorting, and subsequent identification of duplicates, emerging files and themes. Case variables were also analysed at different levels, including nominal and ordinal scales.

Inferential analyses were done from the statistics generated, using SPSS to draw and extend conclusions from the sample to the population. Analyses entailed the calculation of reliability analysis, which included item means, standard deviations, Cronbach's alpha coefficient and inter-item correlation. To establish the statistical significance of the differences in the levels of importance between the micro and macro drivers, the Mann-Whitney U test was also calculated. Canonical correlation analysis (CCA) was computed using the software, to evaluate the multivariate shared relationship between the study's variable sets. More details on this statistic are provided in chapter 4 (section 4.3.10) and chapter 5 (section 5.9). The quantitative data analysed was presented in the form of tables, visual charts and graphs, to enable easy comparison and to provide visual illustrations.

The qualitative data from the study was analysed using Atlas-ti as recommended by Rambaree (2013). The qualitative type data was organised and analysed thematically, in line with the objectives of the study. The model proposed by Guba for qualitative data analysis, was also applied to ensure the data analysis process addressed the elements of trustworthiness, which included credibility (truth value of findings), transferability (applicability of findings), dependability (findings consistency) and confirmability (researcher objectivity) (Lincoln & Guba, 1985, as cited in Shenton, 2004:72). The findings emanating from the qualitative interviews were presented using figures, flow charts, tables and textual write-ups for ease of interpretation.

The outcomes from the two phases were integrated in chapter 7, in order to understand how the participants' views and responses contributed to the achievement of the study's objectives and in addressing the problem identified. The integrated outcomes were used to develop the SCA framework for the foundry industry in South Africa.

The ethical considerations adopted in this study are presented in the following section.

1.10 ETHICAL CONSIDERATIONS

Creswell and Plano-Clark (2018), Fouka and Mantzorou (2011, as cited in Akaranga & Makau, 2016) and Salkind (2012) point out that researchers should aim to protect the integrity and dignity of their subjects, as well as the information that they seek to publish. In conducting this study, the researcher exercised due diligence in ensuring that proper research ethics were adhered to. Ethical clearance from the university's ethics committee was obtained before the study commenced. Subsequent to this, permission to conduct the study was also be obtained from the foundry industry association, SAIF.

Informed consent is crucial for the researcher to ensure ethical behaviour and a buy-in from the participants (Creswell & Plano-Clark, 2018; Salkind, 2012). Permission was therefore also obtained from the potential participants before the questionnaires were distributed and the interviews are conducted. This was done through the use of an informed consent form which had the researcher's details for verification purposes.

The confidentiality of the participants was ensured by using questionnaires with no provision for names to be filled in, for anonymity, and no names were recorded during the transcription of the interviews. Respondents and their companies were also given an opportunity to remain anonymous in the study. Salkind (2012) argues that confidentiality is maintained if whatever is learned about the participants, is kept as confidential as possible. Business sensitive information was not requested, to protect the interests of the different businesses.

Data collection and gathering were conducted online to protect the respondents and participants from possible exposure to COVID-19, as guided by the university's ethics requirements. Non-maleficence or protection from harm is a key issue when conducting research (Saunders *et al*., 2016). The participants were protected from harm, stress or embarrassment in any way, by allowing them to answer the questionnaires at their own time and having interviews conducted in an environment convenient and comfortable to them. The questionnaires and interviews were designed to ensure there were no sensitive or discriminatory questions relating to the topic or the study participants. Debriefing sessions were also be regularly held with the supervisor and co-supervisor, to ensure guidance was provided on the treatment and presentation of sensitive data (Creswell & Plano-Clark, 2018; Shenton, 2004).

1.11 CHAPTER CONCLUSION

The research problem motivating this study is the closure of metal foundries in South Africa. The study explored the statistics available on the number of foundries that have been closed over an 18-year period (2003 to 2021). Although the trend of closures varied between provinces, industry research points to a number of micro and macro-economic challenges that have negatively impacted on the competitiveness of the industry. The overall impact of such closures is detrimental to the South African economy (the DTI, 2015; SAIF, 2015; Lochner *et al*., 2020).

This chapter provided a brief background to the study, discussed the expected contribution, and indicated the study delimitation. A clear indication of the main objective and the supporting objectives was also provided. A 'helicopter view' of the literature reviewed in the main study was also provided, together with the theoretical foundations guiding the study. The research methodology section motivated the proposed adoption of a mixed methods research, using a sequential explanatory design. The study population, data collection and analysis methods for the two phases, together with the ethical considerations were also discussed. An overview of how the outcomes from the two phases would be integrated and used to develop the SCA framework for the South African foundry industry was also provided.

The primary focus of this study was the development of a framework for the sustainable competitive advantage of the foundry industry in South Africa. The study also sought to address the secondary objectives of i) identifying from literature, the micro and macro-economic drivers influencing the sustainable competitiveness of foundries in South Africa, ii) benchmarking the perceptions of stakeholders within the foundry industry on sustainable competitive advantage against the macro and micro drivers identified in literature, iii) making recommendations on strategies to enhance the sustainable competitive advantage for foundries in South Africa (see section 1.5).

The following chapter (chapter 2) discusses the foundry industry landscape from a global and South African perspective, in order to provide context and insight into the problem identified, as well as to understand why addressing competitiveness for this industry is crucial for economic sustainability. This will be followed by the literature review chapter (chapter 3) which will provide an in-depth review of previous research as well as the theoretical perspectives informing the study. Chapter 4 provides an indication of the methodology adopted in the study, chapter 5 presents the quantitative findings obtained from the first phase of the study while chapter 6 presents and discusses the qualitative findings. The last chapter (chapter 7) integrates the findings from the two phases to provide a comprehensive interpretation of the findings as well as articulate how the study’s SCA framework was developed.

CHAPTER 2: LANDSCAPE OF THE FOUNDRY INDUSTRY

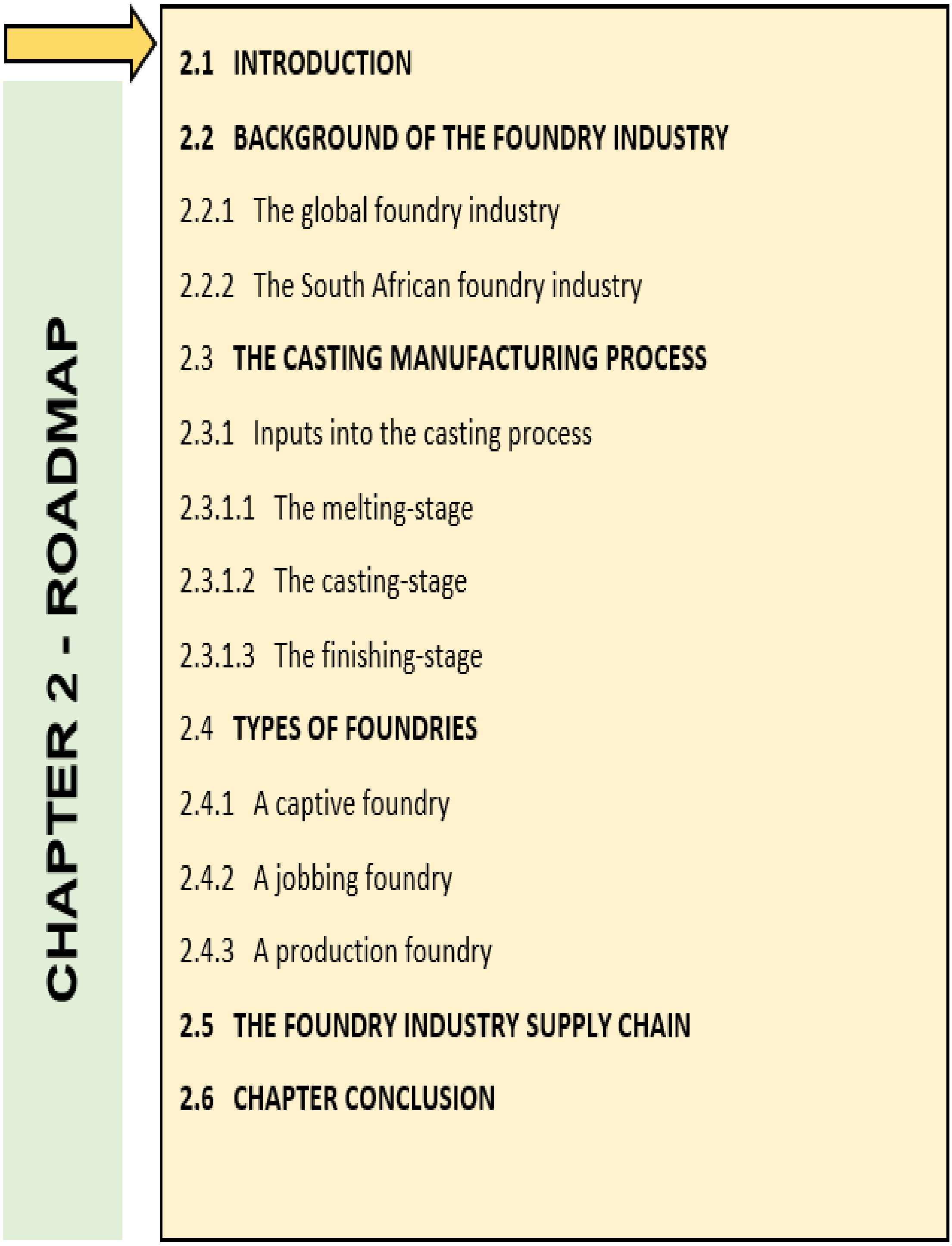

Figure 2.1: Illustration of the layout for Chapter 2

Source: Author's own compilation (2022)

2.1 INTRODUCTION

The closure of foundries in South Africa, over the past two decades, has had a detrimental effect on the ability of the economy to grow and the objective of increasing the level of employment in the country (National Planning Commission (NPC), 2012). In their study of the foundry industry in South Africa, Lochner *et al*. (2020) found that the number of foundries had gone down to 123, from 213, which was the number of operational foundries in 2003 (SAIF, 2015). According to Davis (2015), the foundry industry contributes more than R9 million to the GDP of the South African economy and, therefore, the closure of foundries has a detrimental and negative effect on the local economy.

This chapter presents the landscape of the foundry industry from a global and local (South African) perspective. This discussion brings into focus the volumes of castings manufactured globally, as well as in South Africa between 2004 and 2020. Thereafter, an overview of the casting manufacturing process, the types of foundries available in South Africa and the foundry industry supply chain are provided. An exploration of the foundry landscape and the foundry supply chain is crucial in understanding the micro and macro challenges that contribute to the closure of foundries. This provided the impetus towards addressing the study's primary objective of developing a framework for the SCA of the foundry industry in South Africa. The following section discusses the background of the foundry industry.

2.2 BACKGROUND OF THE FOUNDRY INDUSTRY

Shi *et al*. (2021) point out that despite it being the most "basic industry", the foundry industry contributes significantly to the prosperity of the world economy. Apata and Alani (2016) and the DTIC (2020) assert that the foundry industry presents an avenue for various governments to dispose of scrap metals within the different economies, thereby helping to protect the environment, whilst at the same time, remaining the cornerstone for ferrous and non-ferrous raw materials for the engineering and related industries. The production of castings by foundries has had a significant influence on the development of many world economies over the last two decades, contributing directly and indirectly to more than 82% of world employment (Holtzer, Danko & Zymankowska-Kumon, 2012). According to Freire *et al*. (2021), the global foundry industry employs more than 2 million people and, therefore, contributes significantly to global employment. These statistics alone, bear testament to the important role that the foundry industry plays in job creation in various countries.

Davis (2015) argues that in South Africa alone, foundries contribute significantly to the country's economy through the supply of raw material to other industries. The closure of some of these foundries has negatively affected the country's GDP. According to Viviers (2016), the contribution by the manufacturing sector to the country's GDP fell from 20% in 1994 to 11% in 2015 and this has been, in part, the consequence of the foundries closing down. The importance of having an industry that contributes positively to the country's GDP and to employment creation cannot be underestimated. It is, therefore, crucial to undertake research that explores the sustainable competitive advantage of the foundry industry in South Africa.

Any threat to the sustainability of the foundry industry is likely to have a detrimental effect on employment statistics (Holtzer *et al*., 2012). The need for this industry to be resuscitated and its competitiveness enhanced, motivates this study. It is also a crucial step in ensuring that the industry contributes positively to the country's GDP and plays a part in lowering the unemployment rate in South Africa. The next section provides a detailed perspective on the status of the global foundry industry landscape.

2.2.1 The global foundry industry

The concept of globalisation has brought about several benefits for many economies and yet, it has also presented sustainability challenges to others, particularly in the developing world (Makasi & Govender, 2015). The ability of companies to respond to the effects of globalisation depends on their ability to adapt and respond to changes (Baffour & Amal, 2011, as cited in Makasi & Govender, 2015). The foundry industry has not been spared from the effects of global competition, economic and political decisions (Oudhia, 2015). The impact of the micro and macro-economic sustainability challenges has, therefore, manifested in the scaling down and closure of some foundries within the global landscape (Luo, 2022).

According to the Cast Metals Federation (2018), the exit by the United Kingdom from the European Union will likely have a negative effect on the foundry industry within the block and significantly impact on the global castings supply for the automotive, aerospace construction, defence and energy industries. The foundry industry plays a crucial role in the development of many world economies, through the provision of raw materials for the automotive, mining, manufacturing and chemical industries (Holtzer, Danko & Zymankowska-Kumon, 2014). According to Sa, Thollander, Cagno and Rafiee (2018), within the European Union, the main customer base for the foundry industry includes the automotive industry, which makes up 50% of the foundry market share. This is followed by general engineering (30%) and construction (10%). Technological advancements and the move by automotive manufacturers towards light weighting also presents a threat to the survival of foundries worldwide, as lighter competing materials continue to be used (The Cast Metals Federation, 2018).

According to a study and presentation done by Muralidhar and Datta (2009) at the 57th Indian Foundry Congress, the global foundry industry can be divided into several regional groupings, namely, the Asia Pacific Foundry Cluster (APFC), the European Union Foundry Cluster (EUFC), the Eastern and Central Europe Foundry Cluster (ECEFC), the Latin American Foundry Cluster (LAFC), the Middle East Foundry Cluster (MEFC), the North American Free Trade Area Foundry Cluster (NAFTAFC) and the African Foundry Cluster (AFC). These different regions consist of different casting producing countries.

Muralidhar and Datta (2009) noted that the APFC consists of 14 major casting producing countries which include China, Australia, Japan, India, Taiwan, South Korea, Singapore, Indonesia, Hong Kong, Malaysia, New Zealand, Pakistan, Philippines and Thailand. These produce around 29.46 million metric tonnes per year. The EUFC is made up of 18 countries, which include Germany, Britain, France, Italy, Spain, Poland, Czech Republic, Sweden, Austria, Belarus, Belgium, Netherlands, Finland, Portugal, Hungary, Switzerland, Norway and Denmark. This cluster has 4 500 foundries producing around 15.53 million metric tonnes of castings per year; the ECEFC has five countries which include Ukraine, Russia, Croatia, Romania, Slovakia, Slovenia and Yugoslavia and has 3 343 foundries producing 9.03 million metric tonnes annually (Muralidhar & Datta (2009).

The LAFC is made up of six nations, namely, Brazil, Chile, Argentina, Columbia, Peru, and Venezuela. This cluster has over 1 550 foundries which produce around 2.15 million metric tonnes of castings per year (The Cast Metals Federation, 2018). The MEFC consisting of Turkey, Egypt, Iran, the United Arab Emirates and Israel has around 1 210 foundries producing over 1.74 million metric tonnes of castings per year. Muralidhar and Datta (2009) assert that NAFTAFC is made up of seven countries, namely, the United States of America (USA), Canada and Mexico. This cluster has 4 682 foundries producing metal castings of around 14.63 million metric tonnes per year. Finally, the AFC consists of only two casting producing countries, South Africa and Zambia, that report to the world foundry casting census, with South Africa being the major casting-producing country with an output of around 380 000 tonnes per year (Muralidhar & Datta, 2009).

Among the seven clusters, APFC is the largest castings producer (40.3% of global production) followed by NAFTAFC with 20.2%. The AFC constitutes less than 2% of global castings production (Spada, 2014, as cited in Banganayi *et al*., 2019).

Whilst there has been substantial growth in the number of foundry facilities in Japan, Poland and Brazil, due to low labour and energy costs (Casting SA, 2018), the trend in North America has been different over the past few years, with the number of foundries in the USA dropping to below 2000 in 2014, the first time in more than two decades that this has happened. According to Spada (2014) and Casting SA (2018), between 1999 and 2005, more than 22 foundries in the USA were shutdown, with 20 of these filing for Chapter 11 bankruptcy protection. This was attributed to increasing electricity and labour costs, as well as competition levels within the global foundry industry (Modern Casting Report, 2015). This is in line with the views by Oudhia (2015) and the IKB *Deutsche Industriebank* (2015) report, which identified increasing costs of labour, escalating energy costs, the shortage of trained workforce and high investment requirements as deterrents to the growth of this industry, especially in developing countries.

In order to continue supporting their manufacturing industry, the USA began importing castings from other countries, with 24.7% and 17.1% of these coming from China and other Asian countries, respectively (Spada, 2014). Although global casting volumes increased from 79.7 million metric tonnes in 2004 to 109.8 million metric tonnes in 2017

(Modern Casting Report, 2018), this number also dropped to 105.5 million metric tonnes in 2020. Available data shows that the total number of foundries, in the top 37 casting manufacturing countries, dropped on average from 46 906 in 2009 (Modern Casting Report, 2010) to 45 253 in 2020 (Modern Casting Report, 2021), signifying a 3.52% drop in operational plants.

In contrast, South Africa 'witnessed' a 42% decrease in the number of metal casting foundries between 2003 and 2020, with research showing that between 2015 and 2020 the number of foundries decreased by 27% (Lochner *et al*., 2020). Table 2.1 presents a consolidated view of the volume of castings manufactured globally and in South Africa between 2004 and 2020.

Table 2.1: Volumes of castings manufactured globally and in South Africa

Year	Global Volumes (Million metric tonnes)	South African Volumes (Million metric tonnes)	Census Report	Source
2004	79 745	0.445	39th Census Report	Modern Casting Report (2005)
2009	80 343	0.493	44th Census Report	Modern Casting Report (2010)
2010	91 673	0.539	45th Census Report	Modern Casting Report (2011)
2011	98 593	0.425	46th Census Report	Modern Casting Report (2012)
2013	100 834	0.375	48th Census Report	Modern Casting Report (2014)
2014	103 223	0.375	49th Census Report	Modern Casting Report (2015)
2015	104 129	0.460	50th Census Report	Modern Casting Report (2016)
2016	104 378	0.425	51st Census Report	Modern Casting Report (2017)
2017	109 863	0.443	52nd Census Report	Modern Casting Report (2018)
2018	112 738	0.443	53rd Census Report	Modern Casting Report (2019)
2019	109 059	0.443	54th Census Report	Modern Casting Report (2021)
2020	105 505	0.443	55th Census Report	Modern Casting Report (2021)

Source: Author's own compilation (2022)

As indicated in table 2.1, the Modern Casting Reports indicate that the global casting volumes increased by over 13% between 2010 and 2020, whilst the casting volumes for South Africa decreased by 21.6% in the same period. Although there were significant drops in the number of foundries in various countries, such as Austria (53 in 2004 to 37 in 2020), United Kingdom (550 in 2004 to 420 in 2020), Germany (641 in 2004 to 506 in 2020) and the United States (2 380 in 2004 to 1 661 in 2020) (Modern Casting Report, 2005; Modern Casting Report, 2021), there have been countries that have seen an increase in the number of foundries over the same period. In the context of the BRICS countries, between 2004 and 2020, the number of foundries in Brazil dropped from 1 315 to 1 017; in Russia the number of foundries decreased from 1 900 to 1 140 (Modern Casting Report, 2005; Modern Casting Report, 2021); while in China and India there were increases in the number of foundry plants from 12 000 to 26 000 and 4 200 to 4 500, respectively. South Africa had the largest decrease, with the number of foundries dropping by more than 50% from 256 to 123 (Lochner *et al.*, 2020) during the same period. This significant drop provides a motivation for establishing the need for sustainable competitiveness and survival of the remaining foundry companies. The average number of metal foundries worldwide increased from 33 870 in 2004 (Modern Casting Report, 2005) to 45 377 in 2020 (Modern Casting Report, 2021).

According to the Modern Casting Report (2017), the decrease in the number of foundries in some countries relates to a number of factors, including some foundries consolidating their businesses in an attempt to improve production efficiencies. The Foundry Trade Journal (FTJ) (2018) attributes this decrease to the recession, increasing foreign competition, technological developments, as well as to the tightening of regulations relating to manufacture, health and safety, and import and export restrictions. According to Prairie Industry Markets (2020), from a global perspective, COVID-19 has also contributed to the closure of foundry companies in many countries and even after lockdown, the volume of castings produced is still significantly below pre-pandemic levels. The effects of these challenges have also been extensively observed in the performance of local South African foundries.

2.2.2 The South African foundry industry

According to the World Foundry Organisation (WFO) (2018), the foundry industry in South Africa consists of sectors that deal with ferrous castings (iron and steel), non-ferrous castings (aluminium, brass and zinc), investment casting and high pressure die casting. More than 80% of the foundry output is consumed by the three major economic sectors, which include automotive, manufacturing and mining (WFO, 2018; South African Institute of Foundrymen, 2015). According to SAIF (2015) and the DTI (2015), foundries in South Africa serve different market sectors, which include mining (25%), automotive (25%), manufacturing (25%), railways (10%), agriculture (5%), infrastructure (5%) and other (5%), and contribute to employment creation by directly employing over 11 300 unskilled, semi-skilled and skilled people. In 2014, SAIF (2015) revised this employment figure to around 13 100 while according to the NFTN (2021) this number is currently around 11 390.

The 55th census report shows that South Africa is ranked 20th with annual production volumes of 443 000 metric tonnes, while China, ranked first, produced 51 950 000 metric tonnes (Modern Casting Report, 2021). Iloh, Fanourakis and Ogra (2019) assert that the average decrease in production volumes is a reflection of the macro and micro-economic challenges that the sector faces, which have led to some of the foundry companies either scaling down their operations or closing down completely.

Despite this ranking, the foundry industry contributes directly or indirectly by up to 64.5% to the country's GDP (Davies, 2015; SAIF, 2015), with foundries in Gauteng alone contributing 34.7% of the GDP (Iloh *et al*., 2019). This demonstrates the importance of this industry and motivates the need to ensure its competitiveness and sustainability.

Paul (2013) points out that the number of foundries in South Africa stood at 450 in the mid-1980s, but also argues that this number was still very small compared to other global competitors, such as China and India, which had 12 000 and 4 500 foundries, respectively, in 1989. Recent research conducted on behalf of the Council for Scientific and Industrial Research (CSIR), by Lochner *et al*. (2020), has shown that the South African foundry industry is made up of around 123 companies, geographically spread across eight provinces. This number represents a significant decrease from 213 foundries in 2003 and 194 in 2007. More than 68% of these foundries are situated in Gauteng, with more than 65% of these situated in Ekurhuleni, one of six South African metropolitan municipalities in major urban concentrations (Phele *et al*., 2005; Lochner *et al*., 2020).

As shown in table 2.2, whilst on average between 2003 and 2020, the total number of foundries decreased, Gauteng Province, which is the economic hub of South Africa (NFTN, 2015), saw a 16.4% decrease in the number of foundries between 2004 and 2020. Mpumalanga Province experienced a 93% decline in the number of operating foundries, the biggest decline, in a country where a total of eight (8) provinces lost a number of foundries over the same period (Lochner *et al*., 2020). This decrease remains a cause for concern, as it demonstrates survival and sustainability challenges faced by companies within this industry (NFTN, 2015). The closure of foundries between 2004 and 2020, resulted in job losses in excess of 6000 direct jobs in South Africa alone, while downstream machine and equipment manufacturers either shed more jobs or began importing foundry component inputs or fully assembled products, such as valves, pumps and automotive components (Kaziboni & Rustomjee, 2018; Rustomjee, Kaziboni & Steuart, 2018).

According to Kaziboni and Rustomjee (2018), between 2003 and 2016, the number of non-ferrous foundries dropped by 52%, whilst their ferrous counterparts dropped by 28%. This is due to a number of challenges which are discussed later on in the subsequent chapter. Lochner *et al*. (2020) argue that despite the overall decrease in the number of foundries in South Africa over the 16-year period, casting production only fell by 0.3%, indicating possible consolidation of the sector. Although mergers of companies within the same industry were identified as a possible factor driving competitiveness in South Africa (Haskins, 2008), this does not appear to be the reason behind the decline in the total number of foundries.

Table 2.2: Number of operational metal foundries in South Africa

Province	**Number of foundries (2003)**	**Number of foundries (2007)**	**Number of foundries (2015)**	**Number of foundries (2020)**	**Percentage of foundries per province based on 2020 numbers**
Source	(SAIF, 2015)	(SAIF, 2015)	(SAIF, 2015)	(Lochner *et al*., 2020)	
Gauteng	110	108	114	84	63%
Kwa-Zulu Natal	20	26	20	16	12%
Western Cape	26	16	14	10	7%
Eastern Cape	16	10	8	4	3%
Free State	10	7	5	4	3%
North West	10	9	4	1	1%
Northern Cape	6	3	3	3	2%
Mpumalanga	15	15	2	1	1%
Total	**213**	**194**	**170**	**123****	
** The total number of foundries (123) excluded foundry companies that were confirmed to be in the processes of finalising the modalities of company closure when the study by Lochner *et al*. (2020) was conducted.					

Source: Author's own compilation (2022)

Figure 2.2 provides the geographical distribution of current operational foundries in South Africa (Lochner *et al*., 2020). The number of foundries indicated is in alignment with those reported in table 2.2.

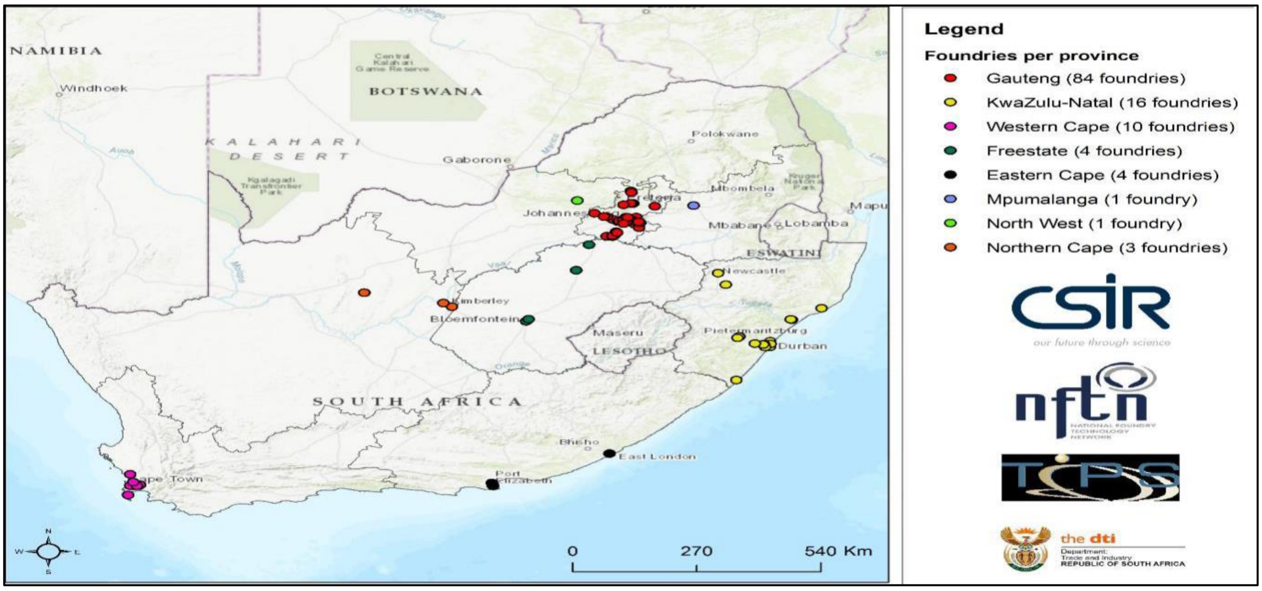

Figure 2.2: The geographical location of foundries
Source: Lochner *et al*. (2020)

The closure of foundries in South Africa has a direct negative impact on the number of jobs within this sector as well as an indirect effect on the number of jobs created along the value chain across all industries that utilise casting components (see table 2.3). This situation is exacerbated by the COVID-19 pandemic which has led to a contraction in the economic activities of many people and businesses (SAIF, 2020; ILO-OECD, 2020). The need to ensure foundry companies are sustainable is critical to directly or indirectly reducing unemployment in the provinces as indicated in table 2.3.

Table 2.3: South Africa's unemployment rate by province

Province (Where foundries are situated)	**Unemployment rate**
Gauteng	34.4%
Kwa-Zulu Natal	32.7%
Western Cape	27.5%
Eastern Cape	42.8%
Free State	32.4%
North-West	32.2%
Northern Cape	28.1%
Mpumalanga	36.1%
Overall Unemployment rate in South Africa	**33.9%**

Source: Statistics South Africa (2022)

This study sought to establish the economical dynamics that contribute to the closing down of local foundries and determine the micro and macro drivers that may enhance the industry's sustainable competitiveness, to ensure efforts are made to combat future closures and job losses.

For sustainable existence and growth, foundries serve a variety of markets, which include engineering, mining, automotive, agricultural, railways and construction industries (SAIF, 2015). This supports the argument that this industry is important in contributing towards the GDP and job creation in South Africa. Due to the various economic challenges facing many economies, Cunningham (2013a) and the DTI (2015) caution that, the threat to the survival, competitiveness and sustainability of the manufacturing industry represents an indirect threat to the local foundry industry, because a reduction in the volume of metal castings procured would translate to a reduction in the volumes of castings produced and number of jobs created. The Deloitte Manufacturing Competitiveness Report (2016) also acknowledges that South Africa has become increasingly vulnerable to increasing competition and imports from other countries, such as Brazil, Russia, India and China, who offer much higher incentives and protection to their local manufacturers. In turn, this threatens the employment of skilled and unskilled workers within the metal foundry industry.

In order to better appreciate the micro and macro-economic challenges faced by this industry in South Africa, it is important that the casting manufacturing process is understood. The casting manufacturing process is divided into three distinct stages, which include the melting stage, casting stage and finishing stage. The following section discusses this process and the stages involved.

2.3 THE CASTING MANUFACTURING PROCESS

According to Mahto (2015), the casting process is divided into three different but interlinked stages, namely, melting, casting and finishing. Although there may be different processes required in the manufacture of castings, the basic steps remain essentially similar. As indicated in figure 2.3, the process, as described by Krieg (2017), begins with the creation of a mould where the molten metal is poured and cooled. A special mixture of silica sand, oils and green sand is used in the making of the mould. This mixture, which is compounded to handle high temperatures and pressure, is non-reactive to the metals being melted and should also be capable of allowing released gases to escape. The different variations of the metals to be used are melted inside a furnace capable of generating temperatures required to melt the metals added. The molten material is then poured into the sand mould, allowed to set and cool down (Metal Casting Bulletin, 2015). Once this has cooled down, the casting is then shaken off manually by breaking the sand or by using a mechanical tool called a vibrator to reveal the final product (Sithole, Nyembwe & Olubambi, 2019). Refer to figure 2.3 for the casting manufacturing flow process. According to the Queensland Foundry Industry (1999), the quality of raw materials used in a foundry plays a significant role in determining the quality of the end-product (Zhenfeng, Xun & Yongjie, 2012; Chadha *et al*., 2022). Raw materials used also contribute significantly to the level of energy consumption in the foundry. If raw materials used have a high melting point, more energy would be required during the melting process, thereby increasing the foundry's input costs.

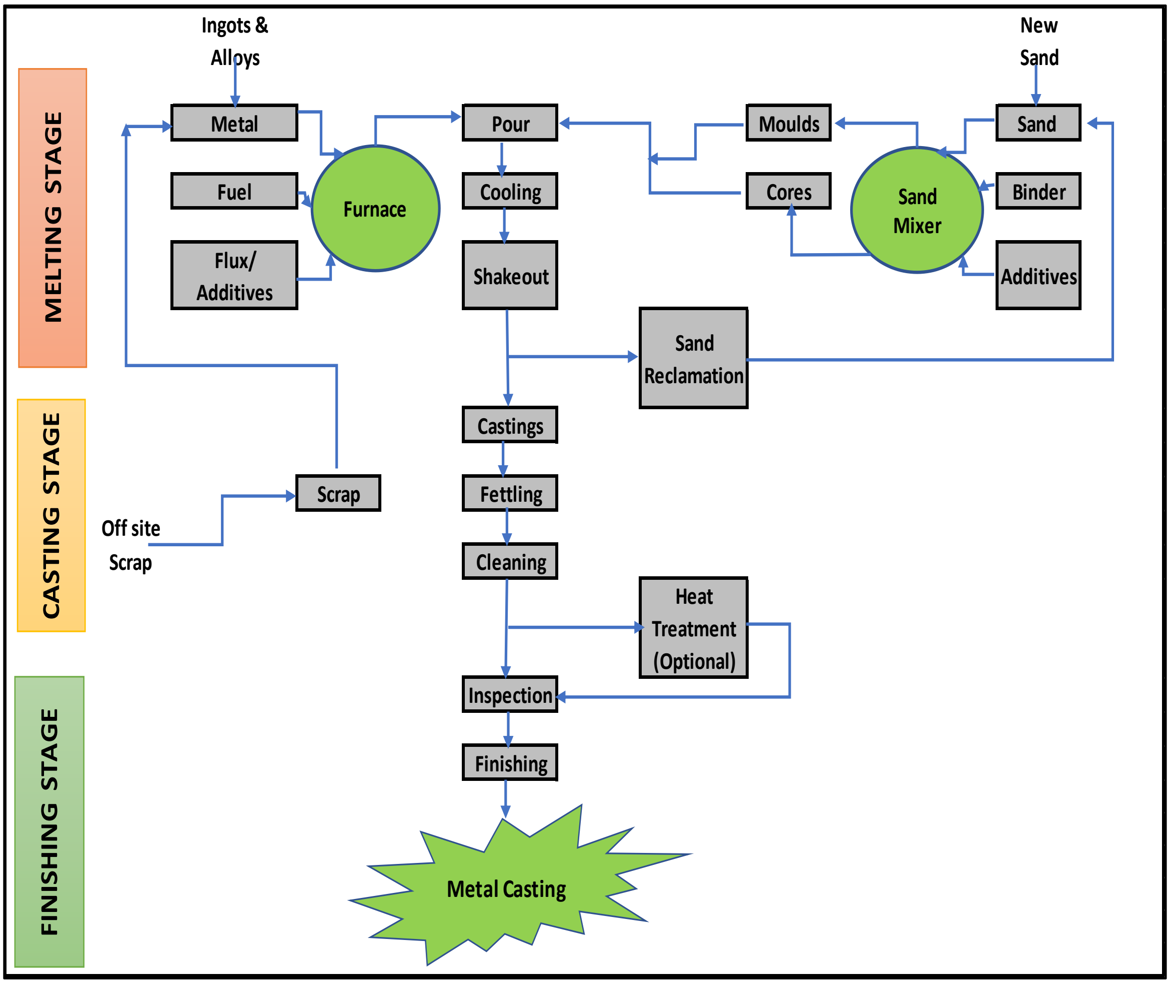

Figure 2.3: The casting manufacturing flow process

Source: Queensland Foundry Industry (1999)

The following section discusses the inputs into the casting manufacturing process with particular emphasis on the ingredients that are incorporated during the mixing stage as well as the subsequent casting and finishing stages.

2.3.1 Inputs into the casting process

As indicated in figure 2.3 and according to Szymszal, Lis, Gajdzik and Klis (2014), the raw materials used in foundries can be grouped into four categories: metals and alloys, fuels, fluxes and refractories.

i) Metals and alloys

The basic metals used in the formation of castings include ferrous and non-ferrous metals, pig iron and scrap metals. Pig iron is used in the manufacturing of cast iron, wrought iron and steel. Scrap metal is used to impart desired specifications to the cast iron that is being manufactured, whereas non-ferrous metals are generally used for castings that require fabrication (Zhenfeng *et al*., 2012). For the conversion of metal alloys and other components into desired castings, the raw materials are heated at temperatures of around 1300 °C to melt them and convert them to castings. The melting temperature used depends on the materials being melted, as well as the quality of the scrap metal incorporated into the mix (Szymszal *et al*., 2014; Chadha *et al.*, 2022).

ii) Fuels

Different fuels and/or sources of heat, such as coal, coke, oil, gas and electricity, are used in the melting process. According to Industrial Technologies Program [ITP] (2005), fuels are an important part of the melting stage during casting manufacture, as they help to elevate the temperature of the metal above its melting point to a temperature appropriate for pouring. More than 60% of the energy requirements for the foundry industry is supplied by natural gas and electricity (ITP 2005; Chadha *et al.*, 2022).

iii) Fluxes

Fluxes such as sodium carbonate, limestone, nitrogen and magnesium are also added into the mix during the melting of the metals, to remove impurities from the molten metals (Zhenfeng *et al*., 2012). According to Görnerup, Hayashi, Däcker and Seetharaman (2004), mould fluxes play a crucial role in the casting process by acting as a lubricator. Brandaleze, Gresia, Santini, Martín and Benavidez (2012) point out that fluxes serve a number of functions in casting manufacturing and these include thermal insulation, prevention of re-oxidation and inclusions entrapment, all characterised as the zone of contact with the liquid steel. The other functions include lubrication between the solidified steel shell and the mould, and heat transfer control, which are characterised as the zone of contact with solidified steel.

iv) Refractories

The remnants of the raw materials used (solid wastes) can be reused to melt more metals, whilst the liquid waste and sand are properly disposed of or reused in other applications. According to Balu (2018), moulding sand obtained from river beds, deserts, the sea and lakes is the most common, non-metallic raw material used in the casting process because of its refractoriness, chemical and thermal stability at elevated temperatures. The ease of availability and good strength properties also contribute to the choice of this raw material.

The three basic stages of casting manufacture are highlighted in the following section:

2.3.1.1 The melting-stage

As illustrated in figure 2.3, a high proportion of scrap metals, alloys, flux (which removes impurities from the molten metal) and other additives are added into the furnace and heated until the desired melt is achieved (Treyger, 2005). The proportion of ingredients added into the furnace and the operational conditions are largely dependent on the type of casting required, and the casting material composition specified by the customer. In South Africa, the key role players in the supply chain at this stage include scrap metal suppliers, such as the Scaw Metals Group, alloys and chemical suppliers, such as Independent Metal Distributors (Pty) Limited and green sand suppliers, such as Delf Sands (SAIF, 2015). These suppliers enjoy a direct channel distribution relationship with the foundries, as they supply raw materials directly to the foundries (Cattani, Gilland & Swaminathan, 2004). This stage of melting and metal holding contributes to the highest energy use for all foundries and significantly drives operating costs (Treyger, 2005).

2.3.1.2 The casting-stage

Before the casting process begins, a sand mould is made using green (wet) sand, a binder and some additives which are mixed in a sand mixer (Cattani *et al*., 2004). The mould shape is facilitated by a wooden pattern which can be made by the foundry or supplied by the customer such as a valve manufacturer that has ordered the casting. The molten metal is then poured into the mould and then transported into a cooling area to cool down overnight at room temperature before the casting is shaken off (see figure 2.3).

2.3.1.3 The finishing-stage

Once the casting has cooled down, it is removed from the moulds by grinding it off to remove excess material. Fettling and polishing are also done to produce castings with the desired quality and finish. These can then be inspected for defects such as blow holes, scar marks and correctness of dimensions before being delivered to or collected by the customer or other manufacturing entity which will use the casting to manufacture their products such as valves or automotive components (Hitchener, 2011; Josan, Ardelean, Adelean & Putan, 2021).

The three stages (melting, casting and finishing) covered in the previous section (see figure 2.3) represent the generic processes that the different foundries follow when manufacturing castings. The following section provides an overview of the types of foundry companies that are typically found within the foundry industry.

2.4 TYPES OF FOUNDRIES

Foundries are classified based on the production techniques that are used to manufacture castings as well as the types of metals that are used in the manufacture process (Krieg, 2017). Steel foundries make use of different raw materials to manufacture carbon steel as well as low and high alloy steels. Grey cast iron foundries are more mechanised and manufacture grey coloured castings, whilst malleable iron foundries produce castings that can be easily hammered into the required shape (Szymszal *et al*., 2014). Other foundry types include light metal foundries which produce aluminium and magnesium as well as those that produce copper, brass and bronze.

Chang and Liao (2013), Jain (2014) and Krieg (2017) distinguish between a captive foundry, jobbing foundry and a production foundry.

2.4.1 A captive foundry

The area of consumption of the castings determines whether a foundry can be classified as captive or not. Jain (2014) argues that this term refers to a type of foundry where the castings that have been manufactured by the specific foundry are also consumed by the same organisation. Krieg (2017**)** on the other hand postulates that this type of foundry is established mainly to meet the spare parts needs of the parent organisation that established it.

2.4.2 A jobbing foundry

A foundry is classified as a jobbing foundry if it manufactures a small number of either specialised or less specialised castings for different customers. Jain (2014) points out that these types of foundries are a typical setting in 3rd world countries where there is cheap labour and the level of financial support for companies is less pronounced. Depending on the size, jobbing foundries are labour intensive compared to other types of foundries, employing between 50 and 1000 workers. Most foundries in South Africa have a typical manufacturing set up as shown in figure 2.3 and are classified as jobbing foundries owing to the reasons behind their formation and the markets they serve (NFTN, 2015).

2.4.3 A production foundry

This type of set up is typical of foundries that manufacture components for the automotive sector. The foundry utilises highly mechanised and specialised equipment to manufacture the castings economically by applying mass production techniques. Because of the high level of automation, compared to jobbing foundries, these foundries employ fewer workers and are cheaper to run in the long run (Jain, 2014).

According to Chang and Liao (2013) semi-production foundries represent the most common type of production foundries available worldwide. These types of foundries possess the physiognomies of both production foundries as well as jobbing foundries (Jain, 2014). This means that this type of foundry, depending on the nature of the work concerned can manufacture specialised castings for different customers and can also embark on mass production. Chang and Liao (2013) also point out that semi-production foundries have sections that are fully mechanised or automated for mass production purposes and other sections that have old and obsolete equipment that can be used for small, specialised and less specialised jobs. Figure 2.4 shows a typical process flow for a production foundry.

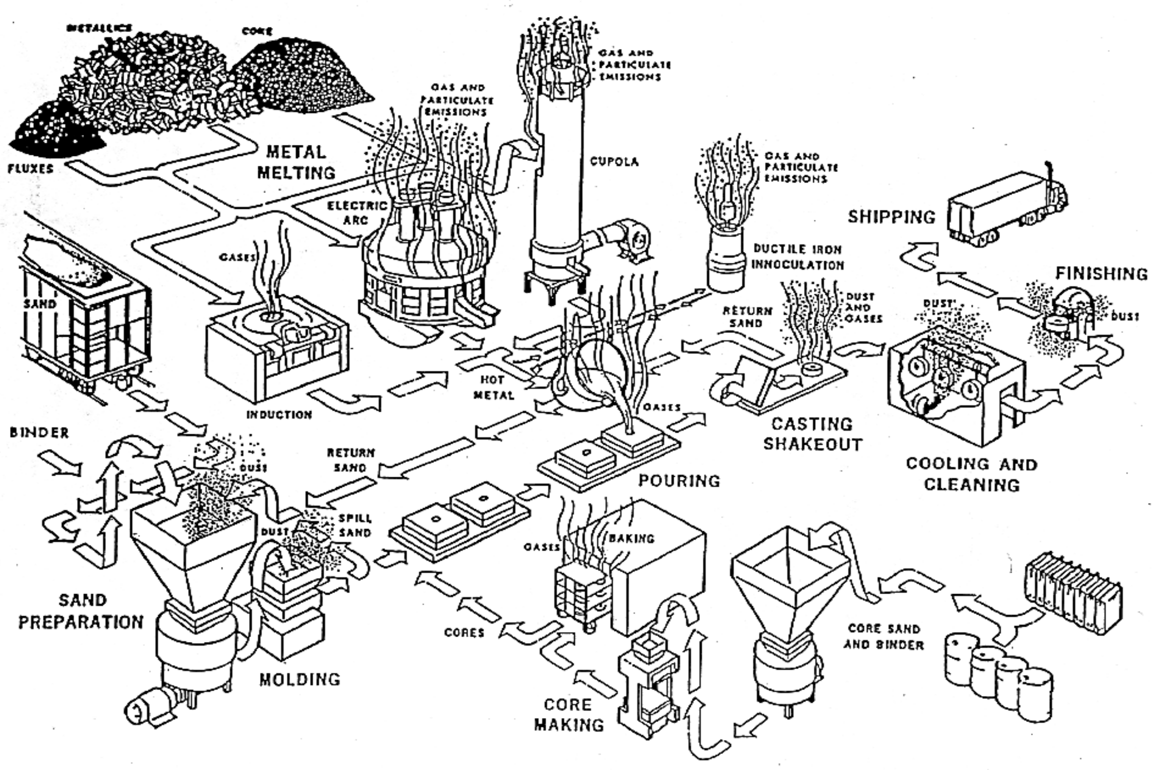

Figure 2.4: Typical process flow for production foundry
Source: SAIF (2015)

Over 42% of South African foundries are classified as production foundries while just over 44% are set up to combine both production and jobbing processes and the rest are jobbing foundries (Lochner *et al*., 2020).

2.5 THE FOUNDRY INDUSTRY SUPPLY CHAIN

Managing relationships with the different stakeholders is important for foundries that seek to have an edge over competition, as suppliers and customers among other stakeholders are key role players within the foundry micro and macro-economic environments. Perdana *et al*. (2018:1822) and Ghadge, Fang, Dani and Antony (2017) posit that effective supply chain management is crucial "in securing competitive advantage and improving operational performance". The supply chain management process for the foundry industry is designed to ensure that the transition of raw materials, through the various transformational production stages, as well as information flow is as smooth as possible to ensure customer requirements are met (Mahto, 2015).

There are three critical elements that serve as the core foundation to effective supply chain management. These relate to enhancing business activities and relationships i) internally within the organisation, ii) with immediate suppliers and iii) with foundry customers. These relationships are discussed in the following section.

i) Internal relationships within the organisation

Perdana *et al*. (2018) point out that internal relationships between the various departments in an organisation are critical in ensuring there is proper cross functional interaction between the different processes. Understanding the needs of the different departments provides an edge for foundry companies as it enhances communication and delivery of the final product to the customers' satisfaction. Yeh, Pai and Wu (2020) believe that a positive internal relationship between and across departments is importance in enhancing coordination on strategy and information sharing which contributes to the competitiveness of organisations. It is therefore essential for foundry companies to ensure the working environment is fertile for healthy internal relationships in order to improve on the core functions of customer satisfaction for the business.

ii) Relationships with immediate suppliers

Rayo and Vizayakumar (2016), posit that the relationship between foundries and suppliers plays an important role in promoting the competitiveness of foundries. The quality of the raw materials supplied and the pricing of the raw materials by the suppliers, help determine the price that foundries can charge for the quality of castings manufactured (Rayo & Vizayakumar, 2016; Tan, 2018) To this effect, it is essential for foundries to build, grow and nurture these relationships (Saarelainen *et al*., 2008). If good quality raw materials are supplied to the foundry, timeously, this increases the chance of good quality castings being produced. In return, this fosters good foundry – customer relationships. This perspective is in alignment with the views of Yeh *et al*. (2020) who argue that a stable buyer-supplier relationship is key to fostering a positive long term relationship and commitment among the parties involved.

iii) Relationships with foundry customers

Foundry customers include Original Equipment Manufacturers (OEMs) such as mining equipment manufacturers, machinery manufacturers, valve manufacturers and automotive manufacturers who make use of castings to manufacture engineering products (Saarelainen, Piha, Makkonen & Orkas, 2009). Yeh *et al*. (2020) posit that organisations cannot operate independent of other external organisations. The authors mention that this type of customer integration focuses on a strategic cooperation between the manufacturers and their customers in order to enhance the quality of decision making based on the needs of the customers. In the context of the foundry industry, a positive relationship with the foundry customers is key in enhancing trust and loyalty which are key to building competitive advantage (Jiwa, Tarigan & Siagian, 2021).

2.6 CHAPTER CONCLUSION

This chapter provided an overview of the global and South African foundry landscape. An indication of the volume of castings manufactured over an 18-year period, for both globally and South Africa, was also provided, signifying how the volumes increased globally whilst there was a decrease for South Africa. Statistics reveal that the number of foundries in South Africa have decreased significantly from 213 to 123, a cause for concern motivating the need for this study. The casting manufacturing process, which included the melting stage, the casting stage and the finishing stage, as well as the different types of foundries (captive, jobbing and production) were also discussed. The chapter concluded by providing an overview of the foundry supply chain and a discussion on how the need to manage relations among the key role players was essential in managing the micro and macro-economic environments for the foundry industry.

The following chapter explores the literature and theoretical perspectives of the concept of sustainable competitive advantage (SCA), relative to the metal casting foundry industry. This was done to provide an expansive scholarly understanding of the micro and macro-economic factors contributing to the closure of foundries in South Africa, as well as provide the foundation for the development of a framework for the sustainable competitive advantage of the foundry industry in South Africa.

CHAPTER 3: LITERATURE REVIEW

CHAPTER 3 - ROADMAP

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3.10	**CHAPTER CONCLUSION**

Figure 3.1: Illustration of layout for Chapter 3

Source: Author's own compilation (2022)

3.1 INTRODUCTION

This study was designed to examine the reasons why South African (local) foundries have been closing down, with the numbers dropping from 450 foundries in the 1980s to 170 foundries in 2014 (Davies, 2015; Mulaba-Bafubiandi, Mageza & Varachia, 2016), further down to 167 in 2018 (Mkansi, Nel & Marnewick, 2018) and then dropping to 123 in 2020 (Lochner *et al*., 2020). Industry research has attributed the closure of local foundries primarily to lack of competitiveness, when compared to their international counterparts, as well as failure to overcome the macro and micro-economic challenges facing the industry (see table 3.1 and figure 3.2) (Davies, 2015; Jardine, 2015b; Samanga, 2013; the DTI, 2014).

This study sought to investigate how the lack of competitiveness for the foundry industry in South Africa contributes to this decline, by focusing on the various drivers for sustainable competitiveness as well as to determine the critical drivers influencing competitiveness within the industry. In this quest, the study explored the effect of the micro and macro-economic drivers on the sustainable competitiveness of firms in the foundry sector, in the light of scholarly philosophies and empirical observations. This was also in partial response to addressing a knowledge gap identified by Kaczmarek (2022) on the need to conduct research on organisational competitiveness at macro, meso and micro levels.

While studies conducted between 2004 and 2020 have shown a 33.9% increase in the number of foundries within the global foundry industry, South Africa has seen a 42% decrease in the number of foundries within the same period (Modern Casting Staff Report, 2020). China remains the global leader in casting production, with volumes increasing from 22 420 452 metric tonnes in 2004 to 51 950 000 metric tonnes in 2020, a 131% production volume increase. The volume of castings produced by South African foundries fell by 17.8% from the 2010 volumes, although estimates indicate that this figure might even be higher (Modern Casting Staff Report, 2020). This is due to an increase in the import of cheaper castings as well as a decrease in demand primarily from the automotive and mining sectors, which contribute around 35% and 32%, respectively, of casting consumption (World Foundry Organisation, 2018; Andreoni, Kaziboni & Roberts, 2021).

The closure of foundries has resulted in a more than 30% decline in employment figures during the same period (Mkansi *et al.*, 2018). The theories and findings that define the direction of this study emanate from extant business and strategic management literature.

A number of studies conducted on foundries have sought to explore total quality management issues (Boikanyo & Heyns, 2019; Mpanza, Nyembwe & Nel, 2013), waste management concerns (Iloh, Fanourakis & Ogra, 2017; Iloh *et al.*, 2019), efficiency in energy consumption (EIUGSA, 2017; Haraldsson & Johansson, 2019; Jain, 2014; Rasmeni & Pan, 2014) and lean manufacturing or production process aspects (Goshime, Kitaw & Jilcha, 2019; Kukreja, Matani & Doifode, 2017; Mishra & Rane, 2019; Srivastava, Tiwari & Singh, 2020). There has been limited emphasis on what drives sustainable competitiveness.

Attempts have been made to investigate competitiveness, however, researchers have focused on examining the effect of a single micro or macro driver on competitive advantage and not sustainable competitive advantage. Cvetkovski (2015) recommends the need for in-depth research on the sustainability of foundries, with the view of identifying opportunities for competitiveness that will revive this matured industry. Haseeb, Hussain, Kot, Androniceanu and Jermsittiparsert (2019) recommend the need for research that explores other micro and macro-challenges, beyond just the social and technological factors on the ability of organisations to gain SCA. On the other hand, Bandaranayake and Pushpakumari (2021), and Barros *et al*. (2019) recommend future research on SCA as well as the formulation of a framework that could be used to measure SCA. This study serves as groundwork in the formulation of such a framework. Figure 3.2 illustrates the statement of the problem as well as the reasons justifying the need for this study to be conducted.

What is the problem?

The problem is that metal casting foundries in South Africa are closing down because of micro and macro-economic circumstances (Davies, 2015; Jardine, 2015b, Mkansi *et al*., 2018; Lochner *et al*., 2020)

Why is this a problem?

This threatens economic growth, direct and indirect employment, industry sustainability as well as negatively affects raw material (casting) supply to original equipment manufacturers in South Africa

Drop in about R9 million contribution to GDP	*Loss of direct (foundry related) and indirect (OEM related) employment opportunities*	*Reduced export opportunities for the foundry industry*	*Lack of competitiveness of OEMs owing to casting raw material supply challenges*	*Increase in foreign foundry players supplying the South African market*	*Loss of skill and expertise as 'employees' leave the industry*
(Davies, 2015; Viviers, 2016; Mkansi et al., 2018)	(Mkansi et al., 2018; Lochner et al., 2020)	(Phele *et al*., 2005; Prairie Industry Markets, 2020)	(Mpanza et al., 2013; Cunningham, 2013; Jardine, 2015b; Nyakabawo, 2017; Dlambulo, 2019)	(Davies, 2015; Dlambulo, 2019; Lochner et al., 2020)	(Mpanza & Nyembwe, 2014; Mulaba-Bafubiandiet al., 2016)

Significance of the study

The development of a framework for the sustainable competitive advantage of the foundry industry in South Africa will assist in providing a blueprint for consideration when formulating strategies in line with both the important and critical drivers for SCA thereby mitigating against closures.

Figure 3.2: Statement of the problem and motivation of the study

Source: Authors' own compilation (2022)

The primary objective of this study is to develop a framework for the SCA of the foundry industry in South Africa. The secondary objectives include:

i) the identification from literature, of the micro and macro-economic drivers for the SCA of foundries in South Africa,

ii) benchmarking the perceptions of stakeholders within the foundry industry on SCA against the micro and macro-economic drivers identified from literature and

iii) making recommendations on strategies to enhance the SCA for foundries in South Africa.

Table 3.1 provides a research matrix depicting the research problem and objectives informing this study.

Table 3.1: Research matrix depicting the research problem and objectives

Research Problem	Primary Objective	Secondary Research Objectives
The problem is that metal casting foundries in South Africa are closing down because of micro and macro-economic circumstances (Davies, 2015; Jardine, 2015b); the DTI, 2015; SAIF, 2015; Mkansi, Nel & Marnewick, 2018; Lochner *et al*., 2020) **Chapter 1, Chapter 2 and Chapter 3**	To develop a framework for the sustainable competitive advantage of the foundry industry in South Africa **Chapter 3, Chapter 5, Chapter 6 and Chapter 7**	To identify from literature the micro and macro-economic drivers influencing the sustainable competitiveness of foundries in South Africa. **Chapter 3, Chapter 5, Chapter 6 and Chapter 7**
Why is this a problem?		To benchmark the perceptions of stakeholders within the foundry industry on sustainable competitive advantage against the macro and micro economic drivers identified from literature. **Chapter 3, Chapter 5, Chapter 6 and Chapter 7**
This threatens economic growth, direct and indirect employment, reduces casting export opportunities and negatively affects raw material (casting) supply to original equipment manufacturers in South Africa (SAIF, 2015, the DTI, 2015). **Chapter 2 and Chapter 3**		To make recommendations on strategies to enhance the sustainable competitive advantage for foundries in South Africa. **Chapter 3 and Chapter 7**

Source: Author's own compilation (2022)

This chapter aims therefore, to a) explore and describe the theoretical perspectives on strategy, SCA and micro and macro drivers for sustainable competitive advantage, b) indicate knowledge gaps in the literature by reviewing empirical studies on SCA strategy orientations and c) identify the inter-connectedness of the various theories in informing how can adopt multiple strategies that enhance SCA. The next section outlines the delimitations and focus of the study.

3.2 RESEARCH FOCUS

This study followed a cross-sectional time horizon (Saunders et al., 2016) and focuses on the South African foundry industry, with the aim of developing a framework for the sustainable competitive advantage of the industry. The sampling frame included top, middle and lower-level management, as well as non-management employees who dealt directly with either foundry suppliers or foundry customers. The non-management employees had to be involved in procurement, project work, sales and marketing, technical and quality management, as well as casting manufacturing operations. The different tiers of employees selected were deemed as having an adequate understanding on the levels of competitiveness of their respective companies.

The study population was also limited to only South African registered foundries that are also members of SAIF, as permission to conduct the study had to be sought from this industry body. Furthermore, the study envisaged to contribute substantially towards the body of knowledge by seeking to fill the void in literature, as discussed in chapter 1, by identifying and examining how the micro and macro drivers for sustainable competitiveness could be used to develop an SCA framework. This framework provides future direction on the selection, formulation, and implementation of strategies that foundry companies can adopt, in order to enhance their sustainable competitiveness and curtail closures. This is also in line with recommendations by Meneses (2021), and Grainger-Brown and Malekpour (2019) on the need for research that is earmarked at developing tools and frameworks that guide organisational competitiveness. The next section reviews the definition and concept of strategy and provides an overview of the theoretical foundations of the study.

3.3 DEFINITION OF STRATEGY

One of the objectives of this study was to make recommendations on strategies that will enhance the sustainable competitive advantage for foundries in South Africa. To achieve this feat, a thorough understanding of the concept of strategy is critical.

The concept of strategy has been discussed extensively in literature, with different authors coining different definitions in line with their fields and areas of expertise. Nickols (2016a:1) argues that despite this "plethora" of definitions, all of them seem to agree on the principle that strategy "bridges the gap between ends and means". Asante and Adu-Damoah (2018) posit that a firm's competitive advantage begins with the process of strategy formulation and implementation. Table 3.2 provides an overview of some of the definitions of strategy, as articulated by various proponents of strategy and strategy formulation.

Table 3.2: Definitions of strategy

Definition	**Source**
Strategy, from a competitiveness perspective is "a broad formula for how a business is going to compete, what its goals should be, and what policies will be needed to carry out those goals." Key decision factors like price, advertising, quantity, and quality are at the discretion of the organisation.	Porter (1980)
Strategy is a tactical plan that an organisation can use to overcome its competitors.	Mintzberg (1987)
Strategy is the business's plan for competing effectively. Since it can be assumed that competing successfully entails having a sufficient performance; performance is also taken into consideration as a factor determined by strategy.	Barney (2001)
Strategy refers to a general plan of action for fulfilling the aims and objectives of an organisation.	Nickols (2016a)
Strategy is the framework that directs decisions that affect an organisation's nature and course.	Ritson (2016)
Strategy is defined as a plan of action that incorporates the interdependence of complex management choices that are intended to attain certain goals	Tynchenko *et al*. (2019)

Source: Author's own compilation (2022)

Based on the set of definitions presented in table 3.2, and in line with this study, it is clear that a strategy provides direction for a business and determines how the goals of the business will be met in ways better than could be achieved by competition. From this perspective, the researcher proposes to define a strategy as;

> *"a road map of measures which inform decisions that an organisation and/or its stakeholders make in order to achieve set targets better than its rivals in the immediate, medium and long-term horizon".*

This definition takes a business competitiveness angle in line with the study's aim of developing a framework which will inform strategy adoption and implementation in enhancing the SCA of the foundry industry in South Africa.

The next section discusses the concept of SCA as a strategy for overcoming competition over extended periods of time during the life cycle of an organisation.

3.3.1 Definitions of sustainable competitive advantage

Parola, Risitano, Ferretti and Panetti (2016:4) argue that although the concepts of competitiveness and competitive advantage have been widely used interchangeably to refer to the ability by firms to outsmart rivals, the concepts have also been used to refer to "rivalry among nations" (Porter, 2008) and "business ecosystems" (Mäntymäki & Salmela, 2017). The terms competitiveness and competitive advantage are very often "not well-defined or understood despite their persistent use by politicians, economists, business people, media and academics" (Aiginger & Vogel, 2015:497; Sigalas, 2015:3).

In his seminal work, Barney (1991) differentiated competitive advantage from sustained (sustainable) competitive advantage. According to the author, competitive advantage relates to the ability of an organisation to "implement a value creating strategy not simultaneously being implemented by any current or potential competitors" (Barney, 1991:102; Barney & Clark, 2007; Wijayanto, Suhadak & Nuzula, 2019). This is in line with Porter's (1985) assertion that competitive advantage emanates from the ability of an organisation to build superior value for its customers.

Over the years, the concept of competitiveness has slowly migrated into a discussion about the SCA of firms and different scholars have proposed different definitions of SCA. These are shown in table 3.3.

Table 3.3: Definitions of sustainable competitive advantage

Definition	Source
Sustainable competitive advantage relates to the capacity of a company to execute the series of processes required to outperform the competition in terms of costs in an effective and distinctive manner, providing customers with value that is distinguished.	Porter (1985)
A firm is said to possess sustained competitive advantage when it is adopting a value-creating strategy that is not being adopted at the same time by any present or potential rivals, and when other companies are unable to replicate the advantages of this plan, it will have succeeded.	Barney (1991)
Sustainable competitive advantage is the long-term benefit of implementing a special value-creating strategy that is not being executed simultaneously by any existing or potential competitors, as well as the impossibility to duplicate the advantages of this approach.	Hoffmann (2000)
A firm has SCA when it is outperforming the marginal firm in its industry in terms of economic value creation and when other businesses are unable to replicate the advantages of this tactic.	Barney and Clark (2007)
Sustainable Competitive Advantage is a strategy for utilising new, unique talents to turn the constrictive impacts of resource shortage into possibilities for sustainable growth.	Brown, Chilcot and Carmichael (2011)
A sustainable competitive strategy is demonstrated if a competitive strategy produces financial results that are above average at least twice throughout the industry life cycle.	Lozano, Carpenter and Huisingh (2015)
Sustainable competitive advantage is a means of describing how a company's sustainability strategy has contributed to its long-term success in the market; the capacity to execute tasks in a unique way to provide customer value and maintain a premium price.	Ojo, Mbohwa and Akinlabi (2015)
Sustainable competitive advantage alludes to a company's resources, qualities, or skills that are difficult to match or surpass, as well as its ability to give it a long-term advantage over rivals.	Gomes and Romao (2019)
Sustainable competitive advantage is a situation of positional supremacy where a firm has a successful strategy that is hard to imitate.	Wijayanto, Suhadak and Nuzula (2019)

Source: Author's own compilation (2022)

The difficulty in understanding the concept of SCA stems from the difficulty in establishing a universally acceptable definition of SCA (Hakkak, Mohammad & Ghodsi, 2015; Lozano, Carpenter & Huisingh, 2015). Some researchers have argued that SCA does not exist (Beal, 2001) or is only temporary (McGrath, 2013), while others have questioned the quantification of the time frame that defines the sustainability of competitive advantage with terms such as “lasting” and “long term” regularly used in literature (Beal, 2001; Ojo & Mbohwa, 2015; Mcwilliams, 2016; Rezaee & Jafari, 2016). There is also a belief that the term SCA is “superficially evident and requires virtually no explanation” hence little effort has been put in trying to define it “explicitly” (Hakkak *et al*., 2015: 24).

Research by Arbi, Bukhari and Saadat (2017) put forward an argument that, if organisational leadership cannot identify sources of competitive advantage for their organisations, they may face challenges in sustaining it. This study seeks to further argue the need to identify and understand micro and macro-economic drivers for SCA within the context of the foundry industry in South Africa in order to alleviate the problems associated with lack of competitiveness and associated closures.
Based on the sets of definitions provided in table 3.3, the researcher proposes the following definition as the basis for this study. Sustainable competitive advantage is defined as

> *“a pro-business superiority strategy that allows a company to out-compete rivals by offering goods and / or services to customers in a manner that is difficult to replicate within the same window period of incessant advantage”*

In order to better understand competitiveness strategy formulation, Porter proposes an analysis tool that leaders in business should consider. The following section discusses the competitive forces model, developed by Porter in 1979 to help assess organisational competitiveness and the environmental forces impacting on this competitiveness (Porter, 2008).

3.3.2 The competitive forces model

Porter (2008) recommends the five forces model as a lynchpin that provides organisations with a better view of their micro and macro environments, and used this model to explain how competition influenced the attractiveness and profitability of firms. As illustrated in figure 3.3, the competitive forces model identified five forces which include: i) threat of new entrants, ii) threat of substitute products, iii) bargaining power of buyers, iv) bargaining power of suppliers and v) rivalry among existing competitors. According to

Porter (1985), these forces drive strategy formulation, and it is important for companies to explore how these forces could impact on their abilities to compete.

In the context of South African foundries, all the competitive forces are relatively applicable to the industry. The chances of new players entering the industry are, however, low owing to the high input costs and level of investment in resources, compliance to legislation, and equipment needed to set up and run a foundry. In respect of the other forces, foundries should be able to identify the micro and macro drivers enhancing SCA, in order to manipulate these competitive forces into promoting industry competitiveness.

Figure 3.3: The competitive forces model
Source: Porter (1985)

Hole and Bhaskar (2019) provide a summary of the features that characterise the competitive forces model. As indicated in table 3.4 there are a number of features that explain the existence of the competitive forces in the context of South African foundries. The rivalry among competitors within the foundry industry exists when there are companies manufacturing similar products, foundry companies select and implement similar strategies, there is low industry growth and the barriers for new entry are low.

The threat of new entrants exist when the market is saturated with patented products making it difficult for new foundries to penetrate the market, there is a need for specialised technology that new players cannot afford, the government regulations are prohibitive, there is a requirement for high levels of investment to set up a plant, the switching costs by customers is high meaning there is a low likelihood that they would switch suppliers and there are problems associated with securing raw materials and accessing an effective distribution channel is a challenge.

The threat of substitute products within the foundry industry, exists when there are alternative products available in the market and customers are likely to buy them depending on perceived benefits. The bargaining power of suppliers exists when foundry companies can negotiate and influence suppliers to lower prices for raw materials better than their competitors can. The bargaining power of customers exists when foundry companies are capable of charging premium prices, without the fear that their customers will switch suppliers. This is a situation typical of a monopoly of supply.

Table 3.4: Competitive forces for the foundry industry

Rivalry exists when	**Rivalry among competitors**	**Entry barriers exist when**	**Threat of new entrants**
	Foundry companies manufacture similar types of products		Castings in the market are patented
	Foundry companies implement similar strategies		There is need for specialised technology and infrastructure
	There is low industry growth		Government regulations are prohibitive
	Low barriers for new exits		Initial investment is high
Threat of substitute products exists when	**Threat of substitute products**		There are high costs for switching of loyal customers
	There are alternative products with materials different to castings that are capable of fulfilling the same requirements		Problems in securing raw materials or difficulty in accessing effective distribution channels
Bargaining power exists when	**Bargaining power of customers**	**Bargaining power exists when**	**Bargaining power of suppliers**
	Foundry companies are able to charge premium pricing to their customers		Foundry companies are able to negotiate for better raw material pricing from suppliers

Source: Adapted from Hole and Bhaskar (2019)

The next section discusses the two sets of theoretical perspectives informing SCA for this study. The first being the “traditional” generic strategies model developed by Porter, as well as the “cotemporary” views which include the resource (Wernerfelt, 1984; Barney, 1991; Peteraf, 1993; Prahalad & Hamel, 1990), market (Peteraf & Bergen, 2003), knowledge (Tiwana, 1999), relational (Dyer & Singh, 1998) and capability-based views (Grant, 1991; Amit & Schoemaker, 1993) (see table 3.5).

3.4 THEORETICAL PERSPECTIVES ON COMPETITIVE ADVANTAGE

The theoretical frameworks available in literature attribute the firm’s ability to attain competitive advantage on the capacity to implement strategies that drive low cost, provide differential advantage and promote better management of internal and external resources (Mabila, van Biljon & Herselman, 2017; Rodriguez, Ricart & Sanchez, n.d.). How well a firm is able to maintain a low-cost base and better utilise its resources than competition, determines the level of competitive advantage a firm has. Hakkak *et al*. (2015) also argue that the size of the target market, restrictions on the powers of competitors, and access to resources and customers determine the ability for firms to gain SCA.

Literature presents the views of various authors on theories that explain the development and sustainability of a firm’s competitive advantage. These theories are grounded in various seminal works and include the generic strategies model (Porter, 1985), the resource-based view (RBV) (Barney, 1991; Peteraf, 1993; Prahalad & Hamel, 1990; Wernerfelt, 1984); the market-based view (MBV) (Peteraf & Bergen, 2003); the knowledge-based view (KBV) (Tiwana, 1999); the relational view (RV) (Dyer & Singh, 1998) and the capability-based view (CBV) (Grant, 1991; Amit & Schoemaker, 1993). Table 3.5 identifies the key theoretical perspectives informing this study.

Table 3.5: Theoretical perspectives on competitive advantage

<table>
<tr><th></th><th></th><th>Theoretical Perspective</th><th>Source of Competitive Advantage</th><th>Proponent(s)</th></tr>
<tr><td rowspan="3">1</td><td rowspan="3">Traditional view</td><td rowspan="3">Generic Strategies</td><td>Cost leadership</td><td rowspan="3">(Porter, 1985; Tanwar, 2013; Cheng, 2019)</td></tr>
<tr><td>Differentiation</td></tr>
<tr><td>Focus Strategy</td></tr>
<tr><td>2</td><td rowspan="10">Contemporary Views</td><td>Resource Based View (RBV)</td><td>Firm Resources</td><td>(Assensoh-Kodua, 2019; Barney, 1991; Peteraf, 1993; Prahalad & Hamel, 1990; Wernerfelt, 1984)</td></tr>
<tr><td>3</td><td>Market Based View (MBV)</td><td>Market and Industry factors</td><td>(Peteraf & Bergen, 2003)</td></tr>
<tr><td>4</td><td>Knowledge Based View (KBV)</td><td>Knowledge, know-how, intellectual assets and competencies</td><td>(Rezaee & Jafari, 2016)</td></tr>
<tr><td rowspan="5">5</td><td rowspan="5">Relational view (RV)</td><td>Interorganisational relationships</td><td rowspan="5">(Kobayashi, 2014; Dyer & Singh, 1998)</td></tr>
<tr><td>Relation specific assets</td></tr>
<tr><td>Knowledge sharing routines</td></tr>
<tr><td>Effective governance</td></tr>
<tr><td>Complementary resources / capabilities</td></tr>
<tr><td>6</td><td>Capability Based View (CBV)</td><td>Firm capabilities</td><td>(Grant, 2001; Amit & Schoemaker, 1993)</td></tr>
</table>

Source: Author's own compilation (2022)

Solesvik (2018) argues that while the theories on competitive advantage have substantially advanced the discipline of strategic management as well as the analysis of sustainable competitive advantage (Wang, 2014), the KBV and the CBV are an extension of the RBV (Solesvik, 2018; Wang, 2014). The knowledge and firm capabilities attributable to these two theories can also be argued as being resources that are at the disposal of the firm in question. The development of the more recent RV theory significantly addresses aspects covered by the former two theories but also introduces the concept of networking and inter-organisational relationships as a source for sustainable competitive advantage.

While the generic strategies model and the RBV take an inside-out perspective to attaining competitive advantage, the MBV, KBV, RV and CBV adopt an outside-in perspective by placing more emphasis on how organisations can utilise the macro environment to gain competitive advantage. These theories therefore form the basis of the study's framework in deciphering the inter-connectedness between the sources of competitiveness within the micro and macro-economic environment and the foundries' attempt to gain sustainable competitive advantage. The following section discusses the first of the competitive advantage theories, Porter's generic strategies.

3.4.1 Porter's traditional generic strategies on competitive advantage

Whilst a variety of parameters can indicate the sustainable position of a firm, "a majority of studies seem to agree on the proxy suggested by Porter in 1980" (Songling, Ishtiaq & Anwar, 2018:6). In his seminal work of 1980, Michael Porter developed and outlined three approaches (refer to table 3.5) which he purported could be used by firms to create a "defendable position" which would allow them to outperform competition (David, 2019).

According to Porter (1985), an organisation can achieve "competitive advantage" over its rivals if it can reduce production or distribution costs to values lower than those of other firms within its market. David (2019) also argues that cost leadership can be achieved through the simplification of products and the manufacturing process, in a way that capitalises on the economies of scale better than competitors can. In agreement, Ogutu and Mathooko (2015) note that cost leadership entails the reduction and controlling of costs in an effort to gain sustainable competitive advantage, by improving organisational efficiency.

Vahdati, Nejad and Shahsiah (2018), in a study done on the effects of generic strategies on competitive advantage, point out that, as long as firms are able to keep their production and operational costs lower than what their competitors can, they will be able to make use of a cost leadership strategy. These findings corroborate Cheng's (2019) findings on toll manufacturing companies in Kenya, where it was found that there was a positive and significant correlation between cost leadership strategy implementation and sustainable competitive advantage.

The foundry industry in South Africa is generally labour and energy (electricity) intensive (Ettmayr & Lloyd, 2017; Mulaba-Bafubiandi, Mageza & Varachia, 2016; Stefana, Cocca, Marciano, Rossi & Tomasoni, 2019), as such, the high employment and electricity costs tend to weigh heavily against the implementation of cost leadership strategies. The availability of cheap imports of castings and casting products from other countries also adversely affects the competitive sustainability of firms, as local foundries struggle to match foreign competitor pricing (Davies, 2015). The application of cost leadership strategies, therefore, presents serious challenges in several respects, owing the above-mentioned input requirements and also the difficulty in reducing production costs because of the ageing infrastructure typically found in most foundries (the DTI, 2015; Jardine, 2015b; Saarelainen *et al*., 2008).

Porter's cost leadership theory and the studies done by Cheng (2019) and David (2019), however, fall short as they do not take into cognisance the dynamic nature of the business environment. Organised labour has greater bargaining power for higher wages (Brändle & Goerke, 2013) and government regulation on minimum wage (Chasomeris & Olufemi, 2015) make it difficult for firms to control or reduce these costs. Karyani and Rossieta (2018) argue that the cost leadership strategy works in situations where customers are price sensitive and the cost benefits for the cost savings are clear.

The second strategy relates to market focus (focus strategy). The fundamental tenet of the focus strategy is that an organisation is better equipped to cater to a specific market segment as compared to firms that attempt to serve a broader range of customers (Salavou, 2015). This strategy is typically used by small firms with limited resources and allows them to apply either a differentiation or focus strategy to only a market niche. According to Karyani and Rossieta (2018), for the cost leadership strategy to be successful, the organisation should have tight cost control mechanisms, a considerable advantage of the market share or preferential access to skilled labour and raw materials – elements that seem to elude foundry companies in South Africa. A focus strategy, on the other hand, enables firms to gain competitive advantage "through efficiency rather than effectiveness" by better meeting the needs of the targeted market (Chasomeris & Olufemi, 2015).

The difficulty of implementing a focus strategy in developing countries, however, lies in the lack of economies of scale, particularly for foundries that operate under an increasingly difficult economy with a number of original equipment manufacturers, such as automotive and valve companies, preferring to procure cheaper imports, owing to increased global competition (Mashilo, 2019; Statistics South Africa, 2018). As a result, this strategy alone would be difficult to implement and operationalise effectively.

The creation of uniqueness in the product or service delivered, drives the differentiation strategy of a firm (Job & Nyongesa, 2016; Okeke & Onyemachi, 2018). According to Porter (2012), for a differentiation strategy to succeed, the firm's customers should be willing to pay a premium price for the "differentiation feature". Kaleka and Morgan (2017), and Khan, Yang and Waheed (2018) support this view and posit that a differentiation strategy will only work if the firm is able to charge a higher price than its competitors based on its product design, brand image, technology and unique service provision, all of which are not easily mimicked by competition.

Cheng (2019), however, argues that differentiation can be achieved; firstly, through vertical differentiation, where customers show and rank their preference on products using general characteristics; secondly, horizontal differentiation, in which "taste preferences" are used to differentiate between competitor products and; lastly, mixed differentiation, where both quality and taste are used to differentiate and show preference for products. Widuri and Sutanto (2019) argue that companies that employ a differentiation strategy are required to understand their customer tastes and preferences better than their competitors do.

Both differentiation and focus strategies are, however, still a possibility for implementation by foundries in South Africa. The vast customer base for casting materials includes mining, automotive, manufacturing, railways, agriculture, and infrastructure industries (Jardine, 2015b). Foundry companies that opt to adopt a differentiation strategy would position their products as being different from competition in terms of attributes such as quality, performance, strength, and originality of structural composition. However, this would come at a cost to the company in terms of branding and advertising, and putting measures to ensure rival companies do not imitate this strategy (Fessehaie & Rustomjee, 2018; Gomes & Romão, 2019).

A focus strategy, on the other hand, would entail the identification of a niche or single market to focus on. This means that a foundry could manufacture, for example, casting suitable for only valve manufacturing or the automotive sector and not service all markets available. The economic difficulties facing most companies in South Africa (Oudhia, 2015;

Iloh *et al.*, 2019) make diversification an attractive alternative for firms seeking to balance their portfolio of product provisions.
Porter’s works on the concept of competitive advantage have not been without criticism. Yusoff, Jia, Azizan and Ramin (2017) argue that state owned institutions and monopolistic companies could still experience competitive advantage and earn higher profits without applying any of Porter’s generic strategies, because of their dominance or support from the government. McGrath (2013:4), on the contrary, believes that in this day and age “achieving a sustainable competitive edge is nearly impossible and should be treated as an exception and not the rule, with transient advantage being the new norm” in the competitiveness space, given the way the business environment has evolved.

Stoyanova and Angelova (2018), and McGrath (2013:4), in separate studies on competitive advantage, argue that the dynamic nature of the competitive environment means that organisations cannot afford to spend long periods of time formulating single long-term strategies, but “need to constantly start new strategic initiatives and exploit many transient competitive advantages at a go”.

Despite the criticisms levelled at the generic strategies model (Yusoff *et al*., 2017), many authors continue to acknowledge the role that these models have played, in the fields of economics and business management, in bringing an understanding of the aspect of competition and competitive advantage for firms, industries and nations (Nickols, 2016b; Widuri & Sutanto, 2019). The generic strategies model (see table 3.5) will play a significant role in the formulation of a SCA framework for foundries in South Africa, since the building blocks of these models directly or indirectly influence the competitiveness of organisations and also provide a starting point for the analysis and formulation of strategies that potentially drive sustainable competitiveness.

The following section discusses the contemporary views on competitive advantage which include RBV, MBV, KBV, RV and CBV (see table 3.5), whose considerations influence strategy formulation to enhance firm competitive advantage (Wang, 2014; Nickols, 2016b).

3.4.2 Contemporary views on competitive advantage

According to Wang (2014) for a firm to attain competitive advantage within an industry, it is essential that the qualities that enable it to outperform its competitors, are developed. As South African foundries compete with both local and international firms, competitive attributes should be identified, developed and used in the formulation of strategies that give them the edge and enhance their sustainability and competitiveness within the metal casting space (Kaningu, Warue & Munga, 2017).

As indicated in table 3.5, various authors identify key contemporary theories that underpin research on competitive advantage. Delbari, Ng, Aziz and Ho (2016), Tescari and Brito (2018) and Zhao, Meng, He and Gu (2019) argue that in order to identify the key drivers for competitiveness and attain a level of competitive advantage, three basic theory streams can be used, namely the RBV, MBV and the RV. Cheng (2019) and Pulaj, Kume and Cipi (2015) on the other hand, view the use of generic strategies as the foundation for identifying these drivers from an organisational perspective. Solesvik (2018:6) points out that, in order to "improve our understanding of strategic management and competitiveness, it is important for researchers to merge debates among resource-based scholars, knowledge-based view proponents and capability-based view researchers". An overview of these theories is discussed in the next section.

3.4.2.1 The resource-based view (RBV)

The RBV theory was coined by Wernerfelt in 1984 and augmented by Barney in 1991 (Wernerfelt, 2020) (see table 3.5). These researchers viewed a firm as a collection of resources that are put together for the benefit of the business (Wang, 2014). According to this view, an organisation's SCA is determined by the presence of unique resources, capabilities and knowledge that it has at its disposal over its rivals (Wang, 2014; Assensoh-kodua, 2019). In a study conducted by Kaningu *et al*. (2017), it was found that the ability of a firm to acquire and retain scarce resources better than its competitors, forms the basis of this theory's argument and provides better competitive advantage as opposed to the market and capability-based views. Kaningu *et al*. (2017) also point out that this 'inside out' perspective can only benefit a firm if the resources are 'inimitable to competition" and if the firm can fully utilise these resources to its benefit.

This theory differs from the CBV which does not distinguish between scarce or inimitable resources and those that are common to all organisations (Rezaee & Jafari, 2016). The CBV prioritises resource allocation abilities over the owning of resources that are rare to competition. Madhani (2007) cautions that not all resources within a firm are strategic, hence not all resources can offer a firm competitive advantage. Madhani (2007) and (Heriyanto, Febrian, Andini, Handoko & Suryana, 2021) cite the seminal work by Barney (1991) who argued that the resources that offer a firm competitive advantage must fulfil the '*VRIN*' criteria of **V**aluable, **R**are, **I**nimitability and **N**on-substitutability by competition (as illustrated in table 3.6). Srivastava, Franklin and Martinette (2013) and Mahdi and Nassar (2021) however, argue that *VRIN* resources alone cannot offer competitive advantage unless organisations have capabilities to utilise these resources to its benefit. To this effect, it is important for the firm to identify and take advantage of those resources that offer an edge over competition if the organisation seeks to obtain and sustain a competitive advantage.

Table 3.6: The *VRIN* criteria for competitive advantage

Resource characteristic	Definition of characteristic
Valuable	Provides strategic value to the firm
Rare	Difficult to locate among the organisation's current and potential competitors
Inimitability	Copying or imitating the resources will not be feasible
Non-substitutability	Cannot be substituted by another alternative resource

Source: Madhani (2007)

Whilst components of the RBV theory can be applied largely to the service industry as well as to some manufacturing concerns, the non-substitutability of firm resources, particularly within the South African foundry context, with an already ageing infrastructure (SAIF, 2015) and a high mobility of expertise and employees within companies makes this difficult to achieve. The dynamism created by globalisation, the 4th industrial revolution (4IR) (Letsoko & Pillay, 2019) and the internet of things (IoT) (Lupton, 2020) means that most companies are now able to "copy or imitate" some of these techniques and resources can be "bought" to enhance the firms' competitive advantage. This therefore questions the 'sustainable competitive advantage' advocated for by this theory and raises the point of 'transient competitive advantage' as articulated by McGrath (2013).

Figure 3.3 provides a typical example of *VRIN* resources for South African foundries depicting resources which would offer SCA. These resources include brand equity, cohesive leadership, patent ownership and well-kept trade secrets (Kaziboni, Rustomjee & Steuart, 2018), ownership of unique technology, company values and reputation in the eyes of the customers and suppliers, trust and loyalty-based relationship with customers as well as ownership of physical assets such as machinery and equipment (Mkansi *et al.*, 2018; Phele *et al.*, 2004).

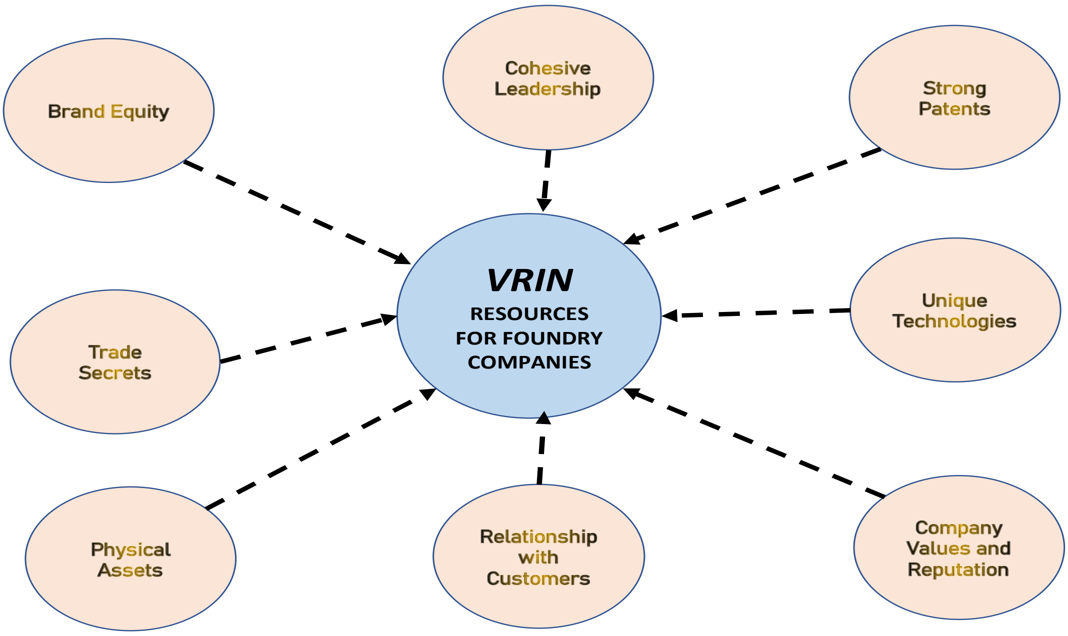


Figure 3.4: *VRIN* resources for South African foundries
Source: Author's own compilation (2022), adapted from Collis and Anand (2019), Srivastava *et al.* (2013).

The *VRIN* resources offer an important and systematic way of understanding the value of firm resources and how these can be used to provide organisations with competitive advantage.

The following section discusses the market-based view perspective of SCA.

3.4.2.2 The market-based view (MBV)

The MBV perspective (see table 3.5) posits that the performance of a firm is primarily determined by industry as well as external market factors (Wang, 2014). According to Kaningu *et al*. (2017) and Wang (2014) an organisation's sources of market power play a crucial role in determining its relative performance within the industry. Kaningu *et al*.

(2017) also argue that a firm's competitive advantage can be attributed to how it is viewed by the market and industry in which it operates as well as its ability to take advantage of entry barriers that keep other firms at bay and therefore protect profit margins.

Kaningu *et al*. (2017)'s views are in alignment with Porter's competitive forces model, which promotes the consideration by firms, of the threat of new entrants, substitutes and bargaining power of suppliers and customers (external market factors) as well as rivalry among competitors. This 'firm introspection and industry or market extrospection' is essential in determining the strategies that firms need to formulate to gain sustainable competitive advantage (Huang, 2019).

This theory finds relevance in this study as it defines the need for foundry companies to identify and understand the industry within which they operate as well as the external market factors that either threaten or support their survival. The capital-intensive nature of the foundry industry (Jain, 2014) and the high level of investment in equipment required (Chang & Liao, 2013) are a deterrent and therefore a barrier to entry by other potential firms seeking to join the industry.

Besides firm resources and the operating market environment, institutional knowledge, through the knowledge-based view lens has also been identified as critical in the creation of competitive advantage (see table 3.5).

3.4.2.3 The knowledge-based view (KBV)

The KBV theory is grounded in the seminal works of Kogut and Zander (1992) and was further developed by Grant (1996:109) who argued that there are "various types of knowledge relevant to the firm" which organisations can make use of to enhance their competitiveness. These types of knowledge include technical, customer-related, managerial and product-related knowledge. This theory, according to Cooper, Pereira, Vrontis and Liu (2020) also identifies organisational knowledge as being the most strategically important antecedent of firm innovativeness, performance and competitiveness. Herden (2020) mentions that the integration and management of knowledge is a management function which, if executed well, can bolster the competitive advantage of a firm.

Organisations that effectively ‘create, capture, distribute and use knowledge’ better than competition position themselves to perform better than their rivals (Rezaee & Jafari, 2016). Knowledge is also viewed as an intangible resource that does not depreciate in a way similar to ‘traditional’ resources and which firms can develop over time. Grant (1996) identified the transferability of knowledge within the firm, capacity and efficiency of knowledge aggregation, appropriability (receipt of return equal to value created by the resource) and specialisation (by individuals in areas of knowledge) as essential characteristics that promote the use of knowledge to create SCA for firms.

The foundry industry in South Africa has been characterised by an ageing workforce (Davies, 2015; Jardine, 2015a), this demonstrates ingrained institutional knowledge that the industry possesses which ultimately, if well managed, would be crucial in spearheading competitive advantage for the industry. The next section discusses the RV perspective on attaining SCA (indicated in table 3.5).

3.4.2.4 The relational view (RV)

According to the RV theory, as developed by Dyer and Singh in 1998, the networking between organisations is crucial in the creation of relationships that promote sustainable competitive advantage which companies outside this network cannot attain (refer to table 3.5) (Tescari & Brito, 2018). This ability by firms to network and form alliances with ‘supplier and buyer partners’ presents an opportunity to make supernormal or additional profits (relational rents) through the exchange of knowledge and “idiosyncratic” resources, combining complimentary capabilities and employing effective governance measures that enable transactional costs to be lowered better than any single firm can achieve (Dyer & Singh, 1998) (see table 3.5).

The dynamic nature of the business environment (Hans, 2018) and globalisation effects where suppliers or buyers can create multiple alliances and trade outside the ‘restrictions of the network’ (Khumalo & van der Lingen, 2018) makes this theory difficult to operationalise in developing countries where sales and market share are crucial in driving the volumes and stricter measures and penalties are promulgated on possible collusions or anti-competitive behaviours (Roberts, 2017). Despite this difficulty, the theory still finds relevance in explaining how its variations from both the RBV and the MBV make for crucial considerations on how foundry companies can use alliances as vehicles toward gaining sustainable competitive advantage.

3.4.2.5 The capability-based view (CBV)

In their seminal works, Grant (1991) and Amit and Schoemaker (1993) developed the capability based view which recognised firm resources as being 'capabilities that cannot be procured but were developed over time, thereby offering firms competitive advantage (table 3.5). Capabilities in this instance are referred to as a " firm's capacity to deploy resources, usually in combination with organisational processes to effect a desired end" – such as SCA (Amit & Schoemaker, 1993:35). Donnellan and Rutledge (2019:4) point out that capabilities are a firm's abilities to "integrate, build and reconfigure internal and external assets and competencies that enable it to perform its activities with distinctive advantage". Grant (1991) posits that, while resources offer firms, capabilities, it is these capabilities that are sources of competitive advantage.

Gimenez, Madrid-Guijarro and Durendez (2019) identify various capabilities which firms could capitalise on for competitive advantage. These include innovative, marketing, financial, managerial and human capabilities. Mahdi and Nassar (2021) and Rothaermel (2008:209) caution that while the *VRIN* attributes are critical for firm competitiveness, it is essential for the firm to have capabilities to "orchestrate and deploy" these resources efficiently and effectively for firm-level competitive advantage.

While the theories above provide guidance on how firms can utilise internal resources, capabilities, and knowledge to enhance SCA, there have been diametrical views to the concept of SCA for firms. The following section discusses the different perspectives against the concept of SCA.

3.5 DIAMETRICAL VIEWPOINTS ON SUSTAINABLE COMPETITIVE ADVANTAGE

Various authors have presented a polarity of views on the concept of SCA, with some pointing out that businesses will find it difficult to generate wealth for their shareholders where there is no competitive advantage in the long term (sustainability) (Ajami & Goddard, 2018). Other authors, however, believe that the concept of SCA is a myth supported only by proponents of Porter's original ideologies on competitiveness (Jackson, 2018; Marčeta & Bojnec, 2020; Maune, 2014).

McGrath (2013:4) argues against SCA, emphasising that companies are now finding it difficult to maintain a SCA because of the dynamic nature of the business environment and the fact that competitors and industry have become “unpredictable” and “amorphous” respectively. Gibson, Gibson and Webster (2021) and Rennison and Verstraete (2013) also put forward the perspective that the concept of SCA assumes that firm and industry performance differences are a result of inimitable resources, capabilities and competitive positions, which is in support of the argument advanced by the RBV and the CBV schools of thought. They go on to argue that the effect of globalisation and the treatment of the world as a ‘single market’ means that resources are now increasingly mobile such that inimitability has become easier to achieve.

Barney (1991), in his seminal work on SCA, theorised that although SCA was crucial for the survival of firms, it was also important to understand that such SCA could also cease to exist, especially if there are structural economic changes within the industry that affect the firm’s operations and ability to compete. This scenario would give opportunity for other firms to have a competitive edge. Cantele and Zardini (2018) contend that SCA does not exist, except where it is generated by government regulation leading to the provision of unfair advantage over other firms.

Although Ghemawat and Rivkin (2014:1) believe that outperforming competition is the obvious way to gaining a competitive edge, the authors also argue that “…unfortunately competitors have also heard the same message” and are therefore also implementing strategies that seek to out-manoeuvre their competitors. This view is supported by Gibson *et al.* (2021) who also posit that it is not uncommon for firms with no competitive advantage to outcompete those that do. Cantele and Zardini (2018) and Kising'u, Namusonge and Mwirigi (2016) argue in support of the latter and stress that in the developing world firms struggle to compete with rivals because most of their resources either offer “unsustainable competitive advantages” (valuable and not barrier protected) or “competitive disadvantages” (not valuable). Kising'u *et al.* (2016) also point out that whilst a firm may have SCA, there could also be offsetting disadvantages which might render the business less competitive.

The arguments above demonstrate the dynamism of attaining SCA, indicating that firm resources and capabilities can only offer competitive advantage for as long as competitors are not able to attain them. The globalised market environment and the advent of the digital age has made the mobility of resources, access to information and advancement of manufacturing technologies easier to achieve (Marčeta & Bojnec, 2020). Firms need to ensure that they identify and 'understand' the drivers contributing to competitive advantage better than their rivals. Despite the perspectives above that seem to oppose SCA, organisations that seek to improve market share and survive in the long term would require to implement strategies that overcome competition. Guntoro, Sulastri, Isnurhadi and Widiyanti (2021) supports this perspective by reiterating that without SCA, firms will not be able to utilise resources at their disposal in order to overcome competition.

The theoretical perspectives discussed, provide organisations with the ability to formulate decisions as well as competitiveness strategies that are informed by changes in both the internal and external environment. The identification of the micro and macro-economic drivers deemed important to achieving SCA would therefore be crucial in enhancing organisational sustainability (Krajnakova *et al.*, 2018). In order to strive towards SCA, foundry companies should overcome a number of challenges presented by both the micro and macro environments in which they operate.

3.6 COMPETITIVENESS CHALLENGES FACED BY FOUNDRIES

Foundry industry closures in South Africa have been attributed to the lack of competitiveness in various sources of literature as well as industry reports. This lack of competitiveness might be attributed to many challenges facing the industry. Table 3.7 provides a summary of some of the challenges identified within the South African context.

Table 3.7: Competitiveness challenges faced by South African foundries

Challenges identified	Literature source
Lack of human capital development	Malaba-Bafubiandi, Mageza and Varachia (2006)
Lack of technology and innovation	
Lack of product and process improvement	
Lack of skills development	Joseph and Varachia (2013)
Lack of skills to utilise new technology	Mpanza and Nyembwe (2014)
Lack of energy efficiency	Thiel (2015)
Import leakages	Davies (2015); SAIF (2015); Jardine (2015a); The DTI (2015)
Rising costs of energy	
Low labour productivity	
Lack of skills development and training	
High costs of compliance with environmental regulations	
High transport and logistics costs	
Limited access to capital	
High cost of investment in new technology	
Lack of training opportunities	Mkansi et al. (2018)
Lack of compliance with environmental regulations	Lochner et al. (2020)
High cost and unreliable energy supply	
High atmospheric emissions licensing costs	
Environmental compliance and authorisations	
Environmental impacts	
Labour and skills development	
Increased imports of castings	
Over reliance on a few customers and suppliers	
Limited supply services	

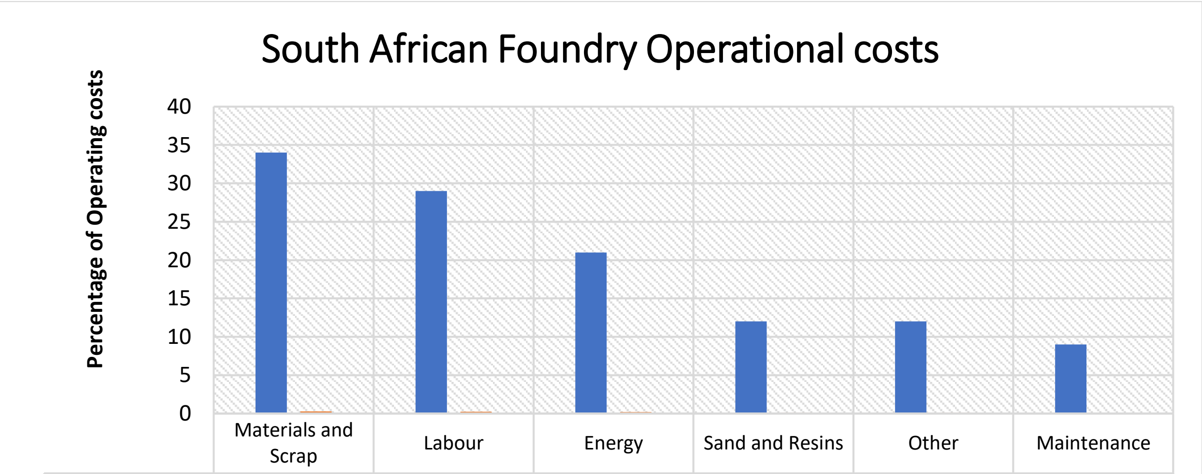
Source: Author's own compilation (2022)

As indicated in table 3.7, most of these challenges have significantly impacted on the profitability and ability to compete for these foundries. This has culminated in foundries scaling down on production, laying off employees and closing down. Mulaba-Bafubiandi *et al.* (2016) mention that the lack of human capital development, technology, innovation and product or process improvement are challenges that foundry companies in South Africa face which impact negatively on their ability to compete. Human capital development relates to the employee skills sets that foundry employees require to operate specialised machinery and develop new products in order to ensure competitiveness (Joseph & Varachia, 2013; Mpanza & Nyembwe, 2014; Davies, 2015; *Mkansi et al*., 2018; Lochner *et al*., 2020).

The lack of knowledge and skills by the employees and management which prevents innovation within the industry and discourages foundries from manufacturing complex casting products out of the fear of making scrap was also identified as one of the main reasons for foundry closures (Jardine 2015a; Davies, 2015).

In a study carried out by SAIF, Davies (2015) attested to import leakages, rising energy costs, low labour productivity, lack of skills, high regulatory compliance costs, limited access to capital and the high costs of investment in new technology as challenges that have negatively affected the ability of the South African foundry industry to remain competitive. These have led to the scaling down of operations by foundry companies. Similarly, Lochner *et al.* (2020) have also identified the high foundry operational costs and the stringent regulatory compliance requirements as contributing significantly to foundry closures, due to the failure by the foundries to afford the associated costs. Environmental regulations such as the atmospheric emissions licencing requirements, environmental impact assessment and greenhouse gas reporting requirements were identified as contributing to foundry closures, because of the high costs associated with ensuring compliance (NFTN, 2015; Lochner *et al*., 2020).

Figure 3.5 shows a breakdown of the operational costs faced by foundry companies.



	Materials and Scrap	Labour	Energy	Sand and Resins	Other	Maintenance
Operating Costs	34	29	21	12	12	9
	29%	25%	18%	10%	10%	8%

Figure 3.5: Average percentage of operating costs for South African foundries

Source: Lochner *et al*. (2020)

As reported in figure 3.5, operational costs include the cost of energy (electricity, gas and fuel) to run the furnaces and the plants, labour, maintenance and raw material costs. According to the Lochner *et al*. (2020), the ageing equipment used by foundries has also contributed to high inefficiencies when compared with international foundries. This has impacted negatively on the operational costs and increased energy inefficiency, with some foundries spending up to R12m per month on energy. This is indicated in figure 3.6.

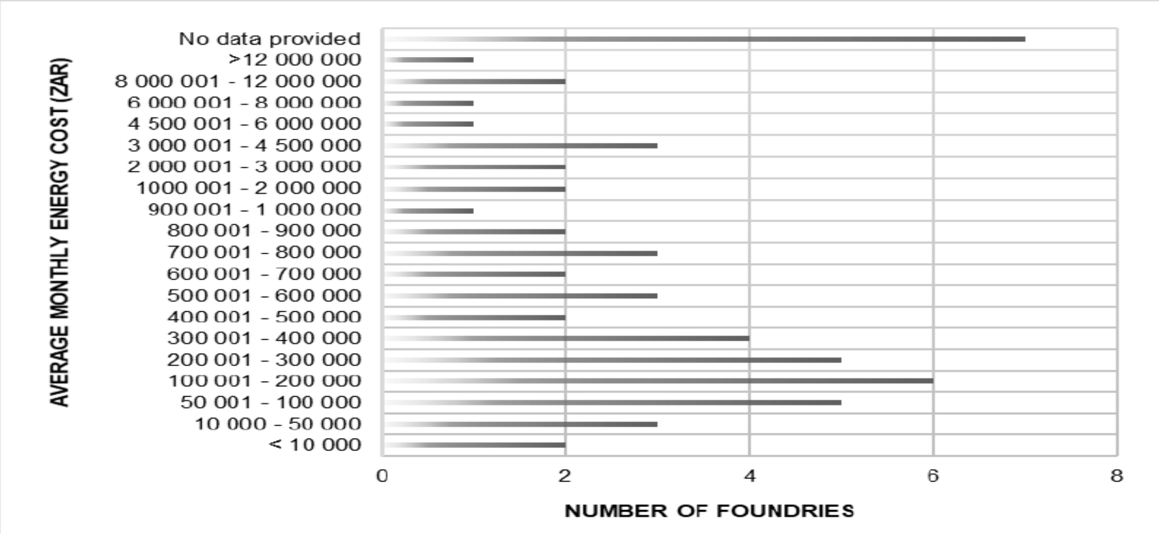


Figure 3.6: The average monthly energy costs for foundries (electricity, gas, and fuel)

Source: Lochner *et al*. (2020)

Ageing infrastructure and lack of investment contributes to inefficiency in manufacture, which makes foundry companies less competitive. The influx of imports from other countries, such as China, has also been identified as an “achilles heel” for South African foundries, as they found it difficult to compete with these foundries on both pricing and quality.

The identification of the drivers for SCA and the formulation of strategies that promote competitiveness will, hopefully, contribute to reducing the negative impact of the challenges that the foundries already face. The following section provides an overview of the drivers for SCA.

3.7 DRIVERS FOR SUSTAINABLE COMPETITIVE ADVANTAGE

Kleynhans (2016) postulates that the drivers that influence firm competitiveness can be classified as micro and macro-economic drivers. Micro-economic drivers relate to the factors internal to the organisation which determine its strengths, weaknesses and responses to threats and opportunities (Siriphattrasophon, 2017; Kleynhans, 2016). Macro-economic drivers are those factors in the external business environment, which the organisation has little control over. Micro and macro drivers for SCA can also be classified based on their source (micro or macro-economic environment) (Cepel, Belas, Rozsa & Strnad, 2019), their sphere of influence (firm-specific or industry-specific) (Masood, Tvaronavičienė & Javaria, 2019) or the form they take (process related, tangible or intangible) (Kraja & Osmani, 2015; Krajnakova, Navickas & Kontautiene, 2018).

Porter (2008) argues that the failure by organisations to understand the factors influencing their performance and competitiveness leads to the formulation and implementation of incorrect strategies to address challenges the organisation faces. Despite this, Liargovas and Skandalis (2010.), and Siudek and Zawojska (2014) argue that competitiveness is still a difficult concept to analyse, as it is measured at different micro and macro-economic levels.

The following section discusses the micro and macro drivers influencing competitiveness for the foundry industry.

3.7.1 Micro-economic drivers affecting foundry competitiveness

In the context of this study, micro-economic drivers are factors within the business' micro-environment which have a direct impact on the business and are largely within the control of organisations (Krajnakova *et al.*, 2018). While it is evident from extant literature that micro drivers have an impact on the firm competitiveness, some authors argue that the criticality of these drivers is dependent on the sector concerned, with people, culture, technology, strategic capabilities and innovation as factors generally accepted as influencing SCA (Sołoducho-Pelc & Sulich, 2020). Within the foundry sector, these primarily include decisions relating to production processes, strategy formulation, labour make-up, skills set, customer base and resource allocation decisions, among others (Davies, 2015; Dlambulo, 2019; Mkansi *et al.*, 2018).

Table 3.8 provides a summary of the micro-economic drivers affecting the global and local foundries. The table also provides a summative indication of how these drivers relate to the South African foundries, as identified from literature and industry reports from SAIF, the DTI and the NFTN.

Table 3.8: Micro-economic drivers affecting foundries

Authors	Micro-economic drivers impacting on the competitiveness of global foundries	Micro-economic drivers – in the context of South African foundries	How the drivers relate to South African foundry competitiveness
	(Drivers in bold appear consistently within the articles reviewed)	*As identified by SAIF (2015), NFTN (2015), Davies (2015), the DTI (2018), Dlambulo (2019)*	*SAIF (2015), NFTN (2015), Davies (2015), the DTI (2018), Dlambulo (2019)*
(Kaningu *et al*., 2017; Ketels, 2016; Brancati *et al*., 2018; Aiginger, Bärenthaler-Sieber & Vogel, 2013; Lakhal, 2009; Sadalia, Irawati & Syafitri, 2017; Kaleka & Morgan, 2017; Porter, 1990; Hamadamin & Atan, 2019; Mohamed, Ndinya & Ogada, 2019; Simionescu, Pelinescu, Khouri & Bilan, 2021; Dvoulety & Blazkova, 2020)	**Poor management**; reduced demand; **product quality**; **high production costs**; inefficient resource allocation; **capital**; **technology employed**; **value-add for customer**; **bargaining power over suppliers**; customers; **process and product certification**; marketing ability; competition; **limited employee skills set (know-how)**; minimal to no research and development; **exposure to external market**; **innovation**; **labour force education**	Insufficiently qualified personnel and local competition with other foundries; Production volumes; Rising input costs; Availability of resources.	The use of technology by foundries contributes to the effectiveness of the supply chain processes.
(Pietrewicz, 2019; Pagone, Jolly & Salonitis, 2016; Sengottuvel & Aktharsha, 2016; Parola *et al.*, 2016; Mkansi *et al.*, 2018; Doyle, Eleanor & Perez-Alaniz, 2017; Sook-Ling, Ismail & Yee-Yen, 2015; Giménez, Madrid-Guijarro & Duréndez, 2019; Alina & Raluca-Andreea, 2018; Shaari, 2019; Hove-Sibanda, Sibanda & Pooe, 2017; Teixeira & Ferreira, 2019; Simionescu *et al.*, 2021; Dvoulety & Blazkova, 2020)	Stringent regulatory framework; environmental impact laws; **quality management systems**; **governance**; operational efficiency; **ability to innovate**; **information sharing within the organisation**; **human resource skills**; **organisational culture**; **product differentiation**; strategies for **globalisation**; **manufacturing capacity**; energy efficiency management; location; branding; possession of **intellectual property**; **plant infrastructure investment**; **government support**	Difficulty in obtaining certification in line with the requirements of Original Equipment Manufacturers (OEMs); High costs of compliance with regulations; Inefficiencies in production leading to high material scrap rates; non-availability of quality inputs at affordable costs, escalating energy costs, High cost of finance; Health and Environment concerns; retaining qualified personnel; certification; investment requirements.	Poor resource allocation and non-adherence to systems and regulations by firms negatively impacts the competitiveness, quality and delivery times. Poor quality of raw materials and poor environmental and health issues impact negatively on foundry production output.

Authors	Micro-economic drivers impacting on the competitiveness of global foundries (Drivers in bold appear consistently within the articles reviewed)	Micro-economic drivers – in the context of South African foundries *As identified by SAIF (2015), NFTN (2015), Davies (2015), the DTI (2018), Dlambulo (2019)*	How the drivers relate to South African foundry competitiveness *SAIF (2015), NFTN (2015), Davies (2015), the DTI (2018), Dlambulo (2019)*
(Mindlin, Stolyarov, Novikova, Smolentsev & Tikhomirov, 2018; Putra, Sudarmiatin & Suharto, 2018; Varga, Csiszárik-Kocsir & Medve, 2016; Quaye & Mensah, 2017; Maket & Korir, 2017; Madhani, 2016; Kalicanin & Gavric, 2014; Osarenkhoe & Fjellström, 2017; Nwabueze & Mileski, 2018)	**A lag in technological development**, **skills shortage across the value chain**. Limited access to **financial support**, flexibility and adaptability; **cluster membership** ageing workforce; **possession of unique resources**; **management quality**; operational efficiency; **price competitiveness**	Ageing skilled workforce, skills shortage among technical staff; technology employed; manufacturing philosophies.	Low literacy and skills levels (lack of formal education among foundry employees in developing countries) negatively affects the coordination of processes.
(Andrews & Gikunoo, 2011; Zhao, Meng, He & Gu, 2019; Jamali & Karam, 2016; Schneider, 2012; Porter, 2008)	A lack of **price competitiveness** and high input and **equipment maintenance costs**, **ageing infrastructure** and experienced labour; **socio-cultural responsibility**	High costs of investment in foundry machinery and equipment, Raw material costs and labour is high compared to global average; on time delivery.	High cost of equipment maintenance and electricity costs, Lack of access to finance drive the costs of manufacture, impacting negatively on organisation competitiveness.

Source: Author's own compilation (2022)

As detailed in table 3.8, poor management decisions, inefficient resource allocation, lack of investment in technology, ageing skilled workforce and dilapidated infrastructure and equipment are micro-economic drivers that affect the competitiveness of foundries, both globally and in South Africa. A comparison of these drivers with the challenges identified by Davies (2015), Dlambulo (2019) and the DTI (2018) reveals similarities in these challenges and demonstrates the fact that the factors affecting global industries also affect the local foundries' ability to remain competitive.

Some of the proposed micro drivers of competitiveness that affect the competitiveness of foundries include: the sophistication of company operations and strategy, and human capital development or training (Porter, 2008); management quality (Ketels, 2016); organisation culture (Azeem, Ahmed, Haider & Sajjad, 2021; Madu, 2014); knowledge, innovation and production techniques (Roman, Piana, Lozano, Mello & Erdmann, 2012; Azeem *et al.*, 2021); improved governance (Schneider, 2012); cost containment, price competitiveness and organisational capabilities (Aiginger & Vogel, 2015); sophisticated products and productivity (Aiginger, Bärenthaler-Sieber & Vogel, 2013); the ability to differentiate (Berns *et al*., 2009; Varga, Csiszárik-Kocsir & Medve, 2016); labour force quality and skill (Brancati, Brancati, Guarascio, Maresca, Romagnoli & Zanfei, 2018; Claude, 2018) and product or service quality, infrastructure and operational efficiency (Parola *et al.*, 2016).

Deshpande (2018), however, argues that cost or price competitiveness does not translate to SCA, as competition can easily replicate this strategy. Deshpande (2018) believes that a differentiation strategy, as elucidated by Porter (2008), can be implemented to overcome price competition concerns and bolster competitiveness, because of the difficulty of imitation by competitors.

Chaaya, Abou-Hamad and Beyrouthy (2019), and Sao Joao, Spowart and Taylor (2019) argue that companies that offer training or upskilling programmes to their employees place themselves in a better competitive position, as employees have access to new knowledge and are trained in new processes in line with technological changes in the work environment. This perspective is supported by Brancati *et al*. (2018) who posit that human resource endowments and knowledge play a crucial role in determining the level of competitiveness of an organisation. The South African foundry industry has struggled to offer comprehensive training to uplift its human resources (Mkansi *et al.*, 2018) and this skills gap is worsened by an ageing workforce, making it difficult to remain competitive within the global space (Kulkova & Litvinenko, 2020).

Despite disagreements on the most prominent micro drivers of competitive advantage, there is a general acceptance that cost containment measures, institutional knowledge, upskilling, and improved production and service processes are key micro drivers in improving firm competitiveness and sustainability. In line with perspectives from Chaaya *et al.* (2019) and Sao Joao *et al.* (2019), a skilled workforce is key to an organisation's drive to reduce operational costs. Aiginger and Vogel (2015) contend that lowering the costs of doing business, by improving on the effectiveness of processes and negotiating with suppliers for better raw material prices, offers firms the opportunity to reduce their product prices, making them price competitive (cost leadership).

An identification of the highest cost drivers for foundry operations is a springboard to understanding areas where cost containment strategies could be implemented. The costs of running foundries have increased significantly over the last decade (Adefuye, Raji, Kasali, Fadipe & Olowu, 2019; Dlambulo, 2019; Mandolini, Campi, Favi, Cicconi & Germani, 2020; NFTN, 2015; Rasmeni & Pan, 2014) and these astronomical costs have contributed to the foundries either shutting down, scaling down on production or downsizing.

Based on the drivers identified in table 3.8, an exercise was conducted to narrow down to the drivers that appeared the most in literature. These drivers were tested for relevance within the South African foundry context. Table 3.9 illustrates the common drivers influencing foundry SCA as extracted from table 3.8.

Table 3.9: Common micro drivers identified in literature (extracted from table 3.8)

	MICRO DRIVERS (Firm Specific – influence competitiveness at company level)		
	DRIVER	**STATEMENTS FROM SOURCE(S)**	**AUTHORS**
1	Investment in plant infrastructure	The possession of quality physical and information technology (IT) infrastructure is crucial in the provision of sustainable advantage for a firm.	(Cvetkovski, 2015; Pagone, Jolly & Salonitis, 2016; Roman *et al.*, 2012; Parola *et al.*, 2016; Mkansi *et al.*, 2018; Doyle *et al.*, 2017; Sook-Ling *et al.*, 2015; Dvoulety & Blazkova, 2020)
2	Cluster membership (e.g., South African Institute of Foundries)	Research demonstrates that networking, conversation, and experience exchange are the perceived advantages of cluster activities. The connections businesses build inside a cluster serve as vital channels for obtaining the resources and knowledge needed to increase competitiveness and serve as links to other clusters abroad.	(Mindlin *et al.*, 2018; Meyer-Douglas & Mohamadi, 2013; Varga *et al.*, 2016; Quaye & Mensah, 2017; Osarenkhoe & Fjellström, 2017)
		Cluster membership maximises the competitive advantages of business entities possible in the framework of competitive clusters.	
		It is important to recognise the importance of industrial clusters and the degree of network they play in gaining a competitive edge. The study's conclusions showed that innovation and horizontal networking in a cluster considerably boost competitive advantage.	
3	Employee skills development (Human capital)	For achieving competitive advantage, the role of human capital is greater than ever before because it is considered the wealth success and major source of competitive advantage.	
		Human capital has been recognised as having the potential to be inimitable because each employee had the ability to contribute in a unique way.	(Sao Joao, Spowart & Taylor, 2019; Hossain & Roy, 2016)
		A hard to imitate and long-lasting competitive edge is human resource through practices of human resources within the company.	(Sadalia *et al.*, 2017; Sengottuvel & Aktharsha, 2016)
		Human capital is the primary factor that gives an organization a competitive advantage, and strategic human resources management (HRM) is used to effectively manage employee skills, knowledge, and capacity in order to have a substantial impact on an organisation's achievement of its strategic goals.	(Hamadamin & Atan, 2019)

	MICRO DRIVERS (Firm Specific – influence competitiveness at company level)		
	DRIVER	**STATEMENTS FROM SOURCE(S)**	**AUTHORS**
4	Product (service) differentiation	By implementing methods that provide them an advantage over rivals, many organisations today are concentrating on becoming more competitive. They need to put differentiation tactics into practice to do this.	(Nolega, Oloko, William & Oteki, 2015)
		Differentiation is crucial for a company to succeed in gaining a competitive advantage.	(Putra *et al.*, 2018; Quaye & Mensah, 2017)
		By elevating the perceived value of their goods and services in comparison to that of rival companies' goods and services, differentiation is one of the techniques used by businesses to obtain a competitive edge.	(Cvetkovski, 2015; Kireru, Ombui, Omwenga & Kenyatta, 2016)
		A company should always work to set itself apart from its rivals and look for unique and uncommon resources to maintain its competitive advantage.	(Nolega *et al.*, 2015; Dvoulety & Blazkova, 2020)
5	Organisational culture	The phenomena of a firm's culture and its social complexity plays a crucial role in defining competitive advantage and the survival of many firms because competencies that are embedded in the culture of the organisation assist sustain competitive advantage.	(Bogdanowicz, 2014)
		The competitive advantage of the company can be significantly boosted by the organisational culture, which is reflected in the members' values, attitudes, and behaviours.	(Sengottuvel & Aktharsha, 2016)
		Organisations that have been effective in developing the necessary cultures and possess the necessary qualities can sustainably outperform the market.	(Shaari, 2019)
		Organisations get a competitive edge in the global market when organisational culture and strategic management are in alignment.	(Madu, 2014; Alina *et al.*, 2018)
		The culture that enables the implementation of market-driven initiatives capable of providing customers with superior value must be nurtured and developed by organisations aiming for greater competitive advantage.	(Violinda & Jian, 2016)

	MICRO DRIVERS (Firm Specific – influence competitiveness at company level)		
	DRIVER	**STATEMENTS FROM SOURCE(S)**	**AUTHORS**
6	Governance	Because sound corporate governance standards result in higher market valuation and a long-term competitive advantage, they are now recognised as a differentiator among businesses.	(Madhani, 2010)
		Organisations get a competitive edge when they draw in new investors and boost their firm's competitiveness by adopting and adhering to corporate governance principles as a distinctive organisational competence.	(Hove-Sibanda *et al.*, 2017; Radebe, 2017)
7	Price competitiveness	A set of activities that can create goods or services for the lowest price possible using a competitive advantage approach are necessary for the development of a cost leadership strategy.	(Karyani & Rossieta, 2018)
		If the company can offer a lower price than its rivals, while maintaining the same level of product value or quality, it will have a greater competitive edge over them.	(Putra *et al.*, 2018)
8	Product quality	Quality has direct impact on organisational performance and indirect impact on organisational performance through competitive advantage.	(Alghamdi & Bach, 2013)
		There is evidence from earlier studies that different aspects of competitive advantage are influenced by the different quality components.	(Ketels, 2016; Brancati *et al.*, 2018; Aiginger *et al.*, 2013)
9	Ability to innovate (research and development)	The competitive advantage of a product is greatly impacted by product innovation.	(de Conto, Junior & Vaccaro, 2016)
		One of the core functions of strategic management is innovation, which is widely acknowledged as the primary driver of competitive advantage for both individual businesses and entire economic and social systems.	(Adhikari, 2017)
		In comparison to technological innovation, business model innovation can provide a competitive advantage.	(Pietrewicz, 2019; Pagone, Jolly & Salonitis, 2016; Sengottuvel & Aktharsha, 2016)
		Since change is the sole constant in sectors that rely heavily on technology, continuous competitive advantage can only be achieved through ongoing innovation.	(Rothaermel, 2008)
		The major difficulty for businesses is to use innovation to gain a competitive advantage.	(Porter, 1990; Brem, Maier & Wimschneider, 2016)

	MICRO DRIVERS (Firm Specific – influence competitiveness at company level)		
	DRIVER	**STATEMENTS FROM SOURCE(S)**	**AUTHORS**
10	Technology (equipment) upgrade	One of the main factors influencing business performance and competitive advantage has long been technology.	(Pietrewicz, 2019)
		The duration of these competitive advantages depends on how quickly competitors can copy them, which is frequently influenced by how difficult the underlying innovation was to develop technologically and structurally.	(Mindlin *et al.*, 2018; Putra *et al.*, 2018; Rothaermel, 2008)
		Any competitive advantage is transient in changing, technologically advanced surroundings.	(McGrath, 2013)
11	Production (raw material input) costs	Competitive advantage refers to a company's outstanding capacity to provide a good or service for less money than comparable offerings from rival businesses.	(Abdelraheem, Serajeldin & Jedo, 2017)
		A cost leadership strategy can be crucial in helping mining companies use costing approaches to gain a competitive edge.	(Mohamed *et al.*, 2019).
		When a company can add value to a process or a product at reduced production costs and that value cannot simultaneously be adopted by current or potential competitors, it has achieved a competitive advantage.	(Kaningu *et al.*, 2017; Ketels, 2016; Brancati *et al.*, 2018; Aiginger *et al.*, 2013)
12	Firm capacity (size)	It has been shown that the strength of the distributor-end customer relationship and the production capacity available are key factors in competitive advantage and value generation.	(Kaleka & Morgan, 2017)
		To gain a sustained competitive edge over rivals, the key is to build up your manufacturing capacity. Successful and failed businesses can be distinguished by this.	(Giménez *et al.*, 2019)
13	Exposure to export market (degree of internationalisation)	A key source of competitive advantage may come from adjusting strategy to also concentrate on export markets, particularly in less developed economies.	(Ciszewska-Mlinaric & Trapczynski, 2019)
		Export-capable businesses are more aware of changes in their competitive environment, are able to adjust to shifting market conditions faster than rivals and can therefore acquire a competitive advantage.	(Hamadamin & Atan, 2019; Mohamed *et al.*, 2019)

	MICRO DRIVERS (Firm Specific – influence competitiveness at company level)		
	DRIVER	**STATEMENTS FROM SOURCE(S)**	**AUTHORS**
14	Socio-cultural responsibility (corporate social investment)	An organisation will gain a competitive advantage from the adoption and implementation of corporate social responsibility by seeing a difference in the firm's market share and the openness of its reported financial data.	(Areiqat, Abdelhadi, Rumman & Al-Bazaiah, 2019)
		While the literature on corporate social responsibility (CSR) continues to grow, the results of scholarly research are becoming more complex and multifaceted, especially work done on the correlation between CSR and competitive advantage, there are several conflicting conclusions, such as positive correlation, negative correlation, and irrelevance.	(Zhao *et al.*, 2019; Jamali & Karam, 2016; Kotler & Lee, 2005; Dvoulety & Blazkova, 2020)
15	Certifications (ISO standards, product certifications)	By establishing product and system certification, businesses can gain an early mover competitive edge.	(Su, Dhanorkar & Linderman, 2015)
		Although numerous studies have demonstrated that businesses can temporarily obtain a competitive advantage from the time of their certification implementation, research on the competitive advantages of applying ISO standards is still equivocal.	(Kaleka & Morgan, 2017)
16	Possession of intellectual property	Utilising intellectual property as a tactical tool for gaining competitive advantage requires management attention throughout a product's life cycle.	(Khota & Stern, 2005)
		Intellectual property has been acknowledged as a source of competitive advantage, in addition to being used by businesses as a tool to attract investment and generate income.	(Teixeira & Ferreira, 2019)
		The laws governing copyright, patents, trademarks, designs, and competition—all of which are considered to be a part of IP—are a tool that product manufacturers must use to gain competitive advantages in the information economy.	(Jamali & Karam, 2016)
17	Managerial choice (decision making process)	A competitive advantage is provided by managerial adaptability, particularly in situations that are constantly changing. Horizon scanning, change management, and resilience are three aspects of adaptive capabilities that are taken into account when making decisions.	(Ali, Sun & Ali, 2017)
		In order to have a competitive advantage globally, management decisions regarding efficiency, innovation, customer service, and public relations are crucial.	(Nwabueze & Mileski, 2018; Putra *et al.*, 2018; Dvoulety & Blazkova, 2020)

	MICRO DRIVERS (Firm Specific – influence competitiveness at company level)		
	DRIVER	**STATEMENTS FROM SOURCE(S)**	**AUTHORS**
18	Bargaining power over suppliers	Due to suppliers' ability to threaten businesses with rising pricing for goods and services, the bargaining power of suppliers can negatively impact profitability and long-term competitiveness in an industry.	(Bruijl, 2018; Porter, 1990)
19	Possession of unique resources (inimitable to competition)	Unique resources that are firm-specific, scarce, valuable, one-of-a-kind, non-tradable, and non-substitutable give a company a lasting competitive edge.	(Maket & Korir, 2017; Madhani, 2016)
20	Value-add for the customer	Provision of value-add to the customer offers the firm competitive advantage over competition, as this is seen as reducing the additional in-process work the customer would still need to embark on to manufacture the final product.	(Hamadamin & Atan, 2019; Ketels, 2016; Brancati *et al.*, 2018; Aiginger *et al.*, 2013)

Source: Author's own compilation (2022)

The following section discusses the macro-economic drivers influencing SCA for foundries.

3.7.2 Macro-economic drivers influencing foundry competitiveness

According to Dvoulety and Blazkova (2020), Cepel *et al*. (2019), and Masood *et al*. (2019), macro-economic drivers are key determinants of business growth and play an important role in organisational competitiveness and sustainability. Krajnakova *et al.* (2018) point out that macro-economic drivers consist of external influences, which affect the organisation's ability to attain competitive advantage. It is further reiterated that organisations rarely have control over macro drivers as opposed to micro drivers (Krajnakova *et al*., 2018).

Cepel *et al.* (2019) identify economic performance, energy costs, regulatory framework and globalisation as some of the drivers within this category that can impact on the competitiveness of firms. Table 3.10 provides a summary of the macro-economic drivers affecting both the global and local foundries, as well as an indication of the extent to which these drivers affect South African foundries. Economic growth, electricity (energy) costs, regulatory framework, government spend, global competition, employment costs, skills shortage, lack of funding and environmental regulations are identified in various studies as macro-economic drivers that define competitiveness within the foundry industry's external environment (Industrial Policy Dossier, 2016; Kaningu, Warue & Munga, 2017; Soiński, Kordas & Skurka, 2016)

Table 3.10: Macro-economic drivers affecting foundries

Authors	Macro-economic drivers impacting on the competitiveness of global foundries	Macro-economic drivers – in the context of South African foundries	How the drivers relate to South African foundry competitiveness
	(Drivers in bold appear consistently within the articles reviewed)	*As identified by SAIF (2015), NFTN (2015) and the DTI (2018)*	*SAIF (2015), NFTN (2015), Davies (2015), the DTI (2018), Dlambulo (2019)*
(Kaningu *et al.*, 2017; Yatich, 2018; Pagone *et al.*, 2016; Cvetkovski, 2015; Fashu, 2018; Iloh *et al.*, 2017; Todericiu & Stanit, 2015; CSIR, 2019; Kutschke, Rese & Baier, 2016)	Economic growth rate; inflation; monetary and fiscal policy; government/political stability; infrastructure; **Number of firms competing for same market**; employment rate; **energy (electricity) supply**; critical skills availability; **legal and regulatory framework**; Introduction of import duty on some raw materials	A lag in skills development. High energy costs; Industry consolidation; Exchange rate. Unreliable energy supply; High electricity costs and Energy costs	Government policy, the regulatory framework, and the availability of energy supply within the foundry industry creates a platform that encourages manufacturing facilities to buy castings from local foundries. High energy costs drive production costs for the foundries, resulting in high prices for castings. This makes foundries less competitive from a pricing perspective.
(Cvetkovski, 2015; Atkinson, 2017; Kutschke *et al.*, 2016; Fessehaie *et al.*, 2016; Rustomjee, Kaziboni & Steuart, 2018; Bruijl, 2018; Altuntas, Semerciöz, Mert & Pehlivan, 2014; Dvoulety & Blazkova, 2020)	Internationalisation; **Bargaining power of customers**; Disparities in costs of labour across nations; innovation; **geographical location** relative to critical resources	Global competition provides cheaper options	High labour and electricity costs increase manufacturing costs, which contributes to the high prices for castings.
(Abioye *et al.*, 2018; Mbatha, 2018, Pakdeechoho & Sukhotu, 2018)	**Level of competition**; **Government subsidies**; Dwindling mineral deposits; **Alternatives to casting products**; Reduction in mining activities; increased regulatory requirements for mining sectors	Slowdown in mining growth and high import leakage	This makes it difficult for the foundries to compete with cheaper imported castings.
(Fashu, 2018; Clare & Uddin, 2019; Karakaya & Parayitam, 2018; Porter, 1990; Iloh *et al.*, 2017; Stefana *et al.*, 2019; Madhani, 2010; Sachitra, 2016)	**Local content implementation**; Increasing labour costs and higher **bargaining power by labour unions**; access to unique resources; **location decisions**; **Market perceptions**; **High energy costs**; **ease of entry and exit from market**	Uncertainty and lack of business confidence; High labour costs and Low economic growth	Low economic growth leads to reduced investment opportunities or construction projects – this negatively affects production volumes for the foundries and threatens their survival.

Authors	Macro-economic drivers impacting on the competitiveness of global foundries	Macro-economic drivers – in the context of South African foundries	How the drivers relate to South African foundry competitiveness *SAIF (2015), NFTN (2015), Davies (2015), the DTI (2018), Dlambulo (2019)*
(Büchner, 2016; Davies, 2015; Industrial Policy Dossier, 2016; Meyer-Douglas & Mohamadi, 2013; Hitt, Ireland & Hoskisson, 2007; World Foundry Organisation, 2016; Neuman, Tissot & Mabrey, 2017; Deringer, Erixon, Lamprecht & van der Marel, 2018; Pakdeechoho & Sukhotu, 2018; Dvoulety & Blazkova, 2020)	Lack of funding; Economic decline; Occupational safety; **Number of competitors**; **Bargaining power from customers**; **Stringent requirements to comply with Environmental regulations (Anti-pollution) and Health requirements for the workers**; **Localisation**; High unemployment; **Availability of substitutes**	Compliance with Environmental regulations; High logistics costs	The use of ageing equipment by foundries makes it difficult for them to contain energy costs while complying with the health, safety and environmental regulations. These add to operational costs and ultimately, to the costs of castings produced, making local foundry products much more expensive than those from their foreign counterparts.
(Apata & Alani, 2016; Büchner, 2016; Department of Public Enterprises, 2019; Mulaba-Bafubiandi, Mageza & Varachia, 2016b; Oudhia, 2015; Haidar, Sekh, Islam, Sarkar & Sutradhar, 2019)	High number of imported castings from other countries with relatively low labour costs, international competition; **Low government spend on projects requiring castings**; **High electricity charges**; High labour costs	Limited access to investment; high energy and labour costs and an unattractive foundry operating environment	The influx of cheap imported castings offers stiff competition to local foundries, who battle to compete on the basis of pricing and delivery.
(EIUGSA, 2016)	Increasing urbanisation puts strain on energy consumption, resulting in **high costs of electricity** and a shortage of water; **Local content requirements**; Unskilled workforce; High production input costs	Lack of skilled workforce in different sectors of the industry; High energy costs; Load shedding; Safety, health and environmental compliance	High operational costs and low levels of investments in machinery and technology impact negatively on the speed of manufacture, and the ability of local foundries to attract skilled labour force.

Source: Author's own compilation (2022)

Research also identifies several other macro drivers that influence SCA, either positively or negatively as well as the possible reasons for the effects thereof. These drivers include rising energy costs, high input material, transport and logistics costs, economic activity, access to funding, ease of entry by competitors into the market, availability of substitute products, as well as the high costs attached to compliance to environmental regulations (Abioye *et al*., 2018; Cvetkovski, 2015; Haidar & Sekh, 2019; Kaningu *et al*., 2017; Meyer-Douglas & Mohamadi, 2013).

According to the EIUGSA (2017) and Casting SA (2018), cost drivers for foundries placed electricity at 43.4%, raw material purchases at 29.8%, labour costs at 11.5%, consumables used at 5.3% and fixed costs at 10.0%. Cumulatively, these costs have gone up by more than 114.4% between 2007 and 2017. High costs put pressure on foundry management to find ways of reduce costs elsewhere in order to remain competitive, especially with foreign foundries leading to sacrifices being made to disinvest in new technologies and employee development, just to ensure foundry companies survive and maintain a certain level of competitiveness (Dlambulo, 2019).

In relation to the regulatory framework within the business environment and in support of the findings by Sato and Dechezleprêtre (2015), Dlambulo (2019) argues that stringent environmental policies in South Africa also increase compliance costs and “crowds out productive investment” for businesses, which in turn makes them less competitive. This is in contrast with Porter’s (2012) view that environmental compliance requirements “force organisations to implement cost cutting efficiency initiatives, which in turn encourage the use of new and better technologies”. Karakaya and Parayitam (2018) believe that access to investment and government support are twin drivers that are strongly correlated with competitiveness, whereas Brancati *et al*. (2018) identify government incentives, localisation and subsidy policies as drivers, which strongly present firms with the propensity to become competitive. This study tested these drivers within the South African context and benchmarked the findings with extant literature perspectives.

Sato and Dechezleprêtre (2015) posit that although governments make use of regulations and policies, such as protectionism and import restrictions, to regulate local trade and protect local industries, extensive research has shown that such policies may also indirectly inhibit competition or the formation of new firms – a critical economic booster for developing countries. This presents a "catch-22" situation for policy makers who have to make weighted decisions between introducing regulatory frameworks that "burden" the already ailing foundry industry (the DTI, 2015) and risk having them close down or suspend these regulations and risk encouraging the sprouting up of firms (including foreign firms), whose manufacturing processes could "eat away" market share from local companies and also be detrimental to the health of the employees, communities and the environment.

Table 3.11 presents ten macro drivers identified from the total set of drivers, as illustrated and extracted from table 3.10. These drivers were tested to establish whether they were significant in enhancing SCA for local foundry companies.

Table 3.11: Common macro drivers identified in literature (extracted from table 3.9)

	MACRO DRIVERS		
	(Industry Specific – influence competitiveness at industry level)		
	DRIVER	**STATEMENTS FROM SOURCE(S)**	**AUTHORS**
1	Energy costs (Electricity rates)	Increased energy efficiency measures are required to lessen the impact of taxes on the firm's attempts to gain a competitive advantage.	(Yatich, 2018)
		Escalating electricity prices impact on the competitiveness of industry and affordability to sustain operations.	(CSIR, 2019; Kutschke *et al.*, 2016)
		The availability of inexpensive coal power generation has long been South Africa's competitive advantage in luring investments into the industrial sector. However, this benefit is being lost as a result of rising electricity prices brought on by coal prices and the Eskom build program.	(Department of Public Enterprises, 2019)
2	Geographical Location	The choice and characteristics of a company's location can have a big impact on its ability to establish and keep a competitive edge.	(Tavakolnia & Makrani, 2016)
		A narrow and precise conception of location-based comparative advantage as the foundation for competitive advantage among multinational corporations is further emphasised by offshore sourcing of both goods and knowledge development.	(Jenkins & Tallman, 2010; Kutschke *et al.*, 2016)
		Location considerations are inextricably linked to competitiveness.	(Atkinson, 2017; Kutschke et al., 2016)
		In developing a competitiveness strategy, organisations need to take into consideration the impact of their location.	(Atkinson, 2017; Jenkins & Tallman, 2010)
3	Industry entry and exit barriers	Entry barriers that are high will allow incumbent businesses to maintain their competitive edge and generate extraordinary returns.	(Karakaya & Parayitam, 2018; Porter, 1990)
		The most frequently studied barriers include incumbent firms' cost advantages, capital requirements, sunk costs, advantages of incumbent firms in product differentiation, access to distribution channels, customer switching costs, regulations, incumbent firms' structural advantages, incumbent firms' market strength, financial investments made by market entrants, the number of firms in a market, and exit barriers. As a result, the incumbent enterprises gain a short-term to long-term competitive advantage.	(Karakaya & Parayitam, 2018; Porter, 1990;)

	MACRO DRIVERS		
	(Industry Specific – influence competitiveness at industry level)		
	DRIVER	**STATEMENTS FROM SOURCE(S)**	**AUTHORS**
4	Customer bargaining power	Researchers have determined that the primary element influencing strategic decision-making by company managers or owners and determining firm competitive advantage and performance is the bargaining power of customers.	(Bruijl, 2018; Porter, 1990; Altuntas *et al.*, 2014; Xue, 2016)
5	Government incentives (Subsidies)	A firm's competitive advantage is significantly directly influenced by government financial support (government equity, government loan, and guarantees), while performance is indirectly impacted.	(Songling, Ishtiaq & Anwar, 2018; Pakdeechoho & Sukhotu, 2018; Mbatha, 2018)
6	Market perception (Brand loyalty) of the foundry company	Brand loyalty represents an important component of product value. This loyalty is maintained through emotional matter instruments and market perception, which gives a company a competitive advantage over the competition's brands promotional actions.	(Kamasak, 2017; Fashu, 2018)
		The value of a brand in the market may be the most significant resource of a firm, offering it sustainable competitive advantage.	(Denoue & Saykiewicz, 2009)
		Corporate image plays a demonstrable role in influencing perceived competitive advantage, as evidenced in prior studies.	(Clare & Uddin, 2019)
7	Localisation (Local content enforcement)	Local content implementation may result in the deterioration of long-term competitiveness of the companies in the country, which implements the local content regulations (LCR).	(Neuman *et al.*, 2017; Deringer *et al.*, 2018)
8	Regulatory instruments (import tariffs, import quotas)	Excessive government regulation interferes with individual company's economic freedom.	(Songling *et al.*, 2018)
		Competition authorities can help eliminate unduly high exit barriers by offering advice, working with other regulators, or collaborating with government agencies to devise policies that will minimize or prevent negative impacts on competition.	Organisation for Economic Co-operation and Development (OECD), 2014; Pakdeechoho & Sukhotu, 2018)
		Government action can also create exit barriers by maintaining inefficient businesses on the market, deterring the entry of efficient businesses, or promoting the entry of inefficient businesses. Governments may refuse to shut down poorly performing business enterprises for reputational or lobbying reasons. Long-term effects of this include decreased industry competitiveness.	(Todericiu & Stanit, 2015; Pakdeechoho & Sukhotu, 2018)
9	The number of foundry companies in South Africa	The ability of a particular organisation to acquire and maintain a competitive edge is influenced by competitive rivalry.	(Hitt *et al.*, 2007; Sachitra, 2016; Porter, 1990)
		When businesses adopt their own competitive actions and then react to those taken by rivals, rivalry results. Competitive rivalry affects a firm's capacity to acquire and maintain a competitive edge.	(Porter, 1985)
10	The availability of substitutes for casting products	For a company to sustain a competitive edge, the threat of alternatives needs to be minimal from an industry and profitability viewpoint.	(Bruijl, 2018; Dobbs, 2014; Porter, 1985; Pakdeechoho & Sukhotu, 2018)
		Viable alternatives limit pricing and increase costs associated with product performance, marketing, and service, decreasing a firm's competitive edge.	(Dobbs, 2014; Sato, 2016; Haidar & Sekh, 2019)

Source: Author's own compilation (2022)

The pursuit for sustainable competitiveness requires a formulation of strategies that create fertile ground for organisational management to make decisions that target these micro and macro-economic drivers and enhance competitiveness (Kaningu *et al.*, 2017).

Based on the perspectives outlined in literature, figure 3.7 provides a summary of the firm-specific (micro) and industry-specific (macro) drivers of sustainable competitive advantage for foundries. Figure 3.7 also presents the common micro and macro drivers as presented in tables 3.9 and 3.11 and is significant in classifying the different drivers according to source (firm specific or driver specific), as well as the nature of the drivers (process, tangible, intangible and industry drivers).

Drivers of Sustainable Competitive Advantage			
Micro economic environment			Macro economic environment
MICRO DRIVERS			MACRO DRIVERS
Firm Specific Drivers			Industry Specific Drivers
Process Drivers	**Intangible Drivers**	**Tangible Drivers**	**Industry Drivers**
Product quality	Socio cultural responsibility (corporate social investment)	Embracing new technology	Cluster membership
	Organisational culture	Investment in infrastructure	Market perception of the foundry company
	Price competitiveness	Product quality	Customer bargaining power
	Production (raw material input) costs		Number of foundry companies in South Africa
	Product (service) differentiation		Availability of substitutes for casting products
	Value add for the customer		Regulatory instruments (import tariffs, import quotas)
	Certification (ISO standards, product certifications)		Industry entry and exit barriers
	Geographical location		Localisation (local content enforcement)
Ability to innovate (research and development)			Energy costs
	Employee skills development (Human capital)		Government incentives
	Firm capacity		
	Posession of intellectual property		
	Possession of unique resources (inimitable to competition)		
Managerial choice (decision making process)			
Governance			
Exposure to export market (degree of internationalisation)			
Bargaining power over suppliers			

Figure 3.7: Drivers of Sustainable Competitive Advantage
Source: Author's own compilation (2022)

As illustrated in figure 3.7, several "unclear demarcations" exist in the classification of some of the drivers for SCA. For example, the ability to innovate is classified by different authors as part of process, intangible or tangible drivers depending on the area and nature of innovation. Employee skills, firm capacity, possession of intellectual property and unique resources have also either been classified as intangible or tangible drivers, while managerial choice, governance, exposure to export market and bargaining power over suppliers are either classified as process or intangible drivers.

While Hollensen (2010, as cited in Siudek & Zawojska, 2014) asserts that national circumstances play a critical role in creating an environment where a business can gain SCA, the author reiterates that it is up to the business to capitalise effectively on these opportunities. McGahan (1999, as cited in Siudek & Zawojska, 2014:100) argues, on the other hand, that the organisation's "characteristics and action" determine the level of competitiveness in an environment where external circumstances are more or less similar for all competing firms. The foundry industry in South Africa is fairly homogenous (Dlambulo, 2019) and, therefore, competing firms will likely be exposed to the same macro environment.

It is important to note, however, that despite the divergent views on the classification of drivers of SCA, there is a general appreciation and consensus by various academics, of the need to formulate strategies that strengthen both the micro and macro drivers, which may influence firm competitiveness (Kang & Na, 2020; Hossain, Kabir & Mahbub, 2019; Madhani, 2016; Parola *et al.*, 2016). On the basis of the drivers identified and the discussion on the competitive forces that firms are exposed to, within and outside of the firm environment, figure 3.8 illustrates a draft framework depicting the interaction between the drivers for SCA, the competitive forces and how an understanding of the drivers and the application of the "correct" SCA strategies can enhance the competitiveness of foundries. Aligning these strategies to changing micro and macro-economic environments presents an opportunity for foundry companies to develop strategies that will enhance SCA thereby opening up opportunities for business growth.

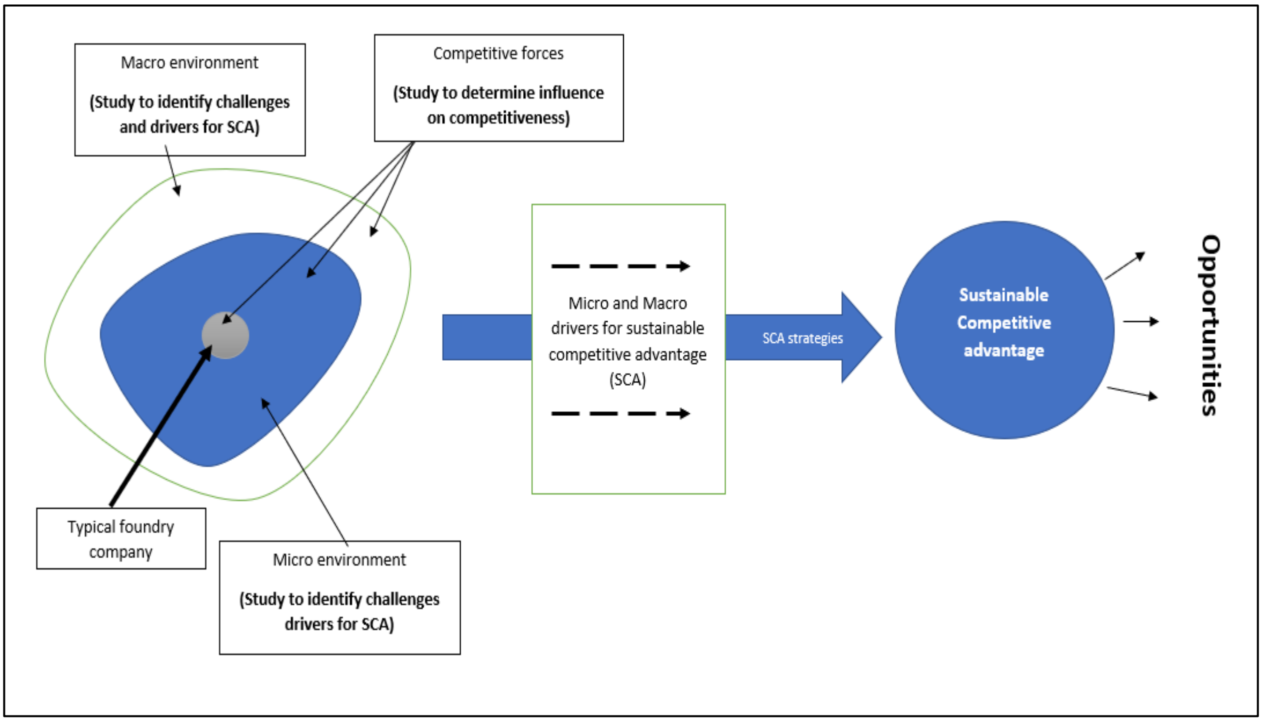


Figure 3.8: The Conceptual Framework for Sustainable Competitive Advantage (*First draft*)

Source: Authors' own compilation (2022)

This study sought to establish if the drivers identified in literature also influence the SCA of foundries in South Africa, and which of these driver(s) are critical for enhancing SCA. This consequently influenced "SCA driver-targeted" strategy recommendations, in order to ensure a sustained level of competitiveness (SCA) for the local foundry industry.

The following section discusses the classification of drivers into constructs, as identified in literature.

3.8 CLASSIFICATION OF DRIVERS FOR SCA

Extensive literature search has shown that there is limited information on the classification of drivers for organisational SCA. Although various studies on competitiveness, competitive advantage and sustainable competitive advantage have attempted to classify the associated drivers into specific categories, the majority have done so at country level (World Economic Forum, 2018). According to Cheba and Kiba-Janiak (2017), Delgado, Ketels, Porter and Stern (2012), and Huang (2019), drivers can be classified as belonging to political, economic, demographic, ecological, socio-cultural and technological environments; while Abdoh, Saany, Jebur and El-ebiary (2020), Donnellan and Rutledge

(2019) and Hans (2018) incorporate the legal environment in their PESTLE (political, economic, socio-cultural, technological, legal and ecological) framework. These studies offer generic classifications which can be applied broadly to both industry and country competitiveness.

Abdoh *et al.* (2020) propose a classification that includes customer, supplier, competitor, intermediary, organisation, and market-related categories. These classifications, however, seem to ignore the influence of process or resource related drivers in the categorisation. Schwab (2019) points out that the global competitiveness report categorises competitiveness into 12 pillars which include institutions, infrastructure, information and communication technology adoption, macro-economic stability, health, skills, product market, labour market, financial system, market size, business dynamism and innovation capability. This classification is in close alignment with the work done by Siudek and Zawojska (2014) on driver categorisation. In their seminal work, Siudek and Zawojska (2014) proposed a more compressed but comprehensive classification of drivers, as shown in table 3.12.

Table 3.12: Classification of micro and macro drivers influencing SCA

	CLASSIFICATION OF MICRO AND MACRO-DRIVERS INTO SUB-CATEGORIES	
CATEGORIES OF DRIVERS INFLUENCING SCA	**COMMON MICRO-DRIVERS FROM LITERATURE**	**COMMON MACRO-DRIVERS FROM LITERATURE**
Assets/Resources	• Employee skills development (Human capital) • Embracing new technology • Firm capacity (size) • Investment in infrastructure • Possession of intellectual property • Possession of unique resources (inimitable to competition) • Socio-cultural responsibility (corporate social investment)	• The market perception of the foundry company • Geographical location
Processes	• Ability to innovate (research and development) • Bargaining power over suppliers • Managerial choice (decision making process) • Exposure to export market (degree of internationalisation) • Product quality	
Firm's Performance	• Organisational culture • Governance • Price competitiveness • Production (raw material input) costs • Product (service) differentiation • Value-add for customer	
Supporting and Related Industries and Clusters	• Cluster membership	• Customer bargaining power • The number of foundry companies in South Africa • The availability of substitutes for casting products
Institutions and Government Policies	• Certifications (ISO standards, product certifications)	• Regulatory instruments (import tariffs, import quotas) • Government incentives (subsidies) • Industry entry and exit barriers • Localisation (local content enforcement) • Energy costs (electricity rates)

Source: Siudek and Zawojska (2014)

As indicated in table 3.12, Siudek and Zawojska (2014) classify the drivers for SCA into five constructs which include assets (resources), processes, firm performance, supporting and related industries and clusters, as well as institutions and government policies. The constructs identified also encompass the classifications proposed by other authors, as discussed in the sections above. This classification is also deemed appropriate for use in this study, as it addresses the drivers according to the factors within and outside the firm's control (micro and macro environment) and includes the process drivers, which seem to be neglected by other classifications.

According to Sarstedt, Hair, Cheah, Becker and Ringle (2019), a construct can be formed by census of constitutive indicators or measures. In deconstructing the proposed constructs, Siudek and Zawojska (2014:97) define processes in the context of competitiveness, as systems and measures "that help identify the importance and performance of core firm developments. These include technology management procedures, operations management processes, human resource management processes, and strategic management processes". According to Zuniga-Collazos, Castillo-Palacio and Padilla-Delgado (2019), processes relate to "a set of interrelated activities that make use of tangible or intangible inputs to deliver an intended outcome and enhance competitiveness".

Firm assets and resources are defined as "the tangible and intangible assets under the effective control of the organisation which enable the firm to conceive of and implement strategies that improve competitiveness" (Galavan, 2015:3). These resources can be divided into five categories: organizational, human, financial, technological, and physical resources. Hamadamin and Atan (2019), and Mweru and Muya (2016) also define assets and resources as capabilities and attributes controlled by the firm, which enable it to conceive of and implement strategies that enhance its competitive advantage.

Firm performance, on the other hand, relates to productivity, quality, cost, financial, technological and international performance issues affecting the competitiveness of firms (Siudek & Zawojska, 2014). Firm performance also refers to "the degree to which an organisation, as a social system with some limited resources and means, achieves its goals efficiently and effectively without an excessive effort from its members" (Taouab & Issor, 2019:94).

Institutions and government policies include systems formulated by the government of the country or other regulatory bodies, in an effort to equalise the competitive landscape (Siudek & Zawojska, 2014).

Porter (1990:83) defines supporting industries and clusters as "a group of mutually supportive firms related together due to the nature of goods and services they produce or distribute. This group is created in order to overcome complex problems and reduce risks inherent to member innovations" and critical in enhancing the competitiveness of its members. In the context of this study, a cluster is defined as a "concentration of independent businesses operating in the foundry industry, with their goal being to encourage the innovation activities through intensive cooperation, the sharing of resources, exchange of knowledge and networking between the firms belonging to the cluster" (Varga, Csiszárik-Kocsir & Medve, 2016:25). On the other hand, related and supporting industries refer to institutions or sectors that work directly or indirectly with the foundries.

Heath (2013, as cited in Siudek & Zawojska, 2014) and Dung *et al*. (2020) contend that enhancing the micro drivers and harnessing the benefits of the macro drivers is central to improving the competitiveness of a firm. The authors also argue that developing processes and policies to improve the competitiveness of firms requires that the businesses themselves understand the major factors that promote or impede their ability to compete (Siudek & Zawojska, 2014).

As indicated in figure 3.9, in order to gain SCA, foundry companies should effectively utilise their assets and resources, put in place processes that are stringent and well defined to enhance efficient company performance, capitalise on the benefit of support structures provided for by stakeholder institutions, such as industry associations and the government through regulatory frameworks that bolster local industry. The level of importance of these constructs and sub-constructs, within the South African foundry industry context, are addressed extensively in chapter 7 of this study (figures 7.4 and 7.5).

Increasing level of importance of micro and macro drivers within each category

Micro and Macro driver classification (Siudek & Zawojska, 2014)

Less effective / uneconomic use	**Assets/Resources**	Effective / economic use
Less stringent or defined	**Processes**	Stringent and clearly defined
Low and inefficient	**Firm's Performance**	High and efficient
Non-existent	**Supporting and Related Industries and Clusters**	Existent
Less supportive of local industry	**Institutions and Government Policies**	Supportive of local industry

Increasing effect on firm sustainable competitive advantage

Figure 3.9: Micro and macro driver importance on firm competitiveness

Source: Author's own compilation (2022), adapted from Siudek and Zawojska (2014)

The following section discusses strategies that firms can develop to positively influence the drivers of SCA.

3.9 SCA STRATEGY DETERMINATION FOR FOUNDRY COMPETITIVENESS

The determination of an organisation's competitive advantage requires careful analysis of the micro and macro environment strategy formulation processes, and the ability by management to ask important questions about the organisation (Baporikar, 2014). Although factors within the macro environment are largely outside the control of organisations, Dvoulety and Blazkova (2020) argue that the decisions taken within the micro environment are crucial in influencing competitiveness. This organisational assessment includes asking questions on i) whether the strategy formulated is different from other companies in the market, ii) whether the company's strategy position will deliver superior profits and iii) whether the strategy is defensible (Baporikar, 2014).

Addressing these issues places an organisation at a favourable position towards attaining a SCA. This view is supported by Atkinson (2017), Cheng (2019), Kanagal (2018), Sigalas (2015) and Kalicanin and Gavric (2016), who mention that firm SCA would be difficult to achieve without consideration of both the micro and macro environmental strategies. This study, therefore, discusses both sets of strategies with the view of identifying those strategies that foundries can implement in order to influence positively the SCA drivers.

3.9.1 Micro driver targeted strategies for sustainable competitive advantage

According to McGrath (2013), competitive strategies are a catapult to the introduction of tools that can be used by strategists and decision makers, to identify competitiveness issues and enhance competitive advantage for their organisations. Bruijl (2018) and Porter (2012) argue that although operational effectiveness is necessary for improved performance, it is not adequate to provide a firm with competitive advantage, with the latter arguing that firms with no clearly defined competitive strategy will always be outsmarted by those that do (Porter, 2012). In support of this perspective, Vlados and Katimertzopoulos (2018) argue that competitiveness at organisational level is determined by how much better the organisation performs compared to its rivals, based on its competitive advantages and available innovative potential.

It is critical that businesses understand their competitive environment and build plans that will give them a long-term competitive advantage (Kraja & Osmani, 2015). According to Parola *et al*. (2016), firms can formulate strategies that seek to manipulate the drivers of competitiveness within the micro-environment and enhance their ability to remain competitive. Cheng (2019) suggests that Porter's generic competitive strategy framework has been the cornerstone of many firm-initiated competitiveness strategies. According to Porter (2008), firms that adopt cost-leadership, differentiation and focus strategies place themselves in an advantageous position in the market, by offering customers services or products at prices that are lower than what competition can offer and are positioned to offer better value than their competitors.

Porter (2008) also posits that en-route to becoming a cost leader, an organisation should vigorously pursue cost reduction measures, ensure tight cost and overhead control as well as practise innovation. Mintzberg (1987), in his seminal work on strategy formulation, cautions that Porter's cost leadership strategy should be referred to as "price differentiation", as it places emphasis on a business' ability to lower pricing better than competition.

Mohamed *et al.* (2019) and Pulaj, Kume and Cipi (2015) argue that whilst firms can apply a cost leadership strategy in order to gain competitive advantage, this strategy is only effective in an environment where the market is price sensitive and the buyers do not have much concern about product differentiation. However, Bruijl (2018) argues that firms must be careful not to “aggressively cut down pricing” such that profits become severely affected as this may negatively affect the operation of the firms.

A cost differentiation strategy takes into consideration only ‘the costs’ that are within the control of the firms. Energy, labour and material costs contribute to more than 80% of foundry operational costs in South Africa (Casting SA, 2018; Energy Intensive Users Group of Southern Africa, 2017) and these costs are largely outside the direct control of the foundries, making cost reduction strategies and hence, cost differentiation, difficult to achieve.

Differentiation and focus strategies allow firms to provide products which their targeted customers perceive as distinct and valuable when compared with those of competition (Pulaj *et al.*, 2015). In support of Pulaj *et al.* (2015), Subrahmanyam and Azad (2019) mention that companies can differentiate according to product features, reputation, customer service, brand image and design. Mcgee (2015) identifies quality, innovation, positioning and customer responsiveness as the primary dimensions of differentiation that can propel the competitive advantage of the business. Both sets of authors emphasise the fact that an effective differentiation strategy should be in accordance with the attributes that satisfy the ‘*VRIN*’ concept as articulated by the RBV theory.

In their seminal work, Wright, Kroll, Kedia and Pringle (1999) argued against the idea that organisations had a choice of cost leadership or differentiation strategies as vehicles for the attainment of competitive advantage. The authors pointed out that there was empirical evidence that showed that companies could still be competitive if they combined both the cost leadership and differentiation strategies. This position is also supported by Kaliappen and Chuah (2018), and Subrahmanyam and Azad (2019), who argue that a combination of the two strategies provides companies with the advantage of capitalising on the benefits of the individual strategies.

Identifying a “niche” of sufficient size with purchasing power and a potential for profitability (Akbar, Razak Bin Omar, Wadood & Bin Tasmin, 2017) is a fertile platform for a focus strategy. Within the foundry industry context, such a strategy would require extensive investments in technology, machinery and equipment, which would enable the foundry company to manufacture specialised castings, which competitors would not be able to match because of the prohibitive costs involved. Phiri, Ng'andwe, Mukutu, Moono and Kapapi (2019), however, caution on the application of this strategy, especially in developing countries, by emphasising that in the long term, there is a possibility of competitors recognising and copying the focus strategy or customer preferences might drift towards product attributes that are common to the market and not necessarily specialised. As a result, the high investment costs could end up not benefiting the foundry as initially envisaged.

Foundry companies in South Africa are faced with a number of competitiveness factors as discussed in section 3.7. These erode the ability for these companies to seek either differentiation or cost leadership strategies. The presence of cheaper material alternatives in the form of castings or casting products from other countries, such as China, as well as the high input costs makes cost containment strategies almost an impossibility (Cunningham, 2013b). Added to this, differentiation strategies are generally costly and compel companies to position themselves as offering premium products (Dälken, 2014). Studies conducted by Deringer, Erixon, Lamprecht and van der Marel (2018), the DTI (2015) and CSIR (2019) revealed that projects and procurement managers in state owned enterprises (SOEs) had "cost saving" as one of their key performance criteria and would, therefore, often seek to procure the cheapest castings as long as "it could do the job", at times, regardless of quality or country of origin concerns. This reflects possible misalignment between departmental priorities and strategies within the organisations, which defeats the drive for the adoption of either the cost or the differentiation strategy. Such actions would also undermine the government's local content initiatives.

In the quest to overcome the challenges associated with high operational costs coupled with increasing international competition, which manifests through the influx of imports, foundries resort to downsizing, eliminating less profitable production lines, scaling down on production times in order to stay afloat and, at worst, close down (Davies, 2015). The over reliance of ageing equipment (Davies, 2015; Dlambulo, 2019; National Foundry Technology Network, 2011) and lack of investment in technology (Davies, 2015; Jardine, 2015b; the DTIC, 2019) deprives this industry of the opportunity to curve niche markets that require specialised castings. As a result, various foundry companies find themselves "fighting" for the same market or looking at external interventions in order to survive.

The following section reviews literature on the various industry specific strategies, which may be implemented by the government or industry, in an attempt to improve on the SCA of the foundry industry.

3.9.2 Macro driver targeted strategies for sustainable competitive advantage

The consequences of globalisation have opened avenues for South African businesses to trade outside the local geographical confinements (Ayob & Senik, 2015; Kraja & Osmani, 2015; McMahon, Barkhuizen & Schutte, 2014) and this has encouraged critical analysis on the impact of the macro-environment on competitiveness. Yaya, Otu and Labonté (2020:3) point out that despite the above, the COVID-19 pandemic "… is now fuelling protectionism … and putting globalisation under threat as governments scramble to reduce local industry vulnerability by limiting global trade". This new reality is "forcing" both industry and governments to re-think and reposition their businesses, in order to enhance competitiveness. Consideration on the type and nature of firm macro drivers is key in the formulation and implementation of strategies that mitigate the negative impact of these drivers, while capitalising on the opportunities that enhance SCA.

As discussed in section 3.8, the macro-environment constitutes factors outside the direct control of the firm and generally affects more than a single firm or the entire industry (Kruger, Rootman & Saunders, 2015). Government policies and the regulatory frameworks are predominant in influencing the macro-environment (David, Semanik, Torsekar, David & Semanik, 2018; Kleynhans, 2016). They introduce support mechanisms such as subsidies, manufacturing incentives and promoting the strict implementation of regulations, such as local content enforcement (localisation) and competition laws, which may act as barriers to entry or limit the availability of alternatives (substitutes) (Barnes, 2015; Infrastructure Dialogues, 2014; Jardine, 2015a; Leigland & Eberhard, 2018; Mbatha, 2018).

Nduhura *et al.* (2017) posit that the economic success of a country is related to its international competitiveness. The authors also argue that government support of the industry is crucial in curtailing "external competition and thus protecting the infant industries", as well as those that are "in the doldrums of decline" (Hüne & Sprich, 2016:3). The foundry industry in South Africa, which has seen a decrease in the number of foundries that are still in operation, has also been classified as a post mature industry in decline (Davies, 2015; Dlambulo, 2019; Dondofema, Matope & Akdogan, 2017) that is in need of government intervention in order to enhance the competitiveness of the overall industry in relation to its foreign counterparts.

According to Deringer *et al.* (2018), governments play a crucial role in influencing the level of competitiveness of selected industries. Governments in countries that anticipate competing in the global space must take up responsibilities that seek to position and encourage local companies to become competitive. To achieve this, governments should formulate policies that stimulate productivity, efficiency and stimulate capital resource development (Dälken, 2014; the DTI, 2018; Songling *et al.*, 2018).

Songling *et al.* (2018) and Ketels (2016) attest that governments should intervene in economic situations where there are market failures, which can be "effectively and efficiently" redressed by policies that the governments decide to implement. Government intervention in market operations should occur when there is a need to set a framework within which markets operate, as well as to influence overall market operations. According to Songling *et al.* (2018), governments can make use of various instruments in order to influence firm and industry competitiveness. These instruments include setting minimum standards, making policy announcements and formulating regulations. Regulatory instruments such as localisation policies, subsidies, tariffs and import quotas are collectively referred to as protectionism (Helm, Gleißner & Kreiter, 2013; Ketels, 2016).

The following section delves into the strategies designed to improve firm competitiveness by influencing macro drivers.

3.9.2.1 Strategies embedded within the regulatory framework

In support of the local foundry industry, the South African government, working through collaborations among the DTIC, the NFTN and industry clusters (SAIF, and Valve and Actuator Manufacturers Cluster of South Africa [Vamcosa]), has put in place measures aimed at curtailing the decline of the foundry industry through various strategies.

The most recent government strategy, aimed at driving the competitiveness of foundries, has been the introduction of local content legislation which compels state owned companies to support local foundries in their procurement effort (Davies, 2015; Government Gazzette, 2014; Jardine, 2015b; Meyer-Douglas & Mohamadi, 2013). This form of protectionism (localisation) is discussed extensively in the following section.

3.9.2.2 Localisation as a protectionism strategy

The concept of protectionism was coined through the seminal work of Mihail Manoilescu, a Romanian economist (1891-1950), who advocated for the permanent protection of industries and argued that protectionism, if implemented properly, gave industries an economic and competitive advantage (Ernst, Merola & Samaan, 2019; Nenovsky & Torre, 2013). Manoilescu also argued that it was necessary to protect growing domestic industries from foreign competition although, over time, the productivity of these industries would equalise (Nenovsky & Torre, 2013). The enforcing of local content requirements on industries is a form of protectionism typically used in developing countries and it stipulates that a portion of the final product must be manufactured in the domestic industry (Leigland & Eberhard, 2018).

Various definitions of localisation (local content or protectionism) have been put forward by different authors and institutions, to reflect the specific area to which the concept applies. According to the Organisation for Economic Cooperation and Development (OECD) Report (2014:2), local content is defined as "… a government policy which compels manufacturers of a particular product to obtain domestically a specified minimum percentage of their basic production input from domestic producers". Local content is another term for "regulatory protectionism which is a form of political privilege that offers competitive advantage to local industries over their foreign counterparts" (Watson & James, 2013:1).

Weiss (2016:1) argues that local content policies are usually drafted and implemented by policymakers "… to pursue targets such as industrial development, job creation, value addition, linkage creation and better value chain incorporation". The author also points out that despite the various debates relating to how well or how bad local content policies have performed, there remains interest from governments in developing countries to introduce and enforce it as a way of promoting local industry competitiveness. On the basis of the above views and for the purposes of this study, local content is defined as "the government's carrot and stick approach to influencing procurement activities where the principles of free trade are overridden by the deliberate drive to shift the balance of power from the buyers to the suppliers and restricting procurement from non-local suppliers in an attempt to boost the domestic industry" (author's own definition).

The common school of thought behind the implementation of local content is that it helps governments to provide industries with an opportunity to grow from infancy until they are large enough to compete on a global scale (Fajgelbaum, Kennedy & Khandelwal, 2019; Monaco, Bell & Nyamwena, 2019). Despite the benefits of localisation, as articulated in the various studies above, Nenovsky and Torre (2013) agree with McCulloch, Balchin, Mendez-parra and Onyeka (2017) that such a strategy also presents challenges for the industry and could, in the long run, be detrimental for the competitiveness of the firms that it originally sought to protect.

The government of South Africa, through the National Planning Commission (2011), makes use of localisation as a policy tool to stimulate economic development (Ettmayr & Lloyd, 2017). According to the NFTN (as cited in the Cape Business News, 2022), the introduction of localisation in South Africa presents growth opportunities for the industry, with Kilongozi, the NFTN project manager adding that, through localisation strategies, the South African government could reduce casting imports by at least 20%. In order to ensure the success of localisation, a set of pre-conditions need to be met (Ettmayr & Lloyd, 2017; Gupta, 2015; Samanga, 2013; the DTIC, 2019). These include the availability of a stable and sizeable market, localisation requirements that are not set too high, so as to be restrictive, and measures such skills transfer targets that enable manufacturing facilities to improve on efficiencies in the long term. Other pre-conditions identified by various authors include policy coherence and alignment, as well as the government's monitoring and enforcement mechanisms (Kambi & Kambi, 2017), industry capacity, available resources and manufacturing input costs (Mutambala & Diyamett, 2017), concentration of ownership and control (Kireru, Ombui, Omwenga & Kenyatta, 2016) and the availability of trade agreements (the DTIC, 2019).

The DTIC established an industrial policy action plan that sought to grow the economy and raise "the aggregate domestic demand", through the localisation of public procurement and the support of industries (the DTIC, 2019). One such industry where there was the need to grow domestic demand, in order to stop the firms from closing down, was the foundry sector (the DTIC, 2019). According to Deringer *et al.* (2018), the formulation of localisation strategies is crucial in the development of local foundries and this, in turn, affords them an opportunity to become competitive in the long term. The authors, however, caution on the need to ensure pre-conditions for the success of local content are in place for this strategy to succeed.

Figure 3.10 provides a summarised view of the pre-conditions which are necessary for localisation to succeed within both the global and South African foundry environment. In order to ensure the success of localisation, it is essential that research is conducted to determine the level of existence of these pre-conditions.

Success of Localisation

Low	Pre-conditions	High
Not clear or Specific	Local Content Framework	Clear and Specific
Small	Market Size and Stability	Large
Low	Local Content Threshold	High
Low	Transfer of skills and technical know-how	High
Low	Monitoring and Enforcement Mechanisms	High
Low	Policy coherance and Programme Alignment	High
High	Concentration of Ownership and Control	Low
Non-Existent	Government Support	Existent
Low	Industrial Resource Endowment	High
High	Manufacturing Input Costs	Low
Low	Industrial Capacity	High
Non-Existent	International Trade Agreements	Existent

Figure 3.10: Pre-conditions for localisation
Source: Adapted from Ettmayr and Lloyd (2017)

Whilst there is vast literature supporting the implementation of local content strategies in order to enhance firm SCA, various scholars present arguments against such a strategy. The arguments against the introduction of localisation are discussed and presented in the following section.

3.9.2.2.1 Arguments against localisation strategies

According to Leigland and Eberhard (2018), almost every government economic, social and financial decision will have an impact on international trade flows and the country's relative competitiveness – whether intended or not. According to Cimino, Hufbauer and Schott (2014:17), the use of localisation requirements introduces "legal uncertainty" into an economy, which is not a characteristic of a “stable and trusted policy environment”. As a result, this environment may deter the establishment of potential investors and investment opportunities. The nature of the effects of localisation measures makes this strategy, a “two-edged sword” which may succeed in reducing imports from abroad, but make it difficult for domestic companies to export their products as other trading countries retaliate, by limiting the quantities of products they procure from that country (Deringer *et al.*, 2018).

In the Trade and Industrial Policy Brief, economist, Nyakabawo (2017) argued that local content policies do not always lead to the desired levels of procurement from local manufacturers. Nyakabawo (2017) observed that local (South African) manufacturers often struggle to compete with foreign suppliers because of lack of capacity, capability and poor quality leading to their exclusion in the process as a result of non-compliance. In the same vein, Leigland and Eberhard (2018:571) caution that if little attention were paid to industry capacity and the ability of firms to compete, localisation would create “disincentives against long term foreign investments”. Cimino *et al.* (2014) also argue that localisation may also not result in value addition, if the government has not put in place the correct measures to promote innovation and the development of ailing firms.

Based on the above, it can be deduced that weak institutional capacity, inconsistencies in government policies, corruption and lack of support are some of the factors that can render localisation futile. According to OECD (2017), protectionism frustrates comparative advantage and has the primary aim of supporting “dying” industries, while slowing down the development of newer ones. Kireru *et al.* (2016) put forward an argument that localisation policies are “merely special interest policies”, which are set up to protect the interests of a small group of local manufacturers at the expense of other members of the public. The report also points out that as soon as an industry or sector starts receiving some form of protection, it is often difficult to remove this protection at some stage in the future.

In a study conducted by Deringer *et al*. (2018) on public procurement localisation, the researchers ranked local content implementation as the fifth type of government policy measure that caused harm to foreign trade and investment in countries where it was implemented. Evenett and Fritz (2015:36) argued that localisation has become one of the “greatest threats to trade liberalisation of the global trading system in the 21st century” because of its ability to stifle foreign competition.

The argument that introducing localisation leads to the creation of jobs, whilst true, is also a “myopic” one. To support this, a study conducted by Leigland and Eberhard (2018) showed that when localisation was introduced to an apparel manufacturing industry in the United States of America, 36 000 jobs were created in the manufacturing sector but 58 000 jobs were lost in the apparel retailing sector.

Abboushi (2010:390) points out that localisation also leads to “efficiency losses” which result from “production distortions” and the added “bureaucratic and government expenditures” used in the monitoring and enforcement of such a policy. Vivek (2017), and Ettmayr and Lloyd (2017) support this view and add that, ultimately, the costs of localisation are borne by consumers in the form of higher prices that are paid for the goods supplied by the local manufacturers. Vivek (2017) also found that the implementation of local content strategies tended to be counterproductive and reduced competition, by encouraging labour and capital to remain in less efficient industries whilst protecting poor performance.

Supporting industry, through the institution of a localisation strategy, might seem an “easier and attractive” option for the South African government to implement. However, regarding helping foundries to become competitive and sustainable, the cons of such a strategy should also be borne in mind. Such a move would not necessarily mean improved efficiency in productivity or improvement in employment levels but could have a detrimental ripple effect on other similar or related industries, which may not be capacitated because of lack of investment and inadequate skills levels, among other factors.

The following section discusses subsidies, tariff and import quota strategies as an aid to the SCA of both firms and industries.

3.9.2.3 Subsidies, tariffs and import quota strategies

Subsidies, tariffs and import quotas represent additional strategies that governments can introduce, in order to both protect local industries as well as augment their level of competitiveness. Whilst subsidies refer to government payments, tax reductions or exemptions that are made to domestic manufacturing companies, tariffs relate to taxes imposed on imports from foreign suppliers and import quotas are trade restriction measures aimed at discouraging the import of specific products, to safeguard domestic production (Cosbey & Ramdoo, 2018; Guarino, 2018).

A study by Doan, Nguyen, Vu, Tran and Lim (2015:19) on the manufacturing sector in Vietnam, revealed that increasing levels of import penetration had a significantly high correlation with the likelihood of “firm death”. The impact of competition that emanates from foreign suppliers within the developing countries can, therefore, not be under estimated, with foundries in South Africa operating in a highly competitive environment composed of other local foundries, as well as foundries based in countries such as Germany, France, Italy, Poland, China, India, Thailand and Brazil, among other countries (Mohamadi & Mertens, 2011). These strategies, therefore, represent “good policy tools when they are used to correct market imperfections where private firms fail to deliver socially or economically desirable outcomes” (Clements & Parry, 2018:56).

One of the foremost arguments against tariff and import quota strategies, is the possibility of other countries taking reciprocal action against the country that initiates such action (Guarino, 2018), resulting in “protectionist spirals” (Evenett, 2020:6). This in turn hinders the firm’s ability to compete with foreign counterparts. A study by Vivek (2017), in the United States, showed that enforcing a 15% import restriction in the steel manufacturing sector would create 26 000 employment opportunities, but would “destroy” 93 000 jobs within the steel importing arm of the industry. In a more recent study, also carried out on the United States manufacturing industry, Flaaen and Pierce (2019:20) note that tariff increases and import quota strategies have also led to reductions in employment within the industries it was meant to benefit, as the positive effects of protectionism are negated by “the negative effects of rising input costs and retaliatory tariffs”. James (2018) argues that raising tariffs and other protectionist measures may lead to an increase in costs for businesses, as inputs become more expensive. This not only reduces the competitiveness and profitability of the entities concerned, but also ensures that the aggregate impact on the economy is negative.

Based on the discussions presented, governments have more influence on the macro-environment than the firms and industry alone. The institution of policies and regulations that deter foreign competition, while promoting the targeted industry, is crucial if pre-conditions are met, monitoring and measurement systems are in place, and if the firms are capacitated to innovate and invest in resources that drive SCA. It should also be noted that protectionism strategies also pose a serious threat to the very industries it seeks to protect, because of the ease with which other countries can copy and implement these strategies in retaliation.

Figure 3.11 provides a summary of the theories, identified in literature, explaining how organisations can attain SCA. The figure also shows the key micro and macro-economic drivers for SCA, which this study tested in order to identify the ones deemed important and critical to the attainment of SCA and draw possible recommendations on the strategies that foundries in South Africa can adopt and implement to achieve SCA.

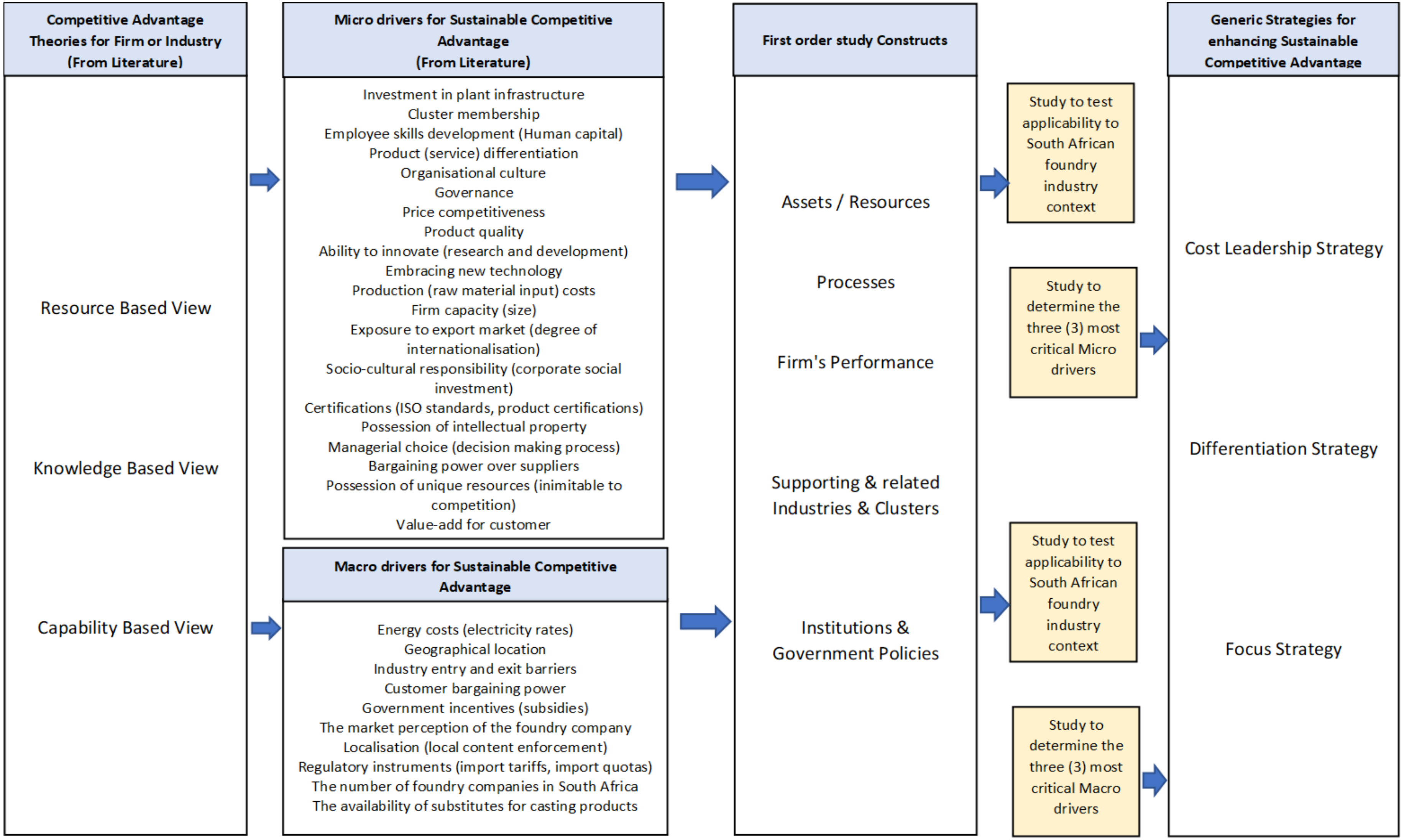


Figure 3.11: The Conceptual Framework for Sustainable Competitive Advantage (*Second draft*)

Source: Author's own compilation (2022)

3.10 CHAPTER CONCLUSION

Despite the polarity of views on the drivers for SCA, as outlined in this chapter, there remains a need for firms to understand how their level of sustainable competitiveness can be affected by factors within the micro and macro-environments. The drivers for SCA can be classified based on the environment where they exert influence, their sphere of influence and the form they take.

The five, first-order constructs identified in this chapter, which include assets or resources, processes, firm performance, supporting and related industries and clusters, as well as institutions and government policies, were discussed and formed the backbone of the study's data collection. The micro and macro drivers identified as important to enhancing SCA for the foundry industry were classified under these constructs. Whilst cost leadership, differentiation and market focus strategies have an effect on the micro drivers, the concepts of localisation, subsidies, tariffs and import quotas remain contentious topics between policy makers and policy takers (McCulloch *et al*., 2017). This can serve as an impetus for the development of infant industries, protection of the interests of local firms (Fajgelbaum *et al*., 2019). In turn this may enhance the SCA of ailing businesses, through the effect of these strategies on macro drivers. The long-term goal of creating SCA for the foundry industry requires further empirical research, as directed by this study, with a primary focus of examining how these drivers relate to and can be used to enhance SCA.

This chapter provided a chronological development on the definitions of strategy and sustainable competitive advantage. This was followed by a discussion on the theoretical foundations of the study, which entailed extensive analysis of the generic strategies, the competitive forces, the RBV, MBV, KBV, RV as well as the CBV theories. These theories identified the key resource elements that organisations can draw from in order to gain a competitive advantage. The micro and macro drivers affecting foundry SCA, and the strategies that enhance competitiveness were also covered. The last section focused on a discussion of strategies that can be implemented to positively influence both the micro and macro-economic drivers, in order to promote SCA.

The next chapter will provide a discussion on the research design and methodology that this study followed.

CHAPTER 4: RESEARCH METHOD AND DESIGN

CHAPTER 4 - ROADMAP

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Figure 4.1: Illustration of layout for Chapter 4

Source: Author's own compilation (2022)

4.1 INTRODUCTION

The previous chapter provided the literature perspectives on strategy and sustainable competitive advantage. The theoretical foundations of the study were explored, leading to the identification of the micro and macro drivers influencing SCA for the foundry industry. The possible strategies for enhancing SCA were also extensively covered. The purpose of this chapter is to explain the research method and design adopted in this study.

This study sought to primarily contribute to the development of a framework for the sustainable competitive advantage of the foundry industry in South Africa and provide recommendations on how micro and macro drivers can be used to enhance SCA, and hopefully mitigate against the closure of foundries. A recent study by Lochner *et al*. (2020) has shown that there are 123 foundries currently in operation in South Africa, compared to 450 in the 1980s and 213 in 2004. Research carried out by industry (Davies, 2015; Samanga, 2013; the DTI, 2014) and individual researchers (Cunningham, 2013a; Dlambulo, 2019; Jardine, 2015b; Nyakabawo, 2017) attributes the closure of foundries to lack of competitiveness, as a result of macro and micro-economic challenges facing the industry as opposed to their foreign counterparts. The study sought to address this problem by first identifying the key micro and macro drivers that enhance SCA.

The secondary objectives of the study include the identification, from literature, of the micro and macro-economic drivers for the SCA of foundries in South Africa, benchmarking the perceptions of stakeholders within the foundry industry on SCA against the micro and macro-economic drivers identified from literature, and making recommendations on strategies to enhance the SCA within the foundry industry.

The current chapter provides the scope as well as the research design and method which enabled the researcher to answer the research question and address the study's objectives. This is followed by a discussion of the mixed methods approach and the rationale behind the selection of this approach. An explanatory sequential mixed methods approach with a prioritised quantitative phase was followed. The population and sampling procedures for both the quantitative phase (first phase) and the qualitative phase (second phase) is discussed, as well as the arguments justifying their adoption. The data collection and data analysis processes for the two distinct phases is also provided, with emphasis being made on both the validity and reliability elements, as well as the trustworthiness of the instruments used. The chapter concludes with a discussion of the limitations of the study as well as the ethical principles adopted throughout the research.

4.2 RESEARCH SCOPE

The closure of South African foundries offers motivation to confine this study to registered South African located metal casting foundries, which manufacture and supply castings to original equipment manufacturers within and outside South Africa. The target population and sampling frame for the study was drawn from this industry for both the quantitative and qualitative phases. The objectives of the study and the problem statement offer further guidance on the study parameters. The next section will discuss the research format.

4.3 RESEARCH FORMAT

Figure 4.2 illustrates an epistemic model, the “research honeycomb”, developed by Wilson (2014) that researchers can adopt to explore the six critical research elements which include, the research philosophy, research approach, research strategy, research design, data collection and data analysis techniques. This model enhances the coherence of the study and guides the development and systematisation of the research frame, as well as ensures that the researcher does not veer off the focus of the study. Figure 4.2 represents the format that was adopted in line with the focus of this study. The model provides a framework that informs the structure and discussion in this chapter.

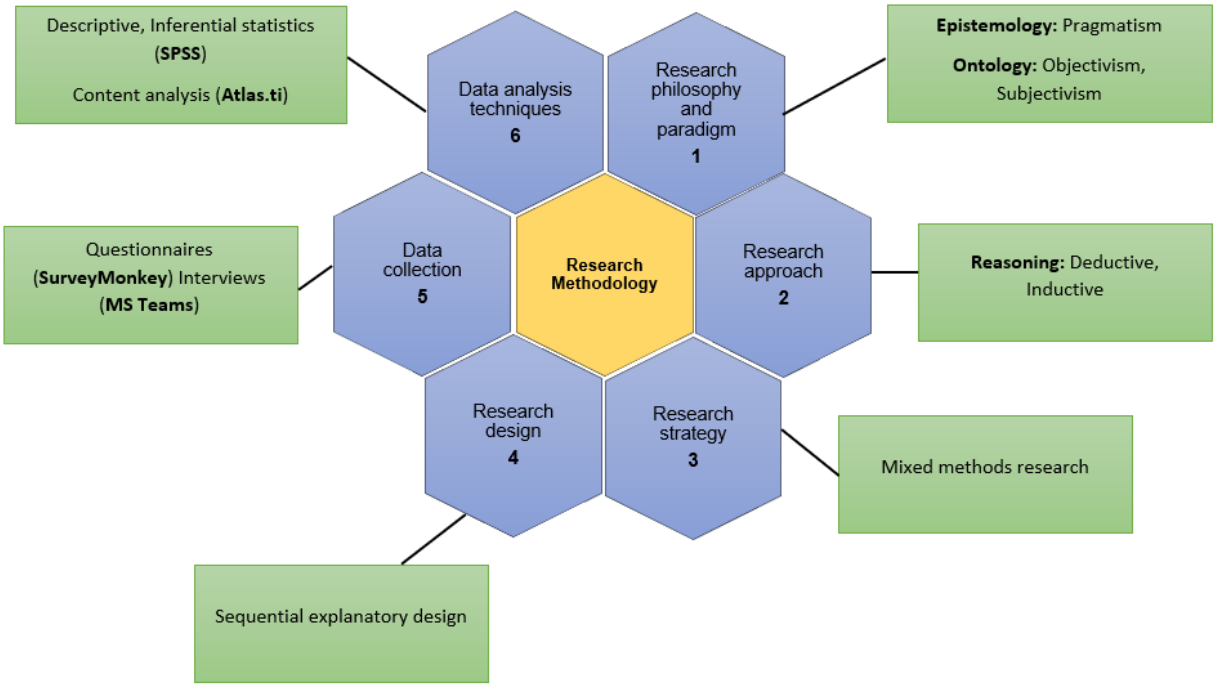

Figure 4.2: The honeycomb of research methodology for this study
Source: Adapted from: Wilson (2014)

The following section provides a discussion of the research philosophy informing this study.

4.3.1 Research philosophy and paradigm

A research philosophy refers to "a system of beliefs and assumptions about the development of knowledge" (Saunders et al., 2016:124). Research paradigms, on the other hand, represent a set of assumptions and philosophical thinking that the professional community adopts, in the acquisition of knowledge about the physical and social universe (Friedrich, Schlauderer, Weidinger & Raab, 2017). Saunders *et al*. (2016:132) define a paradigm as "a set of basic and taken-for-granted assumptions which underwrite the frame of reference, mode of theorising and ways of working in which a group operates". Guba and Lincoln (1994), on the other hand, state that a research paradigm is a set of beliefs and worldwide views that guide the researcher's investigation or philosophical orientation.

This study was grounded within the pragmatism epistemology. While epistemology relates to "what is acceptable, valid and legitimate knowledge" (Wilson, 2014:34; Saunders *et al*., 2016:127), pragmatism is defined as "a philosophical view which considers the function of thought as a tool for prediction, action, and problem solving and not to describe, represent, or mirror reality" (Yawson, 2016:3). This paradigm is also driven by the philosophy that "there are singular and multiple realities" that can be investigated to "solve practical problems in the real world" (Creswell, 2014; Saunders *et al*., 2016:144). Pragmatism is also based on the premise that "no single point of view can provide a complete picture of reality" (Saunders *et al*., 2016:144).

When locating research in a particular paradigm, the researcher should ensure that the study upholds the basic assumptions and values of the selected paradigm (Kivunja & Kuyini, 2017). Mixed methods research is associated with pragmatism (Kaushik & Walsh, 2019; Ngulube, 2015) and provides the "best adaptation" of a pragmatic philosophy in research (Yawson, 2016). According to Saunders *et al*. (2016), for a pragmatist, the research should start with the identification of a problem followed by an articulation of the study aim of providing practical solutions to the problem. The need to ensure the methods used "enable credible, well founded, reliable and relevant data to be collected" (Saunders *et al*., 2016:144) motivates the adoption of pragmatism. This philosophy was adopted for this study.

Wilson (2014) asserts that ontology relates to claims about "what reality is", while Saunders *et al*. (2016:127) note that ontology refers to "assumptions about the nature of reality". This study adopted a multiple ontological view of objectivism and subjectivism in order to address the study questions (Wilson, 2014). Kelly and Cordeiro (2020), in support of the views by Brierley (2017), note that while quantitative research is objective and qualitative research is subjective, the adoption of a pragmatic approach allows the researcher to be flexible enough to adopt both perspectives at the different stages of the research, as far as is practicable.

Through the adoption of pragmatism as a philosophy, the researcher was able to obtain a broader understanding of the "multiple truths", which explained the reasons why foundry companies are closing down and also aided in the proper identification and understanding of the drivers which could be adopted to enhance SCA for the industry.

4.3.2 Research approach

Saunders *et al*. (2016) cite the fact that there are often two methods of thought that researchers can make use of: inductive or deductive logic. With deductive reasoning, “the conclusion is derived logically from a set of premises, the conclusion being true when all the premises are true” (Saunders *et al*., 2016:144). With inductive reasoning, Cooper and Schindler (2014:68) point out that the researcher draws conclusions from “one or more pieces of evidence, with the conclusion explaining the facts and the facts supporting the conclusion”. The pragmatic approach adopted in this study allowed for the researcher to make use of deductive reasoning during the quantitative phase of the study and inductive reasoning during the qualitative phase. To this end, an inclusive logical approach was followed (deductive) as well as an explanation of facts through interviews (inductive) for an in-depth conclusion.

In summary and as detailed in the previous sections, during the first (quantitative) phase of the study, the researcher applied existing theories in the designing and distribution of questionnaires, in line with the proposed research philosophy of positivism (epistemology), objectivism (ontology) and deduction (reasoning). During the second (qualitative) phase of the study, an interpretivist stance (epistemology) was taken with a subjective (ontological) view and inductive reasoning.

The following section discusses the research strategy adopted for this study.

4.3.3 Research strategy

Mixed methods research was adopted for this study because of its ability to draw on the potential strengths of both quantitative and qualitative methods. The following sections provide motivation and rationale behind the choices made.

4.3.3.1 *Mixed methods approach*

As indicated in the previous section, mixed methods research was adopted for this study. Johnson and Onwuegbuzie (1990:17) define mixed methods research as “the type of research where the researcher mixes qualitative and quantitative research techniques, methods, approaches, concepts, or language into a single study". Creswell and Tashakkori (2007:7) point out that mixed methods research "integrates the study's findings and draws inferences using both qualitative and quantitative methodologies in a single study". Leedy and Ormrod (2015) suggest that a researcher may make a more substantial contribution to their field of study by doing mixed methods research than they can if they only employ one strategy. Bowen, Rose and Pilkington (2017a), however, point out that if correctly used, mixed methods research can help researchers build confidence in their findings whilst offsetting the disadvantages that are associated with the use of a single methodology.

Ngulube (2015) points out that the quality of knowledge that emanates from any given study, depends on the methodology that is used. The author further argues that the use of appropriate research methods is crucial in order to "conceptualise" and address the problem identified in the study.

Several factors must be considered as motivation for selecting mixed methods research or when "blending" research methodologies. These include:

i. Triangulation, which refers to the use of different approaches to provide a better understanding of a given phenomenon (Turner, Cardinal & Burton, 2015), thereby enhancing the mutual corroboration of the findings (Schoonenboom & Johnson, 2017);
ii. Completeness, which refers to the notion that using both qualitative and quantitative researches provides a comprehensive account of the study (Bryman, 2012),
iii. Off-setting weaknesses and providing stronger inferences by capitalising on the strengths of qualitative and quantitative methodologies, whilst each methodology offsets the weaknesses of the other (Bryman, 2012);
iv. Answering different research questions, using the different methodologies (Bryman, 2012);
v. Wider explanation of findings by using one methodology to help elaborate and provide enlightenment on findings generated by the other (Bryman, 2012);

vi. Broader illustration of data – Bryman (2012) refers to this as “putting meat on the bones of dry quantitative findings” and generally relates to the use of one methodology to illustrate the findings of the other.
vii. Potential hypotheses development and testing, which refers to the use of qualitative data to develop hypotheses which are then tested using quantitative research within the same study (Bryman, 2012);
viii. Possible instrument development and testing, which entails the use of findings or results of one methodology (from the first phase) to develop the data collection instrument for the methodology that was used in the next phase of the study (Schoonenboom & Johnson, 2017).

The nature of the research problem required the researcher to collect diverse types of data relating to the micro and macro-economic circumstances affecting the foundries, identify drivers for enhancing SCA and provide a deeper understanding of how the closure of foundries could be abated by developing a framework that informs the enhancement of SCA. By adopting mixed methods research, the researcher quantitatively tested theoretical propositions identified from literature and followed this up by qualitatively obtaining richer theoretical insights, in order to better understand the research problem (Saunders *et al*., 2016:170) and provide plausible recommendations towards the enhancement of SCA for the foundry industry.

Saunders *et al*. (2016) identify various configurations of mixed methods designs in which quantitative and qualitative research can be combined, as well as the extent to which this combination may occur. These designs include concurrent, sequential exploratory, sequential explanatory and sequential multiphase. This study adopted a cross-sectional sequential explanatory design.

4.3.4 Research design

Creswell and Plano-Clark (2018:58) define a research design as a “procedure for collecting, analysing, interpreting and reporting data in research studies”. The following section discusses the research design selected for this study.

4.3.4.1 *Sequential explanatory research design*

A cross-sectional, sequential explanatory research design was used in this study with priority being given to the quantitative phase (QUAN $\rightarrow$ qual) (Creswell, 2014). In support of Creswell (2014), and Creswell, Plano Clark, Gutmann, and Hanson (2003), Creswell and Plano-Clark (2018) argue that the sequential explanatory design involves prioritising collecting and analysing data from the quantitative phase before the qualitative phase is initiated.

This study made use of the results of the quantitative stage to develop questions for use in the qualitative stage of the research (Creswell, 2014). Subedi (2016:572) points out that, in line with the works of Creswell *et al*. (2011), the rationale for using a sequential explanatory design is that, whilst the quantitative phase "provides a general picture of the research problem", the qualitative phase takes this further by providing more analysis that "refines, extends and explains this general picture". Creswell *et al.* (2011) refer to this design as the "explanatives design" where qualitative data (figure 4.3) is used to explain the initial quantitative results (figure 4.3). The entire process that guides the selected design is illustrated in figure 4.3.

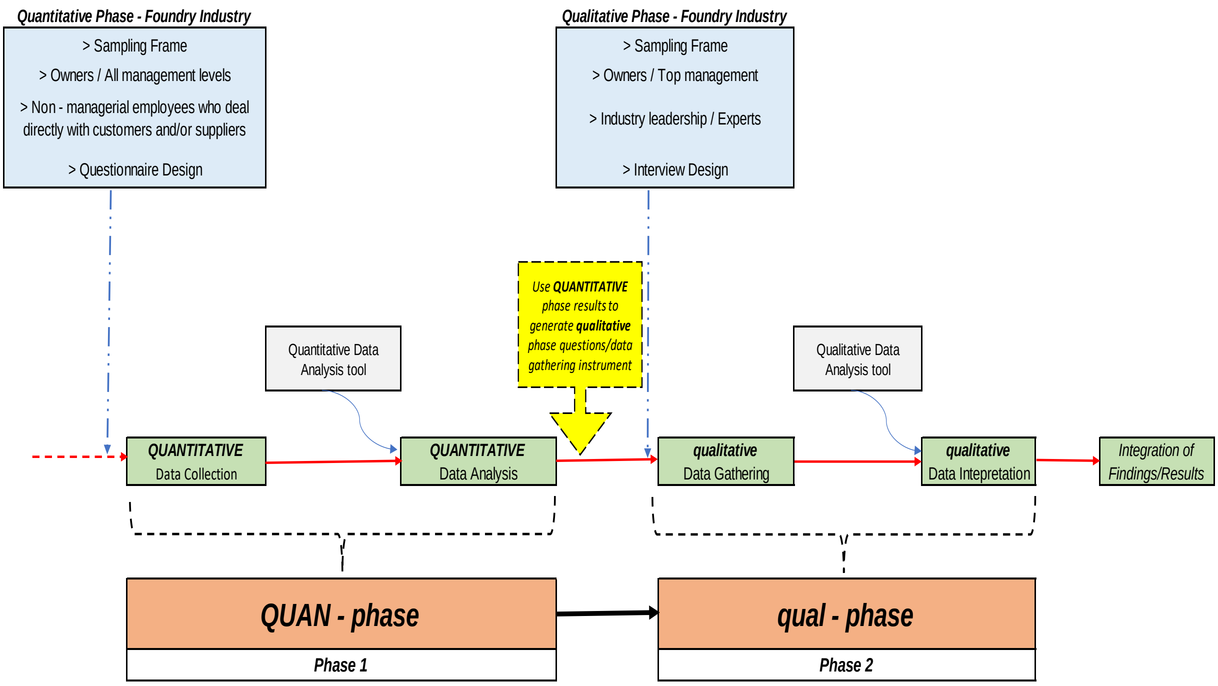

Figure 4.3: Sequential Explanatory Design

Source: Author's own compilation (2022)

As discussed in the previous section, the quantitative phase of this study provided a "general picture" of the micro and macro-economic drivers influencing the SCA of foundries. This allowed the researcher to benchmark the drivers with literature perspectives. The qualitative phase was then used to "refine and explain" the drivers identified and provide deeper insight on how these drivers impact on the sustainable competitiveness of the foundries, proceeding to the researcher's development of a framework for foundry SCA.

As illustrated in figure 4.3, the following section provides a chronological outline of the research design phases that the study followed.

4.3.4.2 Research design phases

As mentioned in the previous section, this study adopted a sequential explanatory research design, which consisted of two phases, the quantitative phase (phase 1) and the qualitative phase (phase 2) (see figure 4.3). Priority was given to the quantitative phase, which is discussed extensively in the following section.

4.3.4.2.1 Phase 1: The quantitative phase

Creswell (2014:32) defines quantitative research as "a means for testing objective theories by examining the relationship between variables in the study". Saunders *et al*. (2016:166) describe quantitative research as "explaining phenomena by collecting data that are analysed by using a range of mathematically based methods, statistics or graphical techniques".

Saunders *et al*. (2016) associate a quantitative methodology with deductive reasoning, where the main aim of the methodology is on utilising data to test theory. They also argue that in some instances, quantitative methodology may incorporate an inductive approach, which entails using data to generate theory. Daniel (2016) posits that the use of statistical data which saves time, effort and resources, makes quantitative research an attractive methodology option for researchers, as it simplifies research descriptions and analysis. Bryman (2012) also mentions that quantitative research is scientific in nature and its data collection and analysis processes make generalisation possible. This methodology also offers a "replicability" benefit as well as "researcher detachment" (Bowen, Rose &

Pilkington, 2017; Neuman, 2014), which mitigates the risk of bias in the data collection and analysis processes.

The quantitative phase of the study was used to test, within the South African foundry industry context, both the micro and macro-economic drivers for SCA, as identified from literature. This phase also allowed for the determination of the “critical” drivers with the strongest correlation towards SCA. The outcome from this phase was crucial in the development of the data collection instrument for the qualitative phase of the study.

4.3.4.2.2 Population and Sampling

Asiamah, Mensah and Oteng-Abayie (2017) distinguish between three types of populations, the general population, the target population, and the accessible population. The general population is defined as “a complete group about which it is necessary to gather certain information. The accessible population is defined as "a subset of the target population to whom the researcher has acceptable access," whereas the target population refers to "the full group of persons or objects to which the researcher would wish to generalize the findings of the study." (Asiamah *et al.*, 2017:1611). Cooper and Schindler (2014) define a target population as a group of people with the desired information or who can answer the questions posed in the research instrument.

The target population for the quantitative phase of the study comprised of management as well as non-management employees who interacted directly with either suppliers or customers in their various areas of work, from the 123 foundries registered to operate in South Africa. Albertus (2019), and Huang, Li and Markov (2018) point out that because of the concept of information asymmetry, where the level of information that management has at their disposal might be different from the information at the disposal of non-managers, it is essential that researchers capture the perspectives from the two groups within an organisation, in order to gain deeper insights of how business decisions are made or accepted. The availability of a foundry industry database meant that the researcher could only contact the individuals whose details were included on the database. Foundries in the Northern Cape could not be contacted, as the contact details were not available on the database during the period when data was collected.

As indicated in table 4.1, a total of 95 foundries were invited to participate in the study. These foundries were identified from the NFTN database. The NFTN is a "key industry support initiative" which is set up and funded by the DTI to *"facilitate the development of a globally competitive foundry industry"* in South Africa (NFTN, 2015). However, not all the potential respondents from the 95 foundries, who were sent the questionnaires, responded. The reasons for non-participation varied from the contact details on the foundry database being outdated to the unwillingness to participate by some foundry companies, due to them not believing the study would add value to their businesses (particularly with family-owned foundries), being too busy at the time when data was collected and not responding at all to requests for participation.

According to Saunders *et al*. (2016), sampling is done when it is not feasible to include the entire population and when there are budgetary constraints to the research. Sampling gives the researcher an opportunity to select potential participants and engage them during the data collection process (Onwuegbuzie & Johnson, 2006). Sampling also allows for the determination of inference quality and influences the degree of generalisability of findings to other contexts (Collins, Onwuegbuzie & Jiao, 2006).

Census sampling was used to select respondents for the data collection process during the quantitative phase. The questionnaires were e-mailed to all the contacts available on the NFTN foundry database. This database contains contact details of registered metal foundries in South Africa. This allowed for every member of the population to be given an "equal chance of participating in the study" (Collins *et al.*, 2006:84).

The sample for this study comprised of top, middle and lower-level management, as well as non-management employees who dealt directly with either foundry suppliers or foundry customers. The non-management employees had to be involved in procurement, project work, sales and marketing, technical and quality management, as well as casting manufacturing operations. These employees have an adequate understanding of competition within the foundry industry in South Africa as well as on the levels of competitiveness of their respective companies. The sampling frame for the study is indicated in table 4.1.

Table 4.1: Sampling frame for the study

Province	Number of foundries in South Africa (2020)	Number of foundries with contacts details available on the foundry database	Number of respondents per province invited to participate**	Percentage respondents invited per province
Gauteng	84	72	151	77.0%
Kwa-Zulu Natal	16	11	24	12.2%
Western Cape	10	5	7	3.6%
Eastern Cape	4	2	3	1.5%
Free State	4	3	8	4.1%
North-West	1	1	1	0.5%
Northern Cape	3	0	0	0.0%
Mpumalanga	1	1	2	1.0%
Total	**123**	**95**	**196**	100%
**Some foundry companies had details of more than one contact person indicated on the database, with some having as many as three possible contacts.				

Source: Author's own compilation (2022)

As indicated in table 4.1, only 95 foundry companies, whose contact details were available on the NFTN database, were contacted. Out of a total of 72 foundry companies located in Gauteng, 151 representatives were contacted for participation, out of 11 foundry companies in KwaZulu-Natal, 24 representatives were contacted, whilst from 5 foundry companies in the Western Cape, 7 representatives were contacted. From the Eastern Cape and Free State provinces, a total of 3 and 8 representatives were contacted, respectively, while 1 representative from the North-West and 2 representatives from Mpumalanga were invited to participate. The database did not have contact details for the 3 foundry companies located in the Northern Cape.

In total, 196 representatives were invited to participate in the quantitative phase of the study. Contact details from the foundry database obtained from the NFTN were used. Surveys were sent to selected employees in these foundries, however, some contact details could either not be obtained, the e-mail addresses provided bounced back or the firms expressed no interest in participating in the study.

Efforts were made to send a minimum of two surveys per foundry to at least a management and non-management employee. According to Huang, Li and Markov (2018), within organisations, there is still a sizable knowledge gap between management and non-management staff, and this gap has a detrimental impact on the performance of the organisation. Obtaining perspectives from both management and non-management allowed the researcher to determine if there was significant information asymmetry between the two groups of respondents, regarding the drivers for SCA.

4.3.4.2.3 Inclusion criteria for the quantitative phase

In determining who could participate in the study, some inclusion criteria were considered. Inclusion criteria relates to “the key features of the population that the researcher used to answer their research question” (Patino & Ferreira, 2018:84). Saunders *et al*. (2016) mention that inclusion criteria specify characteristics that cases must possess in order to qualify for the study. Figure 4.4 illustrates the inclusion that were considered prior to the sample selection exercise for the quantitative phase.

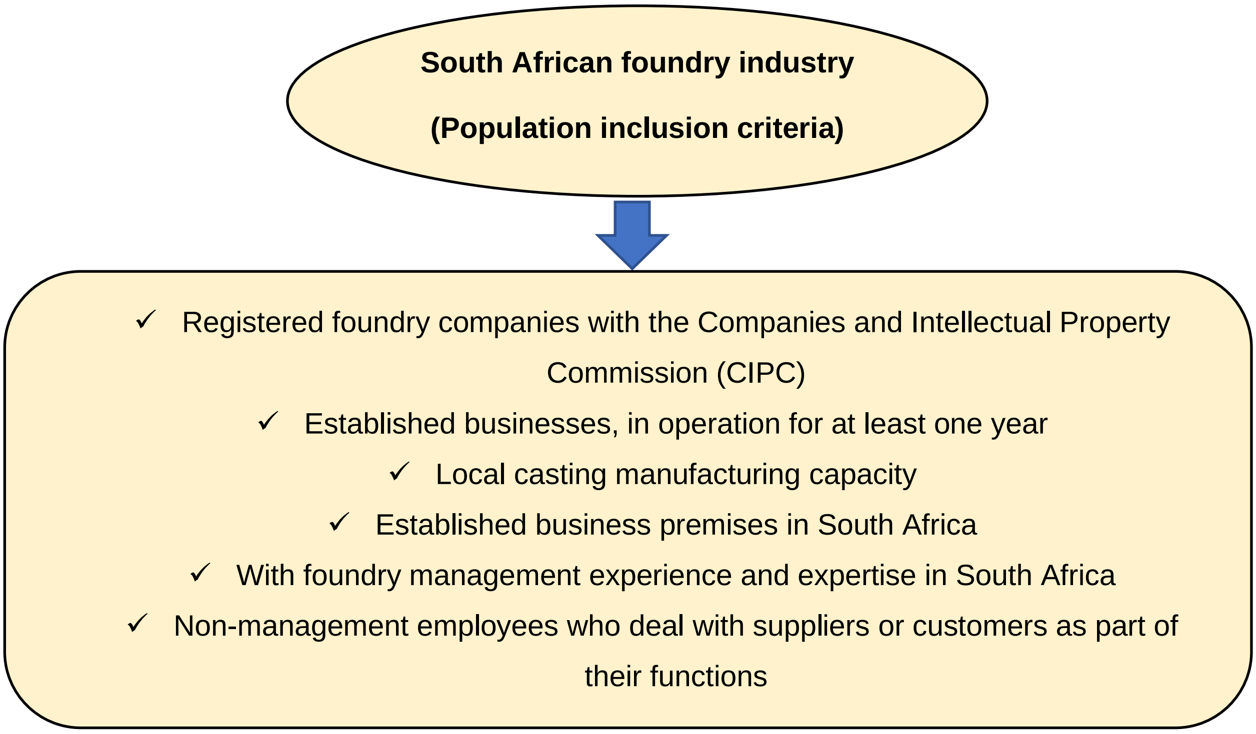

Figure 4.4: Inclusion criteria for the quantitative phase
Source: Author’s own compilation (2022)

4.3.4.2.4 Sample size determination

The sample size was census based and was determined by the availability of contact details on the foundry industry database. Out of a population of 123 foundry companies in South Africa, 95 foundry companies were invited for participation, as only these had contact details available for the researcher to make use of in contacting potential respondents, therefore, only these could be contacted. This sample size was in line with the one recommended by the Raosoft sample size calculator, with 5% margin of error, 95% confidence level and 50% response distribution.

Subedi (2016) argues that increasing the accuracy of the data collection process beyond a specific sample size is crucial compared to having a much bigger sample size. Omair (2014:142), on the other hand, mentions that a smaller sample size than is required, may not have the "appropriate power for the identification of significant differences and associations" which may be present in the population understudy. In order to improve on the response rate, follow-up calls were made, and e-mail reminders sent to ensure the respondents did not forget to return the completed surveys. A total of 196 individual questionnaires were distributed to the 95 foundry companies during the quantitative phase of the study, based on the contact details and consent obtained from the people contacted.

The following section discusses the data collection process, beginning with the development of the data collection instrument for the quantitative phase of the study.

4.3.5 Preparation for the data collection process

Prior to the data collection process, the data collection instrument was developed to ensure that the questions asked helped the researcher solicit responses that would help in the answering of the study's research questions.

4.3.5.1 Development of the quantitative data collection instrument

Clark *et al.* (2007) assert that research questions in mixed methods research may be "predetermined" when they are formulated prior to the study, based on the researcher's understanding of literature and the reality of the discipline. Research questions may also be "emergent" when these are developed during the various stages of the research process (Clark *et al.*, 2007). Questions for this phase were formulated using predetermined questions emanating from the literature findings. Several considerations should be made in the selection of the appropriate data collection instrument. Saunders *et al*. (2016) posit that questionnaires should be an option to use in instances where the researcher has confidence that the standardised questions asked, can be interpreted in the same way by all respondents. In developing a questionnaire, Leedy, Ormrod and

Johnson (2021) suggest that the researcher should keep it short, simple, clear and only ask questions essential to the research effort. They also mention that the questions asked should not lead participants towards a more desirable response and should have a professional "look". Kumar (2011) supports this view and articulates that a questionnaire should be developed and presented in an interactive way that makes the respondents feel as if they are in conversation with someone. According to Kumar (2011), considerations of the nature of the research, the geographical spread of the population and the population characteristics should be made prior to the questionnaire selection or design process.

Bordeianu and Morosan-Danila (2013) propose eight steps that researchers can adopt in instrument development. The simplicity and clear articulation of these steps, as recommended by Bordeianu and Morosan-Danila (2013), motivated the adoption of their guidelines, as indicated in table 4.2, in the development of the questionnaire for this study.

Table 4.2: Eight steps in questionnaire scale development

Stage	Description of questionnaire development steps
Step 1	Determining the purpose of the study
a	*Formulating the scope (why)*
b	*Listing specific objectives that the instrument intends to measure (what)*
c	*Identifying the target group (who, where, when)*
d	*Selecting the conceptual framework / theoretical model*
Step 2	Review of the literature
a	*Studying the existing instruments*
b	*Deciding on the use of existing instruments, adapting them, or creating new instruments*
Step 3	Generating the instrument and the support materials (draft 1)
a	*Generating items based on steps 1 a - d*
b	*Determining the items sequencing*
c	*Developing the structure, the instrument format, and related materials*
d	*Determining the administrative method*
Step 4	Conducting content validation with review of subsequences (draft 2 of the instrument)
Step 5	Pilot testing by applying the draft 2 of the instrument with review of the subsequences (draft 3 of the instrument)
Step 6	Conducting construct validation of the draft 3 and review of subsequences (resulting the draft 4 of the instrument)
Step 7	Reliability testing for draft 4 and review of subsequences – if needed (resulting in the fifth version of the instrument)
Step 8	Review of the instrument and the second pilot testing – if needed

Source: Bordeianu and Morosan-Danila (2013)

The eight steps are articulated in the following section.

Step 1 - **Determination of the purpose of the study**:

This step included the establishment of the boundaries of the study through the study delimitation process (see section 4.2) and listing the specific objectives that the study instrument sought to measure. In the current study, the problem related to the closing down of local foundries because of micro and macro-economic factors. The study sought to determine the micro and macro drivers influencing the sustainable competitiveness of foundries in South Africa.

Step 2 - **Reviewing existing literature**:

The second stage of the development process entailed comprehensively reviewing existing literature, in order to explore what existing research instruments have been developed in similar studies and determine whether these could be adapted, borrowed or a new instrument had to be created. Extensive relevant literature search and review were done to draw up a theoretical framework that would inform the study and identify the micro and macro drivers for SCA in the context of the foundry industry.

Step 3 – Generating the research instrument:

In this step, consideration of the instrument items, sequencing, format, and method of administration were also established to suit the target sample. The target sample were employees of foundry companies in South Africa and, therefore, questions were framed in a language that was simple to understand and with terminology that was not confusing. Each section was clearly marked to provide direction on what the respondents were expected to identify. The final questionnaire used is presented in annexure A (see also section 4.3.7).

Step 4 - **Content validity evaluation**:

Here, expert opinion was sought in the validation of the research instrument by providing insight on whether the instrument addressed the specific objectives of the study. The experts also assessed the "representativeness of each item related the questions" which the respondents were expected to answer (Slavec & Drnovsek, 2012). The researcher's academic supervisors and industry experts, which consisted of consultants within the industry as well as leaders, SAIF, the NFTN and the DTIC, were consulted to ensure the instrument questions were clear, unambiguous, and aligned with the objectives of the study. Care was taken during the development of the questionnaire to ensure relevancy of the research instrument to the requirements of the study, and that the Likert questionnaire items did not infringe on competition legislation and company specific trade secrets. This process was also undertaken to ensure adequate critiquing of the survey instrument and to make certain that the questions asked were aligned with the study objectives (Malmqvist, Hellberg, Mollas, Rose & Shevlin, 2019).

The number of items in the questionnaire were guided by the drivers identified in literature as well discussions conducted with the experts. Items that appeared duplicated or were deemed as lacking relevance in the South African context were also excluded, leaving the most representative, non-redundant items (Slavec & Drnovsek, 2012).

Step 5 - **Pilot testing of the research instrument**:

The questionnaire was divided into six sections which, collectively, sought to solicit data on the respondent’s demographic variables (first section), ratings on importance of the micro drivers and identification of three critical micro drivers (second section), ratings on importance of the macro drivers and identification of three critical macro drivers (third section), ranking of the impact of competitive forces on SCA (fourth section), ranking of business competitiveness approaches to SCA (fifth section) and suggestions on measures to improve SCA (sixth section).

Pilot testing allowed the researcher an opportunity to test the proposed questionnaire, identify potential problems and obtain pre-results on the reliability of the instrument. Zikmund, Babin, Carr and Griffin (2013:650) define a pilot study as “a small-scale research project which collects data from participants similar to the one used in the main study”. Leedy and Ormrod (2015:128) provide a comprehensive definition of a pilot study as “a brief exploratory investigation to determine the feasibility and validity of procedures, measurement instruments, or methods of analysis that might be useful in a subsequent, more in-depth research study”.

Cooper and Schindler (2014) mention that pre-testing of the questionnaire is the final step to improve survey results and is crucial to ensure there are no ambiguous question content and sequencing problems. In support of this view point, Kumar (2011) points out that pilot testing helps streamline processes and procedures in preparation for the main study, while Neuman (2014) contends that pilot testing represents a “dry run” which the researcher uses to identify potential flaws or misunderstandings of the questions asked.

Williams-McBean (2019), through a review of works by several authors, identifies several purposes of pilot studies in qualitative research. These objectives comprise designing, evaluating, and improving the research protocols; creating and improving the research instrument; determining the viability of recruitment protocols; gathering primary data; anticipating potential difficulties with data collection and analysis; enhancing training and confidence in conducting qualitative research; and securing funding (Williams-McBean, 2019). Ismail, Kinchin and Edwards (2018), however, caution against contamination in research, where a sample or data from the pilot study ends up being used in the actual study. Although contamination is less of a concern in qualitative studies (Ismail *et al*., 2018), to mitigate against any chances of it taking place, the participants of the pilot study were not invited to participate in the actual study, in order to maintain the momentum of fresh perspectives from the participants.

The questionnaire was reviewed and evaluated by a statistician and two academics before pilot testing of the instrument was carried out, using members of SAIF as well as industry experts and foundry company representatives. The pilot study revealed that the questionnaire was simple to complete and questions were easy to understand. To this effect, there was no need to further amend the instrument.

Step 6 - Construct validity evaluation:

According to Slavec and Drnovsek (2012), construct validity relates to the scales ability to measure what it should measure. Hair, Black, Babin and Anderson (2014) point out that construct validity can be measured through convergent and discriminant validity. Hair *et al*. (2014:124) also assert that convergent validity “assesses the degree to which two measures of the same concept are correlated”. To address this, the researcher should employ additional measures of a concept and correlate them with a summated scale to determine if the scale measures the concept as intended (Hair *et al*., 2014). According to

Hair *et al*. (2014:3), a summated scale is a “method of combining several variables that measure the same concept into a single variable in an attempt to increase the reliability of the measurement through multivariate measurement”.

Hair *et al*. (2014) postulate that discriminant validity is tested by determining the correlation among measures. In this instance, the summated scale is correlated with a similar, although abstractly different measure, in which case, a low correlation would signify that the summated scale is sufficiently different from the other similar concept (Hair *et al*., 2014). The validity of the research instrument used in this study was comprehensively discussed in chapter 4 (section 4.3.8).

Step 7 - **Reliability testing of the instrument**:

Bordeianu and Morosan-Danila (2013) posit that a research tool has a high level of dependability or reliability if it produces the same results when applied to a group of respondents after a brief period of time and when no changes are anticipated. In determining test-retest reliability, the researcher compares how two instruments are administered to the same respondents. The calculation of the correlation coefficient precedes this process, with high correlations signifying similarities of the two sets of answers and, consequently, demonstrating that there is a less chance of errors (Bordeianu & Morosan-Danila, 2013). Cronbach’s alpha coefficient, which represents another method of establishing the reliability of the research instrument, was also calculated this data was used during the quantitative data analysis phase to better understand the reliability of the instrument as well as to better inform the formulation of the questions for the qualitative phase. Data was collected by the researcher alone to ensure accuracy and uniformity of the data collection process, and the respondents were all comfortable reading and writing in English (Singh, Agarwal, Al-thani, Maslamani & El-menyar, 2018).

Step 8 – **Reviewing the instrument**

According to Bordeianu and Morosan-Danila (2013), this step precedes the adoption of the research instrument in the field. The questions on the final questionnaire were reviewed by the researcher, to ensure they aligned with literature perspectives and addressed the objectives set for this study. Upon a satisfactory review, the distribution of the pilot questionnaires was done in order to test the questions in the field.

A survey-based, self-administered questionnaire of a 5-point Likert type scale was used to collect data during the first phase. Joshi, Kale, Chandel and Pal (2015:15) define a Likert scale as “a psychometric scale commonly used in research based on survey questionnaires where respondents select their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements while responding to a particular Likert questionnaire item”. Croasmun and Ostrom (2011) point out that various researchers have mixed opinions on the optimum number of choices in a Likert type scale, with some arguing that 7 measurement points are adequate, while others argue that increasing the number of choices would have a minimal increase in the reliability of the instrument to warrant the effort (Croasmun & Ostrom, 2011). Hakkak *et al*. (2015) also mention that people generally have a difficult time making a choice if they are given more options.

Fernandez and Randall (1991, as cited in Croasmun & Ostrom, 2011) argue that designing odd number Likert scale choices, gives respondents an opportunity for indecision and does not compel them to make a choice where they are not comfortable. In support, Croasmun and Ostrom (2011) also posit that odd number scales are crucial in eliminating response bias, where the respondents are “forced” towards a tendency to favour one response over others.

The above offers motivation for the use of a 5-point scale in this study. The questionnaire was designed to ensure that it could be reasonably completed within a period of not more than 30 minutes. This was in line with the views of Sahlqvist *et al*. (2011) who found that lengthy questionnaires increased the costs of the survey and reduced the response rate, as well as the quality of the responses. These findings corroborated the works of Bird (2009) who also pointed out that there was empirical evidence which showed that questionnaires of more than 14 pages were less favourable to respondents than shorter ones. Farooq (2018), however, in contrast to these findings, established that the length of the questionnaire had little bearing on the quality and rate of the responses received. The authors, however, emphasised that as long as the questionnaire was interesting to the respondents, the length did not matter.

4.3.6 Questionnaire design

Taherdoost (2020) acknowledges the importance of considering how the data will be collected and what rating scale will be used when a questionnaire is designed. As discussed, and motivated in chapter 1 (section 1.7.1), a 5-point Likert scale rating was used in this study. The scale items ranged from *not important at all*, *slightly important*, *moderately important*, *very important* to *extremely important* and respondents had to select the level of importance they attached to any specific driver, in the context of their organisation or industry. The 5-point Likert scale was considered more appropriate as Saunders *et al*. (2016) point out that there is no point in using a 7 or 9-point Likert scale, if a 5-point scale adequately covers the required scale item categories. Sachdev and Verma (2004:104) argue that a 5-point Likert scale "reduces frustrations and increases the respondents' response rate and response quality". The questionnaire was distributed for data collection using an online platform, SurveyMonkey, in line with the university's requirements for collecting data during the period of the COVID-19 pandemic.

The questionnaire, as indicated in annexure A, incorporated both closed and open-ended questions which allowed the participants to respond to predetermined options in some sections of the questionnaire, as well as provide responses in their own "creative ways" in other sections (Neuert, Meitinger & Behr, 2021). The questionnaire was divided into nine distinct sections to facilitate the ease of completion by the respondents. The first section allowed the respondents to acknowledge having read and understood the participant consent form in line with the ethical clearance process (see annexure G).

According to the London School of Economics and Political Science (2021), researchers should make sure that participants are fully informed about the purpose of the study and that they willingly agree to participate with their anonymity ensured. The next section was designed to solicit the participants' demographic information that included a) the participants' role in the organisation, b) participants' area of focus in the organisation, c) participants' period of employment with the current organisation and d) participants' period of employment within the industry. These details were important for the researcher to understand the nature and type of participants, as well as their levels of experience within the foundry industry. Hammer (2011:3) points out that collecting demographic information is crucial in allowing the readers to "determine to whom the research findings generalise and also allows for comparative studies to be conducted in other areas".

The third section provided participants with 20 micro drivers that were identified from literature (see chapter 3). The participants were asked to indicate the level of importance they attached to each driver, relative to the impact of the drivers on enhancing SCA. This section was followed by a question that required the participants to identify (from the 20 micro drivers) the three drivers they considered critical to enhancing SCA (see annexure A).

The next two sections (five and six) were designed similar to section three and four, except that they required participants to indicate the level of importance of the ten macro drivers identified, from literature, in enhancing SCA as well as identify the three most critical macro drivers. The seventh section required participants to rank six competitive forces for SCA (intensity of rivalry among foundry companies, number of competing foundries, ease of entrance of new competitors into the industry, bargaining power of foundry customers, substitutes for casting products and bargaining power of foundry companies over raw materials) according to their impact in influencing SCA.

The last two sections of the questionnaire (sections eight and nine) required the participants to rank the competitiveness approaches (market, resource, and capability-based approaches) in order of their influence on SCA, as well as provide (in their own words) measures which participants felt would improve foundry SCA, other than the measures that had already been covered by the study (see annexure A).

In order to enhance face validity, the questionnaire was designed using colourful fonts, simple, well-articulated, easy-to-understand English and the university logo was also incorporated to demonstrate authenticity. The instructions on how to complete each section were also clearly provided (Taherdoost, 2016). According to Taherdoost (2016:29), face validity evaluates the appearance of the questionnaire in terms of "feasibility, readability, consistency of style and formatting and the clarity of the language used".

The following section provides an indication of how the validity of the questionnaire was enhanced.

4.3.7 Questionnaire validity

As discussed in chapter 3 (table 3.9), chapter 5 (section 5.5) and further illustrated in the complete questionnaire in annexure A, the questionnaire was divided into various sections that sought to address specific areas of the study in line with the study objectives, as well as the micro and macro drivers of SCA identified in literature.

Section A (1.1) on the questionnaire rated the level of importance of the 20 micro drivers identified. Table 4.3 provides an illustrative example of this section as well as an indication of the literature sources which formed the basis of the identification of the drivers (refer to table 3.8 in chapter 3).

Table 4.3: Validity of the micro drivers used in the questionnaire

No.	Micro driver items	Scale					Literature sources
		Not important at all	Slightly important	Moderately important	Very important	Extremely important	
1	Investment in plant infrastructure						(Cvetkovski, 2015; Pagone, Jolly & Salonitis, 2016; Roman *et al.*, 2012; Parola *et al.*, 2016; Mkansi *et al.*, 2018; Doyle *et al.*, 2017; Sook-Ling *et al.*, 2015; Dvoulety & Blazkova, 2020)
2	Cluster membership (e.g., South African Institute of Foundries)						(Mindlin *et al.*, 2018; Meyer-Douglas & Mohamadi, 2013; Varga *et al.*, 2016; Quaye & Mensah, 2017; Osarenkhoe & Fjellström, 2017)
3	Employee skills development (Human capital)						(Sao Joao, Spowart & Taylor, 2019; Hossain & Roy, 2016; Sadalia *et al.*, 2017; Sengottuvel & Aktharsha, 2016; Hamadamin & Atan, 2019)
4	Product (service) differentiation						(Nolega, Oloko, William & Oteki, 2015; Putra *et al.*, 2018; Quaye & Mensah, 2017; Cvetkovski, 2015, Adimo, 2018; Kireru, Ombui, Omwenga & Kenyatta, 2016; Nolega *et al.*, 2015; Dvoulety & Blazkova, 2020)
5	Organisational culture						(Bogdanowicz, 2014; Sengottuvel & Aktharsha, 2016; Shaari, 2019; Madu, 2014; Alina *et al.*, 2018; Violinda & Jian, 2016)
6	Governance						(Madhani, 2010; Hove-Sibanda *et al.*, 2017; Radebe, 2017)
7	Price competitiveness						(Karyani & Rossieta, 2018; Putra *et al.*, 2018)
8	Product quality						(Alghamdi & Bach, 2013; Ketels, 2016; Brancati *et al.*, 2018; Aiginger *et al.*, 2013; Lakhal, 2009)
9	Ability to innovate (research and development)						(de Conto, Junior & Vaccaro, 2016; Adhikari, 2017; Pietrewicz, 2019; Pagone, Jolly & Salonitis, 2016; Sengottuvel & Aktharsha, 2016; Rothaermel, 2008; Porter, 1990; Brem, Maier & Wimschneider, 2015)
10	Technology (equipment) upgrade						(Pietrewicz, 2019; Mindlin *et al.*, 2018; Putra *et al.*, 2018; Rothaermel, 2008; McGrath, 2013)
11	Production (raw material input) costs						(Abdelraheem, Serajeldin & Jedo, 2017; Mohamed *et al.*, 2019; Kaningu *et al.*, 2017; Ketels, 2016; Brancati *et al.*, 2018; Aiginger *et al.*, 2013)
12	Firm capacity (size)						(Kaleka & Morgan, 2017; Giménez *et al.*, 2019)
13	Exposure to export market (degree of internationalisation)						(Hamadamin & Atan, 2019; Mohamed *et al.*, 2019)
14	Socio-cultural responsibility (corporate social investment)						(Areiqat, Abdelhadi, Rumman & Al-Bazaiah, 2019; Zhao *et al.*, 2019; Jamali & Karam, 2016; Kotler & Lee, 2005; Dvoulety & Blazkova, 2020)

No.	Micro driver items	Scale					Literature sources
		Not important at all	Slightly important	Moderately important	Very important	Extremely important	
15	Certifications (ISO standards, product certifications)						(Su, Dhanorkar & Linderman, 2015; Kaleka & Morgan, 2017)
16	Possession of intellectual property						(Khota & Stern, 2005; Teixeira & Ferreira, 2019; Jamali & Karam, 2016)
17	Managerial choice (decision making process)						(Ali, Sun & Ali, 2017; Nwabueze & Mileski, 2018; Putra *et al.*, 2018; Dvoulety & Blazkova, 2020)
18	Bargaining power over suppliers						(Bruijl, 2018; Porter, 1990)
19	Possession of unique resources (inimitable to competition)						(Maket & Korir, 2017; Madhani, 2016)
20	Value-add for the customer						(Hamadamin & Atan, 2019; Ketels, 2016; Brancati *et al.*, 2018; Aiginger *et al.*, 2013)

Source: Author's own compilation (2022)

Similar to section 1.1, section 1.2 presented the same 20 micro drivers and asked the respondents to choose three micro drivers they identified as critical in enhancing SCA.

Section B (2.1) of the questionnaire presented ten macro drivers, identified from literature, and asked the respondents to rate the drivers according to their level of importance (see table 4.4, chapter 3 [table 3.9 and table 3.11] and annexure A).

Table 4.4: Validity of the macro drivers used in the questionnaire

No.	Micro driver items	Scale					Literature sources
		Not important at all	Slightly important	Moderately important	Very important	Extremely important	
1	Energy costs (electricity rates)						(Yatich, 2018; CSIR, 2019; Kutschke *et al.*, 2016; Department of Public Enterprises, 2019)
2	Geographical location						(Tavakolnia & Makrani, 2016; Jenkins & Tallman, 2010; Kutschke *et al.*, 2016; Atkinson, 2017; Jenkins & Tallman, 2010)
3	Industry entry and exit barriers						(Karakaya & Parayitam, 2018; Porter, 1990; Ogaga & Joseph, 2017; Xie & Xie, 2018)
4	Customer bargaining power						(Bruijl, 2018; Porter, 1990; Altuntas *et al.*, 2014; Xue, 2016)
5	Government incentives (subsidies)						(Songling, Ishtiaq & Anwar, 2018; Pakdeechoho & Sukhotu, 2018; Mbatha, 2018)
6	The market perception of the foundry company						(Kamasak, 2017; Fashu, 2018; Denoue & Saykiewicz, 2009; Clare & Uddin, 2019)
7	Localisation (local content enforcement)						(Neuman *et al.*, 2017; Deringer *et al.*, 2018)
8	Regulatory instruments (import, tariffs, import quotas)						(Songling *et al.*, 2018; Organisation for Economic Co-operation and Development (OECD), 2014; Pakdeechoho & Sukhotu, 2018; Todericiu & Stanit, 2015;
9	The number of foundry companies in South Africa						(Hitt *et al.*, 2007; Sachitra, 2016; Porter, 1990; Porter, 1985)
10	The availability of substitutes for casting products						(Bruijl, 2018; Dobbs, 2014; Porter, 1985; Pakdeechoho & Sukhotu, 2018; Sato, 2016; Haidar & Sekh, 2019)

Source: Author's own compilation (2022)

Similar to section 2.1, section 2.2 presented the same 10 macro drivers and asked the respondents to choose three macro drivers they identified as critical in enhancing SCA.

Item 3 of the questionnaire asked participants to rank the competitive forces according to their impact on the SCA of foundry companies in South Africa (see table 4.5 and annexure A). The competitive force ranked 1 (one) was presumed as having the greatest impact on foundry SCA.

Table 4.5: Validity of the competitive forces used in the questionnaire

IMPACT OF COMPETITIVE FORCES ON SUSTAINABLE COMPETITIVE ADVANTAGE			
No.	**Competitive forces relevant to study**	**Literature sources**	**Relevant element of competitive forces model**
1	Intensity of rivalry among foundry companies	Porter (2008); Mekic and Mekic (2014)	***Rivalry among competitors***
2	Number of competing foundries	Porter (1985)	
3	Ease of entrance of new competitors into the industry	Karakaya and Parayitam (2018); Porter (1990); Xie and Xie (2018)	***Entry/Exit Barriers***
4	Bargaining power of foundry customers	Bruijl (2018); Porter (1990); Altuntas, Semerciöz, Mert and Pehlivan (2014); Xue (2016)	***Buyer Bargaining Power***
5	Substitutes for casting products (e.g., thermoplastics, forgings)	Dobbs (2014); Sato (2016); Ogutu and Mathooko (2015); Baxter (2019)	***Availability of Substitutes***
6	Bargaining power of foundry companies over raw material suppliers	Bruijl (2018); Porter (1990); Dälken (2014)	***Supplier Bargaining Power***

Source: Author's own compilation (2022)

Item 4 of the questionnaire presented the approaches to SCA and asked the respondents to rate the approaches according to their influence on South African foundry SCA (see table 4.6 and annexure A). The approach ranked 1 (one) was deemed as having the greatest influence.

Table 4.6: Validity of the competitiveness approaches used in the questionnaire

COMPETITIVENESS APPROACHES TO SUSTAINABLE COMPETITIVE ADVANTAGE			
No.	**Competitive advantage approaches relevant to study**	**Literature sources**	**Associated theories for SCA**
1	The ability of the foundry to understand industry factors (external market orientation)	Porter (1985); Jain (2014); Wang (2014); Kaningu *et al.* (2017)	MBV / RV / CBV
2	The ability of the foundry to obtain unique resources (inimitable to competition)	Barney (1991); Wang (2014); Madhani (2007)	Generic Strategies / RBV / KBV / RV
3	The ability of the foundry to allocate internal resources effectively (dynamic capability)	Kaleka and Morgan (2017); Quelin, Cabral, Lazzarini and Kivleniece (2018); Teece (2018)	Generic Strategies / CBV / RV
MBV – Market-Based View / RV – Relational View / RBV – Resource-Based View / CBV – Capability-Based View / KBV – Knowledge-Based View			

Source: Author's own compilation (2022)

The next section provides detail on the data collection process for the quantitative phase.

4.3.8 Quantitative data collection

Self-administered questionnaires with closed and open-ended questions were distributed to selected respondents within foundry companies spread across all provinces in South Africa. Leedy and Ormrod (2015) point out that the institution of privacy laws and confidentiality agreements makes the data collection process an intricate part of the research process, which should not be taken lightly by any researcher. The authors also postulate that the researcher must set criteria during the design of the data collection instrument, which will act as gatekeepers in the admissibility of the data collected.

Kumar (2011) argues, however, that the choice of the data collection process depends on the purpose of the study, the resources available as well as the skills of the researcher. The survey was distributed using the SurveyMonkey platform. This platform was selected because of its ability to aid the researcher in the management of the data collection process, as well as in collating the outcomes as soon as the respondents had completed the survey. The restrictions related to COVID-19 protocols meant that the researcher had to select a platform that could be effectively administered without infringing on these protocols and placing the lives of the respondents at risk, by being in physical contact with them (Lobe, Morgan & Hoffman, 2020).

A SurveyMonkey online platform was used to design the questionnaire and collect data from the respondents. SurveyMonkey® is a cloud-based online tool used to create, distribute, and analyse surveys. The distribution of the questionnaires was done by directly e-mailing the survey link to the respondents' inboxes. E-mail addresses for the respondents were obtained from the database drawn by the foundry cluster (SAIF) and the foundry technology sector (NFTN), or on request when the potential respondents were first contacted by the researcher to discuss the study. The e-mail package sent, contained a cover letter explaining the nature of the study and encouraging the recipients to take part in the study. A consent form was also attached outlining the ethical principles that would be observed and the fact that permission to conduct the study had been obtained from the foundry association. The administration of the questionnaires was done over a four-week period. Reminders, via personalised e-mail messaging and telephone calls, were made a week before the due date to ensure an improvement in the response rate.

Correspondence was also made with SAIF to ensure they encouraged participation from their members. Bryman (2012) argues that the issue of response rate is important since, unless it can be proven that the individuals who did not participate have views that do not differ from those who participate, then there is likely to be risk of bias in the data collection process. The steps that the researcher followed in order to improve the response rate included ensuring the questionnaire did not appear unnecessarily bulky, ensuring the questions were not overly long and designing the questionnaire to look attractive, with clear instructions (Bryman, 2012; Saunders *et al*., 2016). In distributing the questionnaires, a personalised e-mail was sent to each respondent to demonstrate their value and to draw them into participation.

The survey document, constructed using the SurveyMonkey® platform, was designed with a "submit" button, which the respondents had to click in order to send their responses back to the researcher via the SurveyMonkey platform. SurveyMonkey was configured to ensure anonymity and, therefore, responses could not be tied back to any specific respondent who had participated. The outcome of the survey process formed the basis for the development of the qualitative data collection instrument and provided the researcher with an indication of which areas to explore in order to gain further in-depth understanding of the study in line with the set objectives.

The following section addresses the validity and reliability aspects of the study.

4.3.8.1 Validity and reliability of the data collection instrument

In carrying out social research, researchers should pay attention to the technical aspects of validity and reliability, in order to enhance the precision and accuracy elements of the research measurement tools (Babbie, 2010). Whilst the concepts of validity are referred to as trustworthiness in qualitative research (Cooper & Schindler, 2014), in quantitative research, validity relates to the idea of the research instrument "truly measuring that which it was intended to measure" (Quinlan, Berbés-Blázquez, Haider & Peterson, 2016:274), or the "extent to which an empirical measure adequately reflects the real meaning of the concept under consideration" (Babbie, 2010:153).

Reliability, on the other hand, relates to "… the degree to which research results are an accurate representation of the entire study population and are consistent over time" (Quinlan *et al.*, 2016:274). Twycross and Shields (2004) define reliability as the consistency and repeatability of the results of a given test. Quinlan *et al.* (2016) identify several ways of establishing measurement validity in quantitative research, which include content and face or logical validity.

According to Saunders *et al*. (2016), content validity entails determining whether the research instrument sufficiently encompasses questions that seek to address all the study's research questions. To ensure content validity was addressed, "careful definition of the research through the review of previous research related to the study" (Saunders *et al*., 2016:450) and engaging the research supervisors as well as industry experts was done, to ensure that all questions asked were essential in addressing the objectives of the study.

Leedy and Ormrod (2015) mention that face validity or logical validity (Babbie, 2010) is the extent to which, at face value, the research tool that is used for collecting data appears to measure a particular characteristic or appears to make sense (Saunders *et al*., 2016). The questions included in the questionnaire were developed from various literature sources (see table 3.8 and table 3.9, in chapter 3 and table 4.3 and 4.4, in chapter 4). In order to enhance face validity, the questionnaires were printed in colour and with the university's logo. On distribution, each questionnaire was accompanied by letters of permission to conduct the study from the university and the South African foundry association.

In addressing the reliability of the research instrument, Cronbach's alpha was calculated using the SPSS version 27. This parameter provided a "measure of internal consistency of the test or scale" (Tavakol & Dennick, 2011:53). An alpha value ranging from 0.70 to 0.95 generally reflects a reliable research instrument (Tavakol & Dennick, 2011).

The next section outlines the data analysis process adopted for the quantitative phase.

4.3.9 Quantitative data analysis

Cooper and Schindler (2014:114) assert that data analysis involves the reduction of "accumulated data to manageable sizes, the development and identification of patterns using statistical and non-statistical techniques". According to Ihantola and Kihn (2011), data analysis in mixed research should aim at addressing the concept of analytical adequacy. This concept relates to whether the data analysis techniques chosen are adequate and suitable in addressing the research questions of the study.

The completed questionnaires were inspected to ensure they were properly filled in before the coding process was carried out (Neuman, 2014). According to Salkind (2012), data coding involves the conversion of data from its original state into a format that can be analysed. SPSS was used to examine the quantitative data sets of the questionnaires. This software was used to calculate descriptive statistics, such as frequencies and item data analysis (Greasley, 2008). According to Zikmund *et al*. (2013:413), descriptive statistics "summarise and describe the data in a simple and understandable manner", while Salkind (2012:162) argues that these statistics allow the researcher to "get an accurate impression of what the data look like". In the analysis, the researcher ensured uniform data capturing and coding at different levels of measurement, which included nominal and ordinal scales.

Inferential analyses were also conducted from the statistics generated using SPSS to draw and extend conclusions from the sample to the population. Greasley (2008) points out that inferential statistics attempt to draw conclusions that reach beyond the data that has been collected. Marshall and Jonker (2011:1) assert that inferential statistics "are used to infer from the sample group, generalisations that can be applied to a wider population". This allows for a "detection of important differences in variables that are relevant to a particular research question" (Marshall & Jonker, 2011:1). Analyses included the calculation of reliability analysis and inter-item correlation analysis (Kumar, 2011). Correlation analysis and the Mann-Whitney U test assisted in determining both the form and degree of the inter-relatedness among the micro and macro drivers for the foundry industry's SCA, as well as providing insight on any group differences pertaining to the responses of the survey questions (Babbie, 2010; Greasley, 2008; Lutabingwa & Auriacombe, 2007; Pallant, 2011). This measure was also critical in assessing the level of statistical significance between the study constructs relative to sustainable competitiveness (Saunders *et al*., 2016; Zikmund *et al*., 2013).

The availability of multiple "dependent variables" in the form of the various micro and macro drivers that are identified as having an influence on the SCA of foundry companies in South Africa motivated the application of the "more appropriate and powerful multivariate analysis technique", canonical correlation analysis (Tabachnick & Fidell, 1996 as cited in Dardas & Ahmad, 2014:2). According to Wickramasinghe (2019:37), the use of CCA "limits the probability of committing Type I errors and allows for an exploration of the complexity of multiple relationships of constructs under investigation". This study identified five different constructs which included i) assets or resources, ii) processes, iii) firm performance, iv) supporting and related industries and clusters, as well as v) institutions and government policies (see section 5.4.1). Understanding the relationship between these constructs and the ability of foundry companies to attain SCA was identified as important in addressing the study's research objectives. Canonical correlation analysis was, therefore, deemed appropriate in "quantifying the strength of the relationship between the sets of variables (canonical variates)" in the study (Sanusi & Muhammad, 2016:4).

The quantitative data results were presented in the form of tables, visual charts, and graphs, to enable easy comparison, interpretation and to provide visual illustrations. The outcomes of the quantitative phase were used as input into the development of the instrument for the qualitative data collection process, which is discussed in the next section.

4.3.10 Development of the data collection instrument for qualitative phase

The quantitative results from the first phase of the study were complemented by literature in the development of the interview questions. The interview schedule for the qualitative phase was prepared after the quantitative results had been analysed. The development of this schedule followed guidelines by Liem (2018) and the process is discussed extensively in chapter 6 (section 6.3).

4.3.11 Phase 2: The qualitative phase

The second phase of this study involved further engagement, by the researcher, of the local foundry industry in an effort to explore further the research questions that inform the study, based on the outcomes from the quantitative phase. This was also done in order to gain more insight on these outcomes and to inform the industry on what the results from the first phase showed. The following section discusses the population and sampling considerations that the researcher undertook.

4.3.11.1 Population and Sampling

The population for the qualitative phase of the study consisted of top management within the foundry industry. This group was considered essential for this phase because of their involvement in strategy formulation and decision making in line with firm competitiveness (Alina & Raluca-Andreea, 2018; Huang *et al.*, 2018). One of the objectives of this study was to "make recommendations on strategies to enhance the sustainable competitive advantage for foundries in South Africa". It was, therefore, deemed necessary to obtain input from top management on the drivers identified as either important or critical to the South African foundry industry, and to gather their perspectives on which drivers they viewed as important and critical for SCA. Through the outcomes from the in-depth interview process and guidance from literature, the researcher would then formulate recommendations on possible strategies for enhancing SCA.

A purposive sampling method was used to identify both the foundry companies and participants with whom qualitative data collection would take place. According to Onwuegbuzie and Leech (2007), if the goal of the study is not to generalise to the total population, then the researcher can purposefully select participants that maximise understanding and provision of insights on the research phenomenon. According to Saunders *et al*. (2016), purposive sampling enables the researcher to use personal judgement in selecting cases that are deemed crucial in providing responses, which allow for the research questions and objectives to be adequately addressed. This is in line with the definition by Zikmund *et al*. (2013:396) of purposive sampling being "a non-probability sampling method in which the researcher selects the sample based on personal judgement about some appropriate characteristic of the sample member".

In conducting purposive sampling, the biographical and demographical details of the participants were described in detail, to ensure that the transferability element of the study was addressed. This was one of the strategies that the researcher made use of in order to enhance the validity and reliability of the qualitative phase of the study (Saunders *et al*., 2016).

Relative to the sample size, Mason (2010) points out that qualitative studies generally use smaller samples than quantitative studies. Korstjens and Moser (2018), and Ritchie, Lewis and Elam (2003, as cited in Mason, 2010) attribute smaller sample sizes to the concept of diminishing returns in qualitative data collection, where more data does not necessarily lead to more information as well as due to resource constraints. Saunders *et al*. (2016) identify the concept of data saturation as the stage where any additional qualitative data collection does not yield new insights. Guest, Namey and Chen (2020:1) posit that data saturation is the "yardstick for estimating and assessing sample size determination" in qualitative research.

Guest, Bunce and Johnson (2006), and Mason (2010) caution that the concept of data saturation should not be observed in terms of the number of interviews the researcher conducts, but on the depth of data. In line with these arguments on data saturation, Fusch and Ness (2015) point out that the researcher should select a sample size that provides the "best opportunity" to obtain data saturation. In another study, Fusch *et al.* (2018) recommend prioritising the richness and thickness of the data collected over the sample size. Nelson (2016) also argues that saturation should not be viewed as a "fixed point" that gives the researcher a sense of completeness in the data collection process and points out that it should be "conceptual depth" which should concern the researcher. Collins *et al.* (2006), in their study, presented a condensed view of sample sizes which they found to be most common in research designs. Table 4.7 illustrates the proposed sample sizes for qualitative studies.

Table 4.7: Guidelines on sampling sizes for qualitative studies

Recommended sample sizes for qualitative studies	
In relation to the research design / method	
Case study	4-5 participants (Creswell, 2013)
	15-30 participants for single case studies (Marshall, Cardon, Poddar & Fontenot, 2013)
Phenomenology	< 10 interviews (Creswell, 1998)
	> 6 participants (Morse, 1994)
Grounded theory	20-30 participants (Creswell, 2013; Marshall *et al.*, 2013)
	35 participants (Morse, 2000)
	5 (1 hour) interviews to attain data saturation (Corbin & Strauss, 2015)
Ethnography	1 group (Creswell, 2002)
	30-50 interviews (Morse, 1994)
Narrative research	2-3 participants (Creswell, 2013)
	30-60 participants, although 10-20 knowledgeable people would be enough (Bernard, 2000)
In relation to data collection procedure	
Interviews	30 participants (Boddy, 2005)
	12 participants (Guest, Bunce & Johnson, 2006)
	12-60 participants, with 30 being the mean (Adler & Adler, 2012)
	12-20 participants (Lincoln & Guba, 1985)
	12 participants (Boddy, 2005)
	Advocate examining similar studies where data saturation was reached and using a figure within the range of such sample sizes (Onwuegbuzie & Leech, 2007)
Focus group	3-6 participants (Onwuegbuzie, Dickson, Leech & Zoran, 2009)
	6-12 participants (Fusch & Ness, 2015)

Source: Adapted from Onwuegbuzie and Collins (2007); Sim, Saunders, Waterfield and Kingstone (2018).

In this study, the researcher employed a combination of “prolonged engagement and richness of data” strategy in order to ensure improved credibility of the data collection process (Babbie, 2010). In this respect, efforts were made to target participants who were knowledgeable of the foundry industry and were involved in strategy formulation within the industry or in their businesses. These participants included foundry owners, top management, and industry experts within the foundry industry associations. These individuals were considered as being able to provide valuable insight on the study topic, in relation to the SCA of foundries in South Africa. Referential adequacy, through the consistent and critical review of available material, and results from the quantitative phase, were also employed to improve on credibility (Anney, 2014; Subedi, 2016).

Pilot interviews were done with seven (7) participants before the actual study was conducted, in order to establish if there was clarity on the proposed interview questions (Majid, Othman, Mohamad, Lim & Yusof, 2017). As indicated in table 6.5, a total of twelve (12) participants took part in the study. The inclusion criteria that were considered in sample selection are outlined in the following section.

4.3.11.2 Inclusion criteria for qualitative phase

The inclusion criteria for the qualitative phase of the study are illustrated in figure 4.5. The inclusion criteria formed the basis for selection of the foundry companies and participants that took part in the qualitative phase of the study.

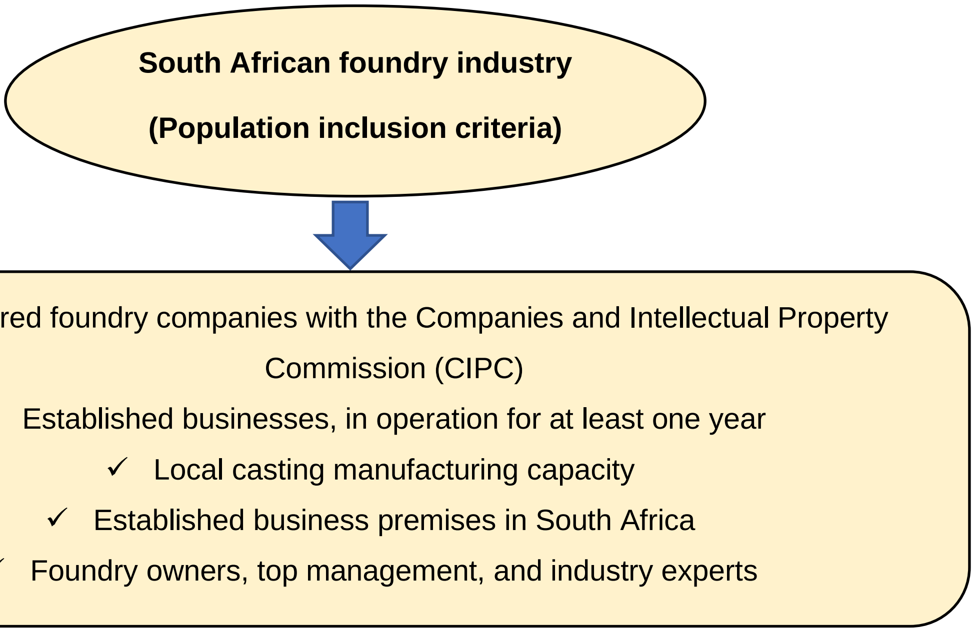

Figure 4.5: Inclusion criteria for qualitative phase
Source: Author's own compilation (2022)

The following section discusses the data collection process for the qualitative phase.

4.3.11.3 Qualitative data gathering

Semi-structured, online interviews with the aid of an interview schedule were used as the data collection instrument for the qualitative phase of the study. Various researchers provide synoptic views on the benefits of semi-structured interviews. According to Ryan, Coughlan and Cronin (2009), semi-structured interviews provide a researcher with a flexible approach to collect data and probe where there are unanticipated or unclear responses. Semi-structured interviews also “facilitate the collection of richer and more textured data”, which is difficult to obtain when other data collection tools are used (Ryan *et al.*, 2009:310). These types of interviews are also generally designed around a set of pre-determined open-ended questions, with other questions emanating from the conversation between the researcher and the interviewee (DiCicco-Bloom & Crabtree, 2006). A set of views by DeJonckheere and Vaughn (2019:2) highlight the fact that if used in mixed method research, semi-structured interviews are typically used in the qualitative phase to “explore emerging concepts as well as explain results that emanate from the quantitative phase that tests hypotheses”.

Prior to the interview process, the researcher engaged the leadership of the foundry association, SAIF, as a way of building on the rapport created during the first phase of the study (DeJonckheere & Vaughn, 2019) and to provide an indication on the progress that had been made. Thereafter, appointments were set up for the data gathering at a time that was convenient to the participants. The interviews were conducted online using the MS Teams platform and in English, based on the assumption that this was the formal language of communication for most businesses in South Africa.

The interview schedule consisted of a total of ten questions that were clustered into eight categories which included, i) reasons for foundry closures, ii) drivers for SCA, iii) critical drivers, iv) strategies for enhancing SCA, v) management challenges, vi) competitive forces, vii) competitiveness approaches and viii) other strategies for SCA. Attached to the schedule, was also a list of the micro and macro drivers identified from literature, and used in the first phase of the study, for the ease of reference for the participants. Each interview took between 30 and 60 minutes and was adequate for all the questions and follow-up questions to be asked.

Permission to record the interviews was obtained, in order to ensure that all details that were verbalised during the interview were captured. Details of the participants were handled in confidence, in line with the Protection of Personal Information Act of South Africa (POPI Act) (Information Regulator South Africa, 2021), to ensure that permission to collect, store and share the information was obtained from the participants prior to the data collection process. The POPI Act gives provisions for "… balancing the rights to privacy, access to information and regulates the way information from data subjects can be processed" (Government Gazzette, 2018:20).

In order to ensure validity and reliability, the data collection and analysis processes were described in detail (thick description) (Denham & Onwuegbuzie, 2013), to ensure that all research protocols were adhered to and records kept, so that there could be traceability of what was done and how the interview process was conducted (Babbie, 2010). Record keeping (reflexive journal) also helped to ensure confirmability of the study and allowed the researcher to revisit the records at a later stage, to reflect on prior to or during the interpretation stage (Anney, 2014).

The next section offers details of strategies that were implemented to address the trustworthiness elements for the qualitative phase.

4.3.11.3.1 Establishing trustworthiness of qualitative data

DeJonckheere and Vaughn (2019) base their work on the model developed by Guba in 1982 in identifying four criteria for establishing trustworthiness in qualitative research. These criteria include credibility, transferability, dependability and confirmability (Anney, 2014; DeJonckheere & Vaughn, 2019; Guba & Lincoln, 1994). Forero *et al.* (2018) refers to these as the "Four-Dimensions Criteria", while Daniel (2019) uses the TACT model (Trustworthiness, Auditability, Credibility and Transferability) to motivate how the authenticity of qualitative studies can be enhanced. These criteria are crucial in ensuring that the quality and rigour of findings in qualitative research are heightened.

Establishing trustworthiness in qualitative research entails demonstrating integrity in how the researcher conducted the study and providing confidence to the reader on how the conclusion was arrived at (Daniel, 2019). Bryman (2012) pinpoints the same criteria as critical for enhancing the "quality" of qualitative data and identifies these as having quantitative equivalents (see table 4.8).

Table 4.8: Qualitative trustworthiness criteria and quantitative equivalents

Qualitative criteria	Quantitative equivalent
Credibility	Internal validity
Transferability	External validity
Dependability	Reliability
Confirmability	Objectivity

Source: Bryman (2012)

Credibility relates to the "confidence that can be placed in the truth of the research findings" (Anney, 2014:276) or how believable the qualitative findings are (Bryman, 2012). According to Noble and Smith (2015, as cited in Daniel, 2019), it is essential for qualitative researchers to demonstrate that strategies for enhancing the study's credibility were in place when the study was conducted. As indicated in table 4.9, prolonged engagement, member checking and triangulation were strategies the researcher put in place to address the credibility of the study.

Transferability refers to the extent to which the study can be "transferred" to other contexts using different participants (Anney, 2014; Bryman, 2012). Daniel (2019:104) states that transferability "suggests that the findings gained in a particular context can offer valuable lessons to other similar settings". In this study, individuals with expertise in the foundry industry and who understood competition within the industry were selected to participate in the study (Forero *et al.*, 2018). As recommended and reported in table 4.9, purposive sampling and the provision of thick description were strategies adopted to address transferability.

The third criteria, dependability, is defined by Kumar (2016:11) as the "stability of findings over time" or the extent to which the findings of the study are consistent and likely to be sustainable over time (DeJonckheere & Vaughn, 2019; Bryman, 2012). Table 4.9 provides an indication of the strategies implemented to ensure the dependability element was addressed.

Confirmability, on the other hand, refers to the degree to which the “findings of an enquiry can be corroborated by other researchers” and that these are derived from the data collected and not a result of biases from the researcher (DeJonckheere & Vaughn, 2019; Anney, 2014; Bryman, 2012). According to Korstjens and Moser (2018), in enhancing confirmability, the researcher can implement a triangulation strategy (table 4.9) and also ensure that the interpretation of the study outcome is grounded in data and not on the researcher’s own preferences.

Various authors have articulated different strategies that researchers can implement in order to ensure that the trustworthiness of the qualitative phase is addressed. Trustworthiness was ensured by, among other strategies, following recommendations articulated in table 4.9.

Table 4.9: Strategies for addressing the trustworthiness of qualitative data

Criteria	Strategy to address criteria	Approach to address criteria in this study
Credibility	Prolonged engagement	Rapport with the participants was created by the researcher who engaged the participants to improve confidence and gain their trust. In this way, the participants were more open to respond to the questions more honestly (Denzin & Lincoln, 2018). The interviews were continued until the point of data saturation was achieved (Fusch & Ness, 2015).
	Triangulation	The use of different employees, management and owners from different foundry companies, and the attainment of similar findings enhanced the credibility of this study as there were no significant group differences in the responses provided (Noble & Heale, 2019).
Transferability	Provision of thick description	The process followed in the gathering and interpretation of data was well documented to ensure all the details were captured. The participant details as well as the online interview process were also documented, to ensure the study maximised the ability to generate meaningful outcomes (Onwuegbuzie & Leech, 2007).
	Purposive sampling	Purposive sampling was used to select the participants who were knowledgeable of the foundry processes and understood strategy and competitiveness within the industry by virtue of their roles within the organisation (Anney, 2014).
Dependability	Peer examination	The findings of the study were discussed with academic peers as well as people with foundry industry experience. This was done with the aim of ensuring that the data was interpreted appropriately (Anney, 2014).
	Use of a code-recode strategy	The data collected was checked against the recordings to ensure the transcriptions were accurate and the interpretations were of an acceptable standard. An expert in qualitative research was also engaged to assist with the co-coding process (Anney, 2014; Leedy, Ormord & Johnson, 2021).
Confirmability	Triangulation	As indicated in the discussion on credibility, the principle of triangulation was adopted to address confirmability (Noble & Heale, 2019; Fusch, Fusch & Ness, 2018).

Source: Author's own compilation (2022)

The next section discusses the qualitative data interpretation process.

4.3.11.4 Data interpretation technique

Bryman (2012) asserts that, unlike with quantitative research studies, there are no clear-cut guidelines on how qualitative data should be analysed. Miles (1979, as cited in Bryman, 2012) used the term "attractive nuisance" to describe the attractiveness of the richness of qualitative data and the complexity of sifting through the data to find patterns that can be analysed.

Saunders *et al.* (2016) point out that in order for research findings to be fully explored and clarified, it is essential that the interactive nature of qualitative data collection and analysis is clearly defined, and that a clear research perspective (inductive or deductive) is identified. The next section provides motivation for the approach to qualitative data interpretation that this study used.

4.3.11.4.1 The approach to data interpretation

Mohamed (2017) mentions that qualitative data interpretation differs from one study to the next, depending on a number of factors which include the research questions, the theoretical framework of the study and the techniques adopted by the researcher to make sense of the data gathered. This is in contrast to perspectives presented by Braun and Clarke (2006:5) who argue that within the paradigms of qualitative studies are "… methods essentially independent of theory and epistemology which can be applied across a range of theoretical and epistemological approaches".

The Atlas-ti software was used to analyse the qualitative data. Archer (2018) identifies a number of techniques for qualitative data analysis. These include content analysis, thematic analysis, grounded theory, narrative analysis, conversation analysis, discourse analysis (Archer, 2018) and interpretative phenomenological analysis (Braun & Clarke, 2006). In separate studies, Archer (2018), Akinyode and Khan (2018), and Mohamed (2017) agree that most of these approaches are based on the same "fundamental principle" of establishing common patterns and themes, through variations of the thematic approach. This is in line with the views by Braun and Clarke (2006:4) who point out that thematic analysis has become the "foundational method" for qualitative analysis.

Braun and Clarke (2006:6) define thematic analysis as a "method for identifying, analysing and reporting themes or patterns within data". It also relates to the process of "breaking a multitude of qualitative data into meaningful sections and then recombining them into groups of concepts and ideas which fit together" (Archer, 2018). Kiger and Varpio (2020) point out that an important characteristic of thematic analysis is that it can be used "within a vast range of theoretical and epistemological frameworks and can be used in a number of designs and sample sizes".

Through thematic analysis, the researcher is able to "...develop connections between the themes and to find themes in the data that capture meaning that is pertinent to the research topic" (Willig, 2008). Based on this discussion, this study made use of thematic analysis based on process guidelines proposed by Braun, Clarke and Weate (2016). According to the two researchers, the six steps illustrated in table 4.10 should be followed when analysing or interpreting qualitative data.

Table 4.10: Thematic analysis process

	Step	**Process**
1	Familiarisation with data collected	Recorded data is transcribed. The researcher gets a thorough familiarisation of this data through repeated reading and identifying emerging ideas
2	Coding process	The researcher begins the systematic coding process using interesting features of the data collected. This is also the initial stage where data is collated to align with the codes identified
3	Generation of initial themes	The codes identified are then collated into potential themes. Data relevant to the potential themes is also gathered and aligned with the potential themes identified
4	Reviewing of the themes	Potential themes are identified relevant to the coded data. This is done through the generation of a "thematic map of the analysis"
5	Defining and naming the themes	The potential themes are further analysed to give the researcher an overall picture of the data collected. The themes are clearly defined at this stage in terms of scope and focus of each theme
6	Report write-up	This is the final phase which involves linking the analytical narrative to the data extracted. The final analysis is then contextualised in relation to the literature of the study

Source: Adapted from Braun and Clarke (2006) and Byrne (2021)

In line with the framework proposed by Braun *et al*. (2016), after the transcription process, qualitative data was read several times to ensure an intimate understanding of the content. This was followed by a coding process where succinct labels (Braun & Clarke, 2006) were generated in order to identify the important features of the data. The codes were then collated in preparation for theme generation and interpretation. Dependability was addressed through the utilisation of a code-recode strategy, where the data was coded twice over a predetermined period of about one week (Anney, 2014). According to Anney (2014), the two sets of coded data should then be compared to see if there are any differences or not.

An independent expert in qualitative research guided the researcher in this process, which allowed the researcher to observe the data from two different perspectives. Each theme generated was analysed in detail, in order to make sense of and contextualise the data collected in relation to existing literature. After the data interpretation phase, the participants were revisited to discuss the findings that had been reported and to obtain verification that there had not been any misreporting (see table 4.4). This is in support of what Anney (2014), and Onwuegbuzie and Leech (2007) referred to when they mentioned member checks as being the "heart of credibility".

The following section covers the study limitations encountered and strategies adopted to overcome or minimise the negative effects thereof in the study.

4.4 LIMITATIONS OF THE STUDY

Limitations are possible shortcomings of the study that are outside the control of the researcher (Theofanidis & Fountouki, 2018) and represent constraints on the ability to generalise the findings of the research to the bigger context (Bogdanowicz, 2014; Gaya, 2017). According to Kumar (2011:214), limitations may also highlight "structural problems" that may be associated with certain aspects of the research methodology adopted by the researcher. According to Bryman and Bell (2007), limitations can also be used as a "springboard" in presenting recommendations and opportunities for future research.

In relevance to this study, focus was made on the South African foundry industry and, therefore, the findings could not necessarily be generalised to foundries outside South

Africa, owing to different macro and micro-economic environments in which they operate. A sequential explanatory research design proved demanding for one particular study, as a result of its resource (budget constraints) and time requirements which the researcher had to obtain (Creswell & Plano-Clark, 2018; Creswell *et al.*, 2011). Adequate time management and access to funding, through research facilities available to the academic institution where the researcher is registered, were used to lessen the negative impact of these resource constraints. The funding provided by the academic institution, however, was not always made available in time when needed. As a result, the researcher had to look for other forms of funding whilst awaiting receipt of the allocated funding by the institution.

The nature of the foundry industry in South Africa, where there are pockets of family-owned businesses (Mkansi *et al.*, 2018), presented challenges on information sharing as these industries have firmly guarded trade secrets and business values, which the owners felt would be compromised. In most instances, representatives of these foundries opted against participation. Ethical clearance from the university and a letter that signified permission to conduct the study were obtained from the respective institutions and used to assure the respondents and participants of the authenticity of the study and the motive behind carrying out this academic study.

During the time in which the study was conducted, the global and South African economy was affected by the COVID-19 pandemic. As a result, most firms including foundries were closed, with some employees working from home. The DTIC was also busy carrying out studies on how the pandemic had affected foundry operations. Two surveys relating to the pandemic had already been sent to the different foundries. This might have resulted in “survey fatigue”, thereby negatively affecting the response rate. Macarthur and Conlan (2012:8) argue that survey fatigue is a “facet of respondent burden due to the frequency of surveys that are required from the participant”, leading to the participant losing interest or not participating altogether. Efforts were made to engage the foundry association (SAIF) to urge member firms to participate. Telephone calls were also made by the researcher to encourage participation.

The study was conducted as a snapshot (cross-sectional) type and not a longitudinal one, therefore, did not have the “capacity to study change and development” (Saunders *et al*., 2016:200). Despite some of the South African foundries not participating in the study, the results still provided a good indication of the perceptions of the industry on the drivers enhancing SCA. The following section addresses the ethical aspects and consideration of the study.

4.5 ETHICAL CONSIDERATIONS

According to Saunders *et al.* (2016), a lot of concerns have been raised over the proper adherence to ethics when conducting research. Fouka and Mantzorou (2011, as cited in Akaranga & Makau, 2016), and Salkind (2012) point out that researchers should aim to protect the integrity and dignity of their subjects, as well as the information that they seek to publish. In conducting this study, the researcher exercised due diligence in ensuring that proper research ethics were adhered to. Ethical clearance from the university’s ethics committee was obtained before the study commenced (see annexure G and H). Subsequent to this, permission to conduct the study was also obtained from the industry association, SAIF (see annexure E).

The contact details for the participants were obtained from the NFTN database following permission to conduct the study, which was provided by the foundry association (annexure E). Informed consent was deemed crucial for the researcher to ensure ethical behaviour and a buy-in from the participants (Salkind, 2012). Permission was obtained from the respondents and participants before the questionnaires were distributed and the interviews conducted. This was done through the use of an informed consent form which had the researcher’s details, as well as those of the supervisor for verification purposes (Lee, 2018). The form offered the participants a brief explanation of the purpose and objectives of the study, as well as an assurance that the study would be for academic purposes only. The two phases for the research were also explained before the commencement of the data collection process, to prepare the participants beforehand.

In compliance with the university’s research requirements on COVID-19, no physical contact was made with the participants. Data collection was done online using the SurveyMonkey and MS Teams platforms. The researcher should always consider the risks and the benefits of the study to the participants (Salkind, 2012; Kothari, 2004). Non-maleficence or protection from harm is a key issue when conducting research (Saunders *et al*., 2016). The questionnaires and interviews were designed to ensure there were no sensitive or discriminatory questions relating to the topic or the study participants. The researcher also made use of a paid for subscription SurveyMonkey platform which had added security features that ensured the data was well secured and could only be accessed via the researcher's log in details. Debriefing sessions were also regularly conducted with the supervisor and co-supervisor, to ensure guidance was provided on the treatment and presentation of sensitive data (Shenton, 2004).

A rigorous review of the data collection questions from both the quantitative and qualitative instruments was also done with the assistance of the researcher's supervisors and industry experts, to ensure that questions asked did not solicit data pertaining to trade secrets or data that may be perceived to infringe on trade secrets (refer to table 4.9).

4.6 CHAPTER CONCLUSION

This chapter provided a comprehensive discussion and motivation of the research approach for this study. A discussion of the research scope and philosophical assumptions, which the researcher took into consideration when determining the paradigm, methodology and research design adopted, was also provided. A discussion on the sequential explanatory research design was broken down into two interlinked phases, the quantitative phase (phase 1) and the qualitative phase (phase 2).

For each phase, a chronological outline of the processes that followed from population identification, sample determination, data collection and analysis was provided. Considerations on the development of the quantitative and qualitative data collection instruments, together with strategies to ensure their validity and reliability, were also discussed. The study limitations and ethical considerations bordering on the choice of methodology and research approach were also discussed, to ensure the researcher overcame the expected and unexpected eventualities that surfaced during the undertaking of this study.

The next chapter will discuss the outcomes of the quantitative phase of this study.

CHAPTER 5: RESULTS FOR QUANTITATIVE PHASE (PHASE 1)

CHAPTER 5 - ROADMAP

5.1	**INTRODUCTION**
5.2	**ITEM LEVEL CASE SCREENING**
5.3	**RESPONDENT PROFILES (SAMPLE DESCRIPTIVES)**
5.3.1	Response rate
5.4	**DEMOGRAPHIC VARIABLES**
5.4.1	Role in organisation
5.4.2	Area of focus in organisation
5.4.3	Period of employment in current organisation
5.4.4	Period of employment in foundry industry
5.4.5	Distribution of foundries by location
5.5	**RESULTS OF QUANTITATIVE PHASE**
5.5.1	Influence of study constructs on SCA
5.5.2	Validity and reliability of the survey instrument for the quantitative phase
5.5.2.1	Validation of micro drivers for quantitative phase
5.6	**ADDRESSING THE STUDY'S CONSTRUCTS AND DRIVERS**
5.6.1	Classification of micro drivers into study constructs
5.6.1.1	Micro drivers – construct 1 (Assets/Resources)
5.6.1.2	Micro drivers – construct 2 (Processes)
5.6.1.3	Micro drivers – construct 3 (Firm's performance)
5.6.1.4	Micro drivers – construct 4 (Supporting and related industries and clusters)
5.6.1.5	Micro drivers – construct 5 (Institutions and government policies)
5.6.2	Classification of macro drivers into study constructs
5.6.2.1	Macro drivers – construct 1 (Assets/Resources)
5.6.2.2	Macro driver – construct 3 (Firm's performance)
5.6.2.3	Macro drivers – construct 4 (Supporting and related industries and clusters)
5.6.2.4	Macro drivers – construct 5 (Institutions and government policies)
5.6.3	Respondents' choice of most critical drivers in providing SCA
5.6.4	Validation of survey instrument for quantitative phase (Competitive Forces)
5.7	**THE STUDY'S FORMATIVE MEASUREMENT MODEL**
5.8	**RELIABILITY ANALYSIS**
5.9	**ANALYSIS OF GROUP DIFFERENCES IN RELATION TO STUDY CONSTRUCTS**
5.10	**CANONICAL CORRELATION ANALYSIS**
5.10.1	Canonical loadings
5.10.2	Canonical cross-loadings

Figure 5.1: Illustration of layout for Chapter 5

Source: Author's own compilation (2022)

5.1 INTRODUCTION

In the previous chapter, a detailed discussion of the methodology the study adopted was presented. The purpose of this chapter is to present the empirical outcomes of the quantitative phase (phase 1) of the study, as indicated in figure 5.2. The chapter also provides detail that informs the development of the SCA framework for the foundry industry in the South African context. The level of positioning of this chapter was key in ensuring that the objectives of the study were met. This study was motivated by the closure of South African foundries as a result of various macro and micro-economic challenges (Cunningham, 2013b; Dlambulo, 2019; Jardine, 2015b; Lochner *et al.*, 2019; Mkansi *et al.*, 2018; Nyakabawo, 2017). To address this problem, it was paramount to first determine the key micro and macro-economic drivers influencing the sustainable competitiveness of foundries in South Africa.

The primary objective of this study was to develop a framework for the sustainable competitive advantage of the foundry industry in South Africa (table 3.1). The secondary objectives included i) the identification, from literature, of the micro and macro drivers for the SCA of foundries in South Africa, ii) benchmarking the perceptions of industry stakeholders on SCA in light of the micro and macro drivers identified in literature, and iii) drawing up recommendations on strategies that can be adopted by the foundry industry in order to enhance SCA. Table 3.1 provides a research matrix that illustrates the chapters where the objectives of the study were addressed in detail.

As discussed in chapter 4, the study adopted an explanatory sequential mixed methods research design where the quantitative phase preceded the qualitative phase (Bowen, *et al*., 2017; Creswell, 2014). The "mixing" in this mixed methods design manifested when the results of the quantitative phase were used to develop the data gathering instrument for the qualitative phase. It was, therefore, pertinent that the quantitative phase was conducted and concluded before the qualitative phase began (Creswell & Creswell, 2018). The development of the instrument for the qualitative phase, the data gathering, and interpretation are presented and discussed in chapter 6 of this study. Chapter 6 is then followed by chapter 7, in which the integration of the quantitative results and qualitative findings, and the subsequent recommendations are discussed.

The study contributes significantly towards the body of knowledge with a current void, specifically regarding SCA in industry (Karman, 2021; Wu, 2013). Wu (2010:3) asserts that there is a need for a "holistic approach to competitive advantage which reflects both the internal and external attributes of firms" while Heriyanto *et al.* (2021) agrees with Hoffman (2000:12) who argued that there is a "lack of research that maps the way strategy could influence firm performance by providing firms with SCA".

The collection of the data related to SCA within the context of South African foundries sets this study apart from other similar studies in the following ways. Firstly, previous studies have focused on the generic competitiveness of foundries and not "sustainable (sustained) competitive advantage". Secondly, the study provided an opportunity for the researcher to test and benchmark SCA drivers, identified in literature, against the perceptions of industry employers and employees (management and non-management), as well as industry experts within the South African context. Thereby, contributing to a knowledge area where there has been limited research. Thirdly, the study seeks to develop a framework that is crucial and makes a contribution to the body of knowledge as well as for both academics and industry, within the foundry sector, to understand what drives foundry SCA as well as what possible strategies could be adopted to enhance firm SCA and, thus, mitigate against firm closures (Lochner *et al.*, 2019; Mkansi *et al.*, 2018; Rustomjee, Kaziboni & Steuart, 2018) (see table 3.1). Bandaranayake and Pushpakumari (2021) recommend research that explores the development of a framework that seeks to measure SCA, while Barros *et al.* (2019) posit that there is a need for future research on the interaction between resources and capabilities, in order to enhance SCA.

This chapter discusses the respondent profiles, item level screening of the data collected, presents the results of the data collected and culminates in the development of the preliminary framework for SCA of the foundry industry in South Africa. The outcomes of this chapter feed into and are the foundation for the instrument development phase for chapter 6.

As illustrated in figure 5.2, in conducting the quantitative phase of the study, surveys were distributed to the respondents using the SurveyMonkey platform, to ensure no physical contact with the respondents was made, as well as to manage better the confidentiality and anonymity of the responses provided. The output from this phase would be used as input to the data gathering instrument development process for the second phase.

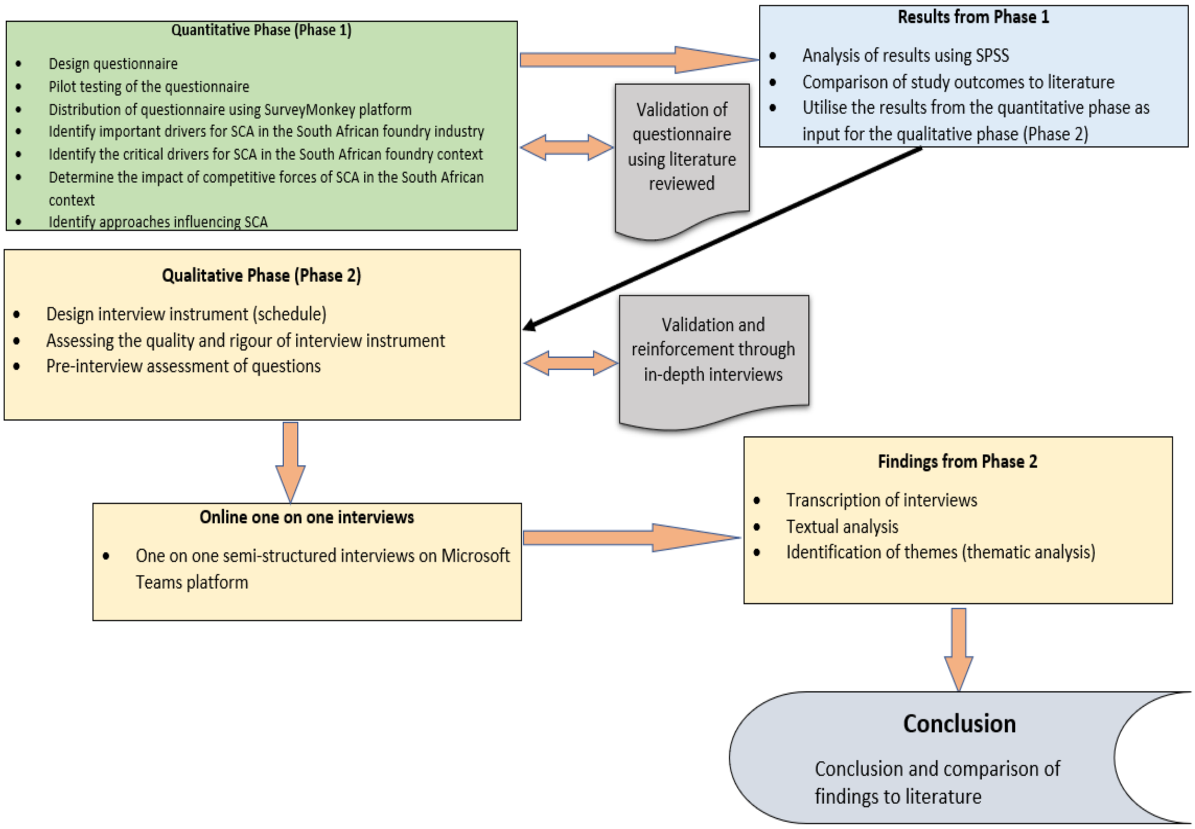

Figure 5.2: Format of the data collection and gathering phases

Source: Author's own compilation (2022)

5.2 ITEM LEVEL CASE SCREENING

Despite there being 123 foundries in South Africa (Lochner *et al.*, 2020), only 95 foundries were invited to participate in the study. This was due to the difficulty experienced in obtaining contact details (phone numbers and e-mail addresses) of the management and employees identified in the participant criteria, discussed in chapter 4 (figure 4.4 and figure 4.5). A total of 196 respondents within the 95 foundries were sent the survey. These respondents were selected because of the availability of their contact details on the database and on the basis of their role in the organisation – either dealing with customers and suppliers, or interacting with other key stakeholders within the industry, such as competing foundries, government organisations or cluster associations.

Foundries of different sizes, turnover or number of employees were approached for participation. According to Ketels (2016), research has shown that the type and size of the firm, resources available and type of geography where a business is located, affect the micro and macro-economic environment in which the firm operates, differently. Marčeta and Bojnec (2020) argue that national instruments, legal infrastructure, and institutional policies also affect the drivers of competitiveness to varying degrees.

Based on these assertions, it was expected that the various drivers presented in the survey (see chapter 3, table 3.11) would be identified by the respondents as impacting on competitiveness to varying degrees of importance. One case (respondent) was identified where the respondent did not show any variation in responses. This signified that the respondent might not have engaged in the questionnaire and, as a result, this case was excluded from further analysis and was not part of the responses analysed. Soland, Wise and Gao (2019) assert that disengaged respondents can create biases in observed scores from surveys, in statistically significant ways. Therefore, it was deemed important to exclude this case. The next section discusses the respondent profiles for the quantitative phase.

5.3 RESPONDENT PROFILES (SAMPLE DESCRIPTIVES)

The following section discusses the response rate and profile for the study.

5.3.1 Response rate

According to Creswell (2012:390), researchers normally seek high response rates in order to “gain confidence in generalising the results to the population understudy”. Babbie (2010:272) defines a response rate or completion rate as “the number of people participating in a survey divided by the number selected in the sample, in the form of a percentage”.

The estimated number of foundries in South Africa stood at 123 at the time of the study (Lochner *et al.*, 2020), as indicated in section 5.2, these were the foundries targeted for this study. Efforts were made to ensure that respondents from foundries from different provinces were included. This was done so that there could be a representation of responses from these provinces. The names of the respondents and companies that took part in the study remained anonymous, in line with the ethical requirements. As mentioned in chapter 4, the population for the quantitative phase of the study consisted of management and non-management employees of foundry companies in South Africa. This selection was done to check for information asymmetry between the two categories of employees (Huang *et al.*, 2018) in their responses to the survey questions. To this effect, at least two respondents (management and non-management employees) were invited to participate from each foundry, in order to afford all members of the population an equal chance of selection (Saunders *et al.*, 2016; West, 2016).

The average response rate for this study was 55.1% (table 5.1), based on 108 usable individual responses received out of 196 survey invites sent. As indicated in section 5.2, one respondent was excluded as the respondent's responses showed a possible lack of engagement with the questionnaire, as there were no variations in the responses provided. Rindfuss, Choe, Tsuya and Bumpass (2015) point out that over the last decade, response rates have been decreasing, with those of cross-sectional web-based surveys hovering around 50%. Jones and Pitt (1999), on the other hand, argue that online-based surveys generally have low response rates of around 34%, as opposed to mail surveys that can solicit up to 45% response rates. Dillman *et al.* (2009) argue that web-based survey response rates vary between 30% and 48%.

According to Rindfuss *et al.* (2015:801), the decline in respondent participation has been widely reported in survey research literature, with the likelihood to participate depending more on a number of factors which include the "respondents' interests, psychological predispositions and obligations". Dillman *et al.* (2009:799) posit that responding to surveys "has changed from being an obligation to being a matter of respondent choice and convenience". Harrison, Henderson, Alderdice and Quigley (2019) also argue that the problem of low response rates in online surveys can be attributed to time pressures, the increasing number of surveys that people are required to respond to at any given time, survey fatigue and concerns around privacy. The reasons outlined above could have contributed, in part, to non-responses from potential respondents who opted not to complete the survey, despite having agreed to do so.

Various strategies were implemented to encourage a high response rate for this research. These included pre-notifying potential respondents that they would receive an e-mail with the survey link, including a consent form and cover letter explaining the purpose of the survey, as well as potential benefits to the respondents and sending a follow-up e-mail with the survey link, two weeks before the due date for submission (Creswell, 2012). According to Ravichandran and Arendt (2008), making contact with key representatives or gate keepers is crucial in ensuring an improvement in the response rate. The foundry industry association (SAIF) was engaged throughout the study, including during the development of the questionnaire. A request was also made by the president of the association encouraging member foundries to participate in the survey, as the association saw value for the industry in the outcome of the study. The e-mail containing the survey link was also personalised to encourage participation. The questionnaire was designed in such a way that it was easy to follow, had an attractive, well designed layout and could be completed in less than 10 to 15 minutes (Vicente & Reis, 2012).

Despite the limited research on the foundry industry in South Africa (SAIF, 2015; Mkansi *et al.*, 2018; Paul, 2013), no past studies have prescribed what the response rate should be for online survey-based studies and more specifically, for the foundry industry. An e-mail survey-based study by Phele *et al.* (2005) produced a response rate of 34%, while another study by Ettmayr and Lloyd (2017) provided a 43% response rate. Mkansi *et al.* (2018), in their study, used structured paper-based questionnaires and obtained a response rate of 52%. This study, therefore, contributes by providing a response rate "benchmark" against which future studies on the foundry industry in South Africa should target. Table 5.1 reports on the distribution of respondents as well as the survey response rate.

Table 5.1 Respondents distribution and response rate for the study

Classification of foundries in South Africa	Number of foundries operational in South Africa (2020)	Number of foundries invited to participate *(Only those with contact details on the database)*	Number of respondents invited to participate	Number of respondents who provided feedback	Overall Response Rate
Gauteng	84	72	151	Not identifiable because of confidentiality associated with SurveyMonkey set up	
KwaZulu-Natal	16	11	24		
Western Cape	10	5	7		
Eastern Cape	4	2	3		
Free State	4	3	8		
North-West	1	1	1		
Northern Cape	3	0	0		
Mpumalanga	1	1	2		
Total	**123****	**95**	**196**	**108*****	**55.10%**

**The total number of foundries (123) excluded foundry companies that were confirmed to be in the processes of finalising the modalities of company closure when the study by Lochner *et al.* (2020) was conducted.
***This number excluded one respondent who appeared not to have engaged with the questionnaire and had no variations in responses.

Source: Author's own compilation (2022)

5.4 DEMOGRAPHIC VARIABLES

Table 5.2 reports the distribution of the respondents according to the demographic variables including: role in the organisation, area of focus in the organisation, period of employment in company and period of employment in foundry industry. The total number of respondents equated to 108 (refer also to table 5.1).

Table 5.2: Demographic variables of respondents

Demographic Variable	Category	Frequency (n)	Percentage
Role within your organisation	1 Top Management	10	9.3%
	2 Senior Management	15	13.9%
	3 Middle Management	14	13.0%
	4 Junior Management	27	25.0%
	5 Non-Management	42	38.9%
	Total	**108**	**100.0%**
Area of focus within your organisation	1 Strategic Management	16	14.8%
	2 Finance and Administration	24	22.2%
	3 Operations / Manufacturing	20	18.5%
	4 Project Management	16	14.8%
	5 Sales and Marketing	19	17.6%
	6 Procurement / Buying / Tendering	13	12.0%
	Total	**108**	**100.0%**
Period of employment with your current company	1 Less than 1 year	20	18.5%
	2 Between 1 and 5 years	37	34.3%
	3 Between 6 and 10 years	26	24.1%
	4 More than 10 years	25	23.1%
	Total	**108**	**100.0%**
Period of employment within the foundry industry	1 Less than 1 year	9	8.3%
	2 Between 1 and 5 years	25	23.1%
	3 Between 6 and 10 years	30	27.8%
	4 More than 10 years	44	40.7%
	Total	**108**	**100.0%**

The following sections address demographic variables including role in the organisation, area of focus in organisation, period of employment in organisation and period of employment in foundry industry, as reported in table 5.2. A good spread and representation of all categories was obtained from the respondents.

5.4.1 Role in organisation

As indicated in figure 5.3, respondents were classified into five categories: top (9.3%, *n=10*), senior (13.9%, *n=15*), middle (13%, *n=14*), junior management (25%, *n=27*) and non-management employees (38.9%, *n=42*). Figure 5.3 presents a distribution of the respondents by role in organisation.

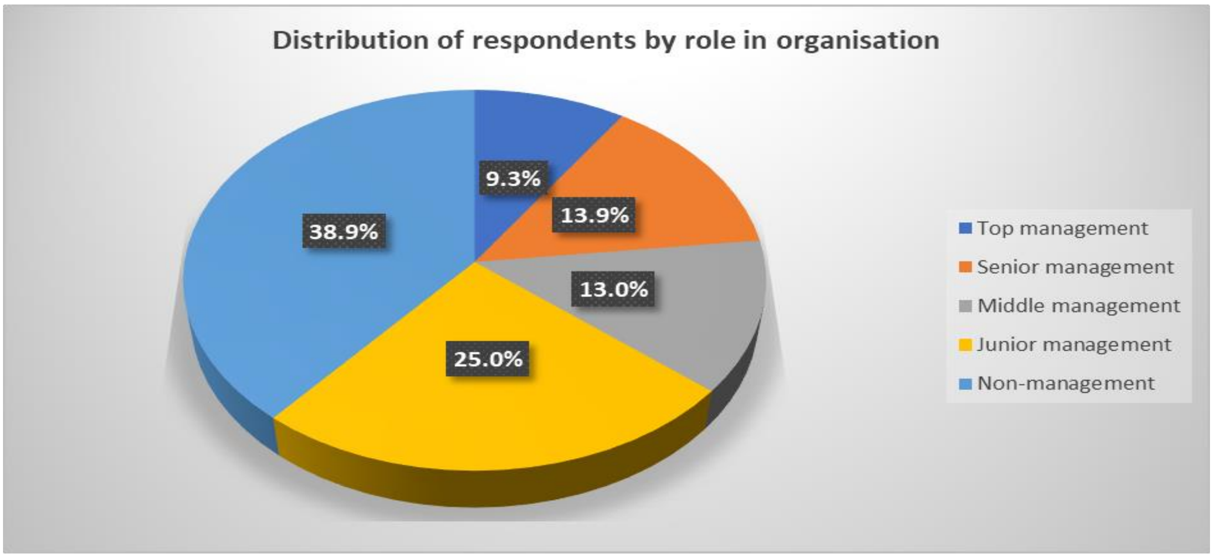

Figure 5.3: Distribution of respondents by role in organisation

The distribution of the survey was such that each foundry had at least a management and a non-management participant partaking in the study. The role of respondents in their organisations was deemed an important category to consider, in an effort to get both management and non-management perspectives represented in the study. For the purposes of further analysis in this study, these categories were clustered into two groups, namely, management and non-management employees, as shown in table 5.3.

Table 5.3: Classification of respondents by role in organisation

Grouping	Role in Organisation	Frequency	Percentage
Management	Top, Senior, Middle, Junior Management	66	61.10%
Non-management	Non-management	42	38.90%
	Total	**108**	**100%**

According to Huang, Li and Markov (2018), significant information asymmetry still exists between management and non-management employees within organisations, and this asymmetry has significant negative consequences. The reluctance by family-owned businesses to hire non-family managers might drive the increase in information asymmetry between the owners and the rest of the employees (Fang, Memili, Chrisman & Penney, 2016). In the same vein, Gilovich, Savitsky and Medvec (1998) caution against the “illusion of transparency concept” in which management may perceive that employees understand their plans for the organisation when, in fact, employees may believe that management is not being fully transparent or communicating well enough.

In order to test this concept and to determine whether both groups were aligned in their understanding of SCA for their firms as well as the foundry industry, the respondents were grouped as indicated in table 5.3 and figure 5.4. The distribution of the participants provided a good spread of all categories ensuring that there was representation of all perspectives.

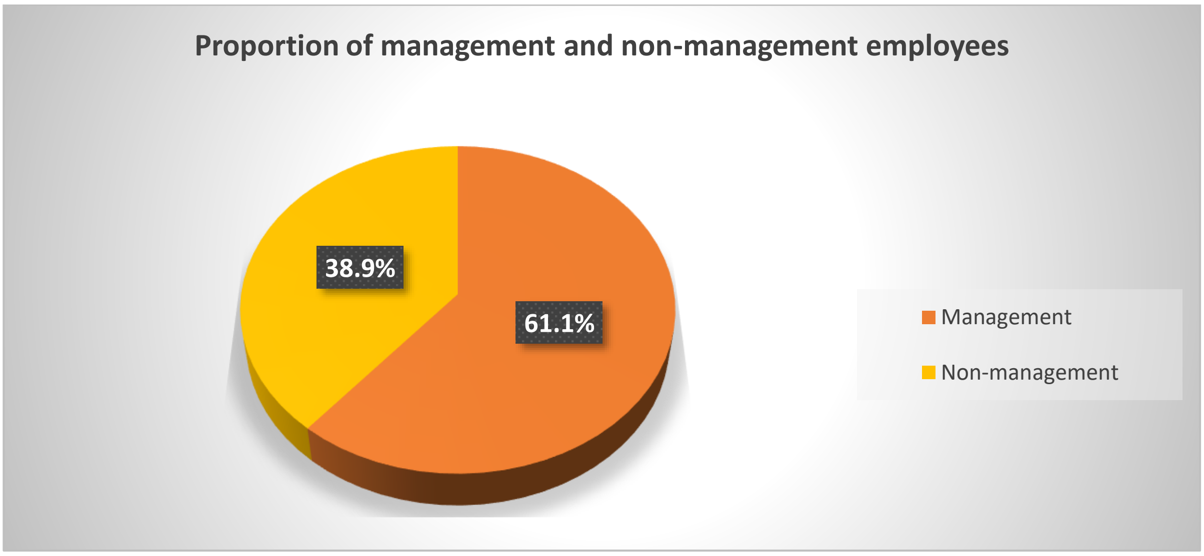

Figure 5.4: Proportion of management and non-management employees

As shown in figure 5.4, the proportion of management employees equated to 61.1%, whereas that of non-management employees was 38.9%. Management employees included respondents employed in top, senior, middle and junior level management positions, whereas respondents employed in positions that were regarded as not managerial, were classified as non-management. It was anticipated that management perspective would provide a more informed opinion on the SCA issues in question.

5.4.2 Area of focus in organisation

The different areas of focus were well represented in the study, with employees in finance and administration contributing 22.2% (*n=24*), operations or manufacturing 18.5% (*n=20*), sales and marketing divisions constituting 17.6% (*n=19*) of the sample. Employees involved in strategic management and project management, each represented 14.8%

(*n=16*) of the sample, while those in procurement, buying and tendering constituted 12.0% (*n=13*). This is illustrated in figure 5.5 below.

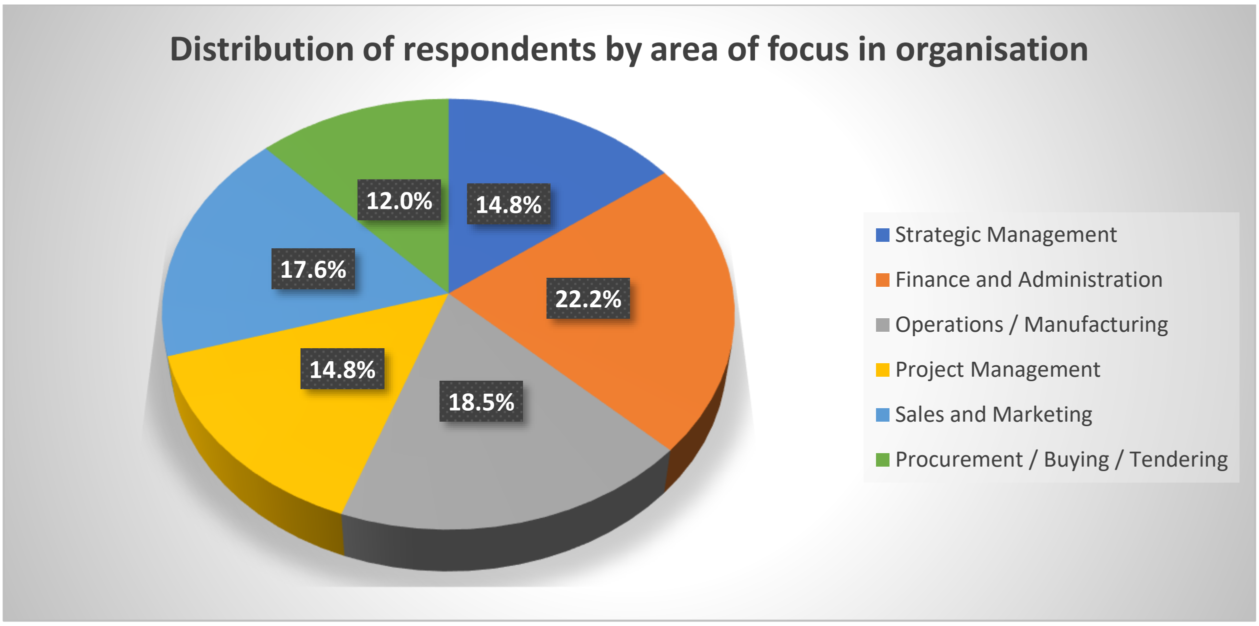

Figure 5.5: Distribution of respondents by area of focus in organisation

From the South African foundry industry perspective, it was crucial that the respondents selected were employed in positions where they interacted with various industry stakeholders and had access to information that would reasonably enable them to understand the nature of competition within the industry. Employees engaged in strategic management, finance and administration, operations, project management, sales, marketing and procurement, buying or tendering (Nyemba, Mhlanga, Chinguwa & Mbohwa, 2017) were identified as possessing information that would be valuable in answering the survey questions. As indicated in table 5.3, the following section discusses the respondents' period of employment within their current places of work.

5.4.3 Period of employment in current organisation

Figure 5.6 illustrates that 18.5% (*n=20*) of the respondents have worked for their current organisations for less than a year, the majority of the respondents (34.3%, *n=37*) reported that they had been with their company for between 1 and 5 years. A proportion of 24.1% (*n=26*) have worked for their current organisation for between 6 and 10 years, while 23.1% (*n=25*) of the respondents indicated that they had worked for their current organisation for more than 10 years (see figure 5.6). This indicated a fair distribution of respondents based on their period of employment within a single organisation and provided an opportunity to reflect on their perspectives on the competitiveness of their organisations.

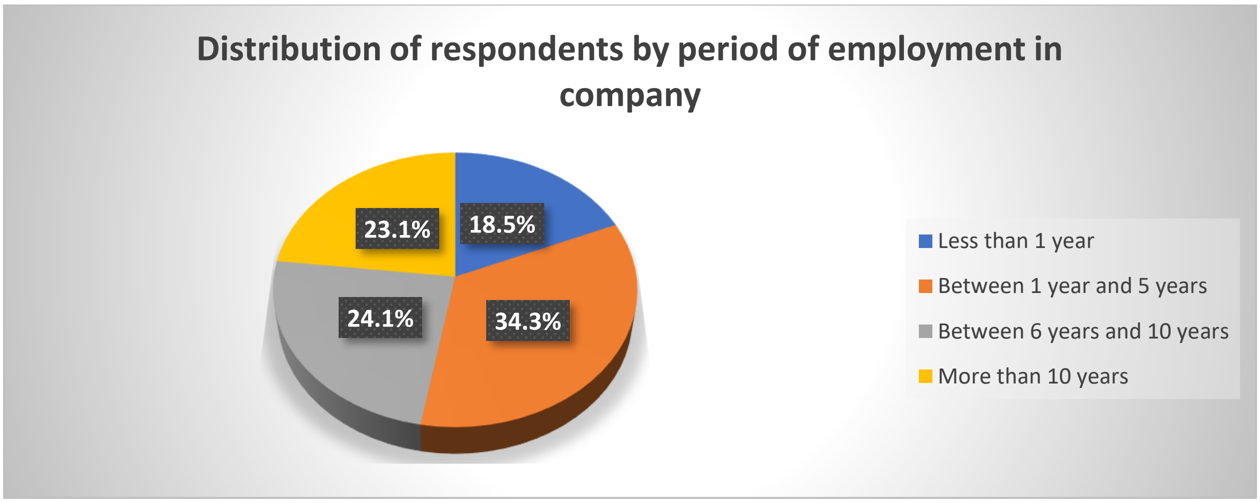

Figure 5.6: Distribution of respondents by period of employment in company

The next section discusses the respondent profiles on the basis of their periods of employment within the foundry industry

5.4.4 Period of employment in foundry industry

As illustrated in figure 5.7, regarding the overall period of employment within the foundry industry, 9.3% (*n=10*) of the respondents indicated that they had worked in the foundry industry for less than a year. A proportion of 30.6% (*n=33*) of the respondents indicated that they had worked within the industry for between 1 and 5 years, 33.3% (*n=36*) had worked within the foundry industry for between 6 and 10 years, while 26.9% (*n=29*) of the respondents reported that they had been employed within the industry for more than 10 years (see figure 5.7).

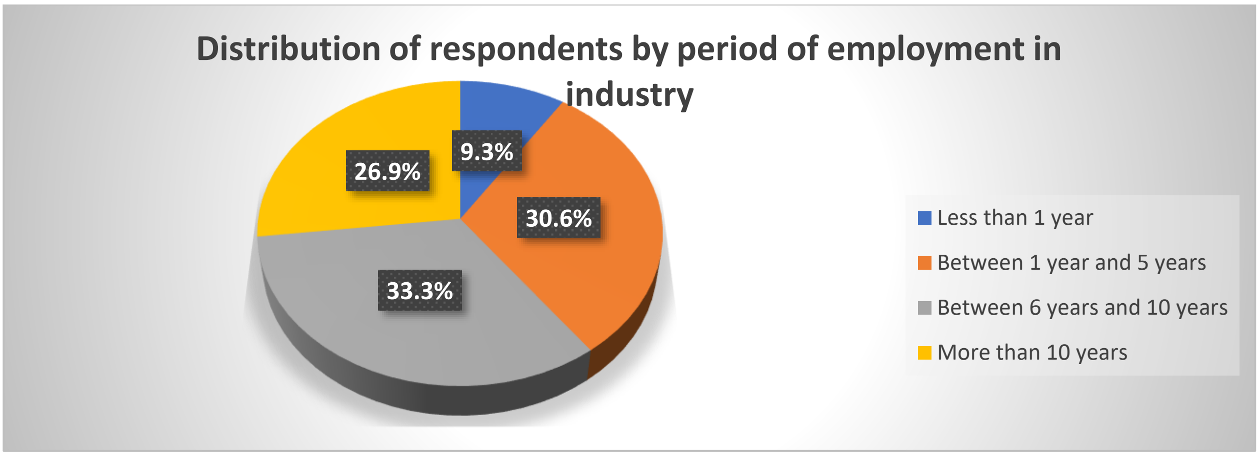

Figure 5.7: Distribution of respondents by period of employment in the foundry industry

The distribution showed that there was a fair representation of respondents who had been within the foundry industry for between 1 and 5 years, 6 and 10 years, and above 10 years. A smaller proportion (9.3%) had been in the industry for less than 1 year. The period of employment in the foundry industry was also considered important, as it reflected the sufficiency in knowledge about the industry, required to complete the survey.

5.4.5 Distribution of foundries by location

A total of 95 foundries participated in the study. The majority of foundries invited to participate in the study were located in Gauteng [76% (*n=72*)], while 12% (*n=11*) were located in KwaZulu-Natal, 5% (*n=5*) in the Western Cape, 3% (*n=3*) in the Free State, 2% (*n=2*) in the Eastern Cape and 1% (*n=1*) in the North-West and Mpumalanga, respectively. Participation could not be obtained in the Northern Cape, due to the difficulty in obtaining the correct contact details to enable the researcher to e-mail the survey to any of the potential respondents. Figure 5.8 illustrates this distribution.

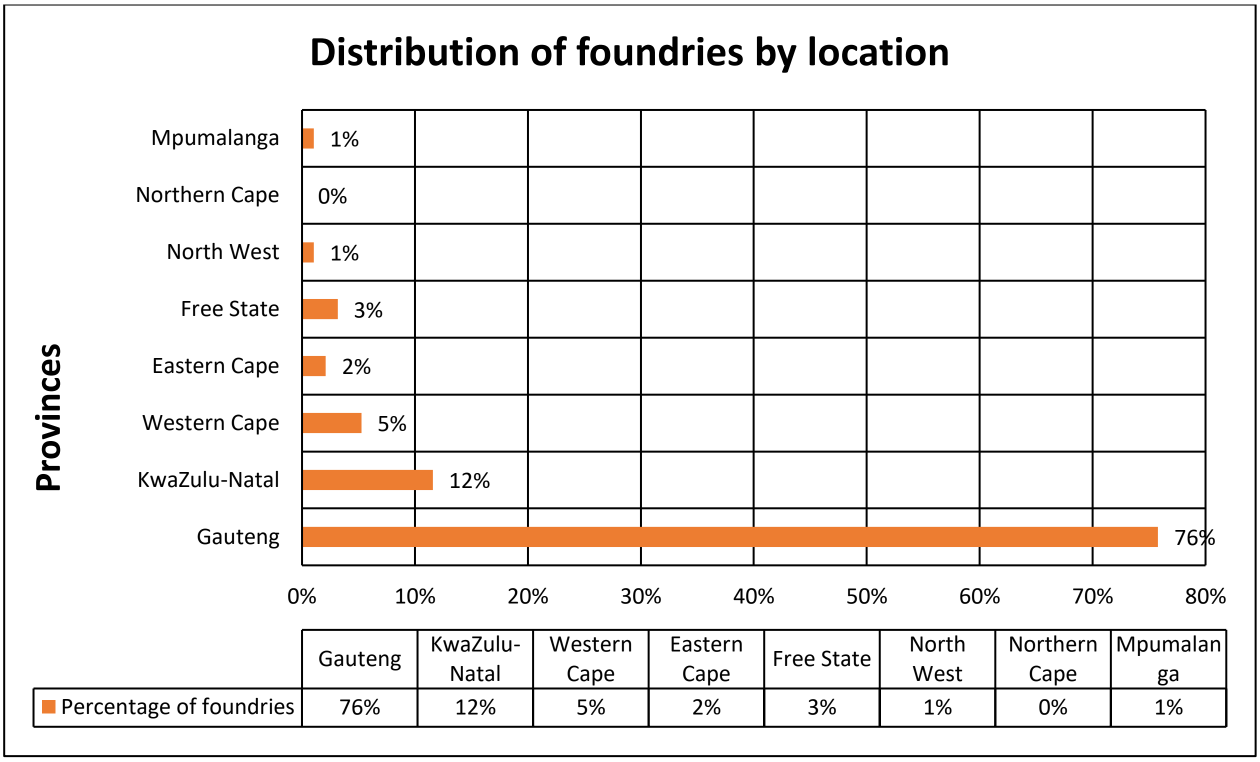

Figure 5.8: Distribution of respondents by foundry size

The next section provides an analysis on the results for the quantitative phase of the study.

5.5 RESULTS OF QUANTITATIVE PHASE

As outlined in chapter 4, this study was divided into two phases (sequential explanatory research design), which entailed having the quantitative phase (phase 1) followed by the qualitative phase (phase 2) (see figure 4.3). This section discusses the results from the quantitative phase, while the qualitative phase is discussed in the next chapter (chapter 6).

In collecting data, the survey instrument (questionnaire) was designed to allow the respondents to select the level of importance of the micro and macro drivers provided, on the basis of a 5-point Likert type scale, ranging from 1 (Not important at all) to 5 (Extremely important) (see chapter 4, section 4.3.7).

1	2	3	4	5
Not important at all	Slightly important	Moderately important	Very important	Extremely important

Section A and B of the survey were each divided into two parts and required respondents to, first, indicate from a list of micro and macro drivers, the drivers they believed were important in influencing SCA for the South African foundry industry. The drivers tested in the study were categorised into five constructs: i) assets or resources, ii) processes, iii) firm performance, iv) supporting and related industries and clusters, as well as v) institutions and government policies (refer to section 5.4.1 and annexure A). This categorisation was conducted prior to the quantitative data analysis stage and was based on an extensive literature study done by Siudek and Zawojska (2014). The next part required the respondents to select (without ranking) three micro and macro drivers which were regarded as critical for foundry SCA.

The other sections of the survey required the respondents to rank the competitive forces and competitiveness approaches they believed influenced the SCA of foundries in South Africa. Finally, the respondents were invited to state how else they felt the SCA of foundries could be improved.

5.5.1 Influence of study constructs on SCA

As discussed in section 3.9 (chapter 3) and section 5.4, the micro and macro drivers identified for testing in the study were classified into five constructs (assets/resources, processes, firm performance, supporting and related industries and clusters, as well as institutions and government policies. As reflected on by Dung *et al.* (2020), and Siudek and Zawojska (2014), the five constructs indicated in figure 5.9 do not necessarily correlate, meaning that respondents could rate drivers within the same construct at different levels of importance. Similarly, drivers between the various constructs could also be rated at different levels of importance by different respondents. These constructs are presented in figure 5.9 and discussed in the following section.

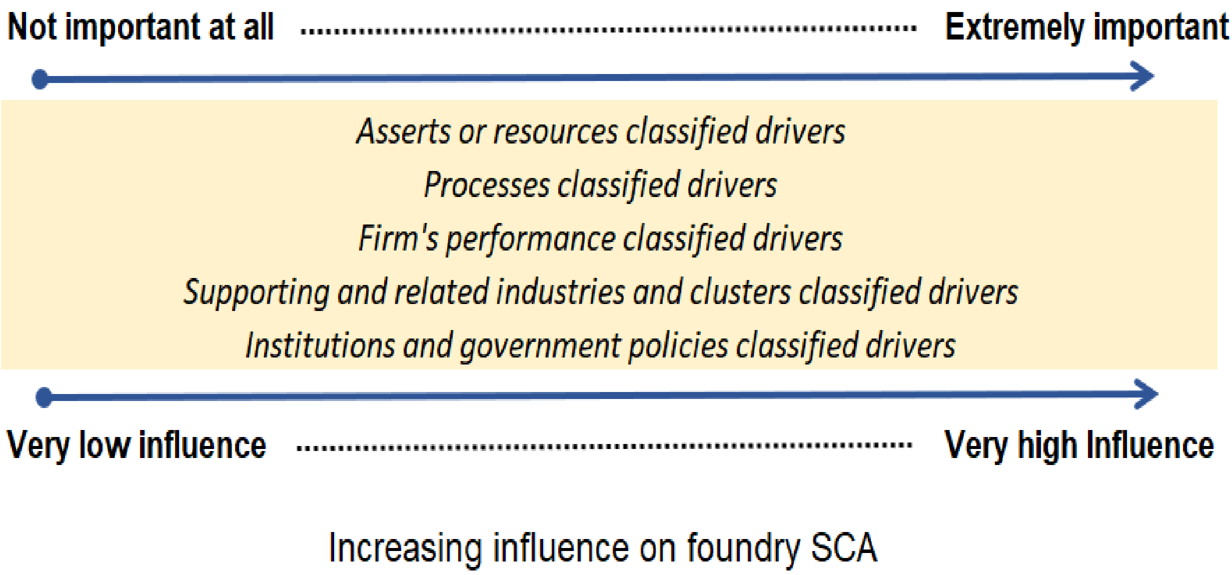

Figure 5.9: Anticipated influence of drivers and influence on foundry SCA
Source: Author's own compilation (2022)

As indicated in figure 5.9 and based on the works of Siudek and Zawojska (2014), it was anticipated that the more a driver was considered important, the greater the influence it was believed to have in enhancing SCA. The next section discusses the validity and reliability of the survey instrument used in the quantitative phase of the study.

5.5.2 Validity and reliability of the survey instrument for the quantitative phase

The following section discusses the validation and reliability of the instrument in response to the need to address the first objective of the study. The first research objective encompassed the identification of micro and macro drivers from literature. This is presented in the following sections.

5.5.2.1 Validation of micro drivers for quantitative phase

As discussed in chapter 3 (and indicated in table 3.8 and table 3.10), the various micro and macro drivers for SCA that were identified in literature, were subsequently tested in the study. The following sections provide a summary of the literature sources, which identified these drivers as important in enhancing the organisation competitiveness and SCA. The identification of these drivers served to address the first research objective for this study.

5.6 ADDRESSING THE STUDY'S CONSTRUCTS AND DRIVERS

As indicated in chapter 3 (table 3.1), the first secondary objective of this study was:

To identify from literature the micro and macro-economic drivers influencing the sustainable competitive advantage of foundries in South Africa

The micro and macro drivers for SCA were identified in literature and presented in table 3.8 and table 3.10 of chapter 3. The drivers were identified as being important in enhancing the sustainable competitiveness of foundries within the global landscape, as well as within the South African context. Among the various drivers identified, it was discovered that certain drivers appeared more consistently in literature than others. A decision was made to further identify these common drivers and test them within the South African foundry context. Table 3.11 illustrates the drivers that were incorporated in the survey for testing. Word and phrase clouds in figure 5.10 and figure 5.11 were used to provide a visual appreciation of how common these drivers appeared in the literature reviewed.

The following figure 5.10 illustrates the micro drivers identified.

Figure 5.10: Word cloud of micro drivers affecting firm SCA

Source: Author's own compilation (2022)

The following section (figure 5.11) illustrates the macro drivers identified in literature as important in enhancing the competitive advantage of foundries.

Figure 5.11: Word cloud of macro drivers affecting firm SCA

Source: Author's own compilation (2022)

As indicated in figure 5.10 and 5.11, the "word and phrase" clouds provide an indication of the frequency of the micro and macro drivers, which were identified as important in enhancing the SCA for firms, both within global foundries and in South Africa, with the big font-sized words or phrases signifying high prevalence in literature. Due to the fact that these micro and macro drivers were identified through an extensive literature review process as being important in influencing SCA within the foundry industry, it was anticipated that the respondents would, although to varying degrees, also find these drivers as important. This study, therefore, sought to draw into the nuances of these drivers in respect of their importance in influencing SCA within the local context and also to gain insight as to what degree these drivers were considered important and relevant to the South African foundry environment.

A total of twenty micro drivers were tested (see table 3.11) and these included: i) investment in plant infrastructure, ii) cluster membership, iii) employee skills development, iv) product or service differentiation, v) organisational culture, vi) governance, vii) price competitiveness, viii) product quality, ix) ability to innovate, x) technology or equipment upgrade, xi) production or raw material costs, xii) firm capacity, xiii) exposure to export market, xiv) socio-cultural responsibility, xv) certifications, xvi) possession of intellectual property, xvii) managerial choice, xviii) bargaining power over suppliers, xix) possession of unique resources and xx) value-add for the customer.

In the same context, ten macro drivers were identified for testing within the South African context and these included: i) energy costs, ii) geographical location, iii) industry entry and exit barriers, iv) customer bargaining power, v) government incentives, vi) market perception of the foundry company, vii) localisation or local content enforcement, viii) regulatory instruments, ix) the number of foundry companies in South Africa and x) the availability of substitutes for casting products (see table 3.11).

The following sections discuss the micro drivers in the context of the constructs to which they had been classified.

5.6.1 Classification of micro drivers into study constructs

A total of seven micro drivers were identified and grouped according to the classification proposed by Siudek and Zawojska (2014) as belonging to the assets/resources construct.

5.6.1.1 Micro drivers – construct 1 (Assets/Resources)

A summary of the micro drivers classified under assets/resources is provided in table 5.4.

Table 5.4: Validation of assets/resource micro drivers

CONSTRUCT 1 – ASSETS / RESOURCES		
Micro drivers	**Summary from literature sources**	**Authors**
Investment in plant infrastructure	The possession of quality physical and information technology (IT) infrastructure is crucial in the provision of sustainable advantage for a firm.	(Cvetkovski, 2015; Pagone, Jolly & Salonitis, 2016; Roman *et al.*, 2012; Parola *et al.*, 2016; Mkansi *et al.*, 2018; Doyle *et al.*, 2017; Sook-Ling *et al.*, 2015; Dvoulety & Blazkova, 2020)
Firm capacity (size)	It has been determined that the effectiveness of the distributor-end customer relationship and firm manufacturing capacity are factors in competitive advantage and value generation.	(Kaleka & Morgan, 2017)
	The key is to generate manufacturing capacity to create a sustainable competitive advantage in relation to competitors. This creates the difference between successful and unsuccessful firms.	(Giménez, Madrid-Guijarro & Duréndez, 2019)
Possession of intellectual property	Utilising intellectual property as a tactical tool for gaining competitive advantage requires management attention throughout a product's life cycle.	(Khota & Stern, 2005)

CONSTRUCT 1 – ASSETS / RESOURCES		
Micro drivers	**Summary from literature sources**	**Authors**
	Intellectual property, more than being used by companies as a tool to attract investment and create wealth, has been recognised as a source of competitive advantage.	(Teixeira & Ferreira, 2019)
	Product creators must use the laws pertaining to copyright, patents, trademarks, designs, and competition—all of which are considered to be a part of IP—to their advantage in order to gain a competitive edge in the knowledge economy.	(Jamali & Karam, 2016)
Possession of unique resources (inimitable to competition)	Unique resources that are firm-specific, scarce, valuable, one-of-a-kind, non-tradable, and non-substitutable give a company a lasting competitive edge.	(Maket & Korir, 2017; Madhani, 2016; Hanson, 2015)
Socio-cultural responsibility (corporate social investment)	The adoption and application of corporate social responsibility will affect the firm's market share and transparency of reports disclosed, thereby earning the organisation a competitive advantage.	(Areiqat, Abdelhadi, Rumman & Al-Bazaiah, 2019)
	While the literature on corporate social responsibility (CSR) continues to grow, the results of scholarly research are becoming more complex and multifaceted, especially work done on the correlation between CSR and competitive advantage, there are several conflicting conclusions, such as positive correlation, negative correlation and irrelevance.	(Zhao *et al.*, 2019; Jamali & Karam, 2016; Kotler & Lee, 2008)
Employee skills development (Human capital)	Human capital is now more important than ever for gaining a competitive edge because it is thought to be the key to success and a major source of wealth.	(Memon, Mangi & Rohra, 2009)
	Because each employee has the potential to contribute in a special way, human capital has been recognised as having the potential to be inimitable.	(Hossain & Roy, 2016)
	A hard to imitate and long-lasting competitive edge is human resource through practices of human resources within the company.	(Sadalia, Irawati & Syafitri, 2017)
	Human capital is the key component that gives an organisation a competitive advantage, and strategic HRM is used to effectively and efficiently manage employee skills, knowledge, and capacity to have a major impact on the attainment of an organisation's strategic goals.	(Hamadamin & Atan, 2019)
Embracing new technology	Technology is one of the factors affecting business performance and competitive advantage.	(Pietrewicz, 2019)
	The length of time that these competitive advantages can be utilised depends on the competitors' ability to quickly copy the underlying innovation's technological and engineering challenges.	(Mindlin *et al.*, 2018; Putra *et al.*, 2018; Rothaermel, 2008)
	In dynamic, technology-intensive environments, any competitive advantage is temporary.	(McGrath, 2013)

Source: Author's own compilation (2022)

The drivers identified included investment in plant infrastructure, firm capacity, possession of intellectual property, possession of unique resources, socio-cultural responsibility, employee skills development and embracing new technology. As discussed in chapter 3, the different literature perspectives on the drivers showed that firm assets/resources were crucial in enhancing SCA (Dung *et al.*, 2020). These assets/resources can be tangible or intangible, should be well managed, allocated and where possible, inimitable by competitors for foundry companies to gain a competitive advantage (Gaya, 2017; Gaya, Struwig & Smith, 2013).

5.6.1.2 Micro drivers – construct 2 (Processes)

Table 5.5 provides a summary of the micro drivers classified under the processes construct.

Table 5.5: Validation of process micro drivers

CONSTRUCT 2 – PROCESSES		
Micro drivers	**Summary from literature sources**	**Authors**
Ability to innovate (research and development)	Product innovation significantly affects competitive advantage.	(Nuryakin, 2018)
	One of the core functions of strategic management is innovation, which is widely acknowledged as the primary driver of competitive advantage for both individual businesses and entire economic and social systems.	(Adhikari, 2017; de Cont *et al.*, 2016)
	Business Model Innovation can be a source of competitive advantage superior to technology innovation.	(Pietrewicz, 2019; Pagone *et al.*, 2016; Sengottuvel & Aktharsha, 2016)
	Since change is the only constant in technology-intensive sectors, maintaining a competitive advantage requires ongoing innovation.	(Rothaermel, 2008)
	The major difficulty for businesses is to use innovation to gain a competitive advantage.	(Porter, 1990; Brem, Maier & Wimschneider, 2015)
Bargaining power over suppliers	Due to the danger of rising costs for goods and services, suppliers' bargaining power can have a negative impact on an industry's profitability and long-term competitiveness.	(Bruijl, 2018; Porter, 1990)
Managerial choice (decision making process)	A competitive advantage is provided by managerial adaptability, particularly in situations that are constantly changing. Horizon scanning, change management, and resilience are three aspects of adaptive capabilities that are taken into account when making decisions.	(Dvoulety & Blazkova, 2020; Ali *et al.*, 2017)
Exposure to export market (degree of internationalisation)	In order to have a competitive advantage globally, management decisions regarding efficiency, innovation, customer service, and public relations are crucial.	(Nwabueze & Mileski, 2018; Putra *et al.*, 2018)
	A key source of competitive advantage may come from adjusting strategy to also concentrate on export markets, particularly in less developed economies.	(Mohamed *et al.*, 2019; Ciszewska-Mlinaric &Trapczyn, 2019)
	Export-capable businesses that are more aware of changes in their competitive environment, are able to adjust to shifting market conditions faster than rivals, and can therefore acquire a competitive advantage.	(Hamadamin & Atan, 2019; Mohamed *et al.*, 2019)
Product quality	Quality has direct impact on organisational performance and indirect impact on organisational performance through competitive advantage.	(Alghamdi & Bach, 2013)
	Prior research has suggested that different aspects of competitive advantage are impacted by the different quality components.	(Ketels, 2016; Brancati *et al.*, 2018; Aiginger *et al.*, 2013; Lakhal, 2009)

Source: Author's own compilation (2022)

The micro drivers identified with respect to this construct included the ability to innovate, bargaining power over suppliers, managerial choice, exposure to the export market and product quality.

Drawing from figure 5.6, the introduction by firms, of processes that drive research and development, quick and effective decision making, negotiation skills, manufacture and provision of quality products and globalisation (internationalisation), promote SCA (Gaya, 2017; Uusitalo, 2017).

5.6.1.3 Micro drivers – construct 3 (Firm's performance)

Table 5.6 provides a summary of the micro drivers classified under the firm performance construct.

Table 5.6: Validation of firm's performance micro drivers

CONSTRUCT 3 – FIRM'S PERFORMANCE		
Micro driver	**Summary from literature sources**	**Authors**
Organisational culture	Competencies found within a company's culture help it maintain its competitive advantage; as a result, the phenomenon of a company's culture and its social complexity play a crucial part in defining competitive advantage and the survival of many enterprises.	(Bogdanowicz, 2014)
	The organisational culture, which is reflected in the members' values, attitudes, and behaviours, is a significant contributor to the competitive advantage of the company.	(Sengottuvel & Aktharsha, 2016)
	Organisations that have successfully developed the needed traits into their cultures can sustainably outperform the market in terms of financial performance.	(Shaari, 2019)
	The organisation gains a competitive edge in the global market when organisational culture and strategic management align.	(Alina *et al.*, 2018)
	Organisations seeking to gain a competitive advantage must foster and establish a culture that promotes the adoption of market-driven initiatives capable of providing customers with superior value.	(Violinda, 2016)
The availability of substitutes for casting products	For a company to sustain a competitive edge, the threat of alternatives needs to be minimal from an industry and profitability viewpoint.	(Bruijl, 2018; Dobbs, 2014; Porter, 1990; Pakdeechoho & Sukhotu, 2018)
	Viable substitutes put a cap on pricing and raise expenses for product performance, marketing, and service, decreasing a firm's advantage over rivals.	(Dobbs, 2014; Sato, 2016)
Price competitiveness	The set of activities that may create goods or services for customer satisfaction at the lowest price through the competitive advantage strategy is what determines the development of the cost leadership strategy.	(Porter, 2012)
	If a corporation can offer a lower price than its rivals, while maintaining the same level of product value or quality, it will have a greater competitive edge over those rivals.	(Putra *et al.*, 2018)
Production (raw material input) costs	A company's outstanding capacity to provide a good or service for less money than comparable offerings from other businesses is known as its competitive edge.	(Abdelraheem *et al.*, 2017)
	A cost leadership strategy can be crucial in helping mining companies use costing approaches to gain a competitive edge.	(Mohamed *et al.*, 2019)

CONSTRUCT 3 – FIRM'S PERFORMANCE		
Micro driver	**Summary from literature sources**	**Authors**
	When a company can add value to a process or a product at reduced production costs and that value cannot simultaneously be adopted by current or potential competitors, it has achieved competitive advantage.	(Kaningu *et al.*, 2017; Ketels, 2016; Brancati *et al.*, 2018; Aiginger *et al.*, 2013)
Product (service) differentiation	By implementing methods that provide them an advantage over rivals, many organisations today are concentrating on becoming more competitive. They need to put differentiation tactics into practice to do this.	(Masaba & Masayi, 2016)
	Differentiation plays a key role in a company's ability to gain a competitive edge.	(Putra *et al.*, 2018)
	By elevating the perceived value of their goods and services in comparison to that of rival companies' goods and services, differentiation is one of the techniques used by businesses to obtain a competitive edge.	(Kireru, Ombui, Omwenga & Kenyatta, 2016)
	A company should always work to set itself apart from its rivals and look for unique and uncommon resources to maintain its competitive advantage.	(Adimo, 2018)
Value-add for customer	Provision of value-add to the customer offers the firm competitive advantage over competition, as this is seen as reducing the extra work or processing the customer would still need to embark of to produce the final product.	(Hamadamin & Atan, 2019; Ketels, 2016; Brancati *et al.*, 2018; Aiginger *et al.*, 2013)

Source: Author's own compilation (2022)

A total of six micro drivers were identified in this catergory. These included organisational culture, governance, price competitiveness, production or raw material costs, product or service differentiation and value-add for the customer. Firm performance was identified as a measure of how well the firm performed activities that promoted SCA, when compared to its competitors.

According to literature, firm or organisational performance relates to the competitiveness culture embedded within the organisation, governance principles and ability to keep operational costs low, thereby enhancing price competitiveness as well as the ability to differentiate product offerings from similar competing products, and adding value to or beyond the expectations of the customers (Abdelraheem, Serajeldin & Jedo, 2017; Bogdanowicz, 2014; Hove-Sibanda, Sibanda & Pooe, 2017; Ketels, 2016). Table 5.7 summarises the only micro driver classified under the supporting and related industries and cluster construct.

5.6.1.4 Micro drivers – construct 4 (Supporting and related industries and clusters)

Table 5.7 provides a summary of the micro drivers classified under the supporting and related industries and clusters construct.

Table 5.7: Validation of supporting and related industries and clusters micro drivers

CONSTRUCT 4 – SUPPORTING AND RELATED INDUSTRIES AND CLUSTERS		
Micro drivers	**Summary from literature sources**	**Authors**
Cluster membership	Research demonstrates that networking, conversation, and experience exchange are the perceived advantages of cluster activities. It follows that the connections businesses make inside a cluster serve as vital channels for obtaining the resources and expertise needed to increase competitiveness and serve as links to other clusters abroad.	(Mindlin, Stolyarov, Novikova, Smolentsev & Tikhomirov, 2018; Meyer-Douglas & Mohamadi, 2013; Varga *et al.*, 2016; Quaye & Mensah, 2017; Osarenkhoe & Fjellström, 2017)
	Cluster membership maximises the competitive advantages of business entities possible in the framework of competitive clusters.	
	It is important to recognise the importance of industrial clusters and the degree of network they play in gaining a competitive edge. The study's conclusions showed that innovation and horizontal networking in a cluster considerably boost competitive advantage.	

Source: Author's own compilation (2022)

One micro driver (cluster membership) fell into this category. Literature perspectives (Osarenkhoe & Fjellström, 2017; Quaye & Mensah, 2017) showed that cluster membership was important in driving SCA, as it provided firms with opportunities to network, share ideas and experiences, thereby presenting members with a platform for developing and sustaining competitive advantage over firms that are not part of the cluster. Table 5.8 illustrates the micro driver identified and classified under the institutions and government policies construct.

5.6.1.5 Micro drivers – construct 5 (Institutions and government policies)

As previously mentioned, Table 5.8 provides a summary of the micro drivers classified under institutions and government policies construct.

Table 5.8: Validation of institutions and government policy micro drivers

CONSTRUCT 5 - INSTITUTIONS AND GOVERNMENT POLICIES		
Micro drivers	**Summary from literature sources**	**Authors**
Certifications (ISO standards, product certifications)	Firms can achieve an early mover competitive advantage when implementing product and system certification.	(Su, Dhanorkar & Linderman, 2015)
	Although numerous studies have demonstrated that businesses can temporarily obtain a competitive advantage from the time of their certification implementation, research on the competitive advantages of applying ISO standards is still equivocal.	(Kaleka & Morgan, 2017)

Source: Author's own compilation (2022)

One micro driver (certifications) was subsequently tested in this study to determine the respondents' perspectives on the level of importance of this driver with regard to their impact in enhancing SCA. For foundry companies to be competitive, it is deemed essential for systems and procedures to be in place (Kaleka & Morgan, 2017).

Certification of systems and manufacturing procedures ensures that the end products meet recognised South African or international standards, and this provides foundries with a foundation for being competitive globally (Su, Dhanorkar & Linderman, 2015).

The following section discusses the macro drivers identified in literature as important in enhancing SCA.

5.6.2 Classification of macro drivers into study constructs

Based on the classification system developed by Siudek and Zawojska (2014), two macro drivers, geographical location and market perception of the foundry company were categorised under the assets/resources construct. This is indicated in table 3.11 (chapter 3) and table 5.9.

5.6.2.1 Macro drivers – construct 1 (Assets/Resources)

Table 5.9 provides a summary of the macro drivers classified under the assets/resources construct.

Table 5.9: Validation of assets/resource macro drivers

CONSTRUCT 1 – ASSETS/RESOURCES		
Macro drivers	**Summary from literature sources**	**Authors**
Geographical location	Decisions associated with the selection and features of a firm's location can have a great impact on the ability to gain and maintain competitive advantage.	(Tavakolnia & Makrani, 2016)
	A narrow and precise conception of location-based comparative advantage as the foundation for competitive advantage among multinational corporations is further emphasized by offshore sourcing of both goods and knowledge development.	(Jenkins & Tallman, 2010; Kutschke, Rese & Baier, 2016)
	A consideration of location cannot be divorced from competitiveness.	(Atkinson, 2017; Kutschke *et al.*, 2016)
	In developing a competitiveness strategy, organisations need to take into consideration the impact of their location.	(Atkinson, 2017; Jenkins & Tallman, 2010)
The market perception of the foundry company	Brand loyalty represents an important component of product value. This loyalty is maintained through emotional matter instruments and market perception, which gives a company a competitive advantage over the competition's brand's promotional actions.	(Denoue & Saykiewicz, 2009)
	The value of a brand in the market may be the most significant resource of a firm offering it sustainable competitive advantage.	
	Prior research has shown that corporate image clearly influences perceived competitive advantage.	(Clare & Uddin, 2019)

Source: Author's own compilation (2022)

Geographical location and market perception of the foundry were also identified as important drivers that enhanced SCA. Location factors for foundries which are either closer to sources of raw materials, customer base or further away from these were critical in determining the existence of a location competitive advantage to firms over competition (Atkinson, 2017). In the same breath, the market perception of the foundry company is deemed to provide an indication of how customers view the foundry (organisational image), including brand awareness and the services it provides, which are essential in enhancing its competitiveness (Clare & Uddin, 2019).

Since no macro drivers were classified under the processes construct (construct 2), as proposed by Siudek and Zawojska (2014), the next set of drivers discussed in the following section were classified under construct 3.

5.6.2.2 Macro driver – construct 3 (Firm's performance)

Table 5.10 provides a summary of the macro drivers classified under the firm performance construct. The availability of substitutes for casting products was identified as the only driver for this construct.

Table 5.10: Validation of firm's performance macro drivers

CONSTRUCT 3 – FIRM'S PERFORMANCE		
Macro driver	**Summary from literature sources**	**Authors**
The availability of substitutes for casting products	For a company to sustain a competitive edge, the threat of alternatives needs to be minimal from an industry and profitability viewpoint.	(Bruijl, 2018; Dobbs, 2014; Porter, 1990; Pakdeechoho & Sukhotu, 2018)
	Viable replacements limit prices and increase costs associated with product performance, marketing, and service, decreasing a firm's competitive edge.	(Dobbs, 2014; Sato, 2016)

Source: Author's own compilation (2022)

The availability of substitutes draws from Porter's five forces model, which asserted that the competitiveness of a firm was affected by the availability of substitute products (Dobbs, 2014). According to Bruijl (2018), for a firm to enjoy SCA, it is important that the threat of substitutes are low or that there are very few alternatives to the firm's product or service offering.

5.6.2.3 Macro drivers – construct 4 (Supporting and related industries and clusters)

Table 5.11 provides a summary of the macro drivers classified under the supporting and related industries and clusters construct.

Table 5.11: Validation of supporting and related industries and cluster macro drivers

CONSTRUCT 4 – SUPPORTING AND RELATED INDUSTRIES AND CLUSTERS		
Macro drivers	**Summary from literature sources**	**Authors**
Customer bargaining power	The primary factor influencing strategic decision-making by company managers or owners and having an impact on firm performance and competitive advantage, according to researchers, is the bargaining power of customers.	(Bruijl, 2018; Porter, 1990; Altuntas *et al.*, 2014; Xue, 2016)
The number of foundry companies in South Africa	The ability of a particular organisation to acquire and maintain a competitive edge is influenced by competitive rivalry.	(Hitt *et al.*, 2007; Baum & Korn, 2010; Sachitra, 2016; Porter, 1990)
	Firms engage in rivalry when they take competitive actions of their own and when they react to competitive acts. The ability of a particular organisation to acquire and maintain a competitive edge is influenced by competitive rivalry.	(Porter, 1985)

Source: Author's own compilation (2022)

Customer bargaining power and the number of foundry companies in South Africa were identified as key macro drivers which have an impact on foundry SCA (Altuntas, Semerciöz, Mert & Pehlivan, 2014; Fessehaie, Rustomjee & Kaziboni, 2017). The ability by firms to limit the bargaining power that customers possess provides a competitive edge for the firm, by allowing for premium pricing. Fewer rivalries or competing firms within the industry also provided firms with a competitive advantage that allowed them to detect pricing with limited resistance from the customers (Hitt, Ireland & Hoskisson, 2007). These drivers were, therefore, identified as important in enhancing competitiveness within the foundry sector in South Africa.

5.6.2.4 Macro drivers – construct 5 (Institutions and government policies)

Table 5.12 provides a summary of the macro drivers classified under the institutions and government policies construct.

Table 5.12: Validation of institutions and government policy macro drivers

CONSTRUCT 5 – INSTITUTIONS AND GOVERNMENT POLICIES		
Macro drivers	**Summary from literature sources**	**Authors**
Regulatory instruments (import tariffs, import quotas)	Excessive government regulation interferes with individual company's economic freedom.	Songling, Ishtiaq & Anwar, 2018; Abbot & Singham, 2016)
	By offering advice and/or working together with other regulators or governmental agencies in the policy design to avoid or minimize negative impacts on competition, competition authorities can play a role through their advocacy efforts to remove unreasonably high barriers to exit.	Organisation for Economic Co-operation and Development (OECD), 2019; Pakdeechoho & Sukhotu, 2018
	Government action can also create exit barriers by maintaining inefficient companies on the market, deterring the entry of efficient companies, or promoting the admission of inefficient companies. Governments may refuse to shut down poorly performing business enterprises for reputational or lobbying reasons. Long-term effects of this include decreased industry competitiveness.	(OECD, 2019; Pakdeechoho & Sukhotu, 2018)
Government incentives (subsidies)	Government financial support (government equity, government loan and guarantees) has a significant direct influence on firms' competitive advantage, while it has an indirect influence on performance.	(Songling *et al.*, 2018; Pakdeechoho & Sukhotu, 2018; Mbatha, 2018)
Industry entry and exit barriers	If entry barriers are high, incumbent firms will be able to enjoy sustained competitive advantage, thereby securing abnormal returns.	(Karakaya & Parayitam, 2018; Porter, 1985; Ogaga & Joseph, 2017)
	The most frequently studied obstacles include incumbent firms' cost advantages, capital needs, sunk costs, advantages in product differentiation, access to distribution channels, switching costs for customers, and government regulations. Other obstacles include incumbent firms' structural advantages, incumbent firms' market dominance, financial investments made by new market entrants, the number of firms in a market, and exit barriers. As a result, the incumbent enterprises gain a short-term to long-term competitive advantage.	(Karakaya & Parayitam, 2018; Porter, 1985; Xie & Xie, 2018)
Localisation (local content enforcement)	Local content implementation may result in the deterioration of long-term competitiveness of the companies in the country that implements the local content regulations (LCR).	(Neuman *et al.*, 2017; Deringer *et al.*, 2018)
Energy costs (electricity rates)	In order to lessen how taxes, affect a company's efforts to gain a competitive advantage, energy efficiency methods must be increased.	Yatich (2018)
	Escalating electricity prices impact on the competitiveness of industry and affordability to sustain operations.	(CSIR, 2019; Kutschke *et al.*, 2016)
	For many years, South Africa's access to affordable coal power generation has served as a competitive advantage in luring investments into the industrial sector. However, due to increased electricity prices brought on by rising coal prices and the Eskom build program, this advantage is being lost.	Department of Minerals Resources and Energy (2022)

Source: Author's own compilation (2022)

Five macro drivers which included regulatory instruments, government incentives, industry entry and exit barriers, localisation or local content enforcement and energy costs were identified and tested in this study. According to Mbatha (2018) and Songling *et al*., (2018), governments and regulatory institutions play a significant role in industry operations. The introduction of legislations or subsidies affects the competitive landscape by opening up or closing the market to external players, or by providing a cushion for struggling firms to survive (Neuman, Tissot & Mabrey, 2017). Energy costs and local content enforcement were also identified as important drivers, because of their direct effect on the operation and performance of the foundries which use substantial amounts of energy, depending on size and operations (Ettmayr & Lloyd, 2017; Jardine, 2015a).

As indicated above, in addressing the requirement of the first research objective of this study, the researcher managed to identify, from literature, the micro and macro drivers influencing the sustainable competitive advantage of foundries in South Africa. Although there was a vast array of these drivers, only those that featured prominently in literature were considered for this study in line with the context of this research. The following section discusses the respondents' views on the drivers that were considered critical to enhancing foundry SCA.

5.6.3 Respondents' choice of most critical drivers in providing SCA

In response to the survey question on the three micro drivers that were considered most critical in providing SCA for foundries in South Africa (see annexure A, question 1.2), the results of the survey showed that i) product quality (34.3%), ii) investment in plant infrastructure (32.4%) and iii) employee skills development (human capital) (32.4%) were identified as the three top critical micro drivers (table 5.13 and figure 5.12). As discussed in chapter 3, a critical driver is one, without which SCA cannot be achieved.

Table 5.13: Respondents' identification of critital micro drivers

Critical Micro drivers		Selected	Total
Crit_SCA_MIC.1 [Crit_SCA_MIC.1] Critical: Investment in plant infrastructure	n	35	**108**
	%	32,4%	**100,0%**
Crit_SCA_MIC.2 [Crit_SCA_MIC.2] Critical: Cluster membership	n	6	**108**
	%	5,6%	**100,0%**
Crit_SCA_MIC.3 [Crit_SCA_MIC.3] Critical: Employee skills development (Human capital)	n	35	**108**
	%	32,4%	**100,0%**
Crit_SCA_MIC.4 [Crit_SCA_MIC.4] Critical: Product (service) differentiation	n	13	**108**
	%	12,0%	**100,0%**
Crit_SCA_MIC.5 [Crit_SCA_MIC.5] Critical: Organisational culture	n	10	**108**
	%	9,3%	**100,0%**
Crit_SCA_MIC.6 [Crit_SCA_MIC.6] Critical: Governance	n	9	**108**
	%	8,3%	**100,0%**
Crit_SCA_MIC.7 [Crit_SCA_MIC.7] Critical: Price competitiveness	n	23	**108**
	%	21,3%	**100,0%**
Crit_SCA_MIC.8 [Crit_SCA_MIC.8] Critical: Product quality	n	37	**108**
	%	34,3%	**100,0%**
Crit_SCA_MIC.9 [Crit_SCA_MIC.9] Critical: Ability to innovate (research and development)	n	27	**108**
	%	25,0%	**100,0%**
Crit_SCA_MIC.10 [Crit_SCA_MIC.10] Critical: Embracing new technology	n	18	**108**
	%	16,7%	**100,0%**
Crit_SCA_MIC.11 [Crit_SCA_MIC.11] Critical: Production (raw material input) costs	n	16	**108**
	%	14,8%	**100,0%**
Crit_SCA_MIC.12 [Crit_SCA_MIC.12] Critical: Firm capacity (size)	n	0	**108**
	%	0,0%	**100,0%**
Crit_SCA_MIC.13 [Crit_SCA_MIC.13] Critical: Exposure to export market (degree of internationalisation)	n	9	**108**
	%	8,3%	**100,0%**
Crit_SCA_MIC.14 [Crit_SCA_MIC.14] Critical: Socio-cultural responsibility (corporate social investment)	n	5	**108**
	%	4,6%	**100,0%**
Crit_SCA_MIC.15 [Crit_SCA_MIC.15] Critical: Certifications (ISO standards, product certifications)	n	13	**108**
	%	12,0%	**100,0%**
Crit_SCA_MIC.16 [Crit_SCA_MIC.16] Critical: Possession of intellectual property	n	12	**108**
	%	11,1%	**100,0%**
Crit_SCA_MIC.17 [Crit_SCA_MIC.17] Critical: Managerial choice (decision making process)	n	12	**108**
	%	11,1%	**100,0%**
Crit_SCA_MIC.18 [Crit_SCA_MIC.18] Critical: Bargaining power over suppliers	n	8	**108**
	%	7,4%	**100,0%**
Crit_SCA_MIC.19 [Crit_SCA_MIC.19] Critical: Possession of unique resources (inimitable to competition)	n	19	**108**
	%	17,6%	**100,0%**
Crit_SCA_MIC.20 [Crit_SCA_MIC.20] Critical: Value add for customer	n	17	**108**
	%	15,7%	**100,0%**

Table 5.13 shows how the participants identified the micro drivers according to how they perceived them as critical for the foundry industry SCA. A pictorial view of this distribution is presented in figure 5.12.

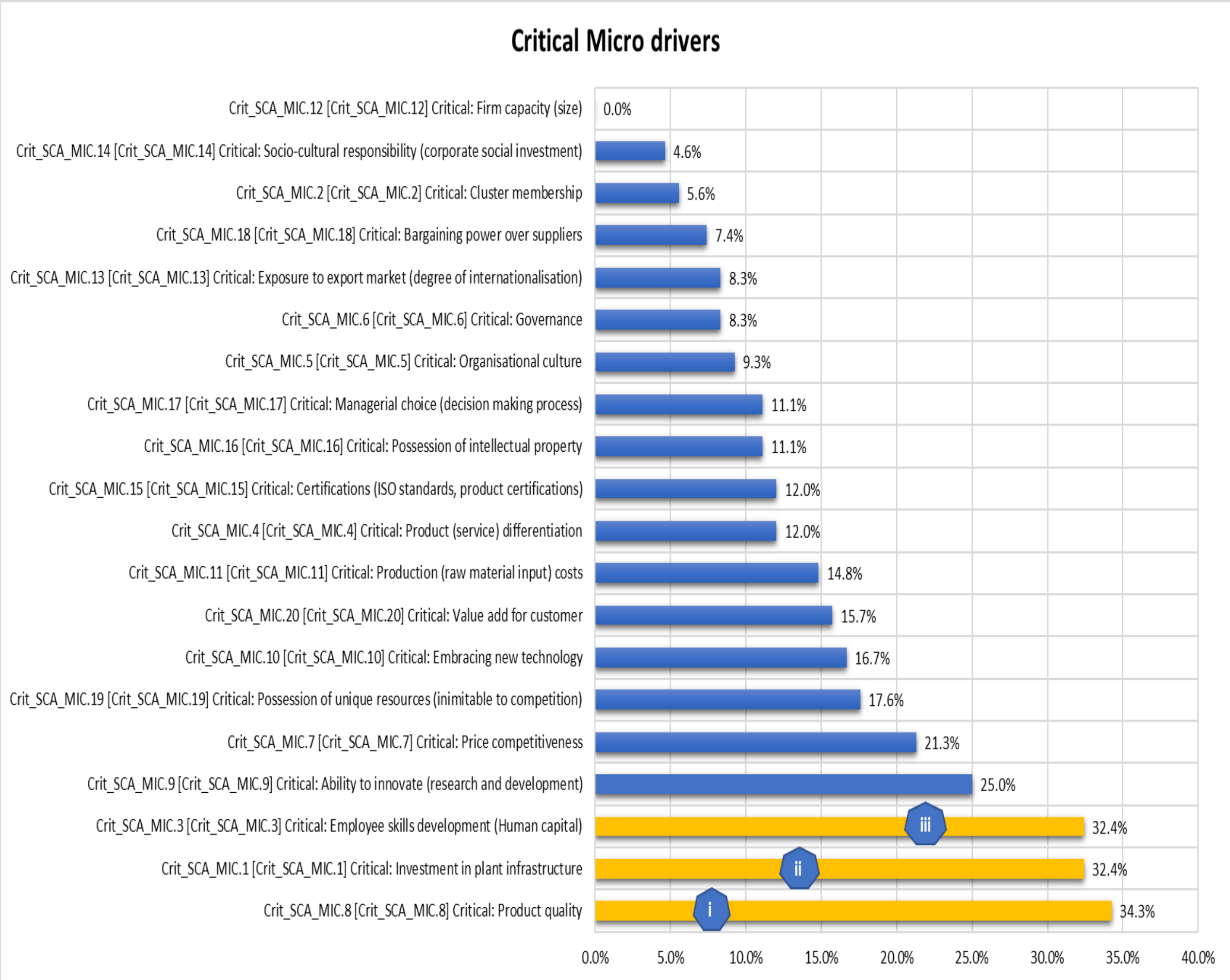

Figure 5.12: Micro drivers considered critical in providing SCA for South African foundries

In response to the survey question on the three macro drivers that were considered most critical in providing SCA for foundries in South Africa (see annexure A, question 2.2), the results of the survey showed that i) localisation (local content enforcement) (50.0%), ii) energy costs (45.4%) and iii) regulatory instruments (import tariffs, import quotas) (40.7%) were identified as the top three critical drivers (figure 5.13).

Table 5.14: Respondents' identification of critital macro drivers

Critical Macro drivers		1 Selected	Total
Crit_SCA_MAC.1 [Crit_SCA_MAC.1] Critical: Energy costs (electricity rates)	n	49	**108**
	%	45,4%	**100,0%**
Crit_SCA_MAC.2 [Crit_SCA_MAC.2] Critical: Geographical location	n	22	**108**
	%	20,4%	**100,0%**
Crit_SCA_MAC.3 [Crit_SCA_MAC.3] Critical: Industry entry and exit barriers	n	35	**108**
	%	32,4%	**100,0%**
Crit_SCA_MAC.4 [Crit_SCA_MAC.4] Critical: Customer bargaining power	n	19	**108**
	%	17,6%	**100,0%**
Crit_SCA_MAC.5 [Crit_SCA_MAC.5] Critical: Government incentives (subsidies)	n	27	**108**
	%	25,0%	**100,0%**
Crit_SCA_MAC.6 [Crit_SCA_MAC.6] Critical: The market perception of the foundry company	n	19	**108**
	%	17,6%	**100,0%**
Crit_SCA_MAC.7 [Crit_SCA_MAC.7] Critical: Localisation (local content enforcement)	n	54	**108**
	%	50,0%	**100,0%**
Crit_SCA_MAC.8 [Crit_SCA_MAC.8] Critical: Regulatory instruments (import tariffs, import quotas)	n	44	**108**
	%	40,7%	**100,0%**
Crit_SCA_MAC.9 [Crit_SCA_MAC.9] Critical: The number of foundry companies in South Africa	n	13	**108**
	%	12,0%	**100,0%**
Crit_SCA_MAC.10 [Crit_SCA_MAC.10] Critical: The availability of substitutes for casting products	n	42	**108**
	%	38,9%	**100,0%**

Table 5.14 shows how the participants identified the macro drivers according to how they perceived them as critical for the foundry industry SCA. A pictorial view of this distribution is presented in figure 5.13.

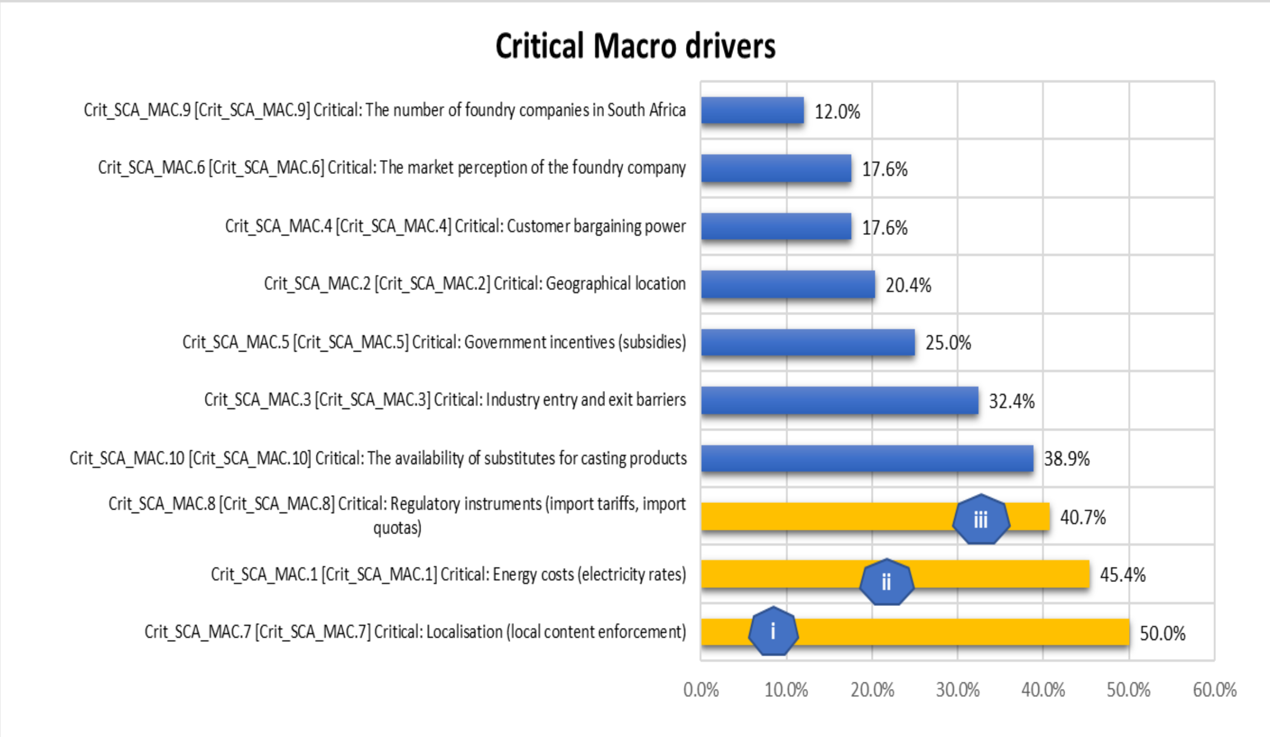

Figure 5.13: Macro drivers considered critical in providing SCA for South African foundries

The macro and micro drivers identified as critical are further explored in chapter 6 (qualitative phase), in order to gain more insight on the reasoning behind their selection as well as their impact towards enhancing the SCA of foundries in South Africa. The following section discusses validation relating to questions presented in the latter sections of the survey.

5.6.4 Validation of survey instrument for quantitative phase (Competitive Forces)

The forces identified and tested in this study included i) rivalry among foundry companies, ii) ease of entrance of new competing foundries into industry, iii) bargaining power of foundry customers, iv) substitutes for casting products and v) bargaining power of foundry companies over suppliers of raw materials and are outlined in table 5.15.

Table 5.15: The impact of competitive forces on sustainable competitive advantage

IMPACT OF COMPETITIVE FORCES ON SUSTAINABLE COMPETITIVE ADVANTAGE			
No.	**Competitive forces relevant to study**	**Literature Sources**	**Relevant element of competitive forces model**
1	Intensity of rivalry among foundry companies	(Porter, 2008; Mekic & Mekic, 2014)	***Rivalry among competitors***
2	Number of competing foundries	(Porter, 1985)	
3	Ease of entrance of new competitors into the industry	(Karakaya & Parayitam, 2018; Porter, 1985; Xie & Xie, 2018)	***Entry/Exit Barriers***
4	Bargaining power of foundry customers	(Bruijl, 2018; Porter, 1990; Altuntas *et al.*, 2014; Xue, 2016)	***Buyer Bargaining Power***
5	Substitutes for casting products (e.g., thermoplastics, forgings)	(Dobbs, 2014; Sato, 2016; Ogutu & Mathooko, 2015)	***Availability of Substitutes***
6	Bargaining power of foundry companies over raw material suppliers	(Bruijl, 2018; Porter, 1990; Dälken, 2014)	***Supplier Bargaining Power***

Source: Author's own compilation (2022)

According to Bruijl (2018) and Dälken (2014), and as discussed in section 3.3.2 of chapter 3, the five competitive forces framework proposed by Porter is still relevant as driving industry competitiveness, and it is essential for managers to understand what these forces are and how strategies can be formulated to capitalise on the benefits they present for businesses. Dälken (2014) also points out that digitalisation, globalisation, and deregulation within manufacturing industries play a significant role in influencing the impact that these forces have on SCA. Respondents were required to rank the competitive forces according to the impact they had on SCA.

The following section discusses the theories identified as essential in determining the SCA of foundries.

Table 5.16: Theory based approaches to sustainable competitive advantage

THEORY BASED APPROACHES TO SUSTAINABLE COMPETITIVE ADVANTAGE			
No.	**Competitive advantage approaches relevant to study**	**Literature Sources**	**Associated theories for SCA**
1	The ability of the foundry to understand industry factors (external market orientation)	(Porter, 1985; Jain, 2014; Wang, 2014; Wilopo & Fitriati, 2015; Kaningu *et al.*, 2017)	***MBV /RV /CBV***
2	The ability of the foundry to obtain unique resources (inimitable to competition)	(Barney, 1991; Wang, 2014; Madhani, 2007)	***Generic Strategies /RBV /KBV /RV***
3	The ability of the foundry to allocate internal resources effectively (dynamic capability)	(Kaleka & Morgan, 2017; Quelin, Cabral, Lazzarini & Kivleniece, 2018; Teece, 2018)	***Generic Strategies /CBV /RV***

MBV – Market-Based View
RV – Relational View
RBV – Resource-Based View
CBV – Capability-Based View
KBV – Knowledge-Based View

Source: Author's own compilation (2022)

As discussed in chapter 1 (section 1.6.3) and chapter 3 (section 3.4), the theoretical perspectives on SCA, which included the market-based view (MBV), the resource-based view (RBV), the capability-based view (CBV), the knowledge-based view (KBV), the relational view (RV) and the generic strategies, all identified the need for organisations to better understand the internal and external environments they operated in, obtain unique resources which would give them an edge over competition and allocate resources effectively.

The competitiveness theory-based approaches outlined in table 5.16 were tested in the study in order to determine, according to their level of influence, which ones the respondents believed had the most effect on firm SCA within the South Africa context.

The outcomes are discussed later on in this chapter (see section 5.11). The next section discusses the formative measurement model and reliability analysis of the study.

5.7 THE STUDY'S FORMATIVE MEASUREMENT MODEL

Jarvis, MacKenzie and Podsakoff (2003) argue that prior to analysing the relationship between constructs and indicators, it is important for researchers to specify the model used as a basis for this analysis, the nature as well as the direction of the relationships between the constructs and the indicators. Slaney and Racine (2013) define a construct as the phenomenon that a measure is intended to reflect.

Two generic measurement models that utilise multiple measures of latent constructs are identified in literature and these include the principal factor (reflective) model as well as the composite latent variable (formative) model (Jarvis *et al*., 2003). Podsakoff *et al*. (2006, as cited in Becker, Klein & Wetzels, 2012:360) point out that "the failure to properly state the higher-order dimensions of the focus construct is a significant factor for measurement model misspecification." Becker *et al.* (2012:360) also argue that a "key requirement for defining and operationalising multidimensional constructs is that they should be derived from theory".

The indicators and constructs identified as enhancing the SCA of foundries in the context of this study were identified from various sources of academic and industry literature. Becker *et al*. (2012) and Jarvis *et al*. (2003) identify four types of models that illustrate the relationship between the first-order latent variables, their manifest variables, and the second-order latent variables. These are illustrated in figure 5.14.

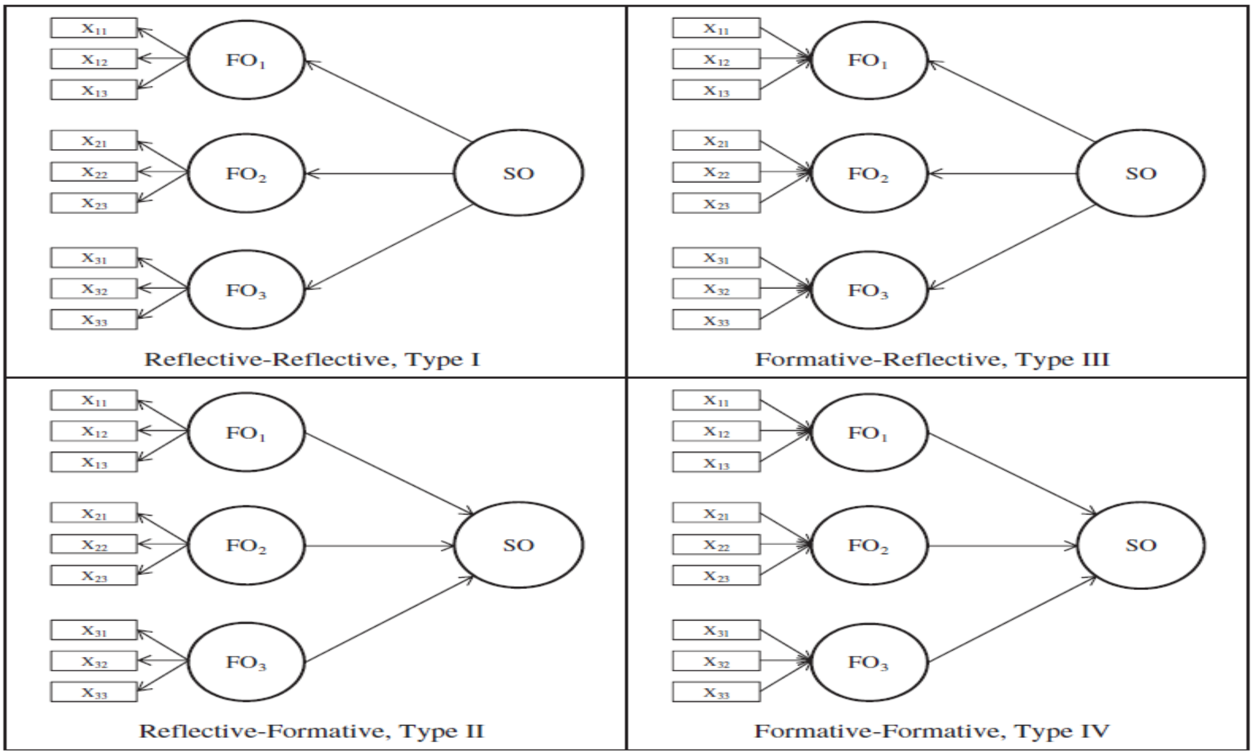

Figure 5.14: The four types of hierarchical latent variable models
Source: Becker *et al.* (2012), Jarvis *et al*. (2003)

Based on the models in figure 5.14, the current study follows a second-order formative-formative model. This model is characterised by formative indicators for both the first- (sub-constructs for the micro and macro drivers) and second-order variables (SCA for the foundry industry).

Figure 5.15 shows this relationship, indicating that the micro and macro drivers as well as the associated study constructs are formative indicators of the overall SCA construct, as they together determine the overall level of SCA of the foundry industry in South Africa, rather than result from it. The constructs presented (firm performance, processes, institutions and government policies, supporters and related industries and clusters, as well as assets and resources) were identified in literature (see chapter 3, section 3.9).

Micro drivers		Macro drivers	
X1	Employee skills development (Human capital)	Y1	The market perception of the foundry company
X2	Embracing new technology	Y2	Geographical location
X3	Firm capacity (size)	Y3	Customer bargaining power
X4	Investment in infrastructure	Y4	The number of foundry companies in South Africa
X5	Possession of intellectual property	Y5	The availability of substitutes for casting products
X6	Possession of unique resources (inimitable to competition)	Y6	Regulatory instruments (import tariffs, import quotas)
X7	Socio-cultural responsibility (corporate social investment)	Y7	Government incentives (subsidies)
X8	Cluster membership	Y8	Industry entry and exit barriers
X9	Organisational culture	Y9	Localisation (local content enforcement)
X10	Governance	Y10	Energy costs (electricity rates)
X11	Price competitiveness		
X12	Production (raw material input) costs		
X13	Product (service) differentiation		
X14	Value add for customer		
X15	Ability to innovate (research and development)		
X16	Bargaining power over suppliers		
X17	Managerial choice (decision making process)		
X18	Exposure to export market (degree of internationalisation)		
X19	Product quality		
X20	Certifications (ISO standards, product certifications)		

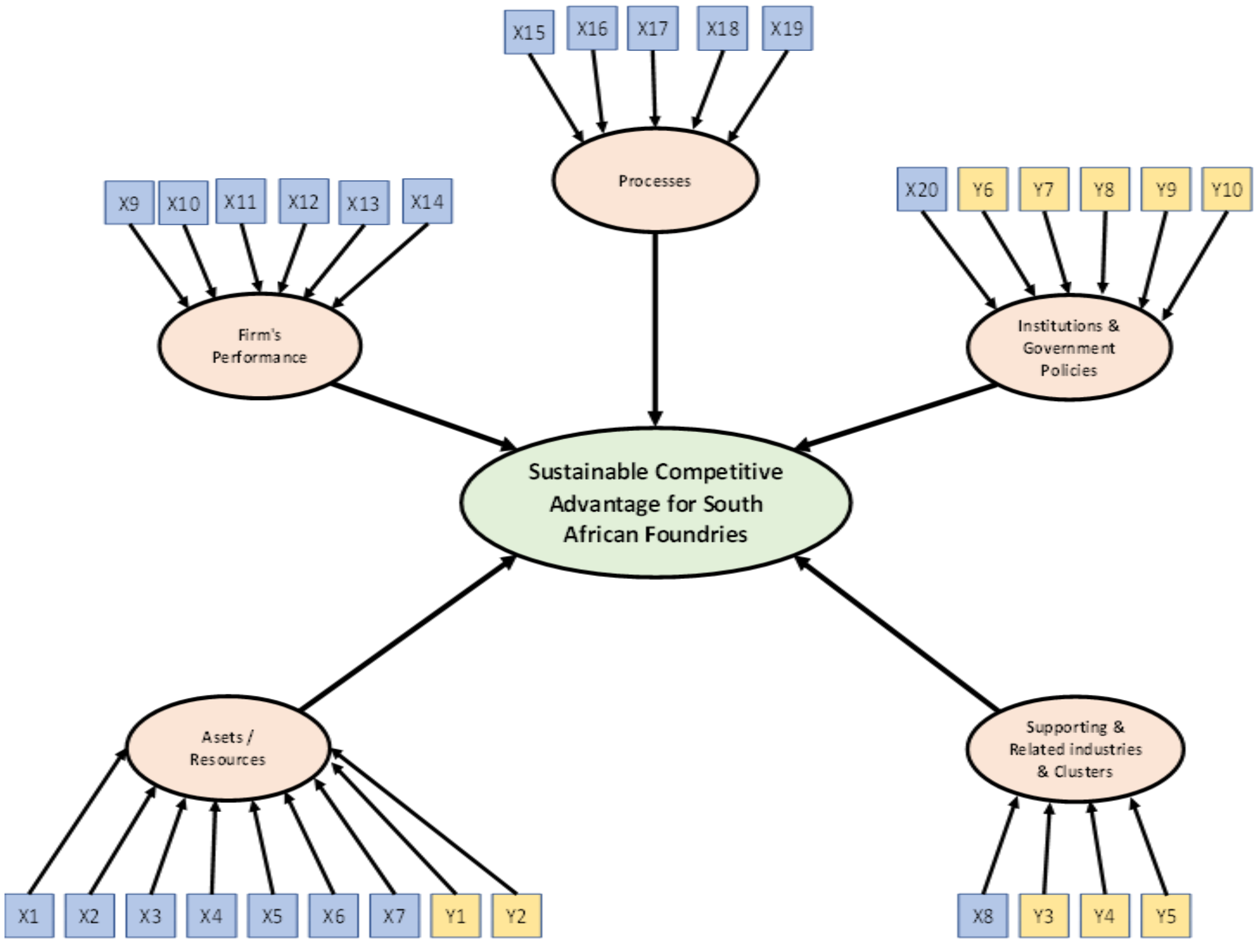

Figure 5.15: The formative model for SCA of foundries in South Africa

Source: Becker *et al*. (2012)

Table 5.17 provides guidance on the decision rules that can be applied for determining if a construct is formative as recommended by Jarvis *et al*. (2003).

Table 5.17: Defining attributes of the formative model

	Characteristic or defining attribute	Formative model characteristic
1	**Direction of causality from construct to measure implied by the conceptual definition**	Direction of causality is from items to construct
	Are the indicators (items) (a) defining characteristics or (b) manifestations of the construct?	Indicators are defining characteristics of the construct
	Would changes in the indicators/items cause changes in the construct or not?	Changes in the indicators should cause changes in the construct
	Would changes in the construct cause changes in the indicators?	Changes in the construct do not cause changes in the indicators
2	**Interchangeability of the indicators/items**	Indicators need not be interchangeable
	Should the indicators have the same or similar content?	Indicators need not have the same or similar content
	Do the indicators share a common theme?	Indicators need not share a common theme
	Would dropping one of the indicators alter the conceptual domain of the construct?	Dropping an indicator may alter the conceptual domain of the construct
3	**Covariation among the indicators**	Not necessary for indicators to covary with each other
	Should a change in one of the indicators be associated with changes in the other indicators?	Not necessarily
4	**Nomological net of the construct indicators**	Nomological net for the indicators may differ
	Are the indicators/items expected to have the same antecedents and consequences?	Indicators are not required to have the same antecedents and consequences

Source: Jarvis *et al*. (2003:203)

As indicated in table 5.17 and as illustrated in figure 5.15, the direction of causality is from the micro and macro drivers to the SCA construct. This shows that the SCA construct is defined by the indicators (items) and the drivers are not manifestations of the SCA construct. Furthermore, dropping any of the drivers is likely to alter the conceptual domain of the SCA of foundries in South Africa (Jarvis *et al*., 2003).

The following section discusses the reliability analysis of the measurement scales used in the study.

5.8 RELIABILITY ANALYSIS

In establishing the reliability of the measurement scales used, it was important to assess for internal consistency. Pallant (2011:6) points out that internal consistency relates to the "degree to which the items that make up the scale are all measuring the same underlying attribute". Cronbach's coefficient alpha is a commonly used statistic with values ranging between 0 and 1, where higher values reflect greater reliability (Pallant, 2011; Tavakol & Dennick, 2011; Saunders *et al*., 2016). While DeVellis (2003, as cited in Pallant, 2011) recommends that the Cronbach's alpha value should be above 0.7, Pallant (2011) also argues that Cronbach alpha values are "sensitive" to the number of items in the scale, with low alpha values common in scales with fewer than ten items. Hair, Black, Babin and Anderson (2014) acknowledge that in exploratory research, a value of 0.6 can also be acceptable.

Briggs and Cheek (1986) posit that in cases where fewer scale items are involved, it is more appropriate to report the mean inter-item correlation of between 0.2 and 0.4. The classification of drivers into five categories, as indicated in table 3.11 in chapter 3, meant that none of the scales had ten or more items. Reporting was done at inter-item correlation level alongside the alpha statistics for the micro drivers first, and then the macro drivers. Table 5.18 shows the item mean, item standard deviation, Cronbach's alpha and inter-item correlation for the micro drivers tested in the study, in determining the reliability of the survey instrument for the quantitative phase.

Table 5.18: Reliability analysis of the micro drivers

Reliability analysis of micro drivers						
Construct	**Items (drivers)**	**Item mean**	**Item standard deviation**	**Construct mean**	**Cronbach's alpha coefficient**	**Inter-item correlation**
Assets/Resources	Investment in plant infrastructure	4.35	0.753	4.01	0.651	0.213
	Employee skills development (Human capital)	4.45	0.858			
	Embracing new technology	4.23	0.923			
	Firm capacity (size)	3.37	1.090			
	Possession of intellectual property	3.86	1.009			
	Possession of unique resources (inimitable to competition)	4.27	0.781			
	Socio-cultural responsibility (corporate social investment)	3.51	1.204			
Processes	Ability to innovate (research and development)	4.51	0.634	4.28	0.459	0.157
	Bargaining power over suppliers	4.18	0.852			
	Managerial choice (decision making process)	4.21	0.798			
	Exposure to export market (degree of internationalisation)	3.82	0.955			
	Product quality	4.66	0.598			
Firm's performance	Organisational culture	3.67	1.230	4.05	0.618	0.201
	Governance	3.92	1.069			

Reliability analysis of micro drivers						
Construct	**Items (drivers)**	**Item mean**	**Item standard deviation**	**Construct mean**	**Cronbach's alpha coefficient**	**Inter-item correlation**
	Price competitiveness	4.31	0.793			
	Production (raw material input) costs	4.21	0.897			
	Product (service) differentiation	4.22	0.846			
	Value-add for customer	3.94	1.075			
Supporting and related industries and clusters	Cluster membership	3.57	1.016	3.57	0.637	0.268
Institutions and government policies	Certifications (ISO standards, product certifications)	3.90	1.215	3.90	0.637	0.538

As reported in table 5.18, the Cronbach's alpha coefficients and inter-item correlations were computed for the five constructs. In assessing the scales for four of the constructs, it was noted that the assets or resources (0.651), supporting and related industries and clusters (0.637), institutions and government policies (0.637), and firm's performance (0.618) met the minimum recommended alpha value of 0.6 (Hair *et al*., 2014). These scales also met the minimum recommended inter-item correlation value of 0.2 (Briggs & Cheek, 1986), with the computed values of 0.213, 0.201, 0.268 and 0.538, respectively.

The scale for the "processes" construct, however, did not meet the minimum recommended values for alpha (0.459) and inter-item correlation value (0.157) (Hair *et al.*, 2014). Taber (2018:1277) points out that, in some instances, Cronbach's alpha values can "underestimate the internal consistency of scales consisting of fewer than ten items". Babbie (2010:171) also argues that "although it is common to examine the relationships among indicators of a variable being measured by an index or scale, researchers should also realise that the indicators are sometimes independent of one another …" and this may result in the reliabilities on the scales being low (De Coster, 2005). During the development of the questionnaire and prior to the data collection process, industry experts were consulted to review the items and item wording included in the questionnaire, as part of assessing construct validity.

The outcome of the review process showed that the items and item wording were considered relevant in relation to the construct that was of interest. Organisational processes were identified and discussed extensively, in literature, as being crucial in driving the SCA of both local and global foundries (Dung *et al*., 2020; Siudek & Zawojska, 2014). For these reasons, the construct measure was retained as an indicator for establishing its level of importance in enhancing the SCA of foundries in South Africa.

Generally, the item means for the micro drivers within the five constructs were on the higher end of the scale of level of importance and ranged between 3.37 and 4.66. This meant that the results confirmed the literature perspectives that these drivers were already identified as being important in influencing SCA. Product quality (4.66), ability to innovate (4.51), employee skills development (4.45), investment in infrastructure (4.35) and price competitiveness (4.31) were identified as the top five (most important) micro drivers for SCA, whilst firm capacity (3.37), cluster membership (3.57), socio-cultural responsibility (3.51), organisational culture (3.67) and exposure to export market (3.82) were identified as being relatively less important.

The item standard deviations reflected the variations in the responses provided by the respondents regarding the levels of importance of the different drivers. High standard deviation values were obtained for organisational culture (1.230), certifications (1.215), socio-cultural responsibility (1.204), firm capacity (1.090) and value-add for the customer (1.075). These indicate that the responses were more polarised as compared to the respondents’ perspectives on the importance of product quality (0.598), ability to innovate (0.634), investment in infrastructure (0.753), possession of unique resources (0.781) and price competitiveness in influencing foundry SCA.

The low item standard deviation values reflected consensus among respondents on product quality and ability to innovate as being important micro drivers of SCA. This meant that the respondents agreed, generally, and believed that these drivers were significantly important in enhancing the SCA of South African foundries. A divergence of views was, however, evident concerning the respondents’ views on organisational culture and certification drivers as being important drivers of SCA and, therefore, reflected some level of disagreement within the industry.

On analysing the study constructs, it was found that the “processes construct” had a higher mean value (4.28), followed by firm’s performance (4.05), assets or resources (4.01), institutions and government policies (3.90), and supporting and related industries and clusters (3.57). This reflected a view that the respondents generally believed that processes (which included the ability to innovate, bargaining power over suppliers, managerial choice, exposure to export markets and product quality micro drivers) were of more importance in influencing SCA than the other constructs. Supporting and related industries and clusters was found to be the least important of the constructs. In this context, the foundry cluster membership was regarded, therefore, as relatively less important in driving SCA when compared to other constructs. This is contrary to the industry perspectives, discussed in chapter 3, on the need for South African foundries to belong to the foundry cluster in order to enhance their competitiveness (Davies, 2015; Dlambulo, 2019; Jardine, 2015a).

The following section discusses the reliability analysis for the macro drivers tested in the study.

Table 5.19: Reliability analysis of the macro drivers

Reliability analysis of macro drivers						
Construct	**Items (drivers)**	**Item mean**	**Item standard deviation**	**Construct mean**	**Cronbach's alpha coefficient**	**Inter-item correlation**
Assets/Resources	The market perception of the foundry company	3.59	1.215	3.46	0.628	0.458
	Geographical location	3.33	1.253			
Supporting and related industries and clusters	The number of foundry companies in South Africa	3.43	1.052	3.52	0.432	0.277
	Customer bargaining power	3.61	1.183			
Firm's performance	The availability of substitutes for casting products	3.93	1.054	3.93	0.543	0.213
Institutions and government policies	Regulatory instruments (import tariffs, import quotas)	3.91	1.000	3.98	0.412	0.134
	Government incentives (subsidies)	3.92	0.948			
	Industry entry and exit barriers	3.55	1.147			
	Localisation (local content enforcement)	4.06	0.979			
	Energy costs (electricity rates)	4.44	0.715			

Table 5.19 shows the Cronbach's alpha coefficients and inter-item correlations that were computed for the four constructs as discussed in section 5.4.5. The scale for the "assets or resources" construct met both the minimum recommended alpha and inter-item correlation values (Hair *et al*., 2014) (0.628 and 0.458, respectively). For the "supporting and related industries and clusters" construct as well as the "firm's performance" construct, reporting was done at inter-item correlation level where the two constructs met the minimum recommended value of 0.2 (Briggs & Cheek, 1986), with correlation values of 0.277 and 0.213, respectively.

The "institutions and government policies" construct did not meet both the minimum recommended thresholds for the two parameters. As detailed in section 5.5, expert reviews were significant in establishing construct validity of all the items included in the questionnaire. Babbie (2010:154) defined construct validity as "the degree to which a measure relates to other variables as expected within a system of theoretical relationships". Both institutional and government policies were, as discussed in chapter 3, identified as important constructs in enhancing SCA (Cosbey & Ramdoo, 2018; Ketels, 2016; McCulloch *et al*., 2017). This construct was, therefore, considered important and had to be tested within the context of the local foundry industry.

As indicated in table 5.16 and table 5.17, the item means for the macro drivers were relatively lower than the item means for the micro drivers. Energy costs had the highest mean (4.44) followed by localisation or local content enforcement (4.06), availability of substitutes for casting products (3.93), government incentives (3.92) and regulatory instruments (3.91). Geographical location had the lowest mean value of 3.33 followed by the number of foundry companies (3.43), and industry entry and exit barriers (3.55).

The low item mean values indicated that the respondents believed that the macro drivers were relatively less important in enhancing SCA, as were the micro drivers. An analysis of the item standard deviations revealed that the majority of the values were greater than 1, showing that there was a divergence of views on the importance of the macro drivers in enhancing SCA. Whilst geographical location had the lowest item mean value, it had the highest standard deviation value of 1.253, which showed a polarisation of views regarding the importance of this macro driver. On the other hand, there appeared to be a convergence of views regarding the importance of energy costs as a driver enhancing

SCA with the lowest item a standard deviation value of 0.715. Other macro drivers with relatively low item standard deviation values included government incentives (0.948) and localisation (0.979).

According to the classification of macro drivers, as proposed by Siudek and Zawojska (2014), no macro driver in this study was classified under the processes construct. Regarding the construct means, institutions and government policies had the highest mean of 3.98 followed by firm's performance with 3.93. This meant that respondents believed that, overall, the institutions and government policies were more important and played a significant role in enhancing SCA, as opposed to the other constructs. Assets and resources (3.46), on the other hand, were regarded as being less important.

5.9 ANALYSIS OF GROUP DIFFERENCES IN RELATION TO STUDY CONSTRUCTS

A non-parametric test, namely, Mann-Whitney U was used to compare whether there were statistically significant differences in levels of importance of the macro and micro drivers in enhancing SCA within the foundry industry between management and non-management participants. Pallant (2011:227) argues that the Mann-Whitney U test is appropriate when one has ordinal data, as is the case with the current data, and when the data does not adhere to the strict assumptions of the parametric techniques including normality.

Table 5.20: Mann-Whitney U test on micro drivers for SCA

Test Statistics[a]	Micro drivers		
	Mann-Whitney U	***Z***	***p - value***
Assets/Resources	1268.500	-0.743	0.457
Firm's performance	1208.000	-1.126	0.260
Certifications	1334.500	-0.342	0.733
Processes	1346.500	-0.252	0.801
Cluster membership	1226.500	-1.065	0.287

a. Grouping Variable: role_BIN Role within your organisation

As indicated in table 5.20, computations of the Mann-Whitney U test revealed the following statistics: assets or resources (U = 1268.50, p = 0.457), firm's performance (U = 1208, p = 0.260), certifications (U = 1334.50, p = 0.733), processes (U = 1346.50, p = 0.801) and cluster membership (U = 1226.50, p = 0.287). Since the probability values (p) are all greater than 0.05, the null-hypotheses of statistical differences can, therefore, not be rejected. The results, therefore, suggest that there is no significant difference between participants' levels of importance of the micro drivers in enhancing SCA and the role of the participants within the organisation. This meant that being in management or non-management roles did not predispose participants to viewing the importance of the micro drivers in enhancing SCA differently on the basis of those roles.

A similar pattern was observed regarding the macro drivers (reported in table 5.21). The Mann-Whitney U test showed that there was no significant difference between the management and non-management views regarding the influence of the macro drivers identified on SCA. This was indicated in the following statistics: assets and resources (U = 1250.50, p = 0.387), availability of substitutes for casting products (U = 1352.50, p = 0.821), institutions and government policies (U = 1295, p = 0.563), and supporting industries and clusters (U = 1309.50, p = 0.624).

Table 5.21: Mann-Whitney U test on macro drivers for SCA

Test Statistics[a]	Macro drivers		
	Mann-Whitney U	***Z***	***p - value***
Assets/Resources	1250.500	-0.864	0.387
Availability of substitutes for casting products	1352.500	-0.226	0.821
Institutions & government policies	1295.000	-0.578	0.563
Supporting industries & clusters	1309.500	-0.490	0.624

a. Grouping Variable: role_BIN Role within your organisation

The following section discusses the canonical correlation analysis of the drivers for SCA.

5.10 CANONICAL CORRELATION ANALYSIS

Canonical correlation analysis (CCA) was selected for use in the analysis of the quantitative data in this study, as it "provided an opportunity to explore the complexity of multiple relationships of the micro and micro drivers as well as the constructs under investigation" (Wickramasinghe, 2019:37). According to Uurtio *et al.* (2017:1), canonical correlation analysis "extracts relations between two sets of variables when the sample size is insufficient in relation to the data dimensionality, when the relations have been considered to be non-linear, and when the dimensionality is too large for human interpretation". The low sample size in this study motivated the use of CCA. By definition, CCA is "a multivariate statistical method that explores the relationship between the study variables by developing a number of independent canonical functions that maximise the correlation between the linear composites known as canonical variates". (Hair, Black, Babin & Anderson, 2014:17; Sherry & Henson, 2014:37).

Canonical correlation analysis (CCA) was performed on the micro and macro drivers that were identified as important in enhancing the sustainable competitive advantage of foundries in South Africa, in order to evaluate the multivariate shared relationship between the two variable sets (Iweka & Magnus-Arewa, 2018). The variable sets are illustrated in figure 5.16 and contributed to the formulation of the study's SCA framework (figure 5.21).

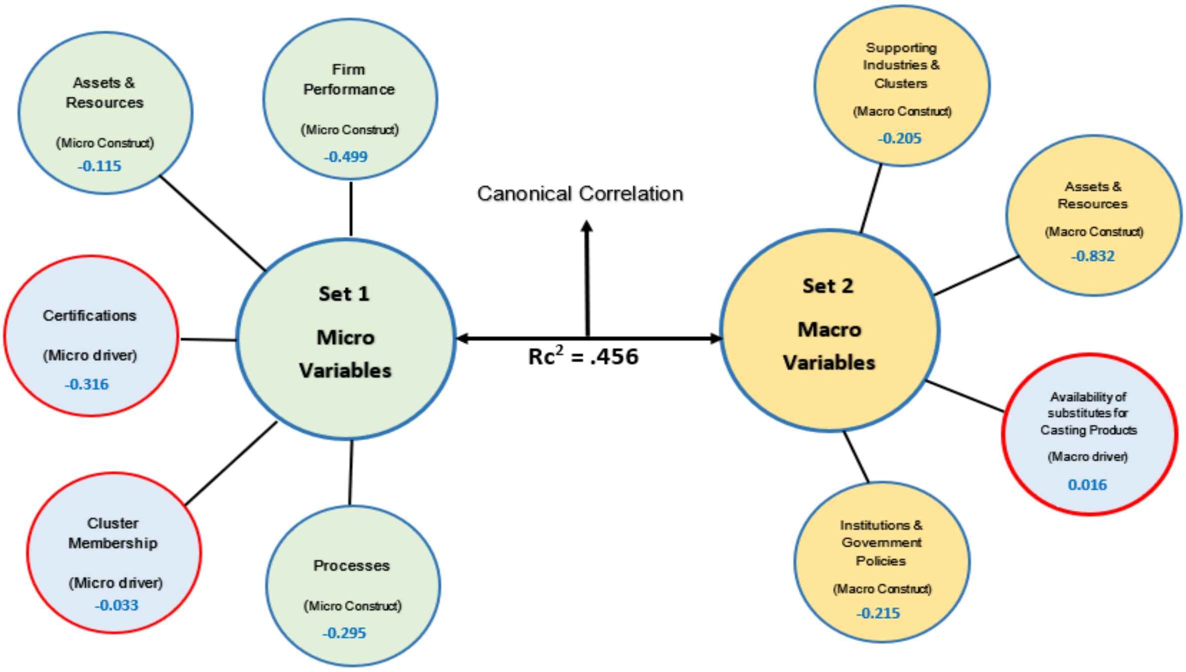

Figure 5.16: First canonical structure of micro and macro drivers for SCA
Source: Author's own compilation (2022)

The CCA technique was deemed appropriate for use in this study as according to Zhuang, Yang and Cordes (2020:3808), and Hair *et al.* (2014:17), it seeks to "establish linear combinations of two random variables so that the correlation between the combined variables is maximised". Sherry and Henson (2014:38) also argue that CCA is a multivariate technique that represents the highest level of the general linear model (GLM) and offers researchers the benefit of limiting “the probability of committing Type I errors anywhere within the study”.

The variables analysed consisted of only those identified by the respondents as being important in influencing the sustainable competitive advantage of foundries in South Africa. As shown in figure 5.16, the first set of variables consisted of three micro driver constructs (assets/resources, firm performance, and processes) as well as two micro drivers (cluster membership and certifications). The second set consisted of three macro driver constructs (assets/resources, institutions, and government policies, and supporting industries and clusters) as well as one macro driver (availability of substitutes for casting products). As discussed in chapter 3, the micro drivers were identified as factors within the control of the organisation, while macro drivers represent the factors outside organisational control.

Three canonical functions with squared canonical correlations of 0.456, 0.083 and 0.060 were obtained. This is in line with observations by Hair *et al.* (2014) that as subsequent functions are responsible for explaining the residual variance not accounted for by the preceding functions, the canonical correlation value progressively decreases. The fourth function was disregarded because of inadequate data obtained for the analysis. According to Sherry and Henson (2014), Wilks’s lambda (λ) represents the amount of variance not shared between the variable sets and, therefore, not explained by the model. Using Wilks’s $\lambda = 0.459$ multivariate criterion, F (4.358, 20), $p < 0.001$, it was determined that the full model across all canonical functions in the study, was collectively statistically significant. The null hypothesis that there is no relationship between the variable sets was, therefore, rejected (rejected $Rc = 0$) signifying a possibility that an association between the variable sets existed. Table 5.20 indicates the canonical correlations for the variable sets.

Table 5.22: Canonical correlation analysis of micro and macro drivers for SCA

Canonical Correlations							
	Correlation	Eigenvalue	Wilks Statistic	F	Num D.F.	Denom D.F.	Sig. (Test H0: r >0)
1	0.675	0.839	0.459	4.358	20	329.296	0
2	0.288	0.09	0.844	1.461	12	264.867	0.139
3	0.245	0.064	0.92	1.427	6	202	0.206
4	0.145	0.021	0.979				
H_0 for Wilks test is that the correlations in the current and following rows are zero							

As indicated in table 5.22, the canonical correlation of the first function was 0.675 which contributed 45.6% ($Rc^2 = 0.456$, $p < 0.001$) of the explained variance relative to the other canonical functions. The canonical correlation of the second function was 0.288 which contributed 8.3% ($Rc^2 = 0.083$, $p = 0.139$) of the explained variance, whilst the canonical correlation of the third function was 0.245 and contributed 6.0% ($Rc^2 = 0.060$, $p = 206$). Except for the first pair of canonical variates, the latter pairs of canonical variates were deemed statistically insignificant.

Considering the recommended cut-off of $Rc \geq 0.3$, each of these two functions ($Rc = 0.288$ and $Rc = 0.245$, respectively), explained less than 10% of the variance in their functions (8.3% and 6.0%, respectively), insufficiently weak to warrant interpretation. These were, therefore, excluded and not considered for interpretation as they could not be used to explain a reasonable amount of association between the original variable sets (Sherry & Henson, 2014).

Parrington, Ball and MacMahon (2012:3) argue that in order to determine whether the model warrants further interpretation, it is crucial "to evaluate both statistical significance and the magnitude of the relationship (effect size)". Sherry and Henson (2014) posit that statistical significance tests can be impacted heavily by the sample size. As recommended by Cohen (1992), Wilks's λ was also used to determine the practical significance of the findings using the "r^2-type effect size" concept. The r^2-type effect size is computed using the formula (1- λ) and according to Cohen (1992), an r^2 metric relates to the degree to which the "null hypothesis is false" and can be interpreted as indicated in table 5.23.

Table 5.23: Criteria for determining statistical and practical significance for multivariate analyses

	Effect Size		
Parameter	**Small Practical Effect**	**Moderate Practical Effect**	**Large Practical Effect**
r^2 metric	> 0.01 to < 0.09	> 0.09 to < 0.25	> 0.25

Source: Cohen (1992)

The r^2-type effect size for the set of three canonical functions was determined to be 0.541 (large practical effect) which indicated that the full model explained about 54.1% of the variance shared between the two sets of variables, which was a substantial portion. The strength of this relationship and the statistical significance warranted further interpretation of the canonical functions of the study.

Table 5.24: Standardised canonical correlation analysis and loadings for the first canonical function (First and second variable sets)

Variates	Standardised canonical correlation coefficient	Canonical loadings	Canonical cross-loadings (Rc)	Squared multiple correlation (Rc^2)
Micro drivers and micro driver constructs				
Assets and resources	-0.115	**-0.823**	**-0.556**	0.309
Firm performance	-0.499	**-0.871**	**-0.588**	0.346
Certifications	-0.316	**-0.753**	**-0.509**	0.259
Processes	-0.295	**-0.774**	**-0.522**	0.273
Cluster membership	-0.033	-0.128	-0.087	0.008
Macro drivers and macro driver constructs				
Assets and resources	-0.832	**-0.960**	**-0.648**	0.42
Availability of substitutes for casting products	0.016	-0.254	-0.172	0.03
Institutional and government policies	-0.215	-0.424	-0.287	0.082
Supporting industries and clusters	-0.205	**-0.557**	**-0.376**	0.141

Notes: n = 108. Rc - values > .30 are indicated in bold. $Rc^2 \leq 0.09$ (small practical effect); $Rc^2 > .09 \leq .25$ (moderate practical effect); $Rc^2 > .25$ (large practical effect size)

Using the Rc $\geq$ .30 cut-off criteria for canonical cross loadings, the significance of the canonical structure correlations was established (Hair *et al*., 2014). This criterion was deemed important in determining the practical significance of the derivation of the canonical variate constructs, while taking cognisance of the variability of the canonical weights and issues of multicollinearity (see table 5.24).

5.10.1 Canonical loadings

As reported in figure 5.15 and table 5.24, regarding the variates associated with the micro drivers and micro driver constructs, firm performance (Rc = -0.871) contributed most to the explanation of the variance in the micro drivers and micro driver construct - canonical variate. This was followed by assets and resources (Rc = -0.823), processes (Rc = -0.774) and certifications (Rc = -0.753). The negative values indicated similar directions in the explained relationships, meaning that the variables mentioned were all positively related.

Regarding the macro drivers and macro driver constructs, assets, and resources (Rc = -0.960) contributed the most, followed by supporting industries and clusters (Rc = -0.557). Similar directions, as indicated by the negative values, showed that there was a positive relation between the variables.

5.10.2 Canonical cross-loadings

As indicated in table 5.24 and using the cut-off criterion of Rc $\geq$ 0.30, firm performance (Rc = -0.588; Rc^2 = 0.346; large practical effect), assets and resources (Rc = -0.556; Rc^2 = 0.309; large practical effect), processes (Rc = -0.522; Rc^2 = 0.272; large practical effect) and certifications (Rc = -0.509; Rc^2 = 0.259; large practical effect) contributed the most (respectively) in explaining the variance in the micro drivers and micro driver constructs variables. On the aspect of the macro drivers, assets/resources (Rc = -0.648; Rc^2 = 0.420; large practical effect) and supporting industries and clusters (Rc = -0.376; Rc^2 = 0.141; moderate practical effect) contributed the most in explaining the variance in the variables relating to the macro drivers and macro driver constructs in the study.

According to Xie, Lawniczak and Gan (2019), although canonical correlation does not imply causality, the results showed that, in essence, the four constructs and micro drivers (assets/resources, firm performance, processes and certifications) best explain the variation in the two constructs and macro drivers (assets/resources as well as supporting industries and clusters). This is in line with responses to the survey questions which showed that the respondents believed that process related drivers (product quality, ability to innovate, managerial choice, bargaining power over suppliers and exposure to export markets) and firm performance related drivers (price competitiveness, product differentiation, production costs, value-add for the customer, governance, and organisational culture) were important micro drivers in determining the SCA of foundries.

Institutions and government policies (energy costs, localisation, government incentives, regulatory instruments, and industry entry and exit barriers) as well as firm performance (availability of substitutes for casting products) were identified as important macro drivers influencing foundry SCA.

5.11 THE IMPACT OF COMPETITIVE FORCES ON SUSTAINABLE COMPETITIVE ADVANTAGE

Table 5.25 shows the frequencies of the respondent rankings of the competitive forces on the sustainable competitive advantage of foundries in South Africa.

Table 5.25: Analysis of respondent ranking on impact of competitive forces on SCA

	Frequencies of respondent selection					
Rank (1 signifies greatest impact)	Intensity of rivalry among foundry companies	Number of competing foundries	Ease of entrance of new competitors into the industry	Bargaining power of foundry customers	Substitutes for casting products	Bargaining power of foundry companies over raw material suppliers
1	13	9	75	1	6	4
2	14	37	22	2	17	16
3	28	23	7	10	25	15
4	17	10	4	36	23	18
5	17	20	0	26	14	31
6	19	9	0	33	23	24
Total no. of Respondents	**108**	**108**	**108**	**108**	**108**	**108**

As shown in table 5.25, six competitive forces adopted from Porter’s competitive forces model were tested in the study, to determine how the respondents ranked these in terms of their impact on the sustainable competitive advantage of foundries in South Africa. Six levels of ranking were identified, with the first rank (1) signifying the competitive force which the respondents identified as having the greatest impact on foundry SCA. The table shows the number of respondents who ranked each force in terms of its importance in influencing the competitiveness of South African foundries. As illustrated, 13 respondents ranked "*intensity of rivalry among foundry companies*" as "1st", while 14 respondents felt it should be ranked 2nd and 28 respondents ranked it 3rd. Figure 5.17 indicates a tabular and graphical view of the scored rankings for the competitive forces.

Competitive Forces	Total Score	Rank
Intensity of rivalry among foundry companies	364	3
Number of competing foundries	410	2
Ease of entrance of new competitors into the industry	600	1
Bargaining Power of foundry customers	249	6
Substitutes for casting products	341	4
Bargaining power of foundry companies over raw material suppliers	304	5

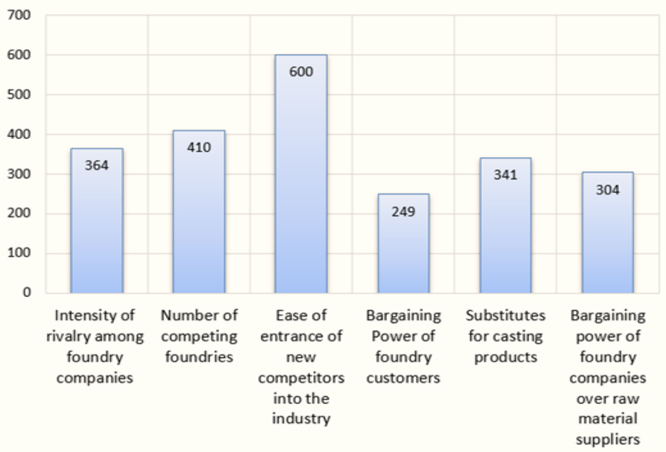

Figure 5.17: Analysis of competitive forces ranking by respondents

Source: Author's own compilation (2022)

Using mathematical computation, the scores of each of the forces were determined on the basis of how many participants had selected the different competitive forces. The resultant scores were then used to rank the forces and determine which ones were regarded as having the most impact on SCA. A high score signified greater impact whereas a lower score signified lowest impact of the competitive force on SCA. As reported in figure 5.17, the ease of entrance of new competitors into the industry (total score, 600) was identified as the competitive force with the greatest impact on the SCA of foundries in South Africa. The number of competing foundries (total score, 410) was ranked as the second competitive force, followed by intensity of rivalry among foundry companies (total score, 364), substitutes for casting products (total score, 341), bargaining power of foundry companies over raw material suppliers (total score, 304) and bargaining power of foundry customers (total score, 249).

Table 5.26: Analysis of respondent ranking on approaches for SCA for foundries

	Frequencies		
Rank (1 signifying greatest influence)	Market Based Approach	Resource Based Approach	Capability Based Approach
1	15	30	61
2	35	41	36
3	58	37	11
Total No. of Respondents	108	108	108

As reported in table 5.26, three approaches identified from literature as influencing SCA were tested in the study, to determine how the respondents ranked these in terms of their influence on the SCA of foundries within the South African context. Three levels of ranking were identified, with the first rank (1) signifying the competitiveness approach, which the respondents identified as having the greatest influence on foundry SCA. Figure 5.18 indicates a tabular and graphical view of the scored rankings for the competitiveness approaches. These approaches are depicted in the development of the SCA framework indicated in figure 5.21.

Competitiveness Approaches	Total Score	Rank
Market Based Approach	173	3
Resource Based Approach	209	2
Capability Based Approach	266	1

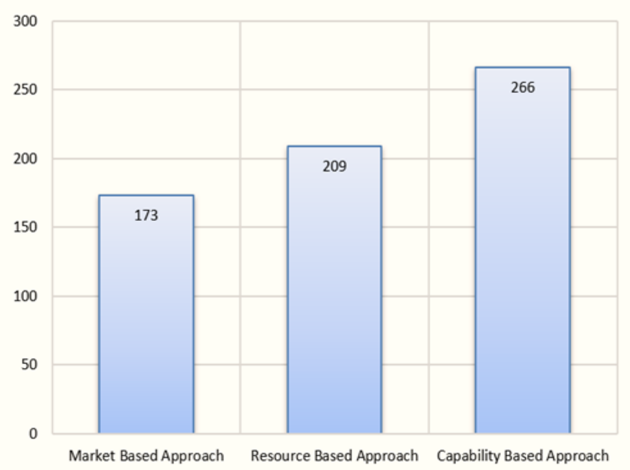

Figure 5.18: Analysis of ranking of competitiveness approaches by respondents
Source: Author's own compilation (2022)

Mathematical computation was carried out to determine the total scores for each approach. As shown in figure 5.18, the respondents identified the capability-based approach (total score, 266) as having the greatest influence on the sustainable competitive advantage of foundries in South Africa. According to Donnellan and Rutledge (2019:4), capabilities relate to the capacity of an organisation to "integrate, build, and reconfigure internal and external resources and competences that enable it to accomplish its operations with distinctive advantage".

The resource-based approach (total score, 209) was ranked second, whilst the market-based approach (total score, 173) was ranked third. Wang (2015) argues that the ability of a firm to possess unique resources is key to attaining SCA. Kaningu *et al.* (2017) posit that according to the market-based theory, a firm's competitive advantage can be attributed to how it is viewed by the market and that market power is crucial in determining its relative performance within the industry.

5.12 OTHER MEASURES TO IMPROVE SCA FOR FOUNDRIES IN SOUTH AFRICA

In response to the survey question on how else the respondents thought the SCA of foundries in South Africa could be improved, a total of 78 responses (72% of total respondents) were solicited. The rest of the respondents felt they could not comment further (N/A – not applicable, no comment or left the section blank). Other respondents indicated that they felt that all the options had been addressed in the preceding sections of the survey. Figure 5.19 shows the key areas, which the respondents identified as critical for foundries to focus on, in order to improve on SCA.

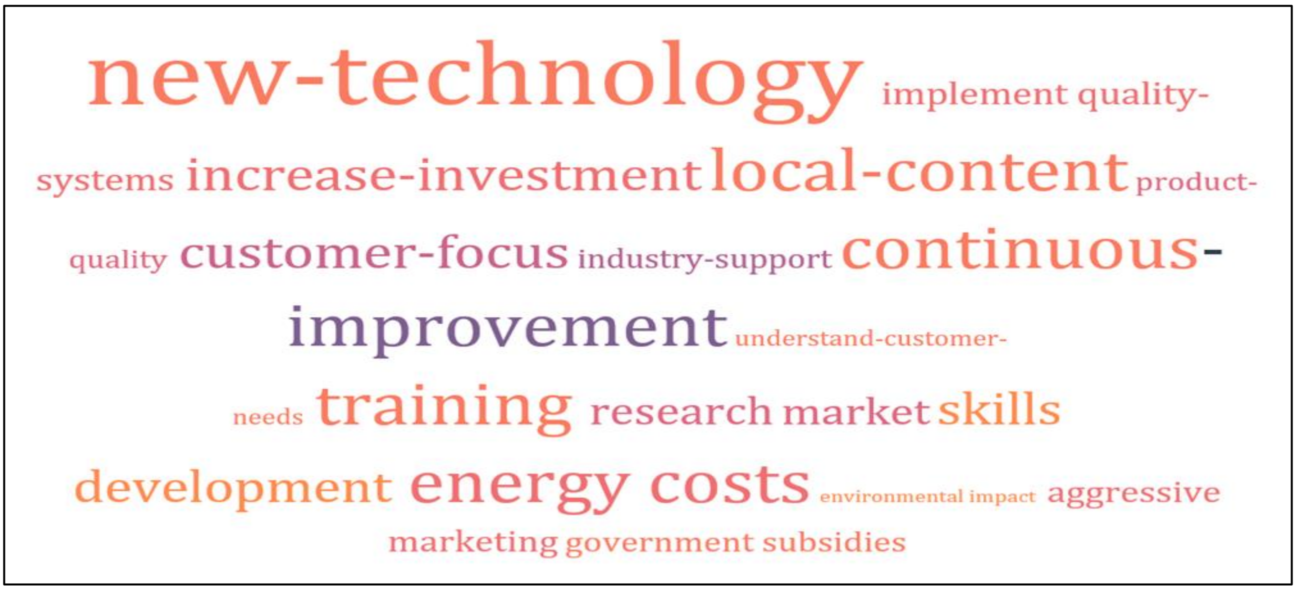

Figure 5.19: Perspectives on improving foundry SCA – word cloud visualisation

Source: Author's own compilation (2022)

The key areas of improvement were further subdivided by the researcher into emergent themes, in line with the responses provided. This is reported in table 5.27.

Table 5.27: Analysis of emergent these identified by respondents

Theme identified	Frequency	Percentage
Upskilling employees	17	21,8%
Promoting local content	10	12,8%
Research and development	10	12,8%
New technology adoption	9	11,5%
Improving customer service	7	9,0%
Increasing capital investment	4	5,1%
Inimitable resources	4	5,1%
Reducing energy costs	4	5,1%
Improving product quality	3	3,8%
Improving production process	3	3,8%
Price competitiveness	3	3,8%
Niche marketing strategy	2	2,6%
Continuous innovation	1	1,3%
Being dynamic and flexible in operations	1	1,3%
Total	78	100,0%

A total of 14 themes were identified as indicated in figure 5.20. Among the top five themes that featured prominently in the responses were upskilling employees (21.8%), promoting local content, research, and development (12.8%), new technology adoption (11.5%), improving customer service (9.0%), increasing capital investment, possession of inimitable resources and reducing energy costs (5.1%).

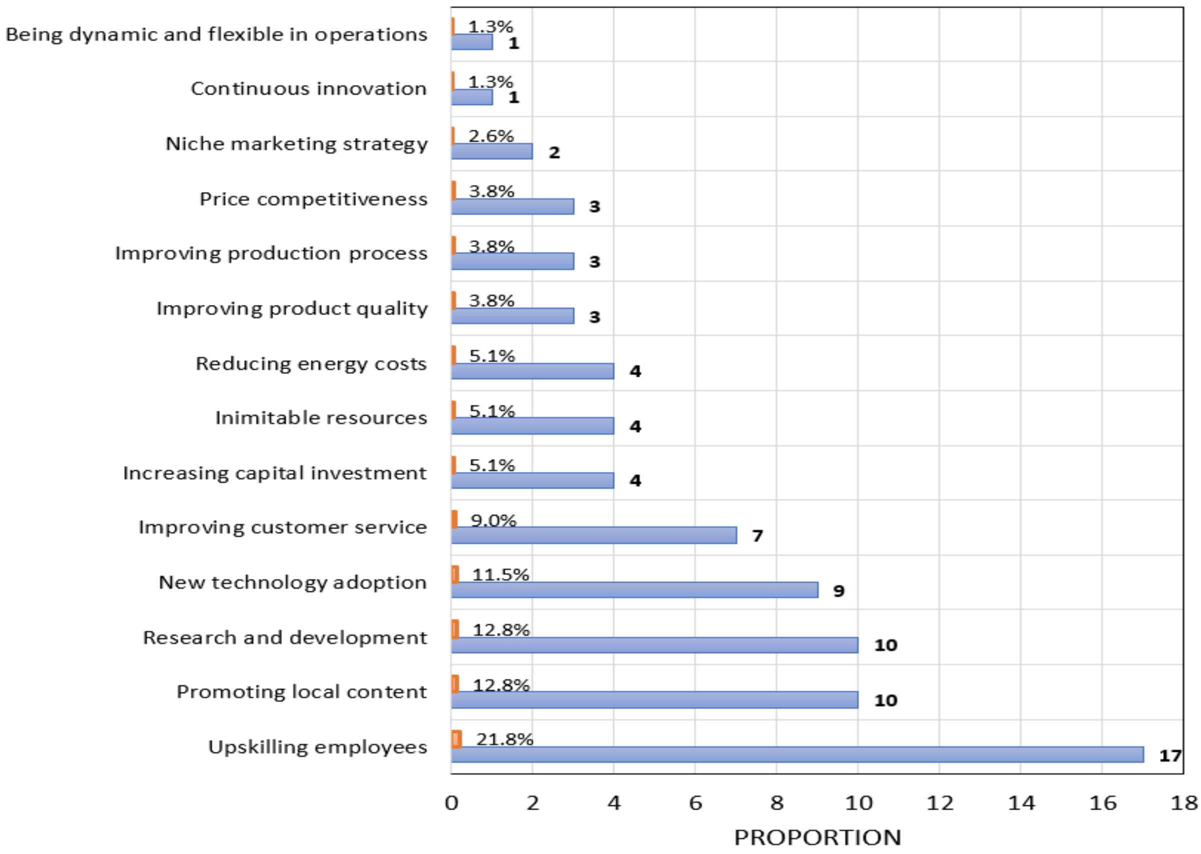

Figure 5.20: Emergent themes on how foundries can improve SCA

Further analysis of the 14 themes revealed that these had already been identified by the researcher from literature and tested in section A and section B of the survey, which the respondents had also been exposed to (see annexure A). This meant that the survey instrument had been comprehensive in identifying the drivers understood to be important in enhancing the SCA of foundry companies in South Africa. Further analyses of the responses to this question were deemed, therefore, not necessary, as these "themes" have already been comprehensively analysed in the earlier sections of this chapter.

Figure 5.21 illustrates the third draft of the SCA framework, which incorporates micro and macro driver groupings as identified in the quantitative phase of the study. Competitiveness approaches have also been incorporated, together with possible strategies that foundry companies can implement to enhance sustainable competitive advantage. The findings, though inconclusive, represented a significant step in the development of the SCA framework for the local foundry industry through the narrowing down and identification of the important micro and macro drivers.

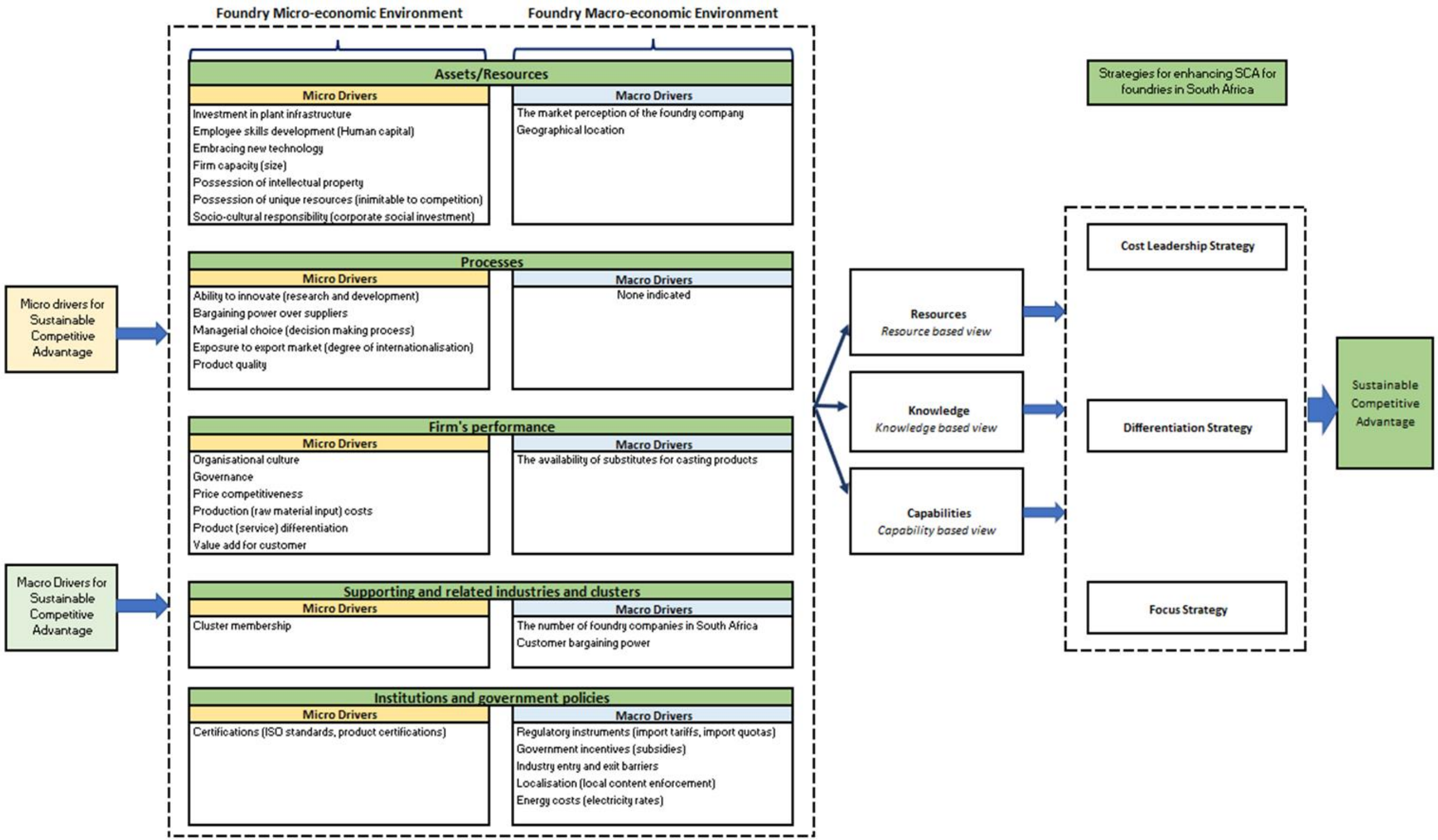

Figure 5.21: Preliminary framework for Sustainable Competitive Advantage (SCA) (*Third draft*)

Source: Author's own compilation (2022)

5.13 CHAPTER CONCLUSION

This chapter presented a discussion on the quantitative phase of this study. An indication of the respondent profiles was provided, together with a comprehensive analysis of the demographics of the people selected to take part in the study. The demographic categories included the respondents' roles in their organisations, areas of focus, period of employment in their current companies, as well as the period of employment in the foundry industry.

A discussion on the micro and macro drivers identified in the study, together with the corresponding constructs, was also provided. Results on the drivers identified as i) important and ii) critical in enhancing the SCA for South African foundries were discussed. This was followed by a discussion on the competitive forces and competitiveness approaches influencing SCA. To determine whether there were statistically significant differences in the levels of importance of the micro and macro drivers in enhancing SCA, the Mann-Whitney U test was done and reported on. A canonical correlation analysis was also performed on the drivers that were identified, in order to evaluate the multivariate shared relationship between the variates identified.

The chapter culminated with a further development of the SCA framework, which provided an illustration of the relationship between the different drivers tested in the study, the competitiveness approaches, and the possible strategies for enhancing SCA for the foundry industry.

Whilst the quantitative phase provided insight into how the respondents ranked all the micro and macro drivers identified from literature, this information was not adequate to indicate which drivers they viewed as more important than the others. The qualitative phase provided a platform for the "managerial and owner" participants to verbalise the 5 drivers they identified as more important. The identification of the critical drivers for SCA was also key for this study, as without these, SCA would be difficult to achieve for the South African foundries. When responding to the question regarding the 3 drivers that the respondents believed were critical in enhancing foundry SCA, it was surprising to note that 19 different micro drivers and 10 different macro drivers were identified by the 108 respondents as "critical".

The qualitative phase provided the researcher with an opportunity to explore in-depth which of these drivers the participants at management level believed were critical and the motivation behind this selection. While the quantitative phase helped understand the respondents' ranking of both competitive forces and the competitiveness approaches in order of importance towards enhancing SCA, the qualitative phase would be used to narrow down the competitive forces and competitiveness approaches to the most influential ones, for foundries in South Africa to gain competitive advantage.

According to Ali, Altin, Chan and Faruk (2020), strategic consensus is a key interpersonal factor for organisational competitiveness. The authors, together with Rahman and Rahman (2020), also argue that managers generally have different opinions on strategy selection and implementation. Whilst the quantitative phase outcomes acknowledge the lack of competitiveness by the foundry industry, the qualitative phase presented an opportunity to engage with management, in order to understand which strategies, they believed would enhance foundry company SCA and the challenges they faced in the implementation of these strategies, in their quest to turnaround the industry.

The next chapter discusses the second (qualitative) phase of the study and articulates how the "mixing" of these two phases contributes further in the development of the SCA framework, as well as provide the researcher with an in-depth understanding of the details that need further exploration for the completeness of this study.

CHAPTER 6: FINDINGS FOR QUALITATIVE PHASE (PHASE 2)

CHAPTER 6 - ROADMAP

6.1	**INTRODUCTION**
6.2	**SIGNIFICANCE OF QUALITATIVE PHASE IN THE STUDY**
6.3	**DEVELOPMENT OF THE QUALITATIVE DATA GATHERING INSTRUMENT**
6.4	**PILOT INTERVIEWS OUTCOME**
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6.7.1.1	Industry shrinkage
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6.7.1.3	Lack of technology advancement
6.7.1.4	High foundry operational costs
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6.8.1.2	Employee skills development (Human capital)
6.8.1.3	Product (service) differentiation
6.8.1.4	Organisational culture
6.8.1.5	Governance
6.8.1.6	Price competitiveness
6.8.1.7	Product quality
6.8.1.8	Ability to innovate (Research and Development)
6.8.1.9	Technology (equipment) upgrade
6.8.1.10	Production (raw material input) costs
6.8.1.11	Exposure to export market (degree of internationalisation)
6.8.1.12	Certifications (ISO standards, product certifications)
6.8.1.13	Possession of intellectual property
6.8.1.14	Managerial choice (Decision making process)
6.8.1.15	Value-add for the customer
6.8.1.16	Firm capacity (size)
6.8.1.17	Cluster membership (e.g., South African Institute of Foundrymen)
6.8.1.18	Socio-cultural responsibility (corporate social investment)
6.8.1.19	Bargaining power over suppliers
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6.13.1	Key outcomes on competitiveness approaches influencing SCA
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6.14.1	Key outcomes on other strategies for enhancing SCA
6.15	**CHAPTER CONCLUSION**

Figure 6.1: Illustration of layout for Chapter 6

Source: Author's own compilation (2022)

6.1 INTRODUCTION

Chapter 5 reported on the quantitative results from the first phase of the study. This included a discussion on the design of the questionnaire as the data collection instrument, sample selection through to the statistical analysis of the results. The results of the quantitative phase were used in the development of the questions for the qualitative interviews.

As detailed in chapter 4 (Research method and design), this study followed a sequential explanatory design that applied a quantitative method followed by a qualitative method. Following chapter 5 (quantitative phase), chapter 6 provides extensive detail on the findings of the second (qualitative) phase of the study. This chapter also reports on the development of the data gathering instrument as well as participant details, which includes the demographic and biographic data. This is followed by a thematic analysis of the transcribed data emanating from the participant responses to the open-ended interview questions. The findings from this phase help complement and explain the results from the quantitative phase and contribute towards the development of the framework for the SCA of foundries in South Africa.

As indicated in the preceding chapters and summarised in table 3.1, the primary objective of this study was to develop a framework for the SCA of the foundry industry in South Africa. The secondary objectives included:

i. the identification from literature, of the macro and micro drivers for the SCA of foundries in South Africa,
ii. benchmarking the perceptions of industry stakeholders on SCA, in light of the macro and micro drivers identified in literature and,
iii. drawing up recommendations on strategies that can be adopted by the foundry industry in order to enhance SCA.

Creswell and Creswell (2018:358) emphasise the fact that a sequential explanatory design is suited in situations where the researcher intends to use qualitative data to explain "significant or non-significant results, outlier cases, surprising results or demographics". The development of interview questions for qualitative research is an important step in ensuring that the process addresses both the research objectives as well as the purpose (Onwuegbuzie & Leech, 2015). This chapter, therefore, follows on from chapter 5 in which the results of the quantitative phase (phase 1) were presented.

Bolderston (2012) argues that the nature of the dyad between the interviewee and the interviewer (researcher) is a delicate one that requires considerable pre-planning on the part of the researcher, in order to create rapport with the participants and identify the "right" questions to ask. Saunders *et al*. (2016) recommend the use of semi-structured interviews in order to explain the "why" and "how" questions in explanatory research. As indicated in chapter 4, rigorous steps were followed in the development of the questions, which were subsequently presented as interview questions to the participants selected.

Chapter 6 discusses and reports on the findings of the second phase of this study. A brief rationale on the significance of this phase, in relation to the adoption of the mixed methods research, is provided. This is followed by a discussion on the demographic details of the participants, as well as the description and analysis of the study's findings.

6.2 SIGNIFICANCE OF QUALITATIVE PHASE IN THE STUDY

The decision to have the qualitative phase preceded by the quantitative phase was based on the researcher's need to "explore in more depth any responses from the first phase which might require further exploration or clarity" (Molina-Azorin, 2016:37). In order to ensure there is a proper integration of the two phases, Carroll and Rothe (2010:3485) emphasise the need for both phases to be "theoretically based and conceptually sound". This study is grounded in theoretical perspectives guiding the enhancement of SCA for foundries in South Africa.

The application of a sequential explanatory mixed methods research allows the researcher to utilise the qualitative research phase i) to explain the results from the quantitative phase (significant and non-significant), as well as surprising and outlier results (Morse, 1991), and ii) build upon, expand and connect to the initial quantitative results (Creswell & Plano-Clark, 2018; Creswell, Klassen, Plano & Smith, 2010). Various authors identify several reasons justifying the significance of mixing quantitative and qualitative research. These are summarised in table 6.1 and include initiation, generalisability, focus, process, different research questions, explanation of findings, explanation of unexpected results, facilitation of sampling, provision of contextual understanding, illustration of data, and for confirmation and discovery.

Table 6.1: Reasons for mixing quantitative and qualitative research

REASONS FOR COMBINING QUALITATIVE AND QUANTITATIVE RESEARCH	JUSTIFICATION FOR MIXING QUANTITATIVE AND QUALITATIVE RESEARCH
Initiation	Aiming to uncover paradoxes and contradictions, fresh framework perspectives, and the reframing of questions or findings from one approach in light of those from another (Molina-Azorin, Tari, Lopez-Gamero, Pereira-Moliner & Pertusa-Ortega 2018; Greene, Caracelli & Graham, 1989).
Generalisability	Use of mixed methods may aid in determining a study's generalizability or relative value (Saunders *et al*., 2016).
Focus	The use of one approach to focus on one feature (for example, quantitative analysis of macro aspects) and the use of a different method to focus on a different attribute (e.g., qualitative on micro aspects) are both possible. (Saunders *et al*., 2016).
Process	Although qualitative research offers a sense of process, quantitative research offers an understanding of social life's structures (Bryman, 2012).
Different research questions	Research questions might be addressed differently using quantitative and qualitative methods (Bryman, 2012; Doyle *et al*., 2009).
Explanation of findings	The results of one of the two research methodologies are used to explain the other's findings (Bryman, 2012; Doyle *et al*., 2009).
Unexpected results	When one method produces unexpected results that the other can be used to explain, quantitative and qualitative research can be combined to good effect (Bryman, 2012).
Sampling	To facilitate the sampling of respondents or cases, one strategy is adopted (Bryman, 2012).
Context	The rationale for the combination is that it combines qualitative research, which offers contextual insight, with either generalisable, externally valid findings or broad connections among variables discovered through a survey (Bryman, 2012).
Illustration of data	The use of qualitative data to illustrate quantitative findings is often referred to as “putting meat on the bones of ‘dry’ quantitative findings” (Bryman, 2012).
Confirm and discover	This means developing hypotheses using qualitative data and testing them within a single project using quantitative data (Bryman, 2012).

Source: Author’s own compilation (2022)

Other reasons for combining quantitative and qualitative research have been a motivation for the use of mixed methods research for this study and these are indicated in table 6.2.

Table 6.2: Motivation for mixed methods research in this study

REASONS FOR COMBINING QUALITATIVE AND QUANTITATIVE RESEARCH	JUSTIFICATION FOR MIXING QUANTITATIVE AND QUALITATIVE RESEARCH
Complementarity	Comparison or clarification of the findings from one approach with those from the other method to elaborate or make clear (Molina-Azorin & Fetters, 2020; Greene *et al*., 1989).
Triangulation	Data may be combined using mixed methods to see whether the results of one method support the results of the other (Saunders *et al*., 2016; Doyle *et al*., 2009; Greene *et al*., 1989).
Instrument development	When a researcher uses the output of one method to inform the development of the use of another (Molina-Azorin & Fetters, 2020; Doyle *et al*., 2009).
Expansion	Utilising several techniques for various inquiry components in an effort to broaden the scope and depth of the investigation (Molina-Azorin & Fetters, 2020; Greene *et al*., 1989).
Facilitation	One approach might yield fresh perceptions that inform and guide the other approach's work (Saunders *et al.*, 2016).
Interpretation	It is possible to employ a method (such as qualitative research) to assist explain correlations between variables that emerge through another (e.g., quantitative) (Saunders *et al*., 2016).
Diversity of views	A broader variety of viewpoints may be able to inform and be reflected in the study through the use of mixed techniques (Saunders *et al*., 2016).
Problem Solving	When an original approach yields unexpected results or inadequate data, using a different method may be helpful (Saunders *et al*., 2016).
Confidence	It is advisable to employ diverse approaches in a study to try and counteract the "method effect." This should increase trust in study findings (Saunders *et al*., 2016).
Offsetting weaknesses and providing stronger inferences	Refers to the idea that because both quantitative and qualitative research methodologies have strengths and flaws of their own, combining them can help researchers overcome such weaknesses and maximise the benefits of each (Bryman, 2012).
Completeness	If both quantitative and qualitative research are used, the researcher can compile a more thorough account of the topic of inquiry in which they are interested (Bryman, 2012).
Credibility	Utilising both methods, improves the reliability of results (Bryman, 2012).
Utility	Relates to increasing the value of the results, where combining the two methodologies will be more beneficial to researchers (Bryman, 2012).
Enhancement	This refers to enhancing or extending quantitative or qualitative conclusions by collecting data using either a qualitative or quantitative research approach (Bryman, 2012).

Source: Author's own compilation (2022)

As reported in table 6.2, the reasons that motivated the use of mixed methods research in this study were vast and included: complementarity, triangulation, instrument development, expansion of the inquiry, facilitation and discovery of new insights, interpretation of outcomes of the preceding phase, diversity of views, problem solving, instilling confidence in study, offsetting weaknesses associated with using a single method, completeness, credibility, utility, and enhancement. The results from the quantitative phase were used in the development of the interview schedule, which was used as a guide when the interviews were conducted. The same interviewer conducted the interviews to ensure consistency across all interviews (Liem, 2018) and to limit variations in the interview technique. The assessment of the quality and rigour of the research instrument and data collection process was carried out as outlined in chapter 4 (Research method and design). The researcher tested the variables obtained from literature by means of a quantitative research method, followed by a qualitative phase where experts from within the foundry industry were asked questions regarding the outputs identified during the quantitative phase.

6.3 DEVELOPMENT OF THE QUALITATIVE DATA GATHERING INSTRUMENT

Subsequent to the quantitative phase, the results of this phase were used to develop questions for the qualitative interviews. According to Roberts (2020:3187), interviews provide an opportunity for the researcher to "understand the word from the subjects' view points and to unfold the meaning of their experiences prior to scientific explanations". Figure 6.2 provides a visual illustration of the interview schedule aspects that were considered, prior to the interviews being conducted.

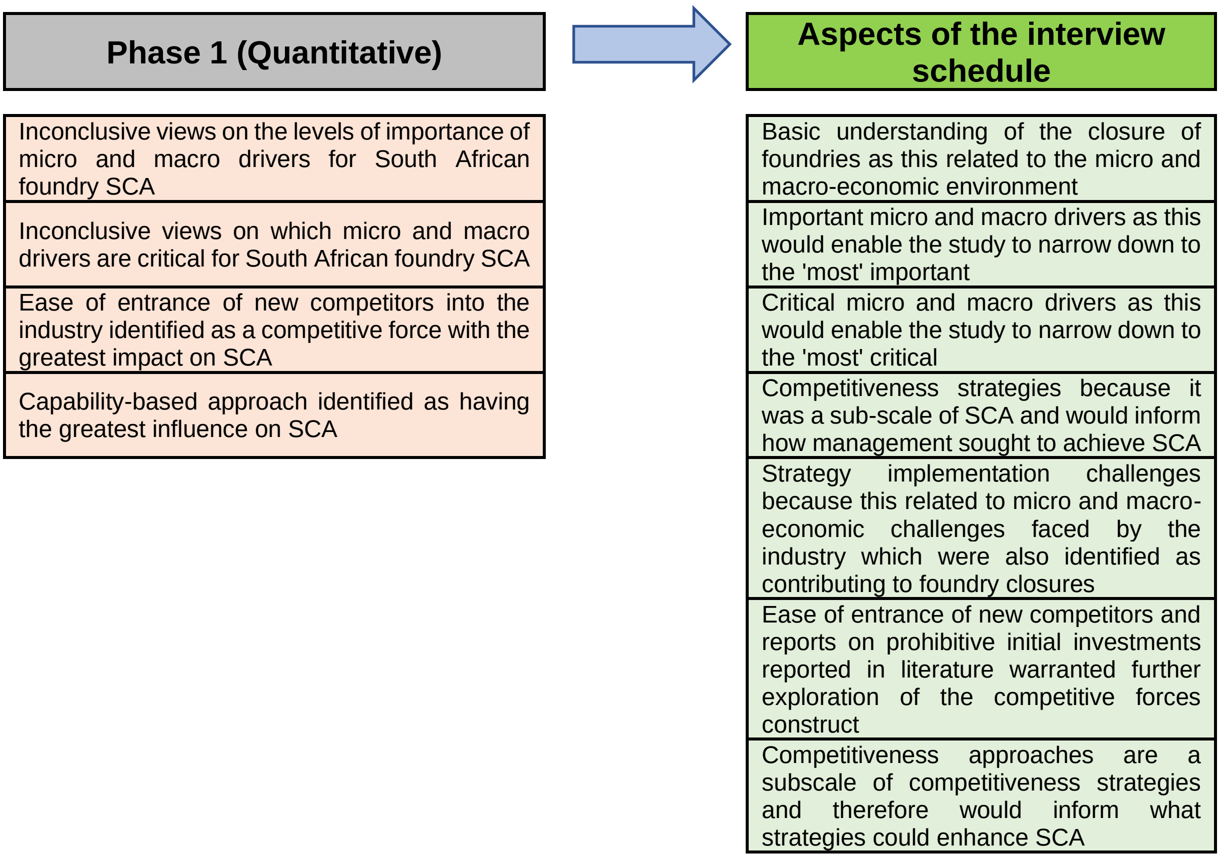

Figure 6.2: Considerations for sequential explanatory interview schedule development

Source: Adapted from Liem (2018)

A total of 7 research aspects identified during the analysis of the results of the quantitative phase were included as part of the interview questions, in order to provide a comprehensive understanding of the study problem (see table 6.3). A question that sought to explore the participants' understanding of why the foundries in South Africa were closing down was asked, as this related to the micro and macro-economic challenges the foundry industry faced, which negatively affected SCA. Whilst the quantitative phase contributed in identifying important micro and macro drivers enhancing SCA, the results were inconclusive as, in some cases, the same driver was classified at different levels of importance. The researcher aimed to narrow down the important drivers to a few which participants believed to be "most" important. A similar "inconclusiveness" on which drivers were regarded as critical was observed. A question designed to encourage participants to select the 3 critical drivers for foundry SCA was also added to the schedule to enable the researcher to understand the reasons for the selection.

In order to achieve SCA, it was deemed important to map out the strategies that foundries could adopt and implement to attain this goal, as competitiveness strategies were a sub-scale of SCA (secondary research objective). A question on competitiveness strategies was added, therefore, to achieve this objective. This also motivated the addition of a question that related to competitiveness strategy implementation challenges that foundry companies faced which hindered SCA attainment. The identification of "ease of entrance of new competitors into the foundry industry" tended to contradict views in literature that identified prohibitive capital layout investments and regulations as factors that discouraged new foundries from "mushrooming" in South Africa. It was, therefore, important for this to be explored further in order to validate this outcome.

A question on the competitiveness approaches was also included in the schedule as these approaches (resource-based, capability-based, and knowledge-based approaches) directly informed what competitiveness strategies were likely to be adopted and implemented to enhance SCA. Table 6.3 provides an indication of the sources (literature and quantitative analysis) used in the development of the questions administered during the qualitative (interviews) phase.

Table 6. 3: Validity of interview schedule

Question category	No.	Item question	Source
1. Reasons for foundry closure	**Q1**	Research on foundries in South Africa has shown that there has been a **decline in the number of foundries** from 213 to 123 foundries over a period of 17 years (2003 – 2020) due to permanent closures.	**Literature and Quantitative Analysis** SAIF (2015); Lochner et al. (2020)
		In your opinion, what could be the likely reasons for the closing down of foundries in South Africa?	
2. Drivers for SCA	**Q2a**	Research focusing on Sustainable Competitive Advantage shows that there are various **macro and micro drivers** for competitiveness. Micro drivers relate to the factors internal to the firm which determine its strengths, weaknesses and responses to threats and opportunities. *Refer to Annexure C*	**Literature and Quantitative Analysis** Martin (n.d.); Siudek and Zawojska (2014); Ghesami and Mehregan (2014)
		In your opinion, what 5 micro drivers would you consider as important to the sustainable competitive advantage of foundry companies in South Africa and why?	
	Q2b	Macro-economic drivers are those factors in the external business environment for which the firm has little control over. *Refer to Annexure C*	**Literature and Quantitative Analysis** Ghasemi and Mehregan (2014); Dvorsky, Gavurova, Cepel and Cervinka (2020)
		In your opinion, what 5 macro drivers would you consider as important to the sustainable competitive advantage of foundry companies in South Africa and why?	
3. Critical drivers	**Q3a**	Which **3 micro drivers** would you regard as **CRITICAL** for the sustainable competitive advantage of foundries in South Africa and why?	
		*A '**critical micro driver**' is one that a firm cannot achieve a Sustainable Competitive Advantage without.*	
	Q3b	**Which 3 macro drivers** would you regard as **CRITICAL** for the sustainable competitive advantage of foundries in South Africa and why?	
		*A '**critical macro driver**' is one that a firm cannot achieve a Sustainable Competitive Advantage without.*	
4. Strategies for enhancing SCA	**Q4**	Various scholars view a **competitive strategy** as *the firm's roadmap which shows how a company can gain a Sustainable Competitive Advantage*. Literature identifies 4 main strategies.	**Literature and Quantitative Analysis** Chikan, Czako, Kiss-Dobronyi and Losonci (2022); Lazarenko, Garafonova, Marhasova and Grigashkina (2021
		<u>Cost Leadership strategy</u>	***Literature and Quantitative Analysis*** *Porter (2008); Ali and Anwar (2021); Nanyangwe and Phiri (2021); Alnoor, Khaw, Al-Abrrow and Alharbi (2022)*
		A cost leadership strategy represents attempts by firms to generate competitive advantage by achieving the lowest cost in the industry. The focus of firms implementing a cost leadership strategy is on stringent cost control and efficiency in all areas of operation.	
		<u>Differentiation strategy</u>	***Literature and Quantitative Analysis*** *Porter (2008); Ali and Anwar (2021); Nanyangwe and Phiri (2021); Alnoor, Khaw, Al-Abrrow and Alharbi (2022)*
		A differentiation strategy involves creating a market position that is perceived as being unique industry-wide and that is sustainable over the long run.	

Question category	No.	Item question	Source
4. Strategies for enhancing SCA	Q4	**Focus strategy**	***Literature and Quantitative Analysis*** *Porter (2008); Ali and Anwar (2021); Nanyangwe and Phiri (2021)*
		A focus strategy is a strategy in which a firm concentrates on a specific regional market, product line, or group of buyers.	
		Hybrid strategy	***Literature and Quantitative Analysis*** *Alnoor, Khaw, Al-Abrrow and Alharbi (2022); Ali and Anwar (2021); Nanyangwe and Phiri (2021)*
		A hybrid strategy represents the simultaneous adoption and implementation of at least two of cost leadership, differentiation or focus strategies.	
		In your opinion, which strategy or strategies do you think foundry companies should implement to enhance their Sustainable Competitive Advantage within the South African context and why?	
5. Management Challenges	Q5	Several scholars argue that management faces **strategy implementation challenges** which include political interference, limited resources and global economic situations that may be beyond the firms' control in their quest to enhance Sustainable Competitive Advantage.	**Literature and Quantitative Analysis** Grabowska and Saniuk (2022); Pella, Sumarwan, Daryanto and Kirbrandoko (2013)
		In your opinion, what are some of the managerial challenges facing South African foundry managers today with regards to implementing Sustainable Competitive Advantage strategies?	
6. Competitive forces	Q6	Which of the following **competitive forces** would you regard as having the most influence on the Sustainable Competitive Advantage of foundries in South Africa and why?	**Literature and Quantitative Analysis** Porter (2008); Kabeyi (2018)
	1	Intensity of rivalry among foundry companies	
	2	Number of competing foundries	
	3	Ease of entrance of new competitors into the industry	
	4	Bargaining power of foundry customers	
	5	Substitutes for casting products	
	6	Bargaining power of foundry companies over raw material suppliers	
7. Competitiveness approaches		Literature identifies three **competitiveness approaches** that influence Sustainable Competitive Advantage.	**Literature and Quantitative Analysis** Porter (1985); Jain (2014); Wang (2014); Wilopo and Fitriati (2015); Kaningu et al. (2017); Barney (1991); Kaleka and Morgan (2019); Quelin, Cabral, Lazzarini and Kivleniece (2018); Teece (2018); Rayo and Vizayakumar (2016)
		In your opinion, which competitiveness approach would you regard as having the most influence on the Sustainable Competitive Advantage of foundries in South Africa and why?	
		Resource based approach – Foundry uses its physical resources to gain competitive advantage	
		Capability based approach – Foundry uses its process capabilities to gain competitive advantage	
		Knowledge based approach – Foundry uses its intellectual property to gain competitive advantage	
8. Other strategies for SCA		How else do you think the Sustainable Competitive Advantage of South African foundries **can be enhanced** either by the foundry companies themselves or through other institutions/bodies.	

6.4 PILOT INTERVIEWS OUTCOME

Yujin (2011:191) defines a pilot study as a "small scale methodological test used to test the research protocol such as the data collection method and sampling strategy". Pilot interviews were conducted with seven (7) participants in order to establish whether the main study participants would understand the questions. The demographics of the participants were as indicated in table 6.4. The interview questions were found to be clear and understandable, as the researcher had made use of simple and easy-to-understand wording. The researcher was asked to define the competitive strategies, which included cost leadership, differentiation, focus and hybrid strategies. The definitions for these were then added on the interview schedule to make it easy for the participant to understand. The rest of the questions and the structure of the interview schedule were deemed acceptable, clear and logical.

Table 6.4: Breakdown of participants by demographic profiles (Pilot phase)

Participants	Period of experience in the foundry industry (rounded off)	Position in organisation	Province
Pilot interview participant 1	11 years	Chief Operations Officer	North-West
Pilot interview participant 2	6 years	Marketing Manager	Gauteng
Pilot interview participant 3	7 years	Procurement Manager	Gauteng
Pilot interview participant 4	2 years	Former NFTN Projects Leader	Gauteng
Pilot interview participant 5	6 years	Managing Director	Northern Cape
Pilot interview participant 6	3 years	Director	KwaZulu-Natal
Pilot interview participant 7	14 years	Managing Member (Co-Owner)	Gauteng

Table 6.4 indicates the breakdown of participants used in the pilot (interview) phase of the study. The 7 participants had a total of 49 years of industry experience. Prior to the interviews being conducted, the interview schedule and questions were validated by two industry experts within the local foundry associations, as well as a professor at the University of South Africa (a qualitative research expert). Subsequent to the validation, pilot interviews were arranged.

Seven pilot interviews were conducted to establish the level of understanding and clarity of the questions which would be asked (Flick, 2018; Taylor, Bogdan & DeVault, 2016; Yin, 2011). The outcomes demonstrated that the questions were clear and understandable to the participants to warrant any additional work or reframing.

The piloting exercise further revealed that not everyone was willing to participate in the interviews, as some of the participants who had originally agreed to participate in the pilot phase were either no longer available to participate anymore, decided to cancel the appointments or did not respond to the researcher's engagement efforts. This prompted the researcher to extend the data collection period for the interviews by a further 30 days to allow more time to accommodate the participants identified. The South African Institute of Foundrymen was also approached for assistance in communicating to its members the need for this study, which the current (2021) SAIF President had also expressed interest in and touted as "*a study, long overdue*".

6.5 DESCRIPTION OF THE PARTICIPANTS' DEMOGRAPHIC PROFILES

Following the pilot interviews, the qualitative phase was conducted. This phase consisted of 12 participants who were regarded as leaders in the foundry industry, both in their capacity as leaders in the different foundry companies that participated in the study as well as based on their foundry industry knowledge, experience, and expertise. The breakdown of the participants used in the actual study is indicated in table 6.5.

Table 6.5: Breakdown of participants by demographic profiles (Actual interviews)

Participants	Period of experience in the foundry industry (rounded off)	Position in organisation	Province
Formal interview participant 1	16 years	Chief Executive Officer	Gauteng
Formal interview participant 2	7 years	Managing Director	Mpumalanga
Formal interview participant 3	12 years	Managing Director	KwaZulu-Natal
Formal interview participant 4	5 years	Chief Executive Officer and current SAIF President	Gauteng
Formal interview participant 5	23 years	Finance Director	Western Cape
Formal interview participant 6	27 years	Owner	Mpumalanga
Formal interview participant 7	7 years	Owner	KwaZulu-Natal
Formal interview participant 8	13 years	Technical Director	Free State

Participants	Period of experience in the foundry industry (rounded off)	Position in organisation	Province
Formal interview participant 9	36 years	Former Managing Director and SAIF President (Retired)	Gauteng
Formal interview participant 10	22 years	Foundry Consultant	Gauteng
Formal interview participant 11	8 years	Managing Director	Limpopo
Formal interview participant 12	30 years	Former Managing Director (Retired)	Gauteng

The participants used in the study were spread across six provinces which included Gauteng (*5 participants*), Mpumalanga (*2 participants*), Limpopo (*1 participant*), Free State (*1 participant*), Western Cape (*1 participant*) and KwaZulu-Natal (*2 participants*), and were selected from the same population that the researcher was interested in (Majid *et al*., 2017). The participants had a collective of 206 years' worth of foundry industry experience, with 4 participants having been in the industry for less than ten years, 3 participants having been in the industry for more than ten years, but less than 20 years, while 5 participants had more than 20 years' experience. All participants were deemed, therefore, to have extensive years of experience in the foundry industry and were well qualified to comment on questions relating to the foundry industry. Table 6.6 provides an indication of the distribution of the participants by industry experience.

Table 6.6: Distribution of participants by foundry industry experience

	Years of experience within the foundry industry						
Participants	**≤ 5**	**6–10**	**11–15**	**16–20**	**21–25**	**26–30**	**> 30**
Formal interview participant 1				1			
Formal interview participant 2		1					
Formal interview participant 3			1				
Formal interview participant 4	1						
Formal interview participant 5					1		
Formal interview participant 6						1	
Formal interview participant 7		1					
Formal interview participant 8			1				
Formal interview participant 9							1
Formal interview participant 10					1		
Formal interview participant 11		1					
Formal interview participant 12						1	
Total	**1**	**3**	**2**	**1**	**2**	**2**	**1**
Percentage distribution of participants	**8.33%**	**25.00%**	**16.67%**	**8.33%**	**16.67%**	**16.67%**	**8.33%**

The interviews were spread across a two-month period, as some participants did not respond on time to invitations made via e-mail or telephonically for them to participate, whilst other potential participants were either not available, declined to participate or felt that the study was not relevant to their businesses (particularly the family-owned foundry companies).

Semi-structured interviews were conducted using the Microsoft Teams platform. The total audio time for the interviews was 514 minutes, with each interview taking between 45 and 60 minutes, on average. Generally, the participants expressed interest in the study and indicated levels of optimism towards the potential that the study could bring in making known what they felt were challenges the industry faced, as well as recommendations on how the competitiveness of the industry, especially against foreign competition, could be enhanced.

Whilst 12 interviews were conducted, data saturation was attained after eight (8) interviews had been conducted. Responses from the last 4 participants seemed to reiterate what the pervious participants had underscored, signifying that no new information was being obtained anymore (Flick, 2018; Given, 2008; Taylor *et al*., 2016). According to Guest, Bunce and Johnson (2006), it is essential that a researcher decides on a numerical guideline for the number of interviews prior to the data gathering process, in order to budget and plan properly for the interviews. Guest *et al.* (2006) identified three elements considered crucial for the researcher to attain data saturation. These are indicated in table 6.7.

Table 6.7: Elements that enhance data saturation in qualitative research

	Element	Description	How the study addressed the element
i)	Interview structure	Similar set of questions asked	Semi-structured interviews were conducted using a schedule, which had a set of core questions informing the interviews.
ii)	Instrument content	Wide distribution of experience or domain of knowledge	The questions on the interview schedule were based on the participants' experiences and knowledge of the foundry industry.
iii)	Participant homogeneity	Participants chosen according to some common criteria	Purposive sampling was used to select participants who were leaders in the foundry industry.

Source: Adapted from Guest *et al.* (2006)

As reported in table 6.7, the design of the interviews, the type of questions asked, and the participant selection process was in line with the recommendations by Guest *et al.* (2006) in ensuring the interviews were stopped when no new data insights were being obtained.

A professional transcriber was used in the transcription process and an independent qualitative expert was used in the open coding process, and to aid with the data analysis. The following section discusses the findings of the qualitative phase of the study.

6.6 DESCRIPTION AND ANALYSIS OF FINDINGS

As indicated in table 6.1, this chapter is significant in discussing how the qualitative phase of the study, in part, helped address the objectives of this study. These include, among others, the development of the SCA framework as well as to benchmark the perceptions of stakeholders within the foundry industry on sustainable competitive advantage against the micro and macro-economic drivers identified in literature. The interview schedule that was used is indicated in annexure B.

The opinions and perceptions of owners, management and experts within the South African foundry industry were solicited, with the aim of attaining rich data and insights as indicated in section 6.3, into areas that included:

i) Reasons for the closure of foundries in South Africa
ii) Drivers of SCA for the South African foundry industry
iii) Critical drivers of SCA for the South African foundry industry
iv) Strategies for enhancing the SCA of foundries in South Africa
v) Challenges faced by management in implementing SCA strategies
vi) Competitive forces influencing the SCA of foundries in South Africa
vii) Competitiveness approaches influencing the SCA of foundries in South Africa
viii) Other strategies (other than the ones already identified) for enhancing the SCA of foundries in South Africa

The aim of narrowing down the questioning to these areas was to follow on from the findings from the quantitative phase of the study and to explore in detail the participants' perspectives on SCA for the foundry industry. The quantitative phase of the study revealed that there were no group differences between the different levels of respondents (management and non-management) on their perspectives of SCA (see chapter 5).

In order to ensure confidentiality and in line with ethical requirements, the names of the participants were removed and pseudonyms such as participant 1 (relating to the participant who was interviewed first), participant 2 (participant interviewed second), participant 3, up to participant 12 are used. The direct quotes used to substantiate the themes and categories emanating from the interviews are presented verbatim.

Table 6.8 provides a summary of the findings from the 12 participants' perspectives on the reasons for the closure of foundries in South Africa by way of presenting, in tabular form, the categories and codes that relate to the first theme on the reasons for the closure of foundries.

Table 6.8: Participants' perspectives on reasons for the decline in foundries

Theme	Category	Code
Open coding		
6.6.1 **Reasons for the closure of foundries**	6.6.1.1 Reduced customer demand	
	6.6.1.2 Industry shrinkage	6.6.1.2.1 Consolidation or mergers within foundries
		6.6.1.2.2 Lack of price competitiveness
	6.6.1.3 Influx of cheap imports	
	6.6.1.4 Lack of technology advancement	
	6.6.1.5 High foundry operational costs	
	6.6.1.6 The government's role as watchdog	6.6.1.6.1 Stringent regulatory compliance
	6.6.1.7 Ageing infrastructure	6.6.1.7.1 Lack of investment
	6.6.1.8 Lack of knowledge and skills: Training *"dried up"*	6.6.1.8.1 Lack of training

6.7 THEME 1: REASONS FOR THE CLOSURE OF FOUNDRIES

As indicated in table 6.8, a number of categories were identified under theme 1. These categories included reduced customer demand, industry shrinkage, influx of cheap imports, lack of technology advancement, high foundry operational costs, the government’s role as watchdog, ageing infrastructure, and lack of knowledge and skills (training “dried up”).

The following sections discuss the categories separately.

6.7.1 Reduced customer demand

The foundry industry has been characterised, for the past few decades, by a reduction in customer demand due to the increase in competing foreign foundries coming into South Africa, as well as the intense competition from substitute materials (SAIF, 2015). The drop in demand for castings results in low throughput for the foundries, leading to reduced levels of operation. This is also exacerbated by difficult to predict cycles of supply (inconsistency of supply of raw materials), the lack of marketing ability by the individual companies, a lack of cohesion and a lack of drive for common interest by the industry in general.

“… foundries are notoriously poor marketers. They expect their clients to come to them. They don’t go out and again, my analysis of the best foundries in South Africa are, where you have personnel, whether it’s the senior management or whether it’s personnel within the company that are not able to strongly market and innovate in the market …

…and foundries are particularly poor at that. They sit and wait. Some of them have no sales or marketing departments at all.” (Participant 4).

“… and ... just because there is no local capacity, and there is no local capacity because there is not sufficient local demand anymore.” (Participant 7).

“… obviously, that will also go hand-in-hand with the orders. We recently found that the demand has gone down for certain items …

… foundries within South Africa are very, it’s a mafia. If you don’t like you, we don’t help you, we don’t like to help out one another. What I have, I’ve got and what you’ve got, you’ve got …” (Participant 8).

"… there has been no unity within the foundry industry, each firm operates on its own and companies do not participate in platforms created to share ideas – hence they lag behind." *(Participant 10).*

The challenging economic situation for South African foundries has also been compounded by the introduction of cost saving initiatives by various foundry customers. These initiatives have meant that instead of replacing old casting components with the new, customers were either stretching the operational life of the product to maximise its use or preferred to repair casting components where possible, instead of installing the placement of new orders with local foundries for new replacements (Lochner *et al*., 2020). This meant that the number of orders the foundries were getting from their customer base was decreasing.

"… the reason behind that is that everybody is starting to do a cost-saving initiative in their own business. So, in the past they used to just provide a new item and install the new item … a cost-saving initiative from the, from my customer till point perspective and that bites me, because they're not placing so many orders again …" *(Participant 8).*

6.7.1.1 Industry shrinkage

The decline in the number of foundries in South Africa has also been attributed to industry shrinkage, which according to the participants, came about as a result of several consolidations or mergers between foundries, as well as some closing down due to lack of competitiveness.

6.7.1.1.1 Consolidation or mergers within foundries

Roberts and Wallace (2016) define a consolidation or merger as the combination of two or more companies to form one new company or corporation. The need to consolidate operations and capture market share, not previously available to individual foundry companies, motivates the move towards strategic merging. This in turn has contributed to industry shrinkage.

"… I think, one of the issues that people tend to gloss over is the fact that there has been quite a lot of consolidation within the foundries …" *(Participant 4).*

"… and the need to consolidate the operations to try and increase the volume and I really can only in the main talk about production foundries …" *(Participant 5).*

"… another reason has been the buying of foundries especially the ailing ones by those foundries that are still doing very well. This is meant to capitalise on the market and if foundries are not doing well, they sell

for a song and so who wouldn't buy it if they have a plant, because all you need is a plan on how to survive in this industry. Smaller foundries are bought out by bigger foundries, and this obviously reduces the overall numbers of foundries operational in the country although at times the volumes might remain unchanged …" (Participant 11).

6.7.1.1.2 Lack of price competitiveness

Lack of price competitiveness by foundry companies in South Africa was identified as another reason that has propelled the closing down of foundries and shrinkage of the industry. This lack of competitiveness manifested in failure by foundries to sustain and grow market share due to a number of reasons, which included the availability of cheap imports from other countries, use of outdated equipment that slows down production output, and lack of training and expertise owing to lack of proprietary investment within the industry.

Price competitiveness and labour costs affect the operation of local foundries that, in turn, determines whether foundry companies remain sustainable or not. The upsurge in foreign competition capable of supplying cheap castings, coupled with the rising costs of labour make it difficult for local foundries to compete, leading to closures.

"… I think one of the issues I guess is a lack of, yes I think, is a lack of competitiveness with, you know, alternative suppliers, mainly overseas suppliers …" (Participant 2).

"… I think, typically those changes could have arisen through, you might say reasons that were brought on by the foundry itself, okay, either it became less competitive, or prices went up. So, it lost customers or lost market share …" (Participant 3).

"… and the main reason for all of those closures has been price competitiveness …" (Participant 5).

"… So, we can't compete with the pricing model from overseas …" (Participant 8).

"… Also, the cost of running a foundry in South Africa has been substantially and the regulatory requirements are so stringent that investors are not encouraged to invest. As a result, foundries have to increase the price of castings, and this has made them less competitive than foundries in China …" (Participant 11).

6.7.1.2 The influx of cheap imports

The imports of castings from other countries, such as China and India, have had a detrimental impact on the sustainable competitiveness of foundries in South Africa (SAIF, 2015, Lochner *et al*., 2020). Foreign foundries offer cheap pricing for relatively similar, if not, better quality casting products as compared to local foundries and this has led to a reduction in demand for local castings. As a result of these cheap imports, production volumes within foundries have declined, with some foundries closing down as they can no longer sustain operations and associated costs at low volumes.

"… the first answer will be because of the fairly cheap imports we get from countries like China, India, and Brazil … because as you know we can buy the castings. We do, at one stage, we used to import from China, and it is like 100% cheaper buying from China than locally…

… I will still blame the cheap import from India, China, Brazil and of course our government is not controlling the export of raw material, as you know …" (Participant 1).

"… because when I went to China to find out why they were so bloody cheap … I found that their labour was a third of our costs … and the equipment that they were using, was all old second-hand equipment, simple equipment. So, the investment is dependent on the market that you're servicing …"
(Participant 5).

"… and what I know, is a lot of foundries have struggled with very cheap imports from India, and China, and these countries …" (Participant 7).

"… and I would also say, well, majority of the stuff, I would also say is imports into South Africa from overseas … we can't compete with the pricing model from overseas … compared to local, local prices …"
(Participant 8).

"… foundries have closed down because of the influx of imports from China. Government is allowing this to happen, and our foundries cannot compete with the foundries in China …" (Participant 9).

"… so, what we've seen is the prices that they were able to import for, you know, in the past few years from China, you know, is that it's below our cost prices, you know …" (Participant 12).

6.7.1.3 Lack of technology advancement

The lack of investment in advanced manufacturing software and the latest foundry technology has meant that foundry companies continue to use old methods of casting that take longer and do not guarantee high quality products, especially when less experienced employees are left to do the job. Competing foundry companies in more developed countries are seen as having a competitive advantage gained through the use of state-of-the-art technology, which enables them to produce better quality castings at faster rates than South African foundries, leading to more improved delivery lead times (Davies, 2015).

"… there has been a lot of technological improvements that's occurred in overseas and everywhere, but haven't been readily adopted by South African foundries …

… it also comes back to the willingness of your workforce to adapt to new technology …" (Participant 2).

"… it's a matter of identifying what is critical to your process and how can the new technologies assist you …

… we spoke robotics, artificial intelligence, 3D printing, all of those sorts of things, those, you know, fourth industrial revolution type of technologies that are available to foundries now …" (Participant 3).

"… If you don't invest ... The market is changing so quickly, with technology these days, if you don't invest, that is a problem …" (Participant 7).

"… the industry has not adapted to changes in the international world where countries like Germany now use specialised technology and it is difficult for us to compete with what we have …" (Participant 10).

6.7.1.4 High foundry operational costs

The various operational costs, such as energy or electricity costs, raw material costs, high wage demands from unionised (and non-unionised) labour, high scrap rates and plant maintenance costs, pushes up the costs of "running" a foundry. The difficulty in absorbing these costs by the foundry companies leads to an escalation in the price of castings when compared to what foreign foundry companies charge for the same type of castings.

The impact of the influx of cheap castings from other countries is exacerbated by the high operational costs that local foundries incur in their day-to-day production activities (Davies, 2015; Jardine, 2015b). These costs are inevitably passed on to customers in the form of high prices for castings manufactured in South Africa and as a result, making them less competitive.

These perspectives were shared as indicated below:

"… you know, the unions and the organisation and the workforces has made, has driven up the cost of labour …" *(Participant 2)*.

"… if you have a labour-intensive operation, working multiple shifts in such an operation is often not the desired results, if you like, because … often shifts carry a burden of additional costs … the introduction of certain compliance factors like the issues around environmental compliance, waste disposal which has caused some foundries high additional costs …" *(Participant 3)*.

"… so, the cost of capital is exceedingly high in this country because the interest rates are so much higher than in the countries, in the Western countries that we compete against … you got to be competitive and under the Labour Laws, etcetera, how do you do that? I mean, here, the country at the moment has got no money. The Government has got no money, but the guys are striking for 18% increases … the labour costs in China is a third of our costs …" *(Participant 5)*.

"… but the things that are very critical for a foundry's success is ... It is very energy intensive, so electricity prices are very important. And we all know what happened with electricity prices. If I just take our foundry, electricity as a proportion of our overall cost, increased from five percent of total cost to about fourteen percent. So almost a three hundred percent increase on energy costs. Okay ...

… so, I would say labour costs. But labour cost is an equation of labour rate times units of labour used … so it is not just that the labour rate has increased above inflation. If you look at all the foundries belonging to the Metal and Engineering Industries Bargaining Council (MEIBC) … and if you go and look over this fifteen-year period what the salary increases have been in this industry …"
(Participant 7).

"… the cost of running a foundry has escalated over the years with electricity costs, environmental, legislation costs and labour costs being very high as compared to other countries …" *(Participant 10)*.

"… also, the cost of running a foundry in South Africa has been substantially and the regulatory requirements are so stringent that investors are not encouraged to invest …" *(Participant 11)*.

"… so, yes, it's just, and then obviously also costs to maintain and comply with, you know, your emissions licenses and, you know, the waste removal and you know, there's much that we have to do to ensure that we are compliant with the environment and all that. So, now all those costs add up and it's just, it's become really hard to maintain momentum and make profits in a foundry, you know, with all these additional costs. But I would say the main thing has been the imports from China that has also affected us …"
(Participant 12).

6.7.1.5 The government's role as watchdog

The closing down of foundries in South Africa has also been partly attributed to failure by the government to institute some measure of control that relates to the exporting of foundry raw materials, such as scrap metal to other countries, thereby, creating artificial shortages for foundry companies (Dlambulo, 2019; Mkansi *et al.*, 2018). This activity also ensures that only the high-quality raw materials are exported whilst substandard raw materials are left behind for use by local foundries (Davies, 2015). The government's role as a watchdog was identified in three areas which included: i) pricing, price competitiveness and labour costs, ii) compliance factors and iii) legislations governing Black economic empowerment.

6.7.1.5.1 Stringent regulatory compliance

The costs of compliance to legislations governing the running of metal foundries in South Africa have been identified as a factor influencing competitiveness (Lochner *et al*., 2020). Environmental and air quality management compliance, as well as waste disposal were identified as crucial legislations that local foundries had to satisfy, although the feeling was that the costs were exorbitant and prohibitive. These costs contributed to some foundries scaling down on production and others closing down.

"… It should be a lot easier; I understand there should be some environmental concern, but it should be a lot easier to go into foundries. If you want to start a foundry today from the word, go, from scratch … It will take you two years to start your first mould if you do it legally, Luckson … two years, eighteen months to two years, ja … to get your environmental licence to run a foundry … it is really expensive to get it … the best part of two million rand I believe …" *(Participant 1)*.

"… those are the issues around government policy shifts, but then couple with that, one also has the introduction of certain compliance factors like the issues around environmental compliance, waste disposal which has caused some foundries high additional costs …

… so, in terms of compliance, they've set the bar extremely high, especially on the environmental side …" *(Participant 3)*.

"… the environmental impact studies and everything that you have to do, is just totally prohibitive … new environmental legislation … labour law changes …

… these kinds of things that have brought additional stress onto foundries, which already were struggling with their markets evaporating … I think that is one of the things that challenged them a lot …"

(Participant 7).

"… there's lots of government legislation that foundries have to adhere to … environmental, what's the word, quality on the, your emissions, all those, the factors do have a cost to them … and then also the orders. If there's no orders, a foundry can't continue …" *(Participant 8)*.

"… the cost of running a foundry has escalated over the years with electricity costs, environmental, legislation costs and labour costs being very high as compared to other countries …"

(Participant 10).

"… obviously also costs to maintain and comply with, you know, your emissions licenses and, you know, the waste removal and you know, there's much that we have to do to ensure that we are compliant with the environment and all that …

… the costs you've got to go on and all the environmental compliance and air emissions licenses and dust monitoring and location-wise you've got to be, you know, you've got to look after the environment … and so, to start up a new foundry will cost a few hundred million …" *(Participant 12)*.

The South African government's legislation around transformation within local industries and the drive for broad-based Black economic empowerment was also identified as a reason for the lack of sustainable competitiveness for some family-owned foundry companies, resulting in closures because of lack of government support. Some family-owned foundries were identified as not being receptive to the idea of transformation, preferring to keep the running of the business within the family structures. This meant that the foundries did not meet the minimum requirements set by the government to avail support, leading to scaling down or closures.

"… most foundries are family-owned and because of BBBEE requirements the government cannot support them as they hardly transform … without government support these have battled to survive …"

(Participant 10).

6.7.1.6 Ageing infrastructure and lack of investment

The use of old equipment and lack of investment in equipment has meant that the industry has lagged behind in terms of the methodology of casting products, precision in the casting process as well as the speed of casting (Jardine, 2015b; Davies, 2015). These elements have impacted negatively on the quality of castings manufactured, volume of scraps made as well as lead times on delivery – elements essential for foundry companies to compete sustainably, both locally and internationally.

"… I am going to make a comment that I know maybe twenty foundries with some details of them and the majority of them has got equipment that is sixty to eighty years old …" *(Participant 1)*.

"… well, it also comes into money, is the lack of, you know, capital investment in new furnaces that use less electricity and new moulding machines that are more efficient and less, and more, you know, more reliable …" *(Participant 2)*.

"… but one of the bigger is almost total lack of investment. You know, if you look at the number of foundries that are running equipment which is thirty to fifty years old. Now, there's no way you can compete against anybody, whether it's your local competitor or whether it's international, on outdated equipment …" *(Participant 4)*.

"… for infrastructure; if you ... If your plant is old, it takes away your competitive advantage. Because things will break down, they will need a lot of electricity, they will be slow. And in a foundry space, you consume a whole lot of electricity as it is. So, you rather have a plant that is so efficient that it will give you an advantage. So, if you invest in your plant, you are better off than your competitors …" *(Participant 6)*.

"… old equipment used is problematic for foundries who want to compete globally …" *(Participant 9)*.

"… old technology used and yet managers are expected to hit targets and remain competitive …" *(Participant 10)*.

6.7.1.7 Lack of knowledge and skills (Limited investment in training)

The general appreciation of the decline in the number of foundries is also attributed to lack of knowledge and skills base within the industry. The demand for high salary increments, which the industry can barely afford, promotes the high attrition of skilled employees and technicians. In the same vein, the lack of investment in new technology and infrastructure means that the industry cannot afford to attract highly qualified personnel.

The lack of training and skills for the employees contribute to the lack of innovation that, in turn, diminishes the industry's ability to adapt to both environmental and technological challenges that would enhance the competitiveness of foundry companies within the industry.

"… there is no way you can make a decent casting if your employees aren't sufficiently skilled, and at the moment, sorry, ja, to add to that …

… we have slipped up a lot, and this comes back to skills, it comes back to the skills of your workforce, it also comes back to the willingness of your workforce to adapt to new technology …" *(Participant 2)*.

"… so, a lot of technical skills that were developed, basically it just dried up for about ten years, and then it sort of, tried to start up again, but I think, there was a lot of momentum lost. So, a lot of skills development potential was lost in the country …

… there are still some people that are employed that, who's reading skills, particularly in English, are poor. Yet, all the documentation for the company and the standard operating procedures and all that are all in English …" *(Participant 3)*.

"… they are prevalent in a lot of industries that we have a huge lack of skills. And so, anything we can do to upgrade the skills, you know, within the foundry industry is going to make a big difference to our industry …" *(Participant 4)*.

"… poor investments made it very difficult for you to keep skilled artisans …" *(Participant 5)*.

"… and other than that, there isn't something that I can actually think of, and oh, skill shortage … there is a serious skill shortage in the people in the foundry industry …" *(Participant 8)*.

"… include lack of adequate skills base from employees making innovation difficult ..." *(Participant 11)*.

6.7.2 Key outcomes from Theme 1: Reasons for the closure of foundries

Table 6.9 provides a summarised view of the reasons provided by the participants on the closure of foundry companies over the last couple of decades.

Table 6.9: Summary of reasons for the closure of foundries

Codes	Occurrences (frequency of responses)
○ High foundry operational costs	8
○ Stringent regulatory compliance	8
○ Lack of knowledge and skills (limited investment in training)	7
○ Ageing infrastructure and lack of investment	6
○ Influx of cheap imports	6
○ Reduced customer demand	6
○ Lack of price competitiveness	5
○ Lack of technology advancement	4
○ Consolidation or mergers within foundries	3
Totals	**53**

As discussed in this chapter, the general overarching perspectives from the participants was that the closure of foundries in South Africa could be attributed mainly to five aspects, which included:

i) *the lack of price competitiveness*, which meant that customers were seeking out cheaper suppliers who comprised mainly of foreign foundries,

ii) *ageing infrastructure*, which negatively impacted on the way local foundries serviced the local market and led to a high scrap rate,

iii) *lack of technology advancement*, which was detrimental to the ability of foundries to become innovative and manufacture complex castings,

iv) *lack of knowledge and skills*, which stalled the process of innovation and meant that limited new ideas to address foundry production and process problems could be implemented and,

v) *consolidation within foundries* – the high costs of doing business for local foundries drove a number of companies to the brink of collapse and the only way they could stay “afloat” was for the owners to sell their companies to better performing foundries. This process contributed to the decrease in the overall number of foundries in operation in South Africa.

The costs of running foundries were also viewed as preventing foundry companies from reducing their prices in order for them to match the imports pricing. Lack of investment was also a key reason provided for lack of sustainable competitiveness of local foundry companies. This lack of investment had the ripple effect of dissuading skilled labour from investing their intellectual properties in the industry.

The lack of investment in employees, through training and development, was also a factor identified as driving the closure of foundries. One participant indicated that training of employees within the industry had “dried up” and this prevented local foundries from actively competing with foreign foundries capable of upskilling and training their employees on state-of-the-art foundry technology. The lack of drive and cohesiveness by the different foundry companies to share ideas and lobby the government for assistance was also identified as a challenge, which led to the closing down of some of the companies.

This perspective was also experienced by the researcher during the interview phase preparations, where some foundry companies mentioned that they *“did not involve themselves in these sorts of studies”* signifying the “lack of unity” and “mafia mentality”, as pointed out by two participants. Figure 6.3 provides a network diagram that summarises the reasons for foundry closures, as detailed in the analysis of the participants’ perspectives.

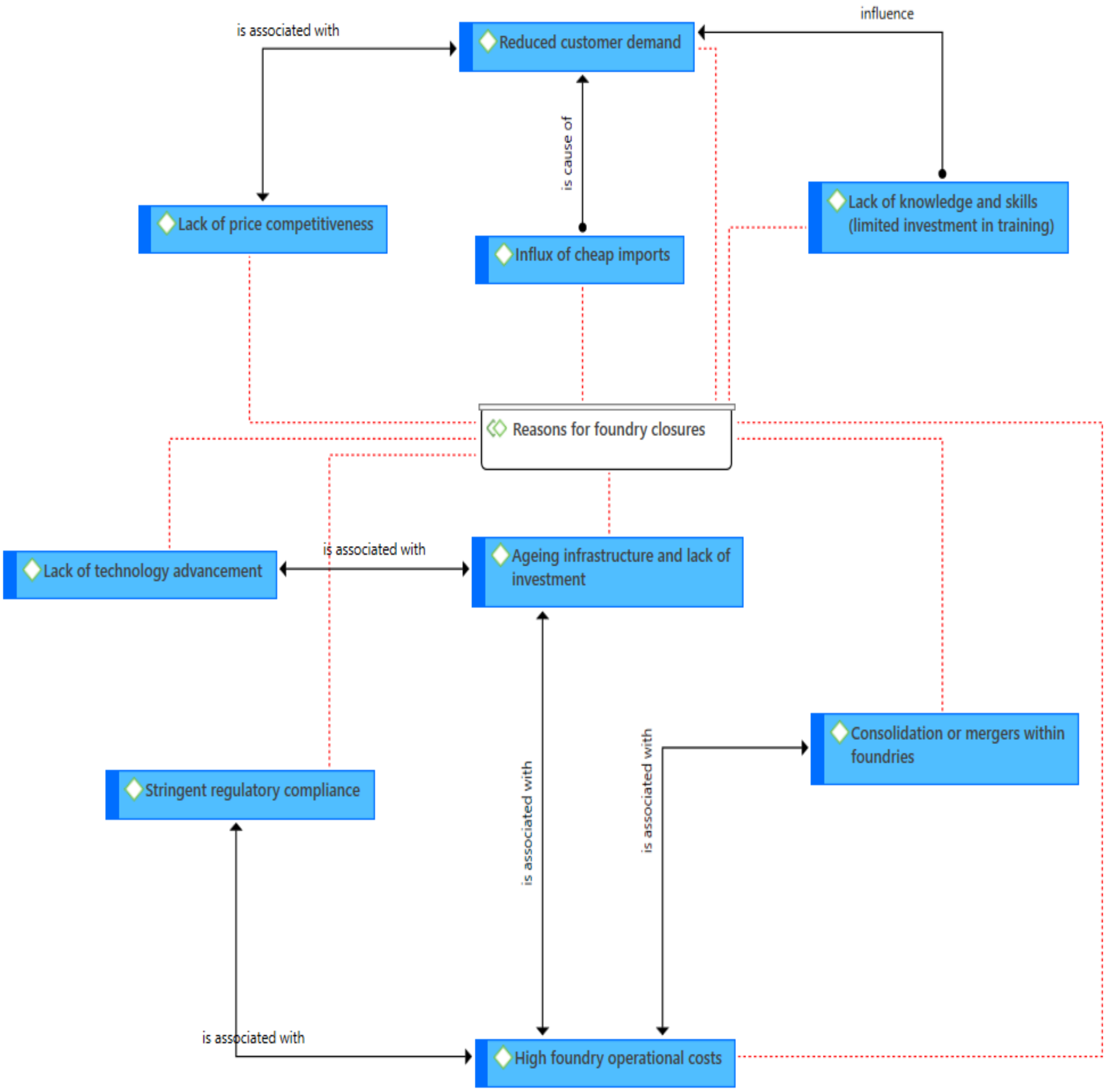

Figure 6.3: Network diagram of reasons for the closure of foundries

Source: Author's own compilation (2022)

The next section discusses the second theme identified in the study: drivers of sustainable competitive advantage.

6.8 THEME 2: DRIVERS OF SCA FOR THE SOUTH AFRICAN FOUNDRY INDUSTRY

Literature identified several factors which were categorised as either micro drivers or macro drivers of SCA (see chapter 3) and in line with the study's objective of benchmarking the perceptions of industry stakeholders on SCA, in light of the micro and macro drivers identified in literature, these drivers were tested within the South African context to determine which ones were deemed important. These are summarised in table 6.10.

Table 6.10: Participants' perspectives on the drivers of SCA for foundries

Theme	Category	Code
Open coding		
6.6.3 Drivers of sustainable competitive advantage	***6.6.3.1 Micro drivers for SCA***	6.6.3.1.1 Investment in plant and infrastructure (1) Interest rates and cheap imports
		6.6.3.1.2 Employee skills development (3) Insufficient artisans and skills to deliver quality products
		6.6.3.1.3 Product: service differentiation, Product range (4) and setting yourself apart
		6.6.3.1.4 Organisational culture (5) Rigid organisational culture leads to a lack of flexibility and innovation
		6.6.3.1.5 Governance (6) Good governance is the foundation of a successful organisation
		6.6.3.1.6 Price competitiveness (7) Price versus quality *Alternative view* Stick to your process and know what you are doing
		6.6.3.1.7 Product quality (8) Quality products that can be exported
		6.6.3.1.8 Ability to innovate (9) Research, improve and adapt to render the best quality at the lowest cost
		6.6.3.1.9 Technology upgrade (10) The need to upgrade equipment
		6.6.3.1.10 Production raw material input cost (11) Knowing and monitoring your overhead costs, metal ratios
		6.6.3.1.11 Exposure to the export market (13) Market exposure, or export market
		6.6.3.1.12 Certification ISO standards and product certifications lack time, seeing the need and compliance
		6.6.3.1.13 Possession of intellectual property, Owning the intellectual property versus owning the foundry

Theme	Category	Code
Open coding		
		6.6.3.1.14 Managerial choice (decision making process [17])
		6.6.3.1.15 Value-add to customers (20) If you have a product, you also need a customer to use it
	6.6.3.2 Macro drivers for SCA	6.6.3.2.1 Energy cost (1) Cost and reliable source of supply
		6.6.3.2.2 Geographical location, Location and access (to ports)
		6.6.3.2.3 Industry entry and exit barriers (3) Licensing, time and cost
		6.6.3.2.4 Customer bargaining power, Meeting the criteria and making a decent profit
		6.6.3.2.5 Government incentives, Incentives, tariffs or import quotas give a competitive advantage
		6.6.3.2.6 Market perception of the foundry company (6) Reputation, representation and reliability, quality and cost influence market perception of the company
		6.6.3.2.7 Views on localisation, Local content enforcement, government incentives, tariffs or import quotas are needed
		6.6.3.2.8 Regulatory instruments (8) Related to other macro factors
		6.6.3.2.9 The number of foundry companies (9) "*it is like the mafia*"
		6.6.3.2.10 The availability of substitutes for casting products (10) The more substitutes, the higher the likelihood that (a local) product is not used

As indicated, table 6.10 reports on the micro and macro drivers of sustainable competitive advantage for foundries in South Africa. As discussed in chapter 3, micro drivers related to factors internal to the companies that influenced SCA, whereas macro drivers were external factors that also influenced SCA. The next section discusses the qualitative findings related to the micro drivers.

6.8.1 Micro drivers for sustainable competitive advantage

Out of a possible 20 micro drivers identified from literature, in response to the question on what five micro drivers were considered important to the SCA of foundry companies in South Africa, the participants identified a total of 15 different drivers classified as shown in table 6.11.

As indicated, cluster membership, socio-cultural responsibility, possession of intellectual property, bargaining power over suppliers and possession of unique resources, inimitable to competition were not selected by any participant, signifying that these were not regarded as micro drivers, which were important to the foundry industry in South Africa.

Table 6.11: Matrix of important micro drivers for the South African foundry SCA

Item No. on interview schedule	Drivers	Participants													
	Micro drivers for Sustainable Competitive Advantage	1	2	3	4	5	6	7	8	9	10	11	12	Frequency	Rank
3	Employee skills development (Human capital)	x	x	x	x	x	x			x	x	x	x	10	1
1	Investment in plant infrastructure				x	x	x	x		x		x		6	2
8	Product quality	x	x			x			x			x	x	6	2
9	Ability to innovate (research and development)		x		x			x		x		x	x	6	2
10	Technology (equipment) upgrade		x	x		x		x	x		x			6	2
4	Product (service) differentiation	x		x	x								x	4	6
7	Price competitiveness		x	x					x		x			4	6
11	Production (raw material input) costs	x						x				x	x	4	6
13	Exposure to export market (degree of internationalisation)						x	x			x			3	9
20	Value-add for the customer			x					x	x				3	9
5	Organisational culture					x	x							2	11
15	Certifications (ISO standards, product certifications)								x	x				2	11
17	Managerial choice (decision making process)				x						x			2	11
6	Governance						x							1	14
12	Firm capacity (size)	x												1	14
2	Cluster membership (e.g., South African Institute of Foundries)													0	16
14	Socio-cultural responsibility (corporate social investment)													0	16
16	Possession of intellectual property													0	16
18	Bargaining power over suppliers													0	16
19	Possession of unique resources (inimitable to competition)													0	16

Employee skills development was identified by ten participants as an important micro driver influencing SCA, whilst investment in plant infrastructure, product quality, ability to innovate and technology upgrade each were identified by six participants as being important micro drivers influencing SCA.

6.8.1.1 Investment in plant infrastructure

The investment in plant infrastructure by South African foundries was also viewed as an important driver for enhancing SCA. The foundry industry has been touted as one of the oldest industries in the country, founded in the 19th century (SAIF, 2015). Although there have been significant improvements on the technology and machinery used in the casting process since then, this industry has lagged in its adoption of state-of-the-art equipment and technology (Kaziboni & Rustomjee, 2018). One participant stated that the industry itself had done little to help the foundry companies upgrade machinery and technology.

"I don't think the foundry industry has really invested money into their industry … they have taken money into the back pocket …" (Participant 1).

The industry is characterised by ageing equipment and the use of old technology, which stifles the competitiveness of the foundries against foreign competition and deters experienced personnel and graduates from joining the industry, due to limited prospects of growth (NFTN, 2015; SAIF, 2015).

"… well, it also comes into money, is the lack of, you know, capital investment in new furnaces that use less electricity and new moulding machines that are more efficient and less, and more, you know, more reliable …" (Participant 2).

"… but it's all a critical dimension that our interest rates are still too high in South Africa for really enhanced capital investment, you know. So, foundries have to borrow money to invest and the, if you like, the competition particularly in Europe, North America, China, India can borrow money much cheaper, you know. So, it makes it difficult to compete …" (Participant 3).

"… I think, in my opinion, the main reasons, there are a number of, obviously a lot of reasons, but one of the bigger is almost total lack of investment. You know, if you look at the number of foundries that are running equipment, which is thirty to fifty years old. Now, there's no way you can compete against anybody, whether it's your local competitor or whether it's international, on outdated equipment …" (Participant 4).

"… so, the investment in plant and infrastructure is dependent, first of all, on the size of the market and what kind of investment, because when I went to China to find out why they were so bloody cheap …

… If you haven't got a market, if you haven't got volume, you can't invest in plant and equipment. You've got to have volume …" (Participant 5).

"... you have got investment in plant infrastructure – that is critical … if you don't invest, the market is changing so quickly, with technology these days, if you don't invest, that is a problem … our foundry is investing six, seven percent of its annual turnover every year in plant and equipment. And we are one of the top foundries – not even in the country, in the world, just because we do that. So, investment is critical …" (Participant 7).

"… lack of government support or investment so that foundries can upgrade their technologies – they are always lagging behind …" (Participant 9).

"… also, the cost of running a foundry in South Africa has been substantially and the regulatory requirements are so stringent that investors are not encouraged to invest …

… lack of investment also makes it difficult for managers to implement different ideas because of lack of resources to make the foundries competitive …" (Participant 11).

6.8.1.2 Employee skills development (Human capital)

Eighty three percent (83%) of the participants believed that employee skills were an important driver for SCA. There was a general feeling that whilst foundry companies could survive with ageing equipment or technology in some instances, skills development was a key driver in the survival and ability of foundries to improve product quality and compete with foreign foundries.

"… you know you could say okay well you obviously going improve on your quality if you improve your skills development so then you can take that out of the picture because that would be a given … there is no way you can make a decent casting if your employees aren't sufficiently skilled …

… we have slipped up a lot, and this comes back to skills, it comes back to the skills of your workforce, it also comes back to the willingness of your workforce to adapt to new technology …" (Participant 2).

"… not just in the field of, let's call it metal casting, but also in the field of, you know, fitters and turners and electricians and mechanics. So, a lot of technical skills that were developed, basically it just dried up for about ten years. And then, it sort of tried to start up again, but I think, there was a lot of momentum lost. So, a lot of skills development potential was lost in the country ...

… and we still feel that today, because there's still a dearth of skills with respect to those essential skills in foundries … you know, one really needs to have the, yeah, how can I call it, the skills and the brainpower in order to be able to have a sustainable competitive advantage ...

… I'm up on that, because I believe that the skills development, you know, continuous training and education of your staff and, you know, bringing people all to sort of leadership positions is all about how you win the game. And, you know, you only have to look at the Springbok rugby team for that ... and then the last really big challenge for me is the whole question of, you know, continuous skills availability. Because without the,

without the skills you basically will not going to be able to sustain an industry at all …"

(Participant 3).

"Your number 3, employee skills development. That gets back to what I was talking about and when I talk about employee skills development, I'm talking everyone from the managing director down …

… well, that's a vital driver, because without the skills at grass roots and all levels, you… unfortunately, there's a degree of mechanisation you can do, but it's absolutely crucial that people operational from the management to the operational down to the man sweeping the floor understands the process. You need to understand the process all the time … well, I think training, real training, not necessarily academic training, practical training, so that we have a very skilled workforce …"

(Participant 4).

"… because they can, if there is a demand for their services, because there aren't enough skilled artisans. So … yes. Skilled artisans in the foundry Industry if you invest in capital equipment, is absolutely critical, especially if you're talking about automatic moulding or electric melting …

… and so, with the strength of our unions, with the shortage of our skills … with the high cost of electricity, I just don't know where to find a sustainable competitive advantage …"

(Participant 5).

"… and then when I am talking about skills development, or employee skills development; what I have noticed about our South African foundries is, we are even proud of ourselves to say we have hired people from the street, and we haven't even empowered them anyhow. But my thinking at the moment is, to be able to gain competitive advantage you need people – employees that are able to think beyond what they are doing – they are the value chain of the whole company. To be able to see that whatever they are doing is making it easy for the next guy in line that will be receiving this part, before it becomes the final product, or the end ... whatever the customer has ordered …

… and then, the companies themselves, they should be focussing on things like continuous improvement, skills development …" *(Participant 6)*.

"… and other than that, there isn't something that I can actually think of, and oh, skill shortage. There is a serious skill shortage in the people in the foundry industry …" *(Participant 8)*.

"... employee skills and the ability to be competitive in casting sales is important for sustainable competitive advantage. This must be supported by good managerial leadership decisions and technology. A well-placed foundry will find it easier to sell in other countries thereby being competitive …"

(Participant 10).

"… well, from my, my personal opinion definitely is employee skills development, you know. You've got to have to have the right guys in the various departments of the foundry, you know, to be able to run each department smoothly and make sure you can deliver a quality product … there's definitely, there's this

challenge of skills as well in the industry. Like pattern making is becoming a dying breed. You know, we've got, we're lucky to have a very, very skilled and qualified pattern maker here that has been with the company for probably …" (Participant 12).

Interestingly, although a majority of the views expressed a need to upskill foundry employees in order to enhance SCA, one participant believed that the issue of skills shortage was no longer a problem for the foundry industry, as measures had been put in place to address this problem.

"… one thing that they cannot complain about too much, anymore ... this is probably a fifteen year ago problem – was technical skills. But the University of Johannesburg (UJ) and so on have done a lot of work, and there are sufficient foundry people being educated today. So, I wouldn't say ...

… experience is maybe something but, I wouldn't say skills. Because there is a lot of talent and skills coming into the ... into the market. So, it is not a problem, if you ask me that has been solved …"

(Participant 7).

6.8.1.3 Product (service) differentiation

Four participants identified product or service differentiation as an important driver for enhancing SCA. One participant highlighted this perspective by pointing out that foundries had to realise that they served specific customers with specific needs and, therefore, it was important to ensure their products also reflected this realisation, so that their customers could appreciate them.

"… for me that's absolutely key, because in order to be able to service a particular market and, you know, when I say the market, the market is really made up of generic type products, but in fact, it's made up of specific customers …

… and so, that differentiation, you need to set yourself apart in terms of, not only the givens like having a competitive price, but, and a good quality, but specifically to be able to offer that service of continuous improvements, so that you're always looking for a way in which your customer can benefit from your intellectual knowledge and, or property …" (Participant 3).

"… in our case product differentiation is also quite a key thing. We aren't you know, caught up into one product line or industry. We supply multiple industries. So, for me that's definitely one key thing … but you've got to be competitive with your cost and obviously you've got to, in our case like I have said, you've got to differentiate …" (Participant 12).

6.8.1.4 Organisational culture

Two participants identified organisational culture as an important micro driver for enhancing SCA. The general belief around organisational culture was that foundry companies that have internal structures that support their ability to compete would perform better than those that did not.

"… because things like the socio-culture, the strikes, the export, exposure to export market, you've got to be competitive, and I've said to you that South African foundries are no longer competitive …

… organisational structure and culture. You've got to have a low overhead structure if you possibly can …"
(Participant 5).

"… that goes into organisational culture. Even a culture ... It is a culture of the organisation is so rigid that they are thinking that we did this thing this way, or my grandfather did it this way, my uncle did it this way – you will not be competitive. You need to have an organisation culture that is so flexible that you are ...

… even why you have a business is to make money, and if your culture is to say; we are doing it this way while you are still facing problems, you are not even changing ... You don't even have the ability to be able to change with the environment, how are you going to be able to gain the competitive advantage? So, the organisational culture is a driver to sustainable competitive advantage …"
(Participant 6).

6.8.1.5 Governance

Only one participant identified governance as a driver capable of influencing a foundry company's ability to gain and sustain competitive advantage. Sajjad, Abbas and Hussain (2019) mention that corporate governance is related to product market competitiveness and, so, it is deemed important for foundry companies to prioritise proper governance policies in order to improve of competitiveness.

"… governance ... I think in every organisation, starting with government and everything ... If there is no good governance, how do I even ... What more can I even say when it comes to governance? It is the foundation of a successful business, or a successful organisation – let's put it that way …

… governance is basically a foundation and if you don't ... If you don't have good governance, it does not matter what you are trying to do …" *(Participant 6)*.

6.8.1.6 Price competitiveness

The influx of cheap casting imports into the South African market has been identified as one of the reasons for the closing down of local foundries (Davies, 2015; NFTN, 2015; Lochner *et al*., 2020). The ability for foundry companies to be price competitive provides them with an edge over a foreign foundry. A number of factors, which include the introduction of cost containment measures and optimising the casting manufacturing process, are key in determining the level of price competitiveness for foundry companies.

"… you see, an interesting lot of options you have given me because price competitiveness is always going to be a factor …" *(Participant 2)*.

"… they always had this idea of being able to, they wanted us to reduce the price of our products every year by 4%. That was the target. Not increase the price, reduce the price …" *(Participant 3)*.

"… everything revolves about how much, what's your price. I found that some companies rather look at the price only, rather than the quality. So, if you are out on your pricing, you're not going to get the job … so, again, the lower the cost, the lower your price as well … how do they say? Cash is king. So, if you can't lower your price, you're basically not going to get an order …

… the price competitiveness. If you're not competitive the imports are going to ruin, you and the other foundries are also going to ruin you …" *(Participant 8)*.

One participant had a different perspective regarding price competitiveness. The participant believed that the issue of price competitiveness was not important in driving SCA and argued that foundry companies should stick to the pricing they are comfortable with, as long as they are assured of the quality of their products.

"… so, we've got to innovate. With saying, in our business, maybe price competitiveness is not really one. We've got to, you know, you've got to stick to your prices. You know what you're doing …"
(Participant 12).

6.8.1.7 Product quality

Casting product quality was identified as one of the important micro drivers for SCA. Six participants agreed that for South African foundries to remain sustainable, it was key for them to ensure they invested in the quality of castings they produced, in order to ensure they were able to compete both in local and international markets.

"… to substitute a high-quality casting is very difficult …" *(Participant 1)*.

"… you know you could say okay well you obviously going improve on your quality if you improve your skills development so then you can take that out of the picture because that would be a given, and not going to be obvious, but then if you just want to take an overall encompassing statement you say well, product quality …

… but you, but now if you get those things right then as a summation of your, or my answers I am saying, competitiveness and proper product quality, because that's the result …" *(Participant 2)*.

"… product quality in an open economy, particularly when you're servicing automotive type companies, you have to, and not only them, but all in the main, all customers want quality… so, you've got to be able to produce a quality product. That's a definite prime requirement …

… and brand loyalty, it's quality. You've got to have quality that can't, that enables you to replace imports …" *(Participant 5)*.

"… and then product quality. That's a given. If you can't deliver the quality of product, then it is as good as no product …" *(Participant 7)*.

"… If you make a product that's of inferior quality, it's not going to come, or you won't get a repeat order and what we have found is that the quality is not good … once again, if you provide a good quality product, the same customer is going to come back again …" *(Participant 8)*.

"… for a foundry to be competitive there must be resources including employees and equipment – this is crucial as it will also promote the manufacturing of quality products …" *(Participant 11)*.

"… and then obviously product quality is very key and a vital factor in our company. You know, you've got to make sure that you've got a quality product that can be exported, you know, worldwide because that is what customers are looking for …

… so, definitely employee skills development, and certainly the product quality. Without that we, ja, if we don't have a quality product, we definitely won't survive …" *(Participant 12)*.

6.8.1.8 Ability to innovate (Research and Development)

Research and development play an important role in getting foundry companies to improve on the quality, type and finish of the castings they manufacture. The existence of research and development departments within the industry helps drive innovation as well as an improvement in the processes used in the casting manufacture (Phele *et al.*, 2005). The advent of new technology, raw materials and processes drive the speed at which companies are able to respond to customer requirements. Specialty foundries are able to remain competitive through identifying niche markets and addressing their needs by instituting innovation through research and development.

"… It's a no-brainer, … but if you cure the problem, you'll get the next work and so on. So, it's a technological sale. So, ability to innovate is crucial ..." (Participant 4).

"… the foundries have run out of new innovative ideas to be able to remain competitive …" (Participant 11).

"… then, you know, ability to innovate is certainly also a key … definitely in my opinion the ability to innovate and to, you know, constantly improve and adapt to make sure that we you know, do not just, we don't fall behind. We constantly improve and innovate and, you know, like I said we're busy with certain ways of moulding, you know, new innovative ways to mould …" (Participant 12).

6.8.1.9 Technology (equipment) upgrade

The application of the latest technology in casting manufacture provides foundry companies with an advantage over competition due to the speed of delivery and the ability to attract skilled employees, such as artisans and engineers (Jardine, 2015b). Specialist companies, such as automotive manufacturers, prefer procuring metal castings from foundries that demonstrate an ability to use the latest technologies in order to enhance precision casting manufacture. A total of 6 participants identified technology upgrade as an important micro driver enhancing SCA.

"… and there has been a lot of technological improvements that's occurred in overseas and everywhere, but haven't readily been adopted by South African foundries ...

… it comes back to, okay, well, you know, the important thing is to get hi-tech equipment, which reduces the human interaction … we are using old, old technology and trying to make a competitive product at the right price and the right quality. And it puts you back on the back foot completely, so getting high-end engineers in will improve the one factor …" (Participant 2).

"… you know, we talk about these, the fourth industrial revolution and all those things very glibly, … but it's a matter of identifying what is critical to your process and how can the new technologies assist you …" (Participant 3).

"… the market is changing so quickly, with technology these days, if you don't invest, that is a problem …" *(Participant 7)*.

"… countries like Germany now use specialised technology and it is difficult for us to compete with what we have …" *(Participant 10)*.

6.8.1.10 Production (raw material input) costs

The ability by foundry companies to minimise or reduce both input and production costs is key in maintaining a low-cost base and, subsequently, assists in keeping the prices of castings low. As identified earlier, the availability of cheap imports and issues around price competitiveness play a role in determining whether foundries close down or continue to operate. A balance, however, needs to be met where foundries are able to reduce costs without compromising on product quality.

"… I don't think a lot of foundries really know their overhead costs from the receiving of raw material to the finish product of a casting … I call it the sand to metal ratio, it is like in your house baking a cake in your oven and you would like to bake a cake that is 80% the size of your oven, or you bake a cake that's 10% the size of your oven. You still going to use the same electricity to produce that cake …

… and a lot of people, or a lot of foundries, don't really care the sand to metal ratio is very critical to make a sustainable value-added casting, and not just to make a casting. Anybody can make a casting … but to make it the most cost-effective way …" *(Participant 1)*.

"… the raw material input costs, as I explained, raw material is about thirty to forty percent of your total cost. And at the moment we are paying higher than international prices for the steel scrap because these guys who export the stuff just say; well, if you don't pay me so much, I can get this price in Pakistan, or India, or China. So, if you don't pay me more, then you can't get it. So, then you are basically impacting forty percent of your costs – you are paying more than the guy in China, who is buying from the same guy …

… at the same time there is a need to ensure costs are maintained lower than those of competition to ensure the foundry can better compete even with Chinese castings … for them to remain competitive it is important that these costs are contained or reduced so that the cost of manufacturing is also reduced. Government incentives such as subsidies can also help by reducing the costs of operation of foundries as well as introducing other support mechanisms to enable foundries to operate optimally …"
(Participant 7).

"… the raw material input cost, that's definitely something that can run away that you need to monitor and make sure that you're on track. You know, we've got a few scrap yards that we phone to make sure that we

[inaudible 12:17] the pricing whenever we do get an increase or so from our supplier that, you know, there is a valid reason for it, you know …

… obviously, most of that foundry consumables and raw materials, they do follow the commodity prices. So, that is a, definitely a key thing, you know. You've got to monitor that and make sure that prices don't run away …" *(Participant 12)*.

6.8.1.11 Exposure to export market (degree of internationalisation)

Exposure to export markets and international trading is an important element for businesses that seek to remain competitive and in operation. Export markets provide foundries with customers outside the country that could be interested in utilising South African castings when manufacturing their products. International trading also exposes local markets to international standards of manufacture, which motivates the foundry companies to improve on their technical know-how and quality of their products.

Three participants identified this driver as important in enhancing SCA for local foundries.

"… but exposure to market, or ... Yes, exposure to market is key if foundries want to continue to survive, you have got to find out what the markets elsewhere want that we here in SA can supply, that way we can compete with them …" *(Participant 6)*.

"… for us personally, the exposure to the export market. I mean, we export one hundred percent of our product … one of ... the third, sort of company ... Foundry group, they have very little export stuff, and they are struggling. So, for me, that is a definite one …

… If you look at global economic situations because we are exporting one hundred percent of our product, okay? Our plant today is four times bigger in terms of capacity, than it was fifteen years ago. We are totally buffing the trend of the other foundries in the country. And as I said, this other foundry in Johannesburg which also exports a lot, is in the same boat as us. They are buffing the trend for the rest of the foundries …" *(Participant 7)*.

6.8.1.12 Certifications (ISO standards, product certifications)

Product certification demonstrates the ability of a foundry to manufacture castings with a "fit for purpose" stamp. Certification to such standards as the International Organisation for Standardisation (ISO) range for quality (ISO 9000) or environment (ISO 14000), provide a measure of assurance to customers and other foundry industry stakeholders. It certifies that a foundry company has systems and procedures in place to ensure consistency in casting product manufacture and that the foundry tries to control its processes to ensure the environment is not polluted or damaged. Other certifications such as the America Society for Testing and Materials (ASTM) relate to the quality and type of casting materials used, as well as testing methods used prior to, during and after the casting process. In critical product requirements, such as in the automotive and mining industries, foundries are compelled to ensure certification in order for them to be approved as suppliers into these industries.

Only 2 participants identified certification as a driver enhancing SCA for South African foundries.

"… ISO standards and product certifications. The ISO standards, there's quite a lengthy, or quite a large process that you have to have within your company that you have to adhere to. Re-certification every year … and I think, ja, that can be something that will cause foundries to close down. That people don't always have the time or the need or the want to adhere to all those certifications and standards …" (Participant 8).

"… these are important factors as they drive how well a foundry can compete using internal capabilities. If a foundry wants to sell to countries other than South Africa, they need to have their products certified and complying with international standards otherwise they will not penetrate that market …" (Participant 9).

6.8.1.13 Possession of intellectual property

None of the participants believed that the possession of intellectual property was key in enhancing SCA for South African foundries. The foundry industry manufactures castings according to customer requirements and, to this effect, most of the casting patterns available to the foundries belong to and are designed by the customers.

6.8.1.14 Managerial choice (Decision making process)

The capabilities by management to make informed financial, process and product decisions have a bearing on the ability of foundries to be competitive (Abdulwase *et al*., 2020). Family-owned foundries and those with flat organisational structures tend to make decisions quicker than those with tall organisational structures. Perspectives on managerial choice were dignified by the below:

"… management, the process know-how, the business management. You have to invest. It's no use telling people they must produce effectively, and you don't give them the tools to do the [Cross-Talk 19:07] job … managerial choice, decision making process, yes, very much so. Yeah. Yeah. Okay …" (Participant 4).

6.8.1.15 Value-add for the customer

Value addition entails providing additional value to the customer in ways that are seen as providing the company with an edge over competition (Sjödin, Parida & Jovanovic, 2020). Examples of activities identified as adding value include machining of castings and assisting the customer in developing better casting products, which would reduce machining and processing time, and costs. A total of 3 participants selected value addition as an important driver for foundry SCA.

"… for me, it's a really important ability to be able to identify for your customer things that are going to add value for him, even if it adds a small cost on your own side. But certainly, I've seen and typical examples in the South African market are those companies that are able to produce the casting, machine or finish their casting, sub-assemble or finish assemble it into a final product …

… you can design the casting and the casting process around the final design of the product … nearly all of them have been able to add value and lock in value for their particular customers and particularly with regards to the machining of the component. So, they produce the component in a final form rather than the as cast form …" (Participant 3).

… value added for the customer. The reason why is, if you've got something you need that the customer can use, or to better the customer that will also be to your advantage …" (Participant 8).

6.8.1.16 Firm capacity (size)

Firm capacity relates to the ability of a foundry company to manufacture various sizes of castings as well as have the flexibility to manufacture speciality castings on demand. Only one participant believed that firm capacity or firm size was important in driving SCA. The participant shared the following view:

"… your capacity, you need to be aware of your capabilities as a foundry and not try to please everyone by claiming you can do it all …" (Participant 1).

6.8.1.17 Cluster membership (e.g., South African Institute of Foundrymen)

Although the issue of cluster membership or belonging to an association within the industry was identified in literature as a micro driver enhancing SCA, none of the participants believed this was an important factor within the South African context, with only one participant making a comment on the driver:

"… that, the next thing, cluster membership. I don't think it's relevant …" (Participant 5).

6.8.1.18 Socio-cultural responsibility (corporate social investment)

The ability by companies to be socially responsible was determined in literature as one of the drivers enhancing the ability of the companies to compete sustainably and to increase market share. All participants interviewed did not believe that socio-cultural responsibility or corporate social investment for local foundries was an important micro driver for SCA within the South African market context.

6.8.1.19 Bargaining power over suppliers

Whilst raw material input costs and the availability of cheap imports were placing pressure on foundry companies in their quest to reduce manufacturing costs, none of the participants believed that bargaining power over suppliers was an important driver in enhancing SCA. With foundries closing down and order intakes dipping, local foundry companies do not appear to have consistent manufacturing volumes that would allow them to negotiate better pricing with the suppliers of critical production-driving raw materials.

6.8.1.20 Possession of unique resources (inimitable to competition)

The use of old technology by most local foundries meant that very few opportunities were available to develop and possess unique resources that were inimitable to competition. None of the participants identified this micro driver as being important in driving SCA for the local foundry industry.

6.8.2 Key outcomes on the micro drivers of SCA

Table 6.12 provides a summary of the micro drivers identified in the study as having some level of importance in enhancing foundry SCA.

Table 6.12: Summary of frequency of selection of drivers by participants

Codes	**Occurrences (frequency of responses)**
○ Employee skills development	10
○ Ability to innovate	6
○ Investment in plant infrastructure	6
○ Product quality	6
○ Technology (equipment) upgrade	6
○ Price competitiveness	4
○ Product (service) differentiation	4
○ Production (raw material input) costs	4
○ Exposure to export market (degree of internationalisation)	3
○ Value-add for the customer	3
○ Certifications	2
○ Managerial choice (decision making process)	2
○ Organisational culture	2
○ Governance	1
○ Firm capacity	1
○ Cluster membership	0
○ Bargaining power over suppliers	0
○ Possession of intellectual property	0
○ Possession of unique resources	0
○ Socio-cultural responsibility	0
Totals	**60**

Based on the findings relating to the micro drivers and as indicated in figure 6.4, a total of five drivers were identified as important by many of the participants in enhancing the SCA of South African foundries. These included: i) employee skills development (human capital) (*10 participants*), ii) investment in plant infrastructure (*6 participants*), iii) product quality (*6 participants*), iv) ability to innovate (research and development) (*6 participants*) and v) technology (equipment) upgrade (*6 participants*). Figure 6.4 provides a network diagram signifying the drivers as discussed.

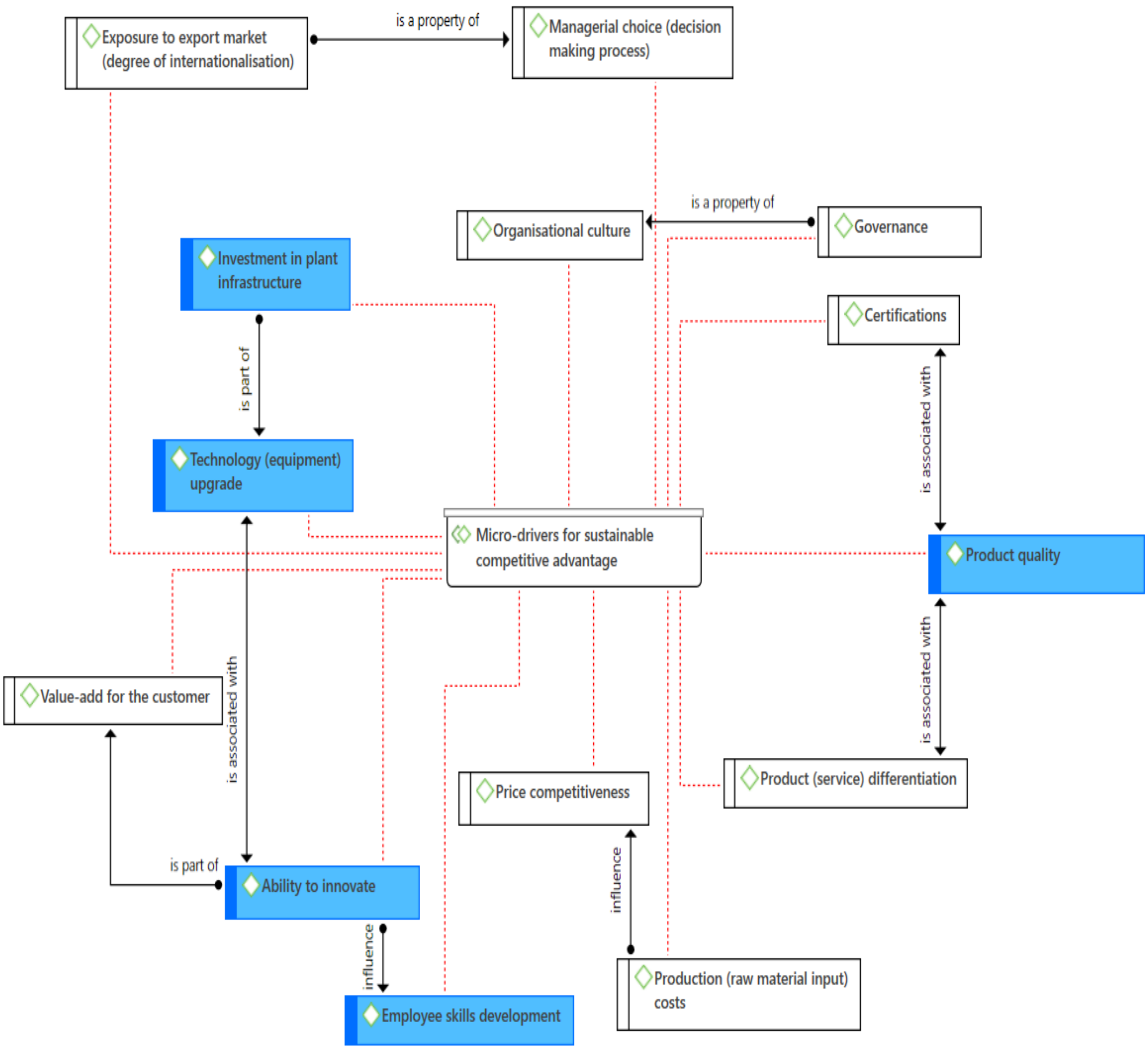

Figure 6.4: Network diagram of micro drivers identified as important for SCA

Source: Author's own compilation (2022)

Although other micro drivers, such as product (service) differentiation, price competitiveness, production (raw material input) costs, exposure to export market (degree of internationalisation), value-add for the customer, organisational culture, certifications (ISO standards, product certifications), managerial choice (decision making process), governance and firm capacity (size), were categorised by some participants as being important in enhancing SCA, only a few participants had selected these drivers.

Cluster membership (e.g., South African Institute of Foundries), socio-cultural responsibility (corporate social investment), possession of intellectual property, bargaining power over suppliers and possession of unique resources (inimitable to competition) were not considered as important drivers for promoting SCA within the South African industry.

The next section discusses the findings relating to the participants' perspectives on the macro drivers and their importance in influencing SCA.

6.8.3 Macro drivers of sustainable competitive advantage

Out of a possible ten macro drivers identified in literature as important in enhancing SCA, five drivers were considered as important by a majority of the participants and these included: i) energy costs (electricity rates) *(12 participants)*, ii) localisation (local content enforcement) *(12 participants)*, iii) government incentives (subsidies) *(9 participants)*, iv) the availability of substitutes *(7 participants)* and v) industry entry and exit barriers *(5 participants)*. These drivers are reported in table 6.13.

Table 6.13: Matrix of important macro drivers for the South African foundry SCA

Item No. on interview schedule	Drivers	Participants													
	Macro drivers for Sustainable Competitive Advantage	1	2	3	4	5	6	7	8	9	10	11	12	Frequency	Rank
1	Energy costs (Electricity rates)	x	x	x	x	x	x	x	x	x	x	x	x	12	1
7	Localisation (Local content enforcement)	x	x	x	x	x	x	x	x	x	x	x	x	12	1
5	Government incentives (Subsidies)		x		x	x	x	x	x	x	x	x		9	3
10	The availability of substitutes for casting products	x		x	x		x		x	x	x	x		8	4
3	Industry entry and exit barriers	x					x	x		x		x	x	6	5
8	Regulatory instruments (import tarrifs, import quotas)	x		x				x				x		4	6
2	Geographical Location				x			x					x	3	7
4	Customer bargaining power	x	x		x									3	7
6	Market perception (Brand loyalty) of the foundry company	x	x	x										3	7
9	The number of foundry companies in South Africa		x						x					2	10

6.8.3.1 Energy costs (Electricity rates)

An average of 43.4% of the foundry cost drivers are due to energy or electricity consumption (SAIF, 2015). All 12 participants in this study identified this as an important driver for SCA, with the general perspective being the fact that rising electricity costs in the country were negatively affecting the ability of the industry to become sustainably competitive.

"… obviously, the number one I have got is the same as your number one, your energy cost, your electricity range …" *(Participant 1)*.

"… Well, it also comes into money, is the lack of, you know, capital investment in new furnaces that use less electricity and new moulding machines that are more efficient and less, and more, you know, more reliable …" *(Participant 2)*.

"… the energy cost for me, because, you know, iron foundries, energy is an increasing cost characteristic. For me that's another factor. One needs to be able to, let's say not only have a competitive cost, but we also need to have a predictable cost ...

… but, you know, you simply can't keep absorbing, let's call it above inflation energy costs and expect that you're going to be able to recover that in productivity improvements in foundries … It's just too much. [Inaudible 38:32] Even with the technologies that are available in terms of simulation and that sort of thing that help us to minimise the amount of waste in foundries, I think it's going to be difficult to recover, you know, 15% energy costs every time, every year … it's not just the cost of energy, it's the reliability of supply …" *(Participant 3)*.

"… well, energy costs, obviously … And energy costs and availability, because of the [Crosstalk 30:28] power, you know, the load shedding is killing us …" *(Participant 4)*.

"… energy cost has just escalated to the point that many foundries that changed to electric melting are in serious problem … I mean, and not only energy costs, but today energy reliability …" (Participant 5).

"… If your plant is old, it takes away your competitive advantage. Because things will break down, they will need a lot of electricity, they will be slow. And in a foundry space, you consume a whole lot of electricity as it is. So, you rather have a plant that is so efficient that it will give you an advantage. So, if you invest in your plant, you are better off than your competitors …" *(Participant 6)*.

"… but the things that are very critical for a foundry's success is ... It is very energy intensive, so electricity prices are very important. And we all know what happened with electricity prices. If I just take our foundry, electricity as a proportion of our overall cost, increased from five percent of total cost to about fourteen percent. So almost a three hundred percent increase on energy costs. Okay?"

(Participant 7).

"… Ja, and there again, once again, the higher your energy costs, the higher your price will be … foundries make use electricity, and once again, cost. The higher the input costs, the higher your output …"

(Participant 8).

"… energy costs are an important component for the foundry industry and higher costs, as is the case currently in SA, makes it difficult to keep the costs down and we are then not competitive …"

(Participant 9).

"… as indicated above, energy costs and support from the government through subsidies and enforcing localisation are critical for competitiveness of foundries …

… electricity cost plays a huge role in driving up costs. Therefore, if it is reduced the foundries will become competitive …" (Participant 10).

"… energy costs are an important element for the foundry. For them to remain competitive it is important that these costs are contained or reduced so that the cost of manufacturing is also reduced …

… unless the costs of energy are reduced drastically, promotion of local procurement enforced and foreign foundries given strict requirements for selling in South Africa, it will be difficult to make them competitive …" (Participant 11).

"… I think obviously also the increases in electricity in the country, you know, for running the furnaces you know, in winter. Especially now June, July August you know, we will be paying, I think it's like, on those furnace accounts, you know, it's nearly double what you would normally pay in a winter month …

… Energy. Yes, I would certainly say energy costs, you know, your electricity rates. We've had another 14% increase. I think that we were notified of yesterday that the municipality is trying to get, you know, so, that is something that could kill a foundry, you know, if the usage we've got, you've got to, it's crucial that you've got that …" (Participant 12).

6.8.3.2 Geographical location

The location of a foundry relative to strategic stakeholders, such as suppliers or customers, was not viewed as an important consideration for enhancing SCA. Only three participants identified this driver as important, with participant 7 even adding that although it was an important driver, it was not critical.

"… I think, geographical location is a factor, because obviously if you're in the Cape, you're not going to compete in Gauteng, for argument's sake … and the geographical location also affects reverse. If you're an export orientated company, it's more advantageous to be near a port … So, I think, that's quite important. If I was looking at establishing a new foundry, geographical location would be important …" (Participant 4).

"… geographic location is important but not critical. But yes, I think that is the next one …" (Participant 7).

"… you know, geographical location, it is like in our case, we are in the 50 km radius within the mines and … so, that is definitely something that is in our favour and something that maybe we haven't explored too much, but that we're trying to get into is supplying the mines, you know, directly, because we are in the 50 km radius …" *(Participant 12)*.

6.8.3.3 Industry entry and exit barriers

The ease and difficulty of entering the foundry industry space as a casting manufacturer was identified by six participants as a macro driver, which has an effect on the SCA for foundries in South Africa. The general feeling, however, was that entry barriers prevented new players from joining the industry and, thus, reducing the level of competitiveness.

"… at the moment, somebody like me, if I want to start a foundry in South Africa ... And if I don't have a market, I will not be able to start a foundry. But if I want to start a foundry, to start a good competitive foundry you will need something between R20 to R30 million ...

… and that is not small change … and I don't think people that want to join the industry have that kind of money. So, if we lower ... If we lower the ... Or we give incentives, or we make it possible for companies to be able to enter the market or the industry, we will be ... We will be ... And I understand. I understand the people that are in, they will rather make it very difficult for the new guys to come in. But, as well, the people that are in are the ones that are battling …" *(Participant 6)*.

"… I would say industry entry and exit barriers, to come into the foundry industry, you know, to start up a new foundry will cost you millions, millions, millions …

… so, if you've got the foundry set up, I mean, we've got our air emissions license, we're compliant in every sense. If you've got the foundry set up, you know, that is ideal. To start a new foundry today is, shew, it will cost you quite a few hundred million to get a foundry started …" (Participant 12).

One participant, however, did not feel that this driver was important enough to enhance SCA as indicated below:

"… industry entry and exit barriers, for me that's quite an interesting one and I do think that's quite an important macro issue. I mean, today we spoke about all the compliance issues …" (Participant 3).

6.8.3.4 Customer bargaining power

Customer bargaining power related to the ability of customers of foundry companies dictating the price they would want to pay for their casting requirements. This behaviour is common in situations where a foundry has a single or very few major customers whose businesses help keep the company afloat. A total of 3 participants viewed this driver as important in enhancing SCA.

"… so, for me, but that's number two on your list, number three is bargaining power of the foundry customers, there is only one industry that can really determine the price of our casting and they will really drive the price down, to me, it is the motor industry …

… they have got a bargaining power because they the only industry today that still buy thousands and thousands of disks, of crank shafts …" (Participant 1).

"… bargaining power, well, you know at the end of the day, it comes down to the … if the customer can bargain, if you can't meet the criteria and make a decent profit …" (Participant 2).

"… the bargaining power of foundry customers … because it's a relatively small market in South Africa and quite a number of players …" (Participant 4).

6.8.3.5 Government incentives (Subsidies)

The provision of incentives or subsidies by the government, in order to support local foundries, was identified by 9 participants as an important macro driver for foundry SCA. According to the views shared, it was important for the government to offer support such as financial leverage and affordable loan (low interest rate) programmes aimed at supporting the growth and sustainable competitiveness of the industry (Nduhura *et al.*, 2017).

"… I think government incentives or subsidies or access to low interest rate funding ..." (Participant 4).

"… government incentives. Now, as you know from Vamcosa … government incentives were a key issue that I was fighting for …" (Participant 5).

"… the government incentives, like I said, if you want to drive – according to me, if you want to drive the market, it will be very difficult for the people to bring their things here ..." (Participant 6).

"… there is one foundry that I know of that got some incentives and subsidies from governmental loans, preferential loans ... And it was an old foundry which was one of the top ones in the country that went basically into liquidation. And these guys revived it and they got some money from government to invest in equipment and things like that, and the foundry is doing much better …" (Participant 7).

"… just think, should you gain a subsidy or incentive from the government, that would help you to bring down costs, once again … And that, according to me, would be a sustainable advantage …"

(Participant 8).

"… government incentives and localisation are key to offering support to ensure SOEs buy from local foundries instead of importing …" *(Participant 9)*.

"… government incentives such as subsidies can also help by reducing the costs of operation of foundries as well as introducing other support mechanisms to enable foundries to operate optimally … lack of government support in the form of subsidies or preferential treatment when it comes to projects by government entities requiring castings – they are free to import instead of buying local …"

(Participant 11).

6.8.3.6 Market perception (Brand loyalty) of the foundry company

Market perception relates to the perspective that customers and other stakeholders have of the foundry company concerned. This also relates to the awareness of foundry companies as brands that customers are willing to support out of loyalty.

"… yeah, so, market perception of the particular foundry, in other words its own reputation, [Crosstalk 39:09] I think is a very important factor. And obviously, you develop representation due to your own reliable supply and quality and pricing programmes and, you know, support for the customer …"

(Participant 3).

6.8.3.7 Localisation (Local content enforcement)

Localisation or local content enforcement is viewed as another important macro driver capable of enhancing the SCA for foundries in South Africa. All 12 participants interviewed identified this as a crucial factor for the local industry. The government was also viewed as an important player in ensuring that local content enforcement is effective. This was also viewed from a government policy perspective and willingness to protect the industry from foreign competition without compromising foreign relations.

"… for me, local content should be almost legalised that you have to say use 70% of any products in the local market must be from the local foundries production, machine shops, paints, whatever you use …

… and for a simple reason, how else will you create jobs, and how else will you make it difficult to import castings? I mean, I am sure you know that people import fully assembled valves at half the price we manufacture in South Africa, I am talking valves not castings, but I think the general term is the same.

For me, local content is a ... it needs to be government and it needs to be implemented as soon as possible across the board. Not only in valves, but any product should be 70% plus localised, so that is my view on that one …" *(Participant 1)*.

"… that's what's giving you work on the doorstep. So, encouraging the localisation and encouraging the customers locally to look, always, or even, to encourage the localisation is a big factor …"
(Participant 2).

"… there was a time when there was a lot of castings produced for the local armaments industry. That industry has shrunk considerably. So, those are the issues around government policy shifts …"
(Participant 3).

"… when the government made it compulsory for the automotive industry to buy local content by weight … That forced the iron foundry industry to substantially increase their capabilities, both in capital investment, as well as in skills …" *(Participant 5)*.

"… the South African government must make it so difficult that it will end up being higher in cost for you to bring it here, than to get it locally. Because that is the way that we can drive the market …"
(Participant 6).

"… If we keep on importing these things, then you are killing the local industry. So, localisation for me would be top ..." *(Participant 7)*.

"… as I will say again, that keeps the exports out, that gives local foundries more, a competitive advantage …" *(Participant 8)*.

"… government incentives and localisation are key to offering support to ensure SOEs buy from local foundries instead of importing …" *(Participant 9)*.

"… the government can do this by stopping imports so that local companies by from local South African foundries. This will also minimise the substitute products that come into the country. Localisation is also important to support the local foundries as SOEs will be forced to buy locally and not import …"
(Participant 10).

"… localisation is important as it allows local industry to support foundries, and this can help save jobs as well as make the South African foundries to become better competitive like the Chinese foundries …"
(Participant 11).

"… and yes, localisation, I think the government will have to push that. And like I said it has been, we've seen it coming through, and I think it's something that we've got to, they've got to localise certain industries and force suppliers and so on to buy locally because it will only improve and help the country …"

(Participant 12).

6.8.3.8 Regulatory instruments (Import tariffs and import quotas)

Regulatory instruments were viewed as a way in which the South African government could assist the foundry industry become more competitive (Nduhura *et al.*, 2017). Although the 4 participants who identified this driver as important, believed that tariffs and import quotas could limit the influx of cheap imports, they seemed cognisant of the fact that too much regulation within the industry would discourage competitiveness.

Some of the participants also believed that the regulatory framework around environmental compliance and emissions was a deterrent for foundries that wanted to grow their businesses or for entrepreneurs who wanted to start new foundries.

"… your regulatory instruments, the import tariffs and the import quotas, for me, the foundries don't need these problems in their lives …" *(Participant 1)*.

"… If I can refer to them like that as one category, because for me those are linked in terms of, okay, local content, enforcement, the government incentives and, or tariffs or import quotas, [Cross-Talk 37:01] regulatory [Inaudible 37:02]. Those are for me all, if you like, government policies or tactics, if you like, or strategies … to enhance, let's call it local production ...

So, I put those three, I've lumped them all together as being [Cross-Talk 37:21] one important … we can call it localisation, if you like, or local content … because they all, they all give rise to more local content. If you put quotas or barriers in place, it does enhance, you know, the localisation programme …"

(Participant 3).

"… I am not in favour of regulatory barriers and things like that, because it doesn't work. If you want, today, to build a new foundry from nothing ... okay? The Environmental Impact Assessment studies (EIA) and everything that you have to do, is just totally prohibitive. First of all, if you want to do an Environmental Impact Study, the Environmental Impact Study is for a specific site – a property site … now, you can't do an Environmental Impact Study on a site that you don't own. So, you must own the land first …

… then you must do an EIA ... which takes you two years. So, you must buy a foundry site, then do the Environmental Impact Study – which takes two years to do. Within this period, you can do nothing ... Just dig a hole in the floor, okay?

… then they will approve your EIA, then you have to start building which will take you another two years … and then you start production, which takes another year … so, you have got to invest hundreds of millions, and wait five years ... Well, two years before you can start building, and five years before you can start to produce. So, to enter is impossible. That is why there is no new foundry in South Africa being built in the last twenty-five years that I have been in the country …" (Participant 7).

"… also, the cost of running a foundry in South Africa has been substantial and the regulatory requirements are so stringent that investors are not encouraged to invest. As a result, foundries have to increase the price of castings and this has made them less competitive than foundries in China …"
(Participant 11).

6.8.3.9 The number of foundry companies in South Africa

Only 2 participants identified the number of foundry companies as an important macro driver for SCA. The 2 participants, however, presented different perspectives regarding how they felt this driver influenced the SCA for the local industry. Participant 2 believed that an increase in the number of foundry companies provided adequate competition within the industry, which would force the companies to improve the quality of their products in order not to be out-competed by their rivals. Participant 8, on the other hand, believed that more foundries would make it difficult for other foundries to compete, whereas if there were few foundry companies, there would be fewer companies to compete with, which provided foundry companies with more opportunities to survive. These perspectives are shown in the following:

"… Ja, I would say, I think the number of foundry companies in South Africa is, you know, it is hard to explain but you can explain I suppose, I can explain. That the more foundries that were here the better would be the image and the overall shall we say quality of the foundry products …" (Participant 2).

"… so, I would also say that directly translates to the number. If there are more foundries, you're going to battle with your products. The less there are, it's not good for the country, but it's good for myself …"
(Participant 8).

6.8.3.10 The availability of substitutes for casting products

The SCA of the foundry industry is affected by the availability of substitute products capable of replacing castings. The advancements in materials technology and the development of processes, such as forging or 3D printing, which can produce these substitute materials quicker and cheaper, have increased the level of competition faced by local foundry companies, leading to the closure of some. A total of 8 participants identified this driver as important in enhancing the SCA of local foundries.

"… and then the last one, substitute for castings, it is a very difficult one for me, because the only way to substitute a proper casting is in the forging and I haven't seen really any forging guys doing any great business in the industry … to substitute a high-quality casting is very difficult …" (Participant 1).

"… you know, the geometric shapes of castings are really important. The [Cross-Talk 42:09] more complicated the shape, the more it lends itself to casting, you know. So, the substitutes for casting are now, I think, the big challenge is with 3D printing and …" (Participant 3).

"… available of substitutes for casting products is, that is also a thorn in the side, because obviously it's using a plastic instead of casting is costing us, but …" (Participant 4).

"… the one substitute for casting ... Yes, that is a threat because we have got things like 3D metal plating at the moment, [inaudible 38:41] from solids, and all those things …" (Participant 6).

"… I would say number 10, the availability of substitutes for casting products … So, the least substitutes there are, the higher the likelihood that my product is going to be used …" (Participant 8).

"… substitutes for casting products – the more of these make it difficult as foundries lose customers …" (Participant 9).

"… substitutes for casting products – the growth of new materials like plastics which can potentially replace castings in other areas is a serious threat to the survival of foundries …" (Participant 10).

"… If there are many substitutes for castings this will make the foundries less competitive …" (Participant 11).

6.8.4 The key outcomes on macro drivers for SCA

Table 6.14 provides an overview of the drivers identified as enhancing foundry SCA in South Africa.

Table 6.14: Summary of important macro drivers for enhancing the SCA of foundries

Codes	Occurrences
○ Energy costs (electricity rates)	12
○ Localisation (local content enforcement)	12
○ Government incentives (Subsidies)	9
○ Availability of substitutes for casting products	7
○ Industry entry and exit barriers	5
○ Regulatory instruments (import tariffs, import quotas)	4
○ Geographical location	3
○ Customer bargaining power	3
○ Market perception of foundry company	3
○ Number of foundry companies in South Africa	2

As shown in table 6.14 and figure 6.5, whilst there were varying levels of agreement on which macro drivers are important in enhancing the SCA for foundries in South Africa, all participants were in full agreement on energy (electricity costs) and localisation (local content enforcement) as being important drivers. However, there were varying levels of agreement on the importance of the other macro drivers. Government incentives, availability of substitutes, and industry entry and exit barriers were also considered by the majority of the participants as important.

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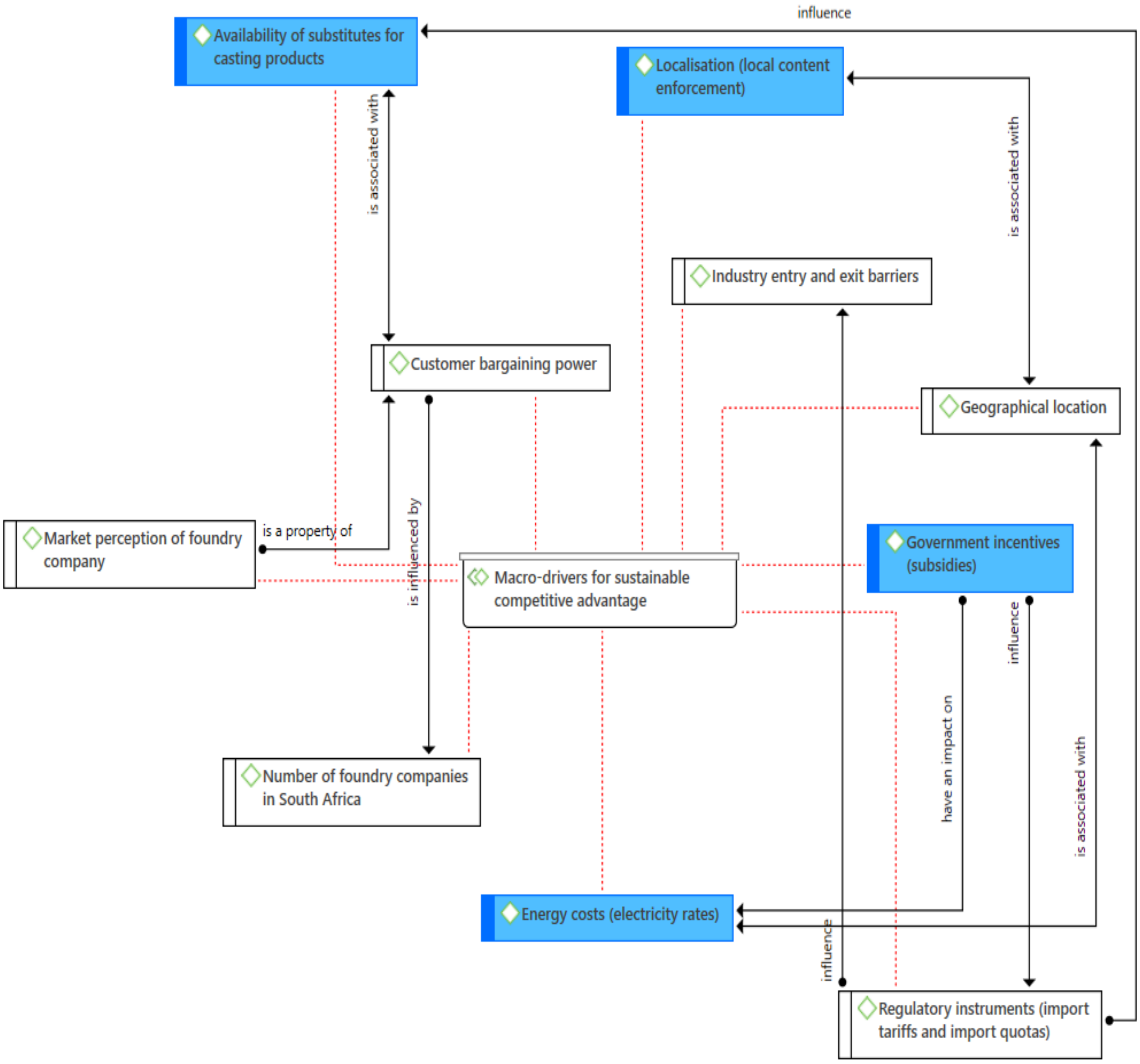

Figure 6.5: Network diagram of macro drivers identified as important for SCA

Source: Author's own compilation (2022)

The next section discusses the third theme identified in the study.

6.9 THEME 3: CRITICAL DRIVERS OF SCA FOR THE SOUTH AFRICAN FOUNDRY INDUSTRY

The next section explores the findings relating to which drivers were regarded as critical.

6.9.1 Critical micro drivers

Each participant had identified five micro drivers as important for enhancing the SCA of the foundry industry in South Africa. The participants were then further asked to identify three drivers that they viewed as critical for enhancing SCA. Table 6.15 indicates the critical micro drivers identified by each participant.

Table 6.15: Price micro drivers for sustainable competitive advantage
Source: Author's own compilation (2022)

	Critical micro drivers			Abbreviated critical micro drivers		
Participant 1	Production (raw material) input cost	Product quality	Firm capacity (size)	Costs	Quality	Capacity
Participant 2	Employee skills development (Human capital)	Price competitiveness	Product quality	Skills	Price	Quality
Participant 3	Employee skills development (Human capital)	Technology (equipment) upgrade	Value add for the customer	Skills	Technology	Value
Participant 4	Managerial choice (decision making process)	Investment in plant infrastructure	Ability to innovate (research and development)	Management	Investment	Innovation
Participant 5	Price competitiveness	Product quality	Employee skills development (Human capital)	Price	Quality	Skills
Participant 6	Organisational culture	Governance	Exposure to export market (degree of internationalisation)	Culture	Governance	Internationalisation
Participant 7	Investment in plant infrastructure	Production (raw material input) costs	Technology (equipment) upgrade	Investment	Costs	Technology
Participant 8	Price competitiveness	Product quality	Value add for the customer	Price	Quality	Value
Participant 9	Investment in plant infrastructure	Ability to innovate (research and development)	Employee skills development (Human capital)	Investment	Innovation	Skills
Participant 10	Employee skills development (Human capital)	Product (service) differentiation	Technology (equipment) upgrade	Skills	Differentiation	Technology
Participant 11	Investment in plant infrastructure	Employee skills development (Human capital)	Ability to innovate (research and development)	Investment	Skills	Innovation
Participant 12	Employee skills development (Human capital)	Product quality	Ability to innovate (research and development)	Skills	Quality	Innovation

As indicated in table 6.15, employee skills development (human capital) (*7 participants*), product quality (*5 participants*), ability to innovate (research and development) (*4 participants*), investment in plant infrastructure (*4 participants*), price competitiveness (*3 participants*), technology (equipment upgrade) (*3 participants*), production (raw material input) costs (*2 participants*), value-add for the customer (*2 participants*), firm capacity, managerial choice (decision making process), organisational culture, governance, exposure to export market (degree of internationalisation) and product (service) differentiation (*1 participant each*) were identified by different participants as micro drivers which were critical in enhancing SCA.

6.9.1.1 Word cloud of critical micro drivers for South African foundry SCA

Using the abbreviated list of the critical micro drivers, the word cloud in figure 6.6 was created in order to create a visual image of the drivers generally accepted by the participants as being critical. From the word cloud, it is evident that employee skills, product quality, investment in plant infrastructure and ability to innovate were the four micro drivers identified as most critical in enhancing the SCA of local foundries, while managerial choice, product differentiation, governance, organisational culture, firm capacity and exposure to market (internationalisation) were regarded as less critical

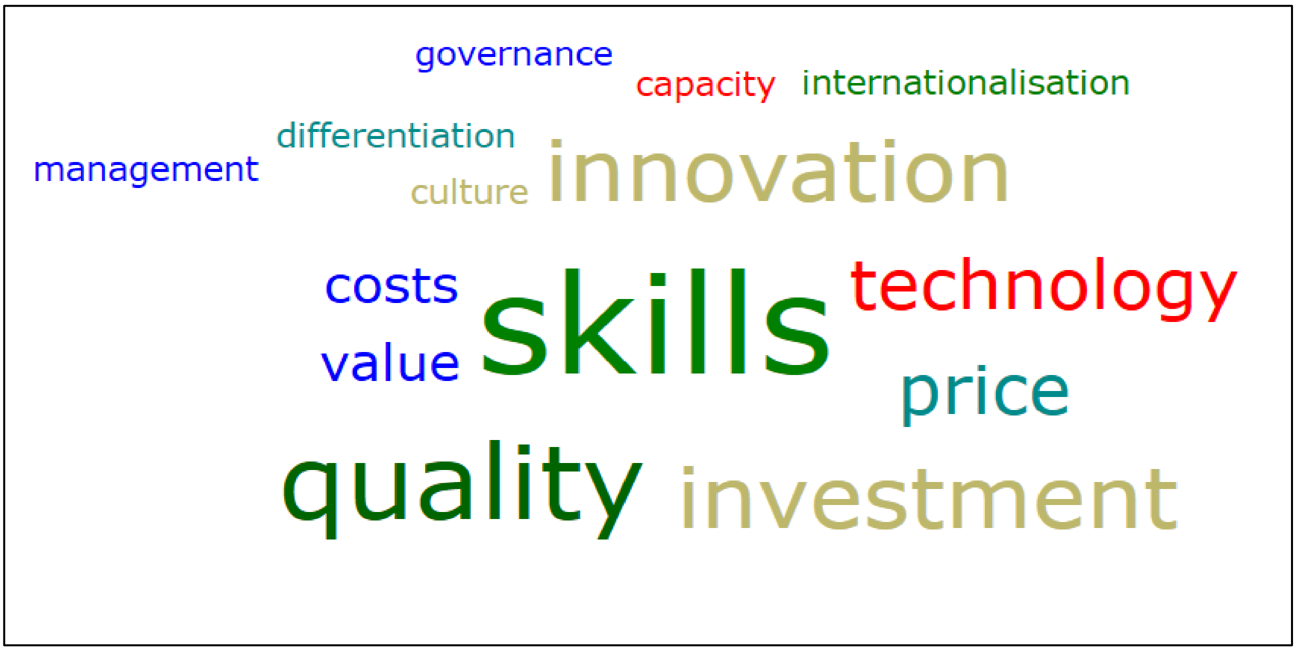

Figure 6.6: Word cloud of critical micro drivers for SCA

Source: Author's own compilation (2022)

The next section discusses the critical macro drivers.

6.9.2 Critical macro drivers

Participants were asked to select from their five important macro drivers, three macro drivers that they believed were the most critical for the South African foundry industry in enhancing SCA. As indicated in table 6.15, the study established that energy costs (electricity rates) (*11 participants*), localisation (local content enforcement) (*11 participants*), government incentives (subsidies) (*6 participants*), regulatory instruments (import tariffs, import quotas) (*3 participants*), industry entry and exit barriers (*2 participants*), market perception (brand loyalty) of the foundry company, customer bargaining power and availability of substitutes for casting products (*1 participant each*) were viewed by the participants as the critical drivers.

Table 6.16: Critical macro drivers for sustainable competitive advantage

	Critical macro drivers			Abbreviated critical macro drivers		
Participant 1	Energy costs (electricity rates)	Market perception (Brand loyalty) of the foundry company	Regulatory instruments (import tariffs, import quotas)	Energy	Perception	Regulations
Participant 2	Energy costs (electricity rates)	Customer bargaining power	Localisation (local content enforcement)	Energy	Customer	Localisation
Participant 3	Energy costs (electricity rates)	Localisation (Local content enforcement)	Regulatory instruments (import tarrifs, import quotas)	Energy	Localisation	Regulations
Participant 4	Energy costs (electricity rates)	Government incentives (Subsidies)	Localisation (Local content enforcement)	Energy	Subsidies	Localisation
Participant 5	Energy costs (electricity rates)	Government incentives (Subsidies)	Localisation (Local content enforcement)	Energy	Subsidies	Localisation
Participant 6	Government incentives (Subsidies)	Localisation (Local content enforcement)	Regulatory instruments (import tarrifs, import quotas)	Subsidies	Localisation	Regulations
Participant 7	Localisation (Local content enforcement)	Energy costs (electricity rates)	Government incentives (Subsidies)	Localisation	Energy	Subsidies
Participant 8	Energy costs (electricity rates)	Localisation (Local content enforcement)	The availability of substitutes for casting products	Energy	Localisation	Substitutes
Participant 9	Energy costs (electricity rates)	Government incentives (Subsidies)	Localisation (Local content enforcement)	Energy	Subsidies	Localisation
Participant 10	Localisation (Local content enforcement)	Energy costs (electricity rates)	Government incentives (Subsidies)	Localisation	Energy	Subsidies
Participant 11	Energy costs (electricity rates)	Localisation (Local content enforcement)	Industry entry and exit barriers	Energy	Localisation	Barriers
Participant 12	Energy costs (electricity rates)	Localisation (Local content enforcement)	Industry entry and exit barriers	Energy	Localisation	Barriers

Source: Author's own compilation (2022)

Using the abbreviated critical macro drivers shown in table 6.16, a word cloud was created (see figure 6.7).

6.9.2.1 Word cloud of critical macro drivers for South African foundry SCA

As indicated, energy costs and localisation were identified as the two most critical macro drivers. These were followed by government incentives (subsidies) and regulatory instruments. Market perception, customer bargaining power and substitutes for casting products were considered less critical in enhancing SCA.

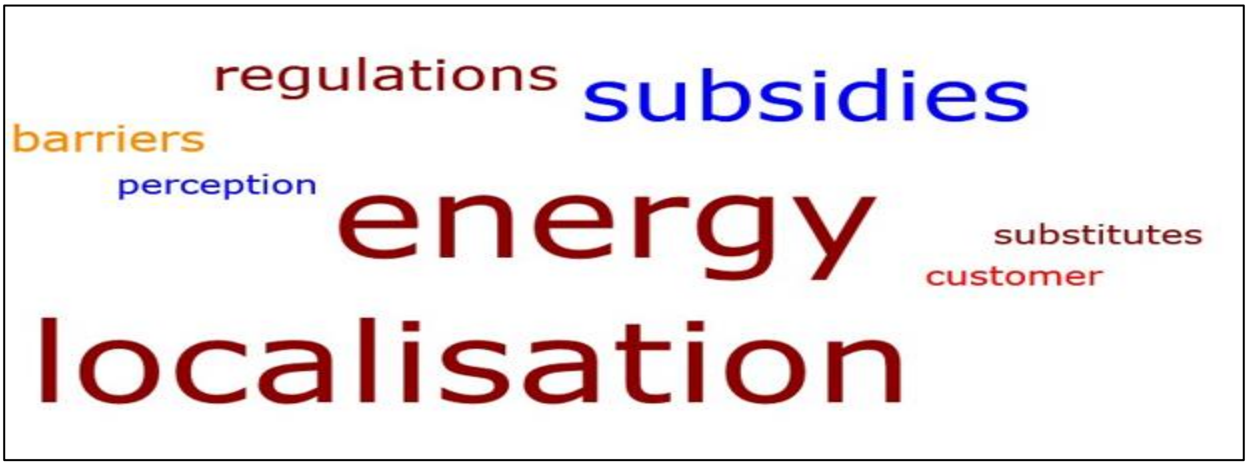

Figure 6.7: Word cloud of critical macro drivers for SCA
Source: Author's own compilation (2022)

The next section provides a synopsis of the critical drivers identified in the study.

6.9.3 Key outcomes on critical drivers for the South African foundry industry

Critical drivers relate to the drivers without which, it would be difficult for foundry companies to achieve SCA. The findings of the study revealed that employee skills development, product quality, ability to innovate and investment in plant infrastructure were critical micro drivers which foundry companies could make use of to enhance SCA. Energy costs and localisation were also regarded by the participants as the critical macro drivers outside of the foundry companies' micro-environment and control, which positively influenced the ability of the foundry companies to become sustainably competitive.

The next section discusses theme 4, which relates to the strategies perceived as enhancing the SCA of the local foundry industry.

6.10 THEME 4: STRATEGIES FOR ENHANCING SUSTAINABLE COMPETITIVE ADVANTAGE

As discussed in chapter 3, (section 3.4.1), the three generic (micro driver targeted) strategies for enhancing SCA include cost leadership, differentiation, and focus strategies. Whilst these strategies can be adopted and implemented individually, a combination of two or all of these strategies (hybrid strategy) can also be adopted. Table 6.17 shows how participants selected strategies they believed could enhance SCA, when incorporated and adopted by foundry companies.

In response to the question on which strategy or strategies the participants believed foundry companies should implement to enhance their sustainable competitive advantage within the South African context, only 2 participants were of the view that the application of a single strategy was adequate to enhance competitiveness. One participant identified a focus strategy as being suitable for implementation by local foundry companies, while the other felt that a cost leadership strategy would be suitable.

"… I would say, focus strategy. If you just look at foundries worldwide ... Okay? They all follow a focussed strategy. And the reason for that is the cost of the equipment and the capital required to build that foundry …

… as soon as you want to make a wide variety of products, then you need higher capital input, you need more complicated quality systems, different technologies ... So, you look at all the big ones, they are all extremely focussed …" (Participant 7).

"… the important strategy is cost leadership as I believe that cost is the major driver for competitiveness. If foundries can aim for cost leadership through reducing overall costs better than competition, then this is the best strategy to use within the South African industry …" (Participant 11).

Table 6.17: Summary of strategies identified as enhancing foundry SCA

Participant	Strategies for enhancing SCA for South African Foundries				Overall Strategy
	Cost Leadership	Differentiation	Focus	Hybrid	
Participant 1	⊙	⊙		x	Hyb (C-D)
Participant 2	⊙	⊙		x	Hyb (C-D)
Participant 3		⊙	⊙	x	Hyb (D-F)
Participant 4		⊙	⊙	x	Hyb (D-F)
Participant 5	⊙	⊙	⊙	x	Hyb (C-D-F)
Participant 6	⊙	⊙	⊙	x	Hyb (C-D-F)
Participant 7			x		Non-Hyb (F)
Participant 8	⊙		⊙	x	Hyb (C-F)
Participant 9	⊙		⊙	x	Hyb (C-F)
Participant 10	⊙		⊙	x	Hyb (C-F)
Participant 11	x				Non-Hyb (C)
Participant 12	⊙	⊙		x	Hyb (C-D)

Key

Hyb (C-D) - Hybrid Strategy (Combination of Cost Leadership & Differentiation Strategies)
Hyb (D-F) - Hybrid Strategy (Combination of Differentiation & Focus Strategies)
Hyb (C-F) - Hybrid Strategy (Combination of Cost Leadership & Focus Strategies)
Hyb (C-D-F) - Hybrid Strategy (Combination of Cost Leadership, Differentiation & Focus Strategies)
Non Hyb (F) - Focus Strategy only
Non Hyb (C) - Cost Leadership Strategy only

A total of 10 participants believed that there was no single strategy that would enhance the SCA of local foundry companies, instead, foundries should implement different strategies simultaneously in line with the changing dynamics of the industry. The participants indicated that a hybrid strategy was suitable for implementation depending on the market environment where the foundry company found itself. Among the hybrid strategies selected, was a combination of cost leadership and differentiation strategies (*3 participants*), differentiation and focus strategies (*2 participants*), cost leadership and focus strategies (*3 participants*), as well as cost leadership, differentiation, and focus strategies (*2 participants*).

"… and I will give you answers, I will use your differential strategy with a cost leadership strategy …" *(Participant 1)*.

"… okay, fine, I'll sit here. For me, the two most important are the niche market as a differentiation and price. Obviously, getting the product cheaper, those would be the two …" *(Participant 2)*.

"… I like the idea of using a differentiated and also a focus strategy … So, I think, it's a hybrid that either embraces all three of the above … Or at least two of them. And you know, for me being the lowest cost doesn't necessarily ensure the sustainable competitive advantage …" *(Participant 3)*.

"… I think, then you could blend. So, to me the cost leadership strategy is not necessarily a strategy. It's a fundamental of how your business should run. If you had a hybrid strategy which will be differentiation and focus, you would combine those two, so you would have some unique products …" *(Participant 4)*.

"… the hybrid strategy … the first one, the differentiation, delivery performance of quality products, you have to focus on delivery performance of a quality product. The next one, your focus strategy …" *(Participant 5)*.

"… the hybrid strategy will be able to simultaneously implement and ... Simultaneously adopt and implement all of the three strategies – the cost leadership, differentiation strategy, and the focus strategy …" *(Participant 6)*.

"… I believe the hybrid strategy represents that, and then the cost leadership strategy definitely. As you know, everybody strives to buy the cheaper, the best product for the cheapest price … So, to keep your cost down, you can go that route … and then also your focused strategy …" *(Participant 8)*.

"… this should involve cost leadership and focus strategies as each customer is different. So, foundries must understand this by focusing on them and better serving them. Costs must be kept as low as possible to ensure prices of castings are also affordable to customers …" *(Participant 9)*.

"… there is no single strategy that can work effectively for the foundries. A hybrid strategy will be the best where management chooses a strategy that is suitable for the market they operate in as well as the economic environment …

… in some instances, cost leadership would work best when combined with focus strategy so that the foundries are able to maintain low overheads but still ensure they are not all over the show trying to please everyone in the market …" *(Participant 10)*.

"… my opinion, it will have to be the hybrid strategy because obviously you've got to try and, obviously the cost. You've got to try and be, you know, not the cheapest necessarily in the industry, but you've got to be competitive with your cost and obviously you've got to, in our case like I have said, you've got to differentiate …

… so definitely, I would say cost leadership and the differentiation strategy …" *(Participant 12)*.

The following sections provides a synopsis on the findings relating to the strategies for SCA.

6.10.1 Key outcomes on SCA strategies for South African foundries

Table 6.18 provides an indication of the number of times each strategy was selected by the participants.

Table 6.18: Summary of strategies selected by participants

Codes	**Occurrences (frequency of responses)**
○ **Cost leadership strategy**	1
○ **Focus strategy**	1
○ **Hybrid strategy**	10
Totals	**12**

The study indicated a general appreciation by the participants that the adoption and implementation of strategies to enhance SCA was situation specific. There was a general belief that a combination of micro driver targeted strategies, which include, cost leadership, differentiation and focus strategies was necessary to overcome competition. It was deemed important for foundry companies to understand the environment they operate in, as well as the type and level of competition they face. Strategies could then be formulated and implemented based on that understanding. Macro driver strategies such as the implementation of localisation and the introduction of government incentives was also identified as key to promoting SCA for the foundry industry in South Africa.

6.11 THEME 5: CHALLENGES FACED BY MANAGEMENT IN IMPLEMENTING SCA STRATEGIES

In response to the question on what challenges management faced in the implementation of SCA strategies, eight participants identified skills shortage within the industry as a major challenge they faced. Four participants identified Covid-19, three participants identified lack of government support and high electricity charges, respectively, while two participants identified limited resources, strikes and lack of investment, respectively. These challenges are indicated in table 6.19.

Table 6.19: Managerial challenges affecting SCA strategy implementation
Source: Author's own compilation (2022)

Participant	Managerial challenges affecting strategy implementation in foundries			
Participant 1	Material_costs	High_electricity_charges		
Participant 2	Skills_shortage	Covid_19		
Participant 3	Market_development	Skills_shortage	High_electricity_charges	
Participant 4	Covid_19	Skills_shortage	Lack_of_marketing_strategies	
Participant 5	Skills_shortage	Lack_of_government_support		
Participant 6	Pestle_factors	Covid_19		
Participant 7	Limited_resources	High_electricity_charges		
Participant 8	Strikes	Global_ecenomic_situation_(Imports)		
Participant 9	Lack_of_government_support	Skills_shortage	Strikes	
Participant 10	Skills_shortage	Old_technology	Lack_of_investment	Lack_of_firm_leadership_from_foundry_association
Participant 11	Skills_shortage	Lack_of_investment		
Participant 12	Lack_of_government_support	Skills_shortage	Covid_19	Limited_resources

As reported in table 6.19, the word cloud in figure 6.8 clearly identifies skills shortage as a challenge identified by most participants, while imports, material costs, global economic situation, pestle factors and market development were not identified as challenges that stifled the implementation of SCA strategies.

6.11.1 Word cloud of SCA strategy implementation challenges

From the outcome, it was observed that the use of old technology was not identified as a major challenge in the implementation of SCA strategies, as would be expected, despite technology upgrade being identified as both an important and critical micro driver for SCA.

Figure 6.8: Word cloud of challenges faced by managers
Source: Author's own compilation (2022)

The quotes below indicate the participants' perspectives on the issue of challenges faced by management.

"… their inability to adapt to the outside influences, such as electricity, high cost of material …" *(Participant 1)*.

"… well, from a manager's point of view, I think the skills of his workforce are very, very high at the top one on the list …" *(Participant 2)*.

"… for me the most important one is, you know, market development and retention …" (Participant 3).

"… well, the major one of course at the moment is Covid … managing of companies through Covid has been a whole new ball game for everybody … I keep harping on that, is the lack of basic know how of the foundry operation … and then poor or no marketing strategies …" *(Participant 4)*.

"… focus on skilled competence to produce low volume jobbing type products within lead time that the customer demands … and taxpayers' money had to be spent on them, but the implementation … by government of that designation policy was pathetic …" *(Participant 5)*.

"… to me it talks straight to Pestle. The challenges that managers are facing, they are all in a Pestle framework. So, the political, the economic, the social, the technological, the environmental, and the legal. So, all of them, like those are the challenges that every manager that ... Not only foundries, in business in South Africa, they are facing …" *(Participant 6)*.

"… New Environmental Legislation. Labour Law changes. These kinds of things that have brought additional stress onto foundries, which already were struggling with their markets evaporating. I think that is one of the things that challenged them a lot. Limited resources – I would not say that …"
(Participant 7).

"… Ja well, I would say the political interference that we might have, is the unions and the wages … the political interference, that is the unions that are involved in, or in the foundry industry, we fall under the metal industry …

… so, the metal industry basically determines how and, or not how, but you must pay your employees a certain increase year-on year. And they fix a contract, and you have to adhere to that contract …

… so, in that, you can't deviate from that contract, and that is something, that's why it's a political interference. They say what you have to do, and you have to do that. If you do not do that, you've got employees that don't want to, they go on strike, or you can get caught up in quite a few different arguments … the global economic situations. That is, according to me, the imports that come from China …"
(Participant 8).

"… most challenges include lack of support from the government in terms of pushing through localisation … lack of support in terms of getting the people who work in industries trained. Old equipment used is problematic for foundries who want to compete globally … strikes by workers make it difficult as the demands by the workers can be high and not sustainable …" *(Participant 9)*.

"… poor literacy levels within the foundry industry … old technology used and yet managers are expected to hit targets and remain competitive …

… lack of investment by owners and no support from government … lack of firm leadership by foundrymen association to drive direction for competitiveness …" *(Participant 10)*.

"… lack of adequate skills base from employees making innovation difficult. Lack of investment also makes it difficult for managers to implement different ideas because of lack of resources to make the foundries competitive …" *(Participant 11)*.

"… but obviously they are challenged with that, you know, like now during Covid obviously we still had to pay the MEIBC bonuses to the guys even though, you know, we were in a difficult financial situation …

there's definitely, there's this challenge of skills as well in the industry. Like pattern making is becoming a dying breed …" *(Participant 12)*.

Below are the key outcomes regarding the challenges faced by management in SCA strategy implementation.

6.11.12 Key outcomes on SCA implementation challenges faced by management

The adoption and implementation of SCA strategies provides foundry companies with the necessary impetus to overcome both local and foreign competition. Any barriers to strategy implementation present management with hurdles that stifle sustainable competitiveness and growth for the foundries. Skills shortage was identified as the most common challenge faced by foundry management, which deterred them from achieving SCA especially when competing against foreign foundries. The lack of government support through the provision of incentives and affordable financial assistance was also identified as a substantial challenge for management. The lack of investment, which meant that foundry companies could not upgrade their ageing equipment and technology, was another challenge, which the participants felt prevented them from implementing SCA strategies for their different companies and this significantly affected product quality as well as their abilities to deliver on time, exposing them to "attack" by foreign competition.

It is important to note that the challenges identified by the participants had already been identified as part of the drivers for SCA. This affirmed the comprehensiveness of the study in identifying the drivers from literature and testing these within the South African foundry industry context.

6.12 THEME 6: COMPETITIVE FORCES INFLUENCING SCA

In his seminal work on competitive strategy, Porter (2008) argued that understanding an industry's competitive forces was key to developing a sustainable competitiveness strategy for a business. In the context of this study, participants were asked to select the competitive force that they believed had the most influence in enhancing the SCA of local foundries. The following were identified:

The intensity of rivalry among foundry companies (*1 participant*),

"… So, I would say the rivalry amongst the foundries ... It should not even be a ... We should be working together, man. If we are going to gain a competitive advantage. Instead of it being rivalry amongst ourselves, because it is useless … rather we are working in silos, and that is killing us. So that is for me, number one …" (Participant 6).

The number of competing foundries (*4 participants*),

"… Yeah. So, I mean, for me the answer is, you probably guessed my answer there is number 2, the number of competing foundries … So, this idea of, and it comes back to the same answer of differentiation of product [Cross- and service ...

… so, if you can set yourself apart from other foundries and I'm, when I look at the number of competing foundries, I'm looking, if you like, globally. I'm not looking at the foundry around the corner. I'm looking at, because unfortunately the market is globalised at the moment. So, you know, I see a lot of products in the Northern Cape being used in the mining industry that's supplied by Chinese companies.

… And you say, well, how the hell did they do that and we've got a foundry here in Postmasburg that couldn't supply it cheaper, you know, or better or quicker. It's just amazing. So, a number of competing foundries. So, one really needs to move into a league where there are only a few players or preferably if you are the only player. That's the best league to be in. But, so, number of competing foundries is my answer, if you like, to that question …" (Participant 3).

"… Okay. Then I want to go number 9, the number of foundry companies within South Africa. The foundry, foundries within South Africa are very, it's a mafia. If you don't like to, we don't help to, we don't like to help out one another. What I have, I've got and what you've got, you've got …" (Participant 8).

"… Number of competing foundries – if more foundries from other countries are able to sell in South Africa this makes local foundries vulnerable and less competitive …" (Participant 10).

"… Number of competing foundries – as if there are more of these especially coming from China then the South African foundries will battle to compete …" (Participant 11).

The ease of entrance of new competitors into the industry (*4 participants*),

"… It is not the ease of entrance; it is the difficulty of entrance of new competitors … It is not the easy way, it is a difficult, difficult way to enter into the industry …" (Participant 1).

"… And it is not new competitors in the sense of new foundries being built locally, it is the ease of new foundries from outside our borders to penetrate our market … and has pushed out a lot of foundries out of

their traditional customer base. Because you have got these importing companies that just import ..." (Participant 7).

"… Ease of entrance of new foundries especially from other countries like China which are able to sell to SA …" (Participant 9).

"… Well, again, this would definitely in my opinion be the ease of entrance of new competitors into the industry because as mentioned, if you don't have that foundry already set up, the cost and the challenges to get a foundry on the go is definitely, it's not an easy thing to do …" (Participant 12).

and the bargaining power of foundry companies over raw material suppliers (*3 participants*) were identified as the competitive forces influential in enhancing SCA.

"… I think is the factor that's been a factor for a long time is the, you know, the ability to negotiate with the raw material suppliers, because there have been problems in that area, where raw material suppliers have had much greater incentives, cash incentives if you like to give it to sell their products overseas.
… and, as a result, they tend not to give, you know, the local industry is taking, the sort of, the worst material, the crappy prices and we can't get the choice on them, ability to bargain very well …" (Participant 2).

"… So, the bargaining power foundry companies is there. I don't know it's the major thing … Yeah. So, that's probably the number 1, the bargaining power …" (Participant 4).

"… the ability to bargain for better raw material pricing is first …" (Participant 5).

The outcome pertaining to the competitive forces are also reflected in table 6.20.

Table 6.20: Competitive forces enhancing SCA for South African foundries

Participants	Intensity of rivalry among foundry companies	Number of competing foundries	Ease of entrance of new competitors into the industry	Bargaining power of foundry customers	Substitutes for casting products	Bargaining power of foundry companies over raw material suppliers
Participant 1			x			
Participant 2						x
Participant 3		x				
Participant 4						x
Participant 5						x
Participant 6	x					
Participant 7			x			
Participant 8		x				
Participant 9			x			
Participant 10		x				
Participant 11		x				
Participant 12			x			
No. of Participants	1	4	4	0	0	3

As indicated in table 6.20, the bargaining power of foundry customers and substitutes for casting products were not viewed as having an influence on the SCA for local foundries.

6.12.1 Key outcomes on competitive forces influencing SCA

According to Porter (2008), the ability of an organisation to become competitive is dependent on the competitive forces within the environment where the organisation operates. The number of competing foundries as well as the ease of entrance of new competitors into the industry were identified as being the competitive forces influencing SCA the most for South African foundries. The ability of foundry companies to bargain for better pricing of raw materials from their suppliers was also deemed as important and having an influence of the competitiveness of foundries. Only one participant felt that the intensity of the rivalry between competing foundries was significant in influencing SCA.

The ability of customers of the foundry industry to bargain for better casting pricing, depending on the volume of castings they bought, from the foundry companies and the availability of material and components, which could be used as substitutes for casting products, were not viewed as influential in enhancing foundry competitiveness.

6.13 THEME 7: COMPETITIVENESS APPROACHES INFLUENCING SCA

On the question regarding which competitiveness approach had the most influence on the SCA for South African foundries, 2 participants (*participants 2 and 11*) believed that a resource-based approach alone would be suitable for foundries to implement. This is shown in the direct quotes, below;

"… well, I think the ability to take advantage of its local, you know, of the resources I think that's one of the ones you said, wasn't it ... the, you know, there are a lot of resources, sorry, I am just trying to find your, ja, resources …" *(Participant 2)*.

"… resource-based approach – for a foundry to be competitive there must be resources including employees and equipment – this is crucial as it will also promote the manufacturing of quality products and delivery as required by the market …" *(Participant 11)*.

Five participants (*participants 1, 4, 7, 9 and 12*) were of the view that a capability-based approach alone had the most influence;

"… capability-based approach … Well, for me, if you not capable of making a certain casting you not going to make it. If you know your ability how to make the product you got to be able to make it. Your resources-based approach is physical resources to gain competitive.

… everybody uses the same resources; everybody has got the same product. Your knowledge-based, for me, foundry got no intellectual property. They have got sand, metal and they have got overheads … and to me the best of those three is the capability-based approach where you use your capability, I am referring to training early on, your guys are capable to make the product I require from them …"

(Participant 1).

"… capability-based approach … What I mean, capabilities to gain competitive advantage. That goes back to what I was saying about … the most successful foundries solve problems. They don't [Cross-Talk 44:11] necessarily sell [Inaudible 44:11], and that's your capability within the company …"

(Participant 4).

"… I would say capability. Yes, capability definitely. Because the resources ... If you think about the resources, the equipment you purchased as capital equipment to make the parts, we all buy them from the same small select group of suppliers that operate worldwide … so everybody has the same equipment ... potentially the same equipment resource pool …" *(Participant 7)*.

"… capability-based approach – the foundry can have all the resources and knowledge but if they are not capable – they can't compete …" *(Participant 9)*.

"… I think all foundries, you know, are different in the sense of, you know, what products and which industries they supply and so and so. I would definitely say the capability-based approach.

… you've got to use what you've got available; you know. You can't, we can delve in any, you know, for instance, you know, any steels or anything like that if we don't have the knowledge to do that, you know. So, you've got to do what you do best and use the, you know, the foundry's capabilities, see what you can do and improve on that …" *(Participant 12)*.

Four participants (*participants 6, 8 and 10*) opted for a knowledge-based approach.

"… so having resources without having the knowledge to use them is futile. The same way about capability. For this answer, I will say knowledge because knowledge gives you the advantage, because you know what you know, and you know what you don't know …" *(Participant 6)*.

"… Okay. That's the knowledge-based approach. Because on the intellectual property, so it's my property, it's, I'm the only guy that can make it. The casting industry is not an exact science. It's an art as well.

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… so, if I've got the intellectual property. I've got an advantage over all the other foundries within South Africa …" *(Participant 8)*.

"… Knowledge-based approach – this is important as foundries gain work on the basis of intellectual property and skill of employees …" (Participant 10).

One participant (*participant 3*) believed that all three approaches were equally influential in enhancing SCA.

"… look, I had some difficulty being selective about that. I suppose and my approach has been, because I've had maybe exposure of a number of different foundries. I think, one needs to have a strategy, if you like, that encompasses some or all of those three aspects …

… so, the resources, I mean this essentially is, I suppose, the type of plant that you've got. The capability, I assume, to mean the, if you like, the size or the flexibility that you have in respect to that ...

… and the knowledge [Inaudible 01:24:00] the intellectual knowledge that you have in terms of how to produce a particular component, but also knowledge that you can acquire with regards to, you know, artificial intelligence and those sorts of things, to enhance your operation. it really is all of them, but each foundry in its own situation is going to have more emphasis on one or another of these three approaches, but you can't simply use one …" (Participant 3).

The last participant (*participant 5*) could not be drawn to make a selection as the participant felt that without the production volumes that foundries needed to survive, it was difficult for any approach to provide SCA for the industry. The participant felt that there was still a need for government commitment in areas around localisation in support of local manufacture, before the competitiveness approaches could work.

"… I couldn't specifically answer this question. Because I felt that everything else that I've said to you up to now, covers this question. Because I find it very difficult in an open economy as we have … to find competitive advantages …" (Participant 5).

As discussed, table 6.21 provides a summary of the participants' views on the competitiveness approaches.

Table 6.21: Competitiveness approaches enhancing SCA for South African foundries

Participants	Resource-based approach	Capability-based approach	Knowledge-based approach
Participant 1		x	
Participant 2	x		
Participant 3	x	x	x
Participant 4		x	
Participant 5			
Participant 6			x
Participant 7		x	
Participant 8			x
Participant 9		x	
Participant 10			x
Participant 11	x		
Participant 12		x	
No. of Participants	3	6	4

The following section summarises the key outcomes relating to the competitiveness approaches selected by the participants.

6.13.1 Key outcomes on competitiveness approaches influencing SCA

The findings of the study showed that the capability-based approach was deemed as influencing SCA the most. This approach related to foundries utilising their capabilities (focusing on what they are good at) to become competitive. The knowledge-based approach was also identified as having an influence on the SCA for local foundries, whilst only three participants believed that a foundry's use of its resources was significant in influencing competitiveness.

6.14 OTHER STRATEGIES FOR ENHANCING SCA FOR SOUTH AFRICAN FOUNDRIES

Participants were also encouraged to share other strategies not discussed in the study, which they felt could be adopted and implemented by foundry companies in South Africa to enhance their SCA. As indicated in table 6.21, the study found that all but one of the "other strategies" proposed by the participants had already been addressed in the study. This meant that 11 of the participants could not identify strategies for enhancing SCA, which had not been covered in the study. Participant 10 indicated that there was nothing to add beyond what had already been discussed.

"… no comment other than what is mentioned above. Thank you …" *(Participant 10)*.

This signified the comprehensiveness of the study in identifying these strategies from literature and testing them in the context of the local industry.

Participant 7 identified vertical integration as a strategy not discussed in the study, which the foundry companies could implement to enhance SCA. This related to having foundry companies "increasing their participation in the value chain through the implementation of make or buy decisions" (Wilson, 2020:1).

"… I think it is to vertically-integrate into the supply chain. Foundries that are doing very well. Either because the original company forward integrated, so the foundry started to machine components ... A lot of foundries are actually doing that. It is a worldwide trend, as well … whether it be forwards or backwards …" *(Participant 7)*.

Table 6.22 provides a summary of the "other strategies" as identified by the participants.

Table 6.22: Other strategies for enhancing SCA for South African foundries

Participants	**Other strategies for enhancing Sustainable Competitive Advantage for South African Foundries**			
Participant 1	Understand customer requirements	Training	Continuous improvement	
Participant 2	Research and development	Skills development		
Participant 3	Skills development	Employee retention		
Participant 4	Skills development	Good equipment		
Participant 5	Localisation			
Participant 6	Continuous improvement	Skills development	Energy management	Niche market focus
Participant 7	Vertical integration			
Participant 8	Government assistance	Skills development		
Participant 9	Government assistance			
Participant 10	Participant had nothing to add			
Participant 11	Foundry investment	Skills development		
Participant 12	Government legislation on imports			

As indicated in table 6.22, training, understanding customer requirements, continuous improvement, research and development, skills development, employee retention, good equipment, localisation, energy management, niche market focus, government assistance, foundry investment and government legislation on imports were all indications of strategies which had been discussed in the study and could not, therefore, be regarded as “other strategies” enhancing SCA for the South African foundries.

6.14.1 Key outcomes on other strategies for enhancing SCA

As already discussed, a majority of the strategies that participants provided as capable of enhancing SCA within the local foundry industry were already addressed comprehensively in the study and, therefore, could not be interrogated further. Vertical integration, however, was a strategy identified by participant 7, which had not been addressed in the study. The participant believed that there was a need for local foundry companies to either forward integrate or backward integrate, in order to have more control over raw material supply or the market demand. This, in turn, would put the foundry company in a position where they are able to contain raw material costs, as well as ensure there are adequate volumes to keep the plant operational and competitive.

6.15 CHAPTER CONCLUSION

This chapter represented and discussed the findings of the second phase of this sequential explanatory mixed methods study. The findings were drawn from responses to semi-structured interviews conducted with 12 participants who had extensive experience and knowledge of the South African foundry industry and, therefore, contributed to the richness of the data gathered, as well as added further insight to the results obtained in the quantitative phase (complementarity).

This phase was significant in “bringing together a more comprehensive account” of the drivers enhancing the sustainable competitive advantage of local foundries (completeness). Whilst the quantitative phase was crucial in confirming the drivers pertinent to the South African foundry industry relative to the drivers identified in literature, the qualitative phase was a “lynchpin” to the provision of in-depth understanding of these drivers, as well as how and why they are relevant in enhancing the SCA of foundries.

This phase contributed to existing knowledge by providing an integrated picture of the drivers, competitive forces, competitiveness approaches and strategies that leadership within the industry believed could enhance competitiveness, as well as address the challenges management faced in the implementation of the SCA strategies for the foundry industry. This was critical in enabling for the benchmarking of both the industry SCA micro and macro drivers against the drivers identified in literature (secondary objective of the study). This phase further contributed by demonstrating the inter-relatedness of the drivers of SCA, thereby providing insight to management on how the implementation of SCA micro and macro driver-targeted strategies could potentially have an impact on other related drivers.

The findings from this study, therefore, significantly influence the development of the SCA framework relevant to the current micro and macro-economic environments of the South African foundry industry.

The next chapter will focus on the integration of the findings from the quantitative and qualitative phases, which form the cornerstone for the development of the SCA framework for the South African foundry industry (primary objective of the study). The outcomes of this chapter will also form a basis for the recommendations on strategies that can be implemented, within the South African context, by local foundries to enhance SCA (secondary objective of the study).

CHAPTER 7: INTEGRATION OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

CHAPTER 7 - ROADMAP

7.1	**INTRODUCTION**
7.2	**RESTATEMENT OF THE STUDY'S SECONDARY OBJECTIVES**
7.3	**KEY OUTCOMES FROM THE STUDY**
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7.3.2	Occurrences of the SCA micro drivers in the study
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7.7	**ETHICAL CONSIDERATIONS**
7.8	**LIMITATIONS**
7.9	**RECOMMENDATIONS FOR FUTURE RESEARCH**
7.10	**SUMMARY OF THE STUDY OBJECTIVES**
7.11	**CHAPTER CONCLUSION**

Figure 7.1: Illustration of layout for Chapter 7

Source: Author's own compilation (2022)

7.1 INTRODUCTION

The primary objective of this study was to develop a framework for the sustainable competitive advantage of the foundry industry in South Africa. Various micro and macro-economic circumstances have resulted in the number of foundries in South Africa dropping from 270 in 2003 to 123 in 2020 (Lochner *et al*., 2020) owing to the closure of some of the foundries. As indicated in chapter 3, whilst a number of studies have been conducted on the foundry industry, such studies have either focused on quality management issues, electricity management, waste management and improving production processes. Where an attempt to study competitiveness within the industry was made, only a single micro or macro driver on competitiveness has been explored. Sustainable competitive advantage has largely been ignored. Cvetkovski (2015) recommends the need for in-depth research on the sustainability of foundries with the view of identifying opportunities for competitiveness that will revive this matured industry. Bandaranayake and Pushpakumari (2021), and Barros *et al*. (2019) recommend future research on SCA framework formulation.

The closing down of foundries in South Africa has detrimental effects on the economy of the country through the cutting down of jobs, reduction of export opportunities and the contribution of the industry to the country's GDP (see figure 3.2). This study contributed to literature by examining the influence of the micro and macro drivers on the SCA of the foundry industry within the South African context, and in the development of a framework for SCA, which to the knowledge of the researcher and through the extensive review of extant literature, has not been developed.

Figure 7.3 illustrates the framework guiding the approach to this study. Chapter 1 of the study provided a discussion on the background informing the research problem. The contribution of the study, context of the study's delimitations as well as the research objectives were also covered. Attention was also given to the theoretical foundations informing the study, followed by an indication of the study's research methodology, design and ethical considerations.

Chapter 2 provided an overview of both the global and South African foundry industry landscapes. This was followed by a discussion of the casting manufacturing process, the types of foundries as well as the foundry industry supply chain.

The literature review was presented in chapter 3. In this chapter, the definition of sustainable competitive advantage (SCA) was provided; this was followed by a discussion of the generic and contemporary theories on competitive advantage, as well the identification of micro and macro drivers for SCA. The chapter culminated with a comprehensive discussion of the various strategies for enhancing SCA. Chapter 4 outlined the research scope, paradigm as well as the application and justification of the use of sequential explanatory mixed methods research. This method followed a two-phase approach, which entailed the mixing of the quantitative phase with the qualitative phase. The population, sample size selection and data collection processes for the two phases were provided. Measures to ensure validity and reliability (quantitative), as well as the rigour and trustworthiness (qualitative) were also comprehensively discussed. Data analysis and limitations of the study were also covered to provide an indication of how the data would be handled and the limitations minimised.

Chapter 5 presented the quantitative phase of the research. The development, pilot testing and distribution of the questionnaires were discussed. The results of this phase were also deliberated on, beginning with a summary of the respondents' demographics, reliability analysis as well as the canonical correlation analysis. The outcome from this phase was critical in informing the development of the research instrument used in the second (qualitative) phase of the study. Chapter 6 provided a discussion of the qualitative phase of the study. The development of the interview questions, assessment of the pilot questions and thematic analysis were covered. This concluded with the identification of themes, categories, and codes, which were subsequently interpreted in order to better understand the study's findings and create a holistic image of how the outcomes from the two phases could be used to develop a framework for foundry SCA.

Chapter 7 offers the researcher the opportunity to integrate the findings from the two phases, as well as develop a framework for foundry SCA within the context of the South African industry. Conclusions and recommendations are also provided on how the SCA framework could be used to create SCA for the local foundry industry. Opportunities for future academic research are expounded, with the hope that similar contributions will assist in making the industry more competitive and halt the upward spiral of foundry closures.

Figure 7.2 provides an overview of the study framework. As mentioned, chapter 2 provided an indication of the research problem identified, as well as the primary and secondary objectives. Chapter 3 expanded on the research problem and provided a detailed overview of the various arguments and theoretical perspectives from different researchers, in order to understand better the nature of the problem as well as the research gaps. Chapter 4 discussed the sequential explanatory mixed methods research, assumptions, and benefits, which culminated in the development of the survey instrument used for data collection during the quantitative phase. This chapter, in combination with chapter 5, also provided extensive and clear details of the data analysis process and associated tests for rigour. The output of this phase was the development of the instrument for the collection of data for the qualitative phase, which was discussed extensively in chapter 6. Chapter 7 provides an integration of the quantitative results and qualitative findings, which were critical in informing the development of the framework for SCA.

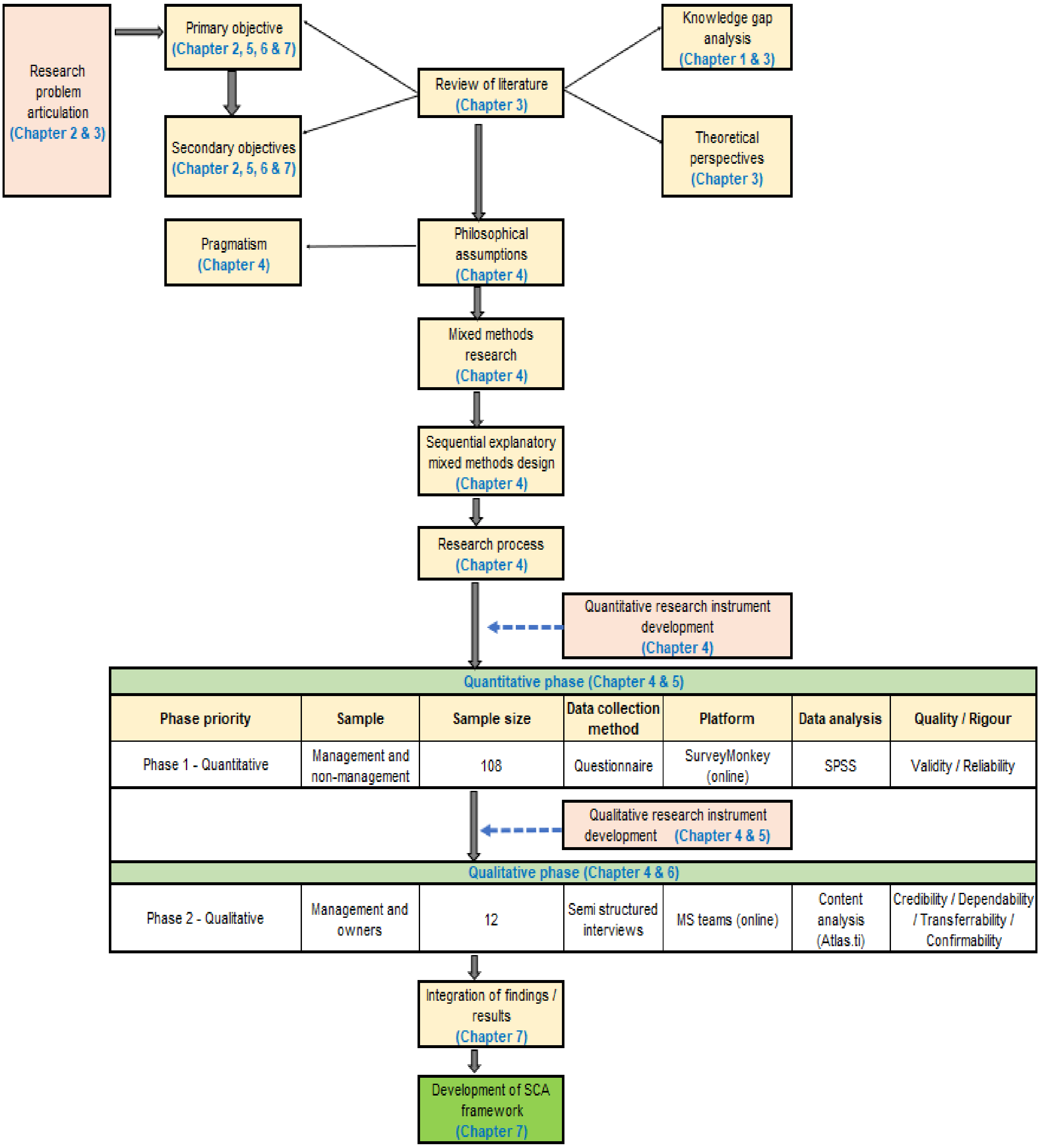

Figure 7. 2: The study framework

Source: Author's own compilation (2022)

7.2 RESTATEMENT OF THE STUDY'S SECONDARY OBJECTIVES

The secondary objectives of the study (see table 3.1 in chapter 3) were outlined as follows:

i) To identify from literature, the micro and macro-economic drivers influencing the sustainable competitiveness of foundries in South Africa.

ii) To benchmark the perceptions of stakeholders within the foundry industry on sustainable competitive advantage against the macro and micro drivers identified in literature.

iii) To make recommendations on strategies to enhance the sustainable competitive advantage for foundries in South Africa.

7.3 KEY OUTCOMES FROM THE STUDY

The following section provides a consolidated view of the key outcomes from the study.

7.3.1 The reasons for the closure of foundries

A number of reasons were put forward on the closure of foundries (see chapter 2) and these included reduced customer demand as a result of cheaper substitute products from foreign competition. The lack of advancement in technology, use of old equipment, lack of skills, stringent regulatory costs and high operational costs have also contributed to firm closures.

7.3.2 Occurrences of the SCA micro drivers in the study

Regarding the micro drivers influencing the SCA of foundry companies, the study found that there was some agreement on the micro drivers identified as important during the quantitative and qualitative phases. There was also some level of agreement on the drivers that both the respondents of the survey and the participants to the interviews identified as less important.

Figure 7.3 provides an indication of the prominent micro-economic drivers identified from the qualitative and quantitative phases.

Quantitative outcomes	
Item (driver)	**Item mean**
Product quality	4.66
Ability to innovate	4.51
Employee skills development	4.45
Investment in plant infrastructure	4.35
Price competitiveness	4.31
Possession of unique resources	4.27
Technology (equipment) upgrade	4.23
Product (service) differentiation	4.22
Managerial choice	4.21
Production (raw material input) costs	4.21
Bargaining power over suppliers	4.18
Value-add for customer	3.94
Governance	3.92
Certifications	3.9
Posession of intellectual property	3.86
Exposure to export market (degree of internationalisation)	3.82
Organisational culture	3.67
Cluster membership	3.57
Socio-cultural responsibility	3.51
Firm capacity	3.37

Common critical micro drivers (Out of top 5 for each phase)

Qualitative findings	
Codes	**Occurrences**
○ Employee skills development	10
○ Ability to innovate	6
○ Investment in plant infrastructure	6
○ Product quality	6
○ Technology (equipment) upgrade	6
○ Price competitiveness	4
○ Product (service) differentiation	4
○ Production (raw material input) costs	4
○ Exposure to export market (degree of internationalisation)	3
○ Value-add for the customer	3
○ Certifications	2
○ Managerial choice (decision making process)	2
○ Organisational culture	2
○ Governance	1
○ Firm capacity	1
○ Cluster membership	0
○ Bargaining power over suppliers	0
○ Possession of intellectual property	0
○ Possession of unique resources	0
○ Socio-cultural responsibility	0

Figure 7.3: Comparison of micro driver selection from the quantitative and qualitative phases.

Source: Author's own compilation (2022)

As indicated in figure 7.3, out of the 20 micro drivers identified from literature, employee skills development, ability to innovate, investment in plant infrastructure, product quality, price competitiveness and technology upgrade were regarded as important in enhancing the South African foundry industry's SCA (see chapter 6). In a similar vein, cluster membership, socio-cultural responsibility, possession of intellectual property, organisational culture and firm capacity were generally regarded as less important. The study also went on find that product quality, investment in plant infrastructure, and employee skills and development were considered critical micro drivers without which, foundry companies would not be able to attain sustainable competitive advantage (see chapter 6).

7.3.3 Occurrences of the SCA macro drivers in the study

Figure 7.5 indicates that energy costs, localisation, availability of substitutes for casting products and government incentives were important macro divers for SCA (see chapter

6). Energy costs and localisation were also identified as the two critical macro drivers for SCA.

Figure 7.4 provides an indication of the prominent macro-economic drivers identified from the qualitative and quantitative phases.

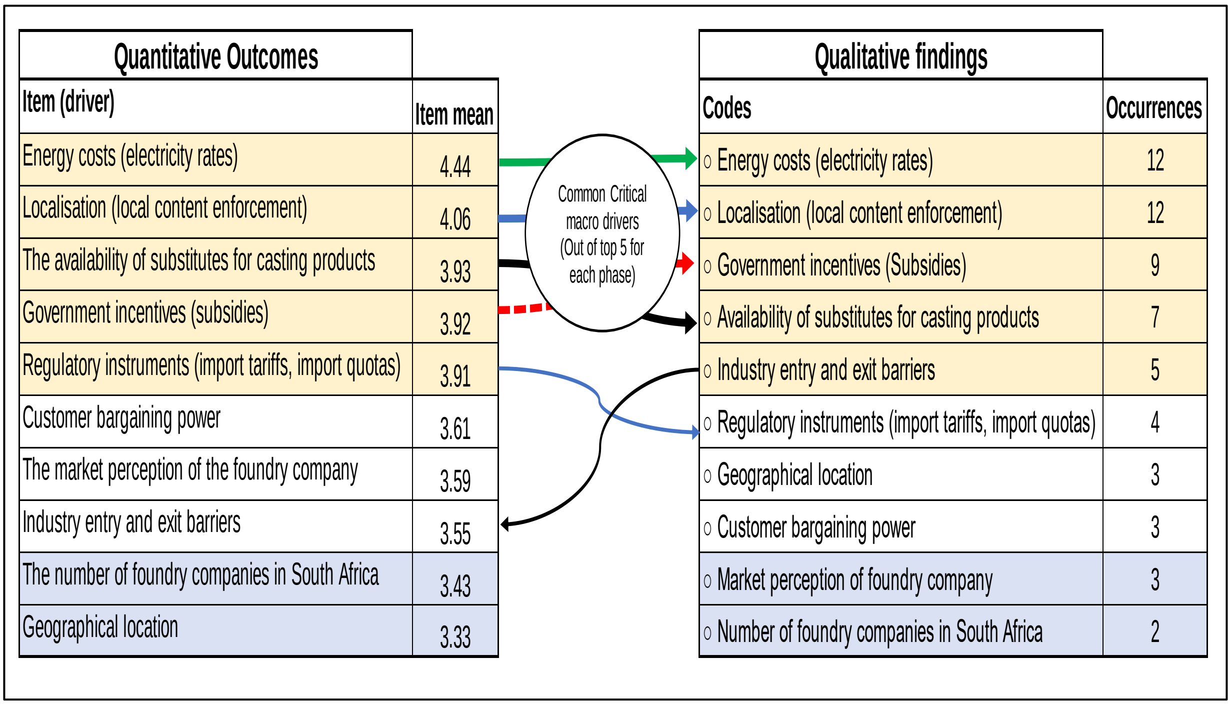

Figure 7.4: Comparison of macro driver selection from the quantitative and qualitative phases

Source: Author's own compilation (2022)

A summary of the study's outcome on the interrelatedness of the constructs and SCA drivers for South African foundries is indicated in figure 7.5. As illustrated in figure 7.5, among the micro drivers, product quality and ability to innovate (process construct), investment in plant infrastructure, and employee skills and development (asset/resources construct) were identified as critical in enhancing foundry SCA. Regarding the macro drivers, localisation, government incentives and energy costs (institutions and government policies construct), and the availability of substitutes for casting products (firm's performance construct) were identified as critical in enhancing foundry SCA.

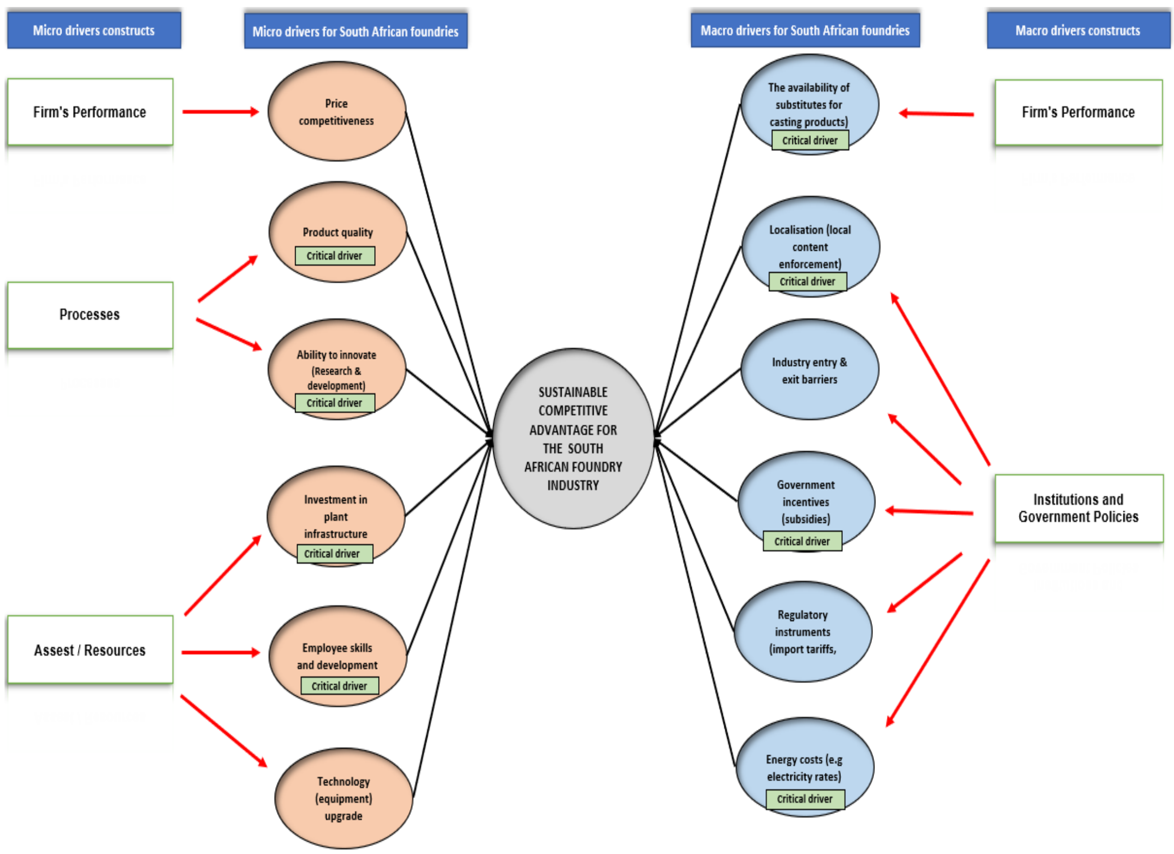

Figure 7.5: Interrelatedness of the constructs and SCA drivers.
Source: Author's own compilation (2022)

The following section discusses the study's outcomes on strategies for enhancing the SCA for foundries.

7.3.4 Strategies for enhancing SCA for South African foundries

As discussed in chapter 3, (section 3.4.1 and 3.4.2) it is essential for foundry companies to adopt and implement strategies that promote the attainment of sustainable competitive advantage. The study found that in the context of the South African industry, there was a general acceptance that no single strategy was sufficient to enhance competitive advantage. A combination of i) cost leadership, ii) differentiation and iii) focus strategies were, thus, deemed appropriate, depending on the type of foundry operation, economic situation, and the market environment where the foundry operated. Whilst a majority of the study outcomes pointed to the adoption and implementation of two strategies, there were also indications that in some situations a combination of all the three strategies could be adopted to enhance SCA.

7.3.5 Strategy implementation challenges for foundry management

All the challenges identified as likely to impact the implementation of the SCA strategies by foundry management, had already been identified and discussed as part of the micro and macro drivers and, therefore, no new challenges were revealed. This was an important observation as it enhanced the credibility of the study by demonstrating that the study had comprehensively identified all drivers in literature and subsequently tested these in the foundry industry.

7.3.6 Competitive forces influencing sustainable competitive advantage

The ease of entrance of competing foundries into the South African industry space, the number of competing foundries and ability of foundry companies to bargain for better pricing of raw materials from suppliers were identified as the competitive forces that had the most impact on the ability of foundry companies to gain SCA. The study found that despite the closure of some foundries, the ease of entrance by foreign foundries into the South African market space still increased the number of foundry companies competing for the South African market and, hence, reduced the competitiveness of the local foundries. The study also established that the ability for local foundry companies to bargain for better raw material pricing when compared to competition, provided foundry companies with an edge over competition as they could in turn reduce the pricing of castings to competitive levels, hence moving a step closer to gaining SCA.

7.3.7 Competitive approaches influencing sustainable competitive advantage

The study found that the capability-based approach was the most important approach in enhancing SCA. The study participants predominantly believed that the capabilities of foundry companies were more important than just the knowledge or the resources that the companies had. The study, however, also established that in some instances, resources and knowledge were deemed important in enhancing SCA and this was demonstrated by the selection of these two approaches by some of the respondents and participants.

Based on the findings from the two phases, a framework for SCA could then be consolidated, as indicated in figure 7.6.

7.4 A FRAMEWORK FOR THE SCA OF FOUNDRIES IN SOUTH AFRICA

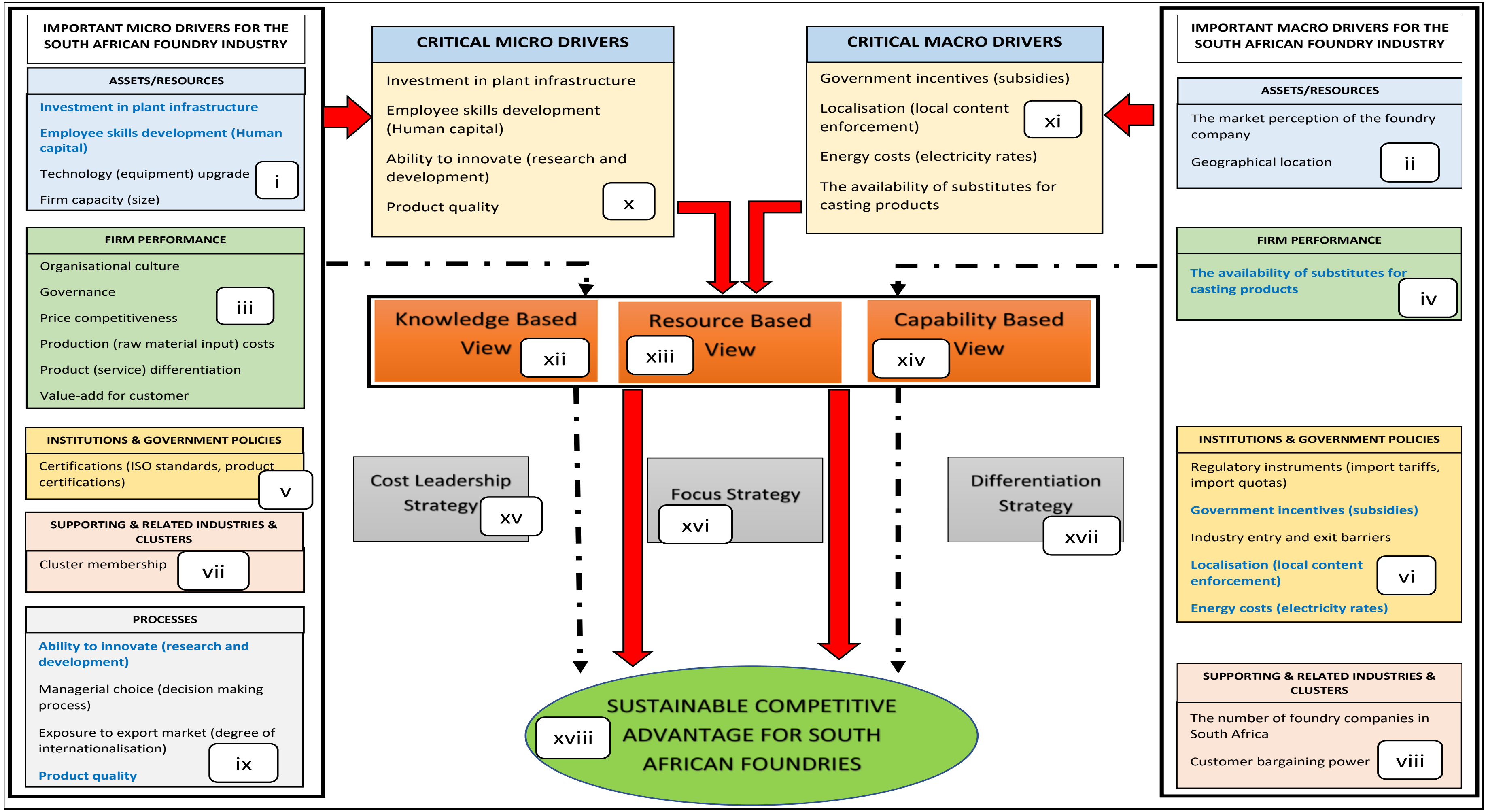

Figure 7.6: Framework for the Sustainable competitive advantage of South African foundries (Final framework).

Source: Author's own compilation (2022)

Figure 7.6 illustrates the framework for the sustainable competitive advantage of the foundry industry in South Africa. A total of 20 micro drivers and ten (10) macro drivers were identified from literature as important in contributing to the SCA of foundry companies. These drivers were also categorised into five different constructs: assets/resources, processes, supporting and related industries, firm performance and clusters, institutions, and government policies (see chapter 3, table 3.12).

This study tested these drivers within the South African foundry industry and established that only 16 of the 20 micro drivers were regarded as important in enhancing SCA. The possession of intellectual property, possession of unique resources (inimitable to competition), socio-cultural responsibility (corporate social investment) and bargaining power over suppliers were the drivers regarded as not important for South African foundry companies. All ten macro drivers identified in literature were regarded as important for South African foundry SCA.

7.4.1 Important drivers for the South African foundry industry

This section discusses the drivers identified in the framework as important in enhancing SCA. As discussed, the drivers are classified into various constructs as indicated in the following sub-sections.

i) Assets/Resources – Micro drivers

As indicated in figure 7.6, a total of four asset/resource micro drivers were identified as important in enhancing SCA. These included investment in plant infrastructure, which the study found as relating to capital investment in machinery such as furnaces, moulding tools and patterns meant to improve on the efficiency and quality of the casting products made. Stundziene and Saboniene (2019) posit that it is crucial for businesses to invest in tangible assets in order to provide a measure of improved labour productivity and competitiveness. The authors, however, caution that low productivity and subsequently, lack of competitiveness can still be realised if investment is used inefficiently.

The second driver identified was employee skills development (human capital), which relates to the training and skills upgrade for foundry personnel. The study found that well trained and skilled employees contributed to the SCA of foundries in South Africa.

Hamadamin and Atan (2019:1) argue that SCA is no longer "deep rooted" in the business's physical assets, but on the skills set that its employees possess and add that employees stand out as a major source of gaining SCA for any business. According to Grobler and De Bruyn (2018), organisational practices that promote employee knowledge and skills are crucial in strengthening organisational SCA.

Technology (equipment) upgrade was identified as the third micro driver enhancing SCA. The move away from manual operations during casting design, development, and manufacture to the use of computer-aided processes was deemed as crucial in enhancing the competitiveness of foundry companies. The seminal work by Barney (1991:114) postulated "an information processing system that is deeply embedded in a firm's management decision making process may hold the potential of sustained competitive advantage". Nicodemus and Egwakhe (2019) point out in order to advance SCA, it is imperative to consider the core technology transfer aspects of technology adoption, technology infrastructure, and technology innovation. This view is also supported by Hoffman (2000), and Salisu and Julienti (2019) who point out that the ability of firms to adapt to changing technological environments is key to enhancing firm SCA.

Firm capacity was also identified as an important micro driver for SCA. According to the study, firm capacity related to the ability of foundry companies to accommodate the volumes of casting orders required by the customers, as well as the flexibility to adopt product configuration changes to suit the different product dynamics. Foundry company capacity provided an edge for the company over competition whose capacity was seen as "limited". Lee and Yoo (2021), in their study on the determinants of SCA, support this outcome and point out that several researchers identify company capacity as an important resource for enhancing competitiveness.

ii) Assets/Resources – Macro drivers

The two macro drivers that fell into this category included the market perception of the foundry company as well as geographical location (see figure 7.6). The study found that company perception or reputation was an important driver for SCA. A company perceived as being reliable with a history of trading in quality products was likely to be competitive when compared to companies that were perceived in a negative light. Smith, Rupp and

Motley (2013) point out that company perceptions are normally held by customers, employees, and other stakeholders. They argue that positive perceptions of a company were valuable as they allowed the company to gain market share, charge higher prices and attract employees with high expertise within the industry, and this provided a level of SCA. This perspective is supported by Sarjana and Khayati (2017) who pointed out that market perception had a positive effect on the competitive advantage of a business and, therefore, it was important for organisations to manage these perceptions through implementing strategies such as corporate social responsibility.

Geographical location was also identified as an important macro driver as the study found that the strategic location of foundry companies closer to sources of resources, such as raw materials as well as customers, provided the company with a competitive edge over foundries located further away.

The following section discusses the drivers which were categorised under the firm performance construct and regarded as important in driving SCA.

iii) Firm performance – Micro drivers

Six micro drivers were identified (see figure 7.6). The first was organisational culture which provides organisations with an identity and “personality” (Muriithi, 2021). Mwenda, Senaji and Mwiti (2019:6) define organisational culture as “a value system consisting of attitudes and beliefs which directly affects the behaviour of employees”. The difficulty in imitating organisational culture makes this driver an important factor for enhancing SCA for competing foundries (Barney, 1995). According to Muriithi (2021), and Senaji and Mwiti (2019), the type of culture created within the organisation determines SCA.

Governance, as the second micro driver, is “the method by which a corporation is directed, administered or controlled” (Madhani, 2016:1). The study found that good corporate governance was associated with an improvement in the organisation’s SCA. In her seminal work, Peteraf (1993) argued that good corporate governance provides the assurance that the business is well managed and this is important in creating competitive advantage. Nginyo, Ngui and Ntale (2018) mention that embracing the corporate governance pillars of responsibility, fairness, accountability, and transparency promotes long-term competitive advantage (SCA).

Price competitiveness was also identified as another important driver for SCA. The study found that the ability for South African foundries to charge prices that matched or were lower than those charged by both local and foreign competition, presented the companies with a better ability to compete for market share (Kuncoro & Suriani, 2018). The influx of casting imports was identified as one of the factors that contributed to the closing down of local foundries and this was because foreign foundries were able to charge lower prices than the local foundries. Heim (2017), however, argues to the contrary and believes that price competitiveness can easily be imitated and, therefore, does not provide a long-term competitive advantage for companies. This view is also supported by Cocioc (2021) and Putra (2018) who point out that price competitiveness would only apply in situations where there was a high elasticity of demand and homogeneity of products being manufactured. This driver, therefore, would enhance SCA in situations where foundries manufacture similar products and in high numbers.

Production (raw material input) costs relates to the ability of foundry companies to contain manufacturing costs better than their competition. The study found that this ability enabled foundry companies to reduce their pricing, allowing them to compete with “cheaper” imports. Roy (2021:5) points out that the emphasis by businesses to reduce manufacturing costs is regarded as the “key to gaining competitive advantage”. This view is also supported by Potjanajaruwit (2018), who places emphasis on the ability of organisations to improve on their technological and innovation capabilities on production related processes, in order to reduce costs and gain cost competitive advantage.

Product (service) differentiation as a micro driver is associated with the ability of foundry companies to differentiate their product or service provision from that of their competition. The study found that product or service differentiation was deemed an important driver if local foundries wanted to gain SCA. Putra (2018) mentions that product differentiation strategies allow organisations to gain a measure of uniqueness, which may be viewed as delivering more value to the customer.

Value-addition for the customer was identified as the sixth micro driver capable of enhancing the SCA for foundries. The study found that there was a need for foundries to consider value-adding activities, such as machining castings for the customer, in order to provide fully machined components and engaging with the customer's product designers, technicians and pattern makers during product development, in order to minimise design flows, reduce casting manufacturing costs and delivery lead times. Porter (1985:6) attested that in order for firms to gain competitive advantage, "they should systematically provide added value to customers relative to competition".

iv) Firm performance – Macro drivers

Only one macro driver was identified under the firm performance construct (see figure 7.6). The availability of substitutes for casting products was deemed as playing an important role in determining the competitiveness of local foundries. Porter (2016) identified the availability of substitute products as a threat to the competitiveness of firms. Substitute products such as forgings, fabrications, the use of three-dimensional (3D) printing and the use of alternative materials present threats to the foundry industry. It is essential for local foundries to be cognisant of this threat when developing strategies for SCA.

The following section discusses the drivers categorised under the institutions and government policies construct.

v) Institutions and government policies – Micro drivers

The ability of foundry companies to implement certification programmes for their products and processes was identified as an important micro driver for SCA. According to Roy (2021), product quality is a significant factor in determining customer satisfaction and loyalty. The study found that there was an increasing need and requirement for local foundries to gain some form of product or process certification. This was viewed as a demonstration that the foundry product complies with the minimum set standards for product performance and provided the customer with "peace of mind" that the final product would perform as anticipated. Damor and Thakkar (2014) posit that there is a need for foundry companies to come up with "breakthrough strategies" that promote the improvement in product quality and processes in ways that "delight the customer".

vi) Institutions and government policies – Macro drivers

As shown in figure 7.6, five macro drivers in this category were found to be important in promoting SCA for local foundries.

Regulatory instruments, which included import tariffs and import quotas, were found to influence the level of foreign competition into South Africa. The study found that the strengthening of trading regulations on castings and related products had an impact on promoting local foundries, by protecting them from the influx of castings from foreign competition. On the other hand, the lack of regulatory enforcement made it easy for foreign foundry companies to sell their casting products in South Africa, in direct competition with the local foundries. The current regulatory environment did not appear to be a deterrent for foreign firms to sell their casting products in South Africa.

Although Monsreal-Barrera, Cruz-Mejia, Ozkul and Saucedo-Martínez (2020) acknowledge the benefits of government regulations in influencing the SCA of local industries, Mugo and Macharia (2021) caution that government regulations can also result in retaliatory policies by foreign governments, which might disadvantage South African foundries. Moshi and Mwakatumbula (2017) also point out that where government regulations are not well thought through, these may end up favouring certain firms at the expense of others within the industry, leading to unfair advantage.

Unlike with regulatory instruments, government incentives or subsidies were found to positively influence the SCA of South African foundry companies. Government incentives relate to a reduction in taxes paid by the foundries, a provision of loans or financial assistance at favourable interest rates, as well as the provision of services that provide foundry companies with an edge over foreign competition. The injection of financial assistance into the industry as well as the promotion of initiatives, such as the industrialists incentive scheme, also enhances firm competitiveness (the DTIC, 2019).

The third macro driver, industry entry and exit barriers, was also identified as an important macro driver enhancing SCA in South Africa. Islami, Islami, Latkovikj and Mulolli (2019) argue that the existence of industry entry and exit barriers present positive and negative implications to both the incumbent and non-incumbent firms. The study found that huge capital investment requirements were a major barrier for “new” entrants into the industry.

The cost of compliance to legislative requirements as well as that of manufacturing equipment were found to be deterrents for new local foundry companies to set up in South Africa. The study also found that exit barriers did not have much influence on foundry companies, and this explained the increase in the number of foundry companies that were closing down and, therefore, “exiting the industry”. This resulted in a situation where very few, if any, new foundry companies were “entering” the industry and, yet there was a high number “exiting” the industry.

The enactment and enforcement of local content measures (localisation) was found to be a very important driver in enhancing SCA. This protectionism strategy related to the promulgation by the government that state owned entities had to procure a certain percentage of their casting requirements from local foundries. The study participants believed that this driver, when well policed, would help revive the ailing industry and prevent more company closures. According to Seyfullayev (2020:123), the enforcement of localisation policies is a “double-edged sword” due to its ability to protect and help revive local industries, but at the same time, dissuade “healthy” competition from other sectors and encourage “laziness” for protected companies.

The fifth macro driver categorised under the institutions and government policies construct was that of energy costs. The high energy costs (which include electricity and gas) were found to be key in influencing SCA. The study found that there was a general agreement between participants that the cost of energy was high and this made it difficult for foundry companies to contain their costs and offer competitive pricing to their customers. Rasmeni and Pan (2014) point out that the energy consumption levels by South African foundries was high when compared with the global average. According to the DTIC (2021:20), the “uncertainty regarding electricity pricing and supply is a disincentive to investment” and has a negative impact on the competitiveness of South African industries.

The following section discusses the supporting and related industries and clusters construct as identified in chapter 3. Only one micro driver and two macro drivers were regarded as important in enhancing SCA under this contract.

vii) Supporting and related industries and clusters – Micro drivers

The availability of supporting and related industries and clusters provide a support structure for local foundries in a number of areas which include, the provision of training, resources, legal, financial, business and moral support (Mkansi *et al.*, 2018; The DTIC, 2019). Although the study identified cluster membership as an important micro driver for SCA (see figure 7.6), there was a diversity of views as some participants were not convinced that belonging to a cluster, such as the South African Institute for Foundrymen, provided them with a competitive advantage. Some participants believed that foundry clusters in South Africa were not effective and had not promoted significant change in the foundry industry to deter foreign competition and solicit stakeholder support for local foundries.

viii) Supporting and related industries and clusters – Macro drivers

The number of competing foundries was identified as an important driver for SCA (see figure 7.6). More foundries competing for the same market reduced the competitiveness of the foundry companies concerned, as customers would be presented with various options to purchase from (increased rivalry). This means that foundry companies are not able to charge premium pricing as they are bound to lose customers to cheaper competing products. A reduction in the number of foundry companies, on the other hand, offered foundry companies with more opportunities to venture into the different sectors of the market, seeking competitive advantage (reduced rivalry).

According to Bruijl (2018), customer bargaining power relates to the ability of customers to influence the price of products they buy from suppliers. The study found that the foundry industry was regarded as relatively homogeneous, with similar casting products manufactured and sold. However, customer bargaining power was an important driver for SCA in instances where the customer procured large quantities of casting products, was the sole user of a specific casting product, which the foundry company manufactured, or could easily switch suppliers if dissatisfied with the price, quality or service provided.

The following section discusses the processes construct where only the micro drivers were regarded as important.

ix) Processes – Micro drivers

As indicated in figure 7.6, the ability to innovate was identified as the first micro driver under the processes construct. The study found that foundry companies that invest in research and development, and were willing to improve on their processes, had a competitive advantage over those that did not. Banganayi *et al*. (2019) point out that there was a close link between the adoption of technology (internet of things) and innovation. Innovative foundries can manufacture castings better, quicker and cost effectively, as opposed to foundry companies that are averse to the adoption of technology.

Managerial choice, another important micro driver for SCA, relates to the ability by foundry management to make timely and informed decisions relating to employee treatment, manufacture, service, and marketing approach. The study found that decision making for family-owned or smaller foundries was quicker, as opposed to the decision-making processes of big foundries. This was because there was not much consultation up or down the organisational hierarchy that needed to take place, as the owner(s) made the decisions. Abdulwase *et al*. (2020) point out that the ability by management to formulate and implement quick decisions as well as growth strategies are critical in ensuring businesses become competitive. The bureaucratic nature of decision-making processes in bigger foundry companies was viewed as a barrier to the implementation of management decisions, which had a bearing on competitiveness.

The exposure by foundry companies to export markets provided them with an understanding of the needs of the global market. This exposure was identified as an important driver in that it encouraged local foundries to improve the quality of their products and service offering, in order to match global standards. This in turn gave such foundries a competitive advantage over companies that focused solely on the local market.

Product quality was also identified as an important micro driver for SCA. Sitanggang, Sinulingga and Fachruddin (2019) point out that performance, features, dependability, compliance to specifications, durability, usability, aesthetics, and perceived quality are all aspects of product quality. The totality of these dimensions was identified as important for the foundry industry. The study found that poor casting quality made the foundries less competitive, while foundries that made high quality castings attracted more business and could charge premium prices for the castings. In the seminal work of Prajogo (2007), the author mentioned that prioritising product quality matched the objectives of both a differentiation strategy as well as a cost leadership strategy, and was critical in enhancing the competitiveness of a firm.

7.4.2 Critical drivers for the South African foundry industry

Out of the micro and macro drivers identified as important, as stated in the previous section, the study went on the establish which driver the industry identified as critical for enhancing SCA. As discussed in chapter 5, critical drivers were identified and defined as drivers without which it would be difficult to achieve SCA.

7.4.2.1 *Critical micro drivers (x)*

Four (4) out of 16 micro drivers were identified as critical for enhancing SCA. These drivers include:

a) Investment in plant infrastructure

The investment in plant infrastructure is crucial in ensuring an improvement in casting production and foundry performance. The use of state-of-the-art technology and less energy intensive equipment will help manage foundry costs thereby making the local industry more competitive.

b) Employee skills development (human capital)

The training and development of employees was identified as key in enhancing foundry competitiveness through a knowledge-based approach. The human capital could be improved through programmes such as on the job training as well as cluster engagements to facilitate knowledge sharing.

c) Ability to innovate (research and development)

The ability to innovate provides foundry companies with the added advantage of improving manufacturing processes and developing new cost-effective solutions. This in turn provides an opportunity for the industry to compete with foundries from more developed countries which have advanced casting facilities.

d) Product quality

The provision of good quality casting products is critical in satisfying industry needs. This requirement is affirmed by the issue of globalisation which has presented customers with a wide range of supplier options to choose from. Understanding the customers' definition of quality products will enhance the industry's competitiveness.

7.4.2.2 *Critical macro drivers (xi)*

Four (4) out of ten macro drivers were identified as critical for enhancing SCA. These drivers include:

a) Government incentives (subsidies)

Government incentives were identified as essential in helping foundries to manage high operational costs. The ability by the government to provide incentives such as loans, utility rebates and tax breaks, allow foundries to also reduce costs and attract expertise that would help them to become more competitive.

b) Localisation (local content enforcement)

Enforcing local content regulations was also identified as a critical macro driver. This regulation would encourage other industries to procure their casting requirements from local foundries instead of importing these leading to better capacity utilisation by the foundries (economies of scale) and reduced foreign competition.

c) Energy costs (electricity, gas rates)

The energy intensive nature of the foundry industry makes energy costs a critical macro driver for enhancing SCA. The management of energy availability and introduction of programs that help manage the associated costs will assist foundries in manufacturing to capacity and deter them from operating for a reduced number of hours. This will in turn ensure customer demands are met thereby preventing foreign competition from taking away the local market share.

d) The availability of substitutes for casting products

The availability of substitutes for casting products was identified as a critical macro driver for SCA. Depending on the customer requirements, products such as thermoplastics, rubber and forgings provide alternatives to casting materials in certain applications. The ability to manage costs, improve delivery and quality of casting products offers foundries an opportunity to compete against suppliers of alternative materials thereby enhancing SCA.

While the eight critical drivers were of extreme importance in driving foundry SCA, the remaining drivers were also viewed as relatively important in influencing SCA, even though SCA could still be achieved without these. Based on the important and critical drivers, the foundry companies could then determine what competitiveness approaches to adopt, in order to gain competitive advantage.

7.4.3 Competitiveness approaches

As shown in figure 7.6 and as previously discussed extensively in the validation process in section 5.6.4 (chapter 5), all three marketing competitiveness approaches, the knowledge-based view (xii), the resource-based view (xiii) and the capability-based view (xiv), were found to influence the way foundry companies attained SCA. These approaches were discussed comprehensively in chapter 3, section 3.4.2. The approaches could be used either individually or in combination with the other approaches. The choice of approach a foundry could adopt was dependent on whether the foundry company had knowledge, resources, or capabilities as its strongest points in gaining competitive advantage within the industry.

Having identified the competitiveness approach to adopt, it is essential that a go-to-market strategy is developed and implemented in order to achieve SCA.

7.4.4 Competitiveness strategies

Three strategies for enhancing SCA were identified in the study (see figure 7.6). These included a cost leadership strategy (xv), a focus strategy (xvi) and a differentiation strategy (xvii). According to Onditi (2018:1870), competitive strategies are crucial for firms seeking to “attract customers, withstand competitive pressure and improve market position”.

Whilst the study found that all three strategies could be adopted by local foundries to gain SCA, a majority of the participants felt that no single strategy could be adopted and applied in exclusivity. Various combinations (hybrids) of these strategies were identified, which included a combination of a cost leadership strategy and a differentiation strategy, cost leadership strategy and focus strategy, differentiation strategy and focus strategy, and a combination of all three. The choice of strategy or strategy combination was found to be dependent on the micro and macro-environment of the foundry, the level of competition faced, as well as the resource, capability, and knowledge base that the company had (Onditi, 2018).

7.4.5 Sustainable competitive advantage for South African foundries (xviii)

As discussed extensively in chapter 3, section 3.4, a definition of SCA was formulated as "a pro-business superiority strategy that allows a company to out-compete rivals by offering goods and/or services to customers in a manner that is difficult to replicate within the same window period of incessant advantage" (Author's own definition). According to Sołoducho-Pelc and Sulich (2020), because organisations now face increasing local and globalisation challenges that threaten their survival, it is imperative that they also develop "new" rules for managing their competitive advantage. Companies that can "maintain a competitive advantage, give advantages to a permanent character" (Sołoducho-Pelc & Sulich, 2020:13).

As illustrated in the proposed SCA framework (see figure 7.6), the determination of important and critical drivers, and the adoption of appropriate competitiveness approaches and strategies are essential in establishing SCA for the foundry industry in South Africa.

7.5 RESEARCH CONTRIBUTIONS

The contribution of this study is considered in terms of the importance of this type of research to the South African foundry industry as well as to academia. Research contribution can be classified as either theoretical or practical. Saunders *et al*. (2016:53) point out that it is key for researchers to prioritise on the "originality and usefulness" of their studies.

7.5.1 Theoretical and methodological contributions

Zhou, Shafiq, Adeel, Nawaz and Kumar (2019) note that a theoretical contribution should be based on facts and add value to the existing body of knowledge. The study demonstrates originality by developing a framework for the sustainable competitive advantage of the foundry industry in South Africa. This addresses a gap in literature on the issue of SCA within the foundry industry and in the South African context. The development of a framework for SCA provides blueprint that foundry companies can adopt in enhancing sustainable competitiveness.

Despite a plethora of research on competitiveness and sustainable competitive advantage, this study, more than complements research in the field of business management, by providing a comprehensive understanding and inter-linkage of the drivers for SCA, competitiveness approaches as well as the strategies for enhancing SCA for the foundry industry, which no previous studies have attempted to do. The study also contributes by going beyond only identifying the micro and macro drivers enhancing SCA for the foundry industry. It also further establishes the drivers deemed as critical in promoting sustainable competitiveness within the South African context.

In the context of the methodology, Bergh, Boyd, Byron, Gove and Ketchen (2022:2) argue that researchers should establish novel ways that contribute and enhance the methodology of the research process. Such processes should enable researchers to “answer new questions about how people, groups and organisations behave and to revisit existing questions in a more rigorous way”. Miles (2017:4) points out that such a contribution “offers a new line of approach to research which is different from what currently exists”. The questionnaire developed, tested (see section 4.3.6.1 and annexure A) and adopted for this study presents a new data collection tool for adoption in similar studies, where an understanding of the drivers for firm or industry specific SCA is sought.

7.5.2 Managerial contributions

The closure of foundries in South Africa has been attributed to a number of economic factors both within and outside the control of firms. A comprehensive understanding of the drivers for SCA, as provided for in this study, offers management an impetus towards formulating strategies that would help “arrest” similar company closures.

In respect of competitiveness approaches, the study contributes by determining that the foundry industry views the capability-based perspective as an all-encompassing approach, which is crucial in enhancing SCA more than the knowledge-based and resource-based approaches alone. This demonstrates to management that knowledge and resources alone, without capabilities by South African foundries to develop and manufacture castings, would not be adequate in enhancing SCA. This is in support of Teece's (2018) assertion that capabilities enhance firm competitiveness through the use of bundles or sets of skills, knowledge and assets that transform inputs (often resources) into valuable outputs that satisfy customer requirements.

The study also revealed a managerial propensity towards a balanced, hybrid approach to strategy adoption relating to enhancing SCA. The study reflected that the dynamic nature of the foundry's operating environment was crucial in determining what combination of competitive strategies would enhance SCA. A single strategy did not appear to provide the firm with the much-needed flexibility to counter competition, as opposed to a hybrid strategy. Figure 7.7 provides a summary of the theoretical and managerial contributions of the study as discussed in section 7.5.1 and 7.5.2.

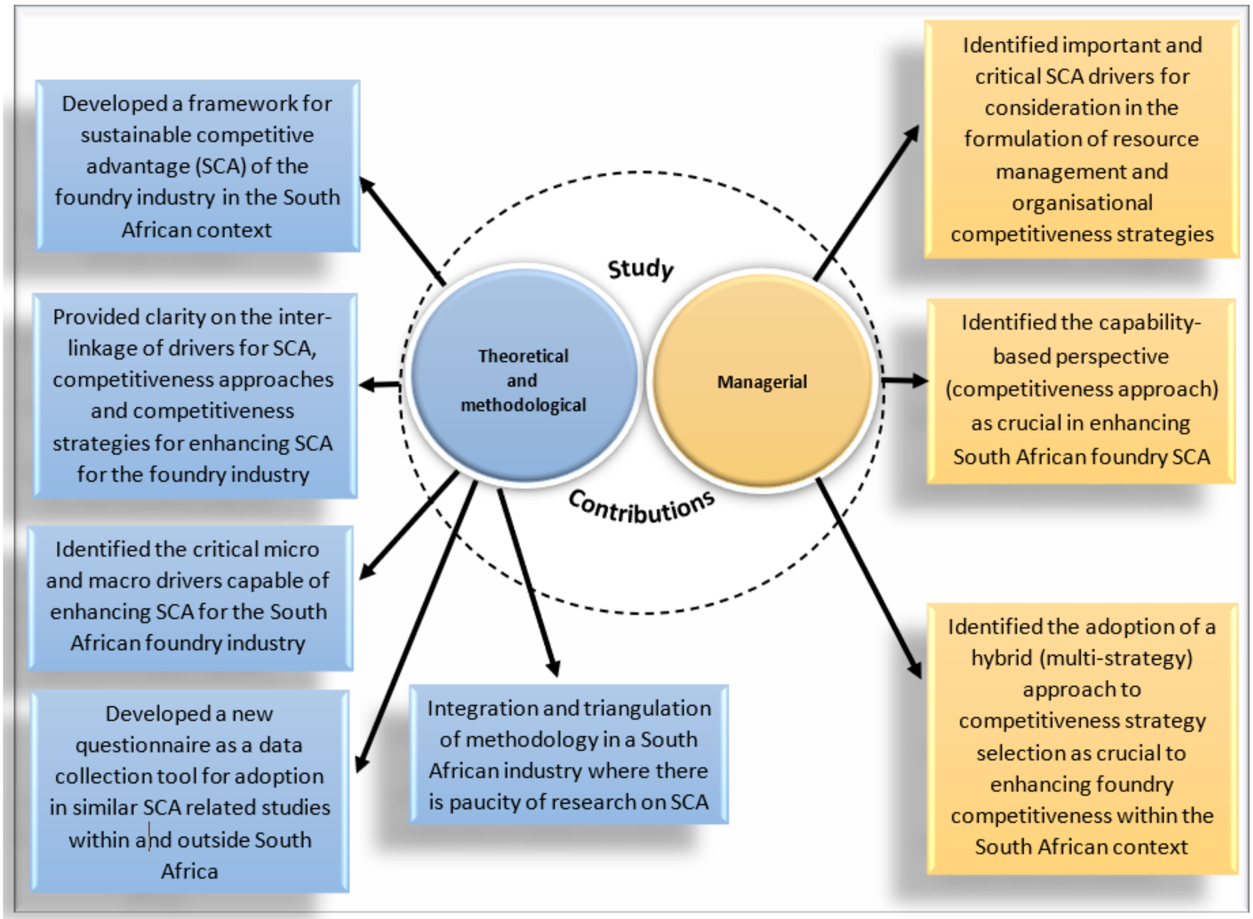

Figure 7.7: Summary of contributions of the study

The following section discusses recommendations of the study.

7.6 RECOMMENDATIONS OF THE STUDY

The third secondary objective of this study related to making recommendations on strategies that can enhance the sustainable competitive advantage for foundries in South Africa.

7.6.1 Strategies for enhancing the SCA for foundries in South Africa

Throughout the study, it was determined that while there still is room for the application of single competitive strategies, the dynamic and volatile nature of the foundry business in South Africa positions the industry at a vulnerable position. This is owing to the influx of foreign competition capable of manufacturing both the standard and specialised castings at costs that are much lower than those of local foundries. It is, therefore, recommended that foundry companies adopt a hybrid strategy whose benefits include capitalising on the positives of the other strategies to enhance SCA.

A hybrid strategy would allow foundry companies to achieve lower cost than other foundries, by introducing cost-efficient manufacturing processes and improving on the utilisation of machinery (cost leadership strategy), distinguish products and services through high emphasis on research and development initiatives (differentiation strategy), as well as identifying possible market gaps where customer requirements are not fully addressed (focus strategy). Depending on the foundry's micro and macro-economic environment, hybrid strategies could take the form of a cost leadership – differentiation strategy, cost leadership – focus strategy, differentiation – focus strategy or a combination of all three strategies

The following section provides the study's recommendations for policy and practice, as well as for future academic research.

7.6.2 Recommendations for policy and practice

The study culminated in the development of a framework, which identified the micro and macro drivers deemed critical for enhancing SCA for the South African foundry industry. Table 7.1 illustrates recommendations specific to the critical micro and macro drivers.

Table 7.1: Recommendations of the study pertaining to the drivers enhancing SCA for South African foundries

Construct	Driver	Driver-centric recommendations
Critical micro driver	Investment in plant infrastructure	As indicated in section 7.6, there is a need for the foundry industry to prioritise investment in plant infrastructure in order to enhance SCA and align the local foundry industry with the global expectations on performance, technology, and delivery.
		Recommendation: Foundry companies should invest in plant infrastructure, equipment and casting technology.
Critical micro driver	Employee skills development (human capital)	As mentioned in section 7.6, it is recommended that the industry and key stakeholders formulate a comprehensive training programme for employees within the industry. Training should not only focus on the technical (hard) skills but the softer skills as well, in order to ensure that there is an all-round appreciation of the manufacturing, administration, financial and quality processes, as well as service provision within the industry.
		Recommendation: Foundry companies and associated stakeholders should invest in employee development programmes, to train and upskill current and new employees on casting processes and new technology.
Critical micro driver	Ability to innovate (research and development)	Innovation enables firms to develop new products and establish new ways of cost-effective manufacturing. The demand to provide cost effective solutions to foundry customers is critical for competitiveness. It is recommended that a culture that promotes new ideas and encourages innovation is “cultivated”, in order for local foundries to compete within the global landscape.
		Recommendation: The foundry industry should encourage and incentivise foundry companies to become innovative, so that new casting products and more efficient manufacturing processes are developed.

Construct	Driver	Driver-centric recommendations
Critical micro driver	Product quality	Product quality was identified as a critical driver enhancing SCA. Whilst a number of foundry companies view the adoption and implementation of a quality management system within the foundry as avoidable cost drivers (xx), there was an indication that the industry realises the need to manufacture and supply quality casting products in order to remain competitive.
		Recommendation: Foundry companies should adopt and implement quality management systems that guide casting manufacture and ensure uniform product quality, in order to compete with local and foreign foundries.
Critical macro driver	Government incentives (subsidies)	As discussed in section 7.4.2, xi, although there is a sense of appreciation of government intervention within the foundry industry, there was also a general feeling that more could still be done. The government should offer incentives across the foundry supply chain from raw material procurements through to manufacture, testing and supply. These incentives could be in the form of subsidies, which are aimed at reducing the cost of casting manufacture and testing. Foundry companies should also be incentivised to develop their employees by offering them grants or tax incentives, which would encourage the foundries to channel more efforts into firm and employee development.
		Recommendation: The South African government should, directly or through various players and platforms, such as the NFTN, CSIR, TLIU and among others, provide support to foundry companies through offering incentives and reduced taxes, so that foundries are able to channel the rest of the funding to other value adding activities.

Construct	Driver	Driver-centric recommendations
Critical macro driver	Localisation (local content enforcement)	Localisation helps inefficient local industries by limiting foreign competition. A polarity of perspectives on localisation was discussed in this study. The foundry industry supports the enforcement of localisation by the South African government, in order to cushion the industry from foreign imports. The government should be clear in its policy around local content, specifically on its expectations from local industry as well as the time frame for the enforcement of localisation. This will ensure poorly run foundries do not just benefit from this regulation without giving "something back to the economy", but also formulate strategies to enhance their competitiveness even after the localisation enforcement period.
		Recommendation: The South African government needs to capacitate the local foundry companies by enforcing local content regulations, so that there is total buy-in from both the public and private sectors on the capabilities of the industry to service their needs at quality levels comparable to foreign foundries. Local industries should also be incentivised to support local foundries without bearing the prohibitive costs for local content evaluations or audits. The foundry industry should also be encouraged to produce strategic plans on further employee, company, and industry development, to enhance long-term competitiveness and sustainability beyond the local content enforcement period.
Critical macro driver	Energy costs (electricity, gas rates)	As discussed in the study, the energy costs (and availability) in South Africa impact negatively on foundry competitiveness. There is, therefore, a need for more extensive research on energy alternatives that can be used by the foundry industry, in order to reduce the associated costs as well as minimise the disruptions to production due to the intermittent power supplies created by load shedding. Any strategies that significantly reduce energy costs will enhance the ability of foundries to become competitive in the long term.

Construct	Driver	Driver-centric recommendations
		Recommendation: There is a need for exploration and investment into alternative energy sources for the foundry industry. Upgrading equipment and technology into less energy intensive ones will also significantly reduce the consumption patterns for the foundries, as most currently use aging equipment with high energy consumption requirements.
Critical macro driver	The availability of substitutes for casting products	Whilst the availability of substitute materials capable of replacing casting products will not necessarily affect the competitiveness of the foundry industry, it is the availability of cheaper alternatives that does. There is a need for the foundry industry to invest in measures that promote the manufacture of high-quality castings efficiently, at affordable costs, in order to render them competitive especially against foreign foundries as well as competing materials.
		Recommendation: The foundry industry, through innovation initiatives and collaborations with institutions such as CSIR, NFTN and NTI, work on developing processes, technologies, and low-cost castings capable of competing with any potential substitute materials. This would discourage potential new material players from entering the market and competing with the traditional foundry companies for a “shrinking piece of the castings pie” market.

In addition to the recommendations provided in table 7.1, and to support the foundry industry in its quest for achieving SCA, the following recommendations are also proposed. These recommendations were drawn from extant literature (chapter 3) as well as from the participants' responses to question eight (8) of the interview schedule (see annexure B), which sought to understand what other strategies could be adopted to enhance foundry SCA.

7.6.2.1 Electricity and energy management alternatives

As discussed in section 3.6 (chapter 3), foundries are regarded as energy exhaustive operations due to the nature of their manufacturing processes, which use different forms of energy such as heat, electrical and mechanical energy. The exorbitant cost and availability of energy, particularly electricity, for running foundry companies were identified as deterrents to the competitiveness of the industry. A proportion of 43.4% of total foundry costs relate to electricity usage with energy costs estimated at being around 15% of the costs of the castings. Reducing energy costs and implementing energy management systems that minimise energy consumption are crucial measures in reducing the overall foundry costs. Such measures, in turn, would allow the company to channel funds to other areas of the business, such as employee training and skills developments as well as technology upgrades.

Energy consumption audits that help establish process outputs relative to energy consumption should be conducted. Such an audit would assist South African foundries streamline and optimise these processes, in order to reduce energy consumption and formulate technology-linked energy management strategies, which would reduce costs and improve foundry competitiveness. There is also a dire need for a re-look at the electricity tariffs being levied by municipalities, as these have proven to be exorbitant when compared to direct Eskom tariffs.

7.6.2.2 Government financial support

The need for government support of the foundry industry, in terms of providing financial assistance and offering subsidies, was underscored in this study (see section 3.9 in chapter 3). The Covid-19 situation has exacerbated the industry's financial position. Government support can include debt finance support, employment cost support and tax support. One of the outcomes of this study pertained to the difficulty that local foundries had in matching the low product costs of foreign competition. The provision of financial support and subsidies would offer companies with an opportunity to work off a low-cost base and reduce the price of castings, thereby enhancing foundry company competitiveness.

7.6.2.3 Government regulatory support

As discussed in section 3.9.2.3 (chapter 3), government support through the institution of regulatory frameworks, such as protectionism (local content enforcement) and trade restrictions for foreign foundries, were also identified as important support mechanisms for the local industry. Despite the various schools of thought that argue for or against local content regulations, there can be little doubt that when properly implemented and managed, protected industries will benefit in the short term. Although local content regulations were introduced in support of local casting procurement for various sectors, there have been concerns by industry around the ability of the government to "police" compliance, especially by SOEs in procuring their casting requirements from local foundries. The high costs of local content compliance or verification audits, as charged by the South African Bureau of Standards (SABS), are also a deterrent to the enforcement process as industries are hardly realising the benefits of localisation.

The impact of Covid-19 on the foundry industry, without doubt, has put a strain on the ability of foundry companies to compete both at a local and international level, with a number of foundry companies either being forced to temporarily shut down, retrench employees or reduce working hours. There is, therefore, a need for policy makers to consider more aggressive and better regulatory measures, to enforce local content in support of casting procurement by both government entities and the general South African industry. The influx of cheaper imported castings, for which local foundries have the capacity and capability to manufacture, should also be curtailed by strategically disincentivising imports or encouraging foreign-local foundry partnerships through fostering governmental multi-lateral policies (such as with the BRICS arrangements), which would also benefit the South African foundry industry.

7.6.2.4 Investment in foundry operations

The lack of advancement in technology, use of old equipment and shortage of skills within the industry negatively impact on the competitiveness of the foundry industry in South

Africa (see section 3.9 in chapter 3). In order to enhance SCA, there is a need for stakeholder engagement to facilitate investment into the industry. The reliance on ageing equipment and old technology affects the quality of the castings produced as well as the delivery times, whilst employee skills shortages contribute to the industry's lag in product and process innovation. The National Tooling Initiative (NTI) and the National Foundry Technology Network (NFTN) represent initiatives that have been set up to try and increase the foundry industry's competitiveness through critical skills development, technology upgrades and enterprise development, among others. Foundry companies should be encouraged to capitalise on these initiatives in order to benefit from the investments.

The foundry industry consists of companies that work in silos. This was revealed during the study when the researcher approached the different companies during the data collection phases, as well as from the responses that came from the individuals who participated in the study. There is a limited level of belief that government institutions, such as the DTIC and the NFTN, as well as industry bodies like SAIF, are vehicles set up to further the cause of the entire industry and these result in a hesitancy to take up new opportunities. This limits the involvement of foundry companies from accessing support from NTI as well as the NFTN, among others. It is important for this paradigm shift to happen, so that the competitiveness of the industry is enhanced.

7.6.2.5 Stakeholder relationship values

It is important for organisations to understand and effectively manage their relationships with their stakeholders. For the foundry industry, stakeholders include employees, shareholders, customers, suppliers, the society, government as well as non-governmental organisations. As discussed in section 2.5 (chapter 2) and in line with section 3.4.2.4 (chapter 3), which focuses on the relational view, it is crucial for the foundry industry in South Africa to ensure that the internal and external relationships with various stakeholders are maintained, so that cross functional interactions between the different foundry processes are enhanced. Healthy stakeholder relationships are key in ensuring the foundry industry attracts investments, support and maintains cordial support from customers.

7.7 ETHICAL CONSIDERATIONS

Saunders *et al*. (2016:239) define ethics as "standards of behaviour that guide researcher conduct". Before the data collection process commenced, ethics approval was obtained from the university (see annexure G), thereby paving way for the researcher to contact the participants for primary data collection (University of South Africa, 2021). Leedy, Ormrod and Johnson (2021) identify four categories of classifying ethical issues, which include honesty, participation from harm, voluntary and informed participation as well as right to privacy. In line with the recommendations by Saunders *et al*. (2016), the following ethical issues were addressed in the study.

Table 7.2: Ethical issues addressed in the study

Ethical issue	**How the ethical issues were addressed in the study**	**Source**
1. Permission to conduct the study	Permission from the University's Research Ethics Committee was obtained before the study commenced. Permission was also obtained from the foundry association (SAIF), as authorisation to conduct the study and collect data from the different foundries across South Africa.	Lenton, Smith, Bacon, May & Charlesford, (2021)
2. Integrity and objectivity of the researcher	The researcher was truthful and open in communicating with the respondents and the participants during the data collection process for the two phases. In all processes, deception and misrepresentation was avoided.	Leedy, Ormrod and Johnson (2021); Saunders *et al*. (2016); Lenton *et al*. (2021)
3. Respect for others	All respondents and participants were treated with respect and informed that their participation was valuable. The researcher made sure that a strict time schedule on appointments was kept, without having to keep the participants waiting. Efforts were made to create rapport with both the respondents and participants prior to, during and after the data collection process.	Leedy *et al*. (2021); Saunders *et al*. (2016)
4. Avoidance of harm (maleficence)	During the data collection and gathering processes, questions were designed and asked in such a way, that no one was embarrassed or demeaned. No discrimination was done and the researcher also made sure that no intrusive or "trade secret" questions were asked. The risks associated with the Covid-19 pandemic were also considered during the data collection process. SurveyMonkey and MS Teams platforms were used to ensure there was no physical contact with the respondents or participants. This also ensured that no physical documents were shared.	Salkind (2012)

Ethical issue	How the ethical issues were addressed in the study	Source
5. Privacy of those taking part	The privacy of the respondents during the first phase was ensured by configuring the SurveyMonkey platform to allocate pseudonyms to the respondents, thereby making it difficult to identify who had responded. Participants from the qualitative phase had personal identifiers removed, with pseudonyms used for data interpretation purposes. The participants were also given the option to disable the video function in order to hide their identity, if they chose to.	Salkind (2012); Leedy and Ormrod (2021); Saunders *et al*. (2016)
6. Voluntary nature of participation and right to withdraw	Participants and respondents were made aware that participation in the study was completely optional and that they might stop at any time if they did not feel comfortable, without any repercussions or penalties. Participants were also informed that they could opt not to answer any specific questions, which they felt were of a sensitive nature or were less comfortable to answer.	Salkind (2012); Newman, Guta and Black (2021)
7. Informed consent of those taking part	Before the data collection processes began, the researcher ensured that all respondents and participants were provided with enough information and details of the nature of the study, and their role and implications of their participation, in order to ensure that they provided fully informed decisions to participate.	Leedy and Ormrod (2021); Saunders *et al*. (2016)
8. Ensuring confidentiality of data and maintenance of anonymity of those taking part	The respondents and participants were informed and assured of confidentiality. The data collected was analysed as part of a collective without mentioning the people or foundries involved.	Salkind (2012)
9. Responsibility in the analysis of data and reporting of findings	As discussed, during the analysis of data, anonymity and confidentiality was ensured by removing personal identifiers to ensure responses were not linked to any participant. Efforts were also made to ensure that the findings from the study were reported as accurately as possible and sources used were clearly acknowledged.	Newman *et al*. (2021)
10. Compliance in the management of data	The data collected (hard copies) were stored securely in a locked drawer at the researcher's office to ensure controlled access. Soft data and electronic storage devices were also password protected to ensure only authorised individuals could access the files. The devices used to store the data were also stored in a locked drawer.	Saunders *et al*. (2016)
11. Ensuring the safety of the researcher	Data was collected using online platforms to protect the researcher from the risk of contracting or spreading Covid-19.	Saunders *et al*. (2016)

Source: Adapted from Saunders *et al*. (2016)

7.8 LIMITATIONS

The paucity of recent academic and industry literature on the history, operations, and competitiveness of the metal casting foundry industry globally, as well as in South Africa, presented challenges on the ability to obtain recent literature. To this end, this study will present future researchers with much more recent literature to utilise as a basis to their studies. As indicated in chapter 4, a sequential explanatory research design proved demanding for a single study, as a result of its resource (budget constraints) and time requirements, which the researcher had to carefully manage (Creswell & Plano-Clark, 2018; Creswell *et al*., 2010). Adequate time management and access to funding, through research facilities available to the academic institution where the researcher is registered, were used to overcome these resource constraints. The study strongly focused on the South African foundry industry; therefore, the findings cannot be generalised to contexts outside South Africa due to the differences in the micro and macro-economic environments governing the different foundry industries.

The general hesitancy by the industry to participate in academic studies, where there are fears that the information shared might provide competitors with insight into their strategies and operations, and the unavailability of some of the individuals targeted for the first phase, negatively impacted on the number of people who participated in the quantitative phase of the study. Some potential respondents, particularly from family-owned foundry companies, did not respond to requests to participate despite some of them originally agreeing to do so.

The low number of respondents was, however, in line with previous studies carried out on the industry where the sample sizes have been generally low (see also section 5.3.1, in chapter 5). This low sample size meant that the outcomes from the quantitative phase could not be generalised to the entire foundry industry population. Singh and Masuku (2014) mention that if the sample size is too low, the study may fail to detect impacts or associations precisely, whilst a very high sample size might be costly for the study. The qualitative phase of the study, however, provided the researcher with an opportunity for an in-depth analysis of the responses from the first phase, as well as to fill in the knowledge gaps resulting from the responses from the quantitative phase of the study.

This study was carried out at a time when a number of industries, including the foundry industry, were being asked by various government departments to complete a number of Covid-19 related surveys. This might have contributed to a “survey fatigue” phenomenon where potential respondents were “too tired” to participate in the study. This meant, therefore, that some companies could not be represented in the study. According to De Koning *et al*. (2021), the Covid-19 pandemic has resulted in survey fatigue which leads to a reduction in both response rates and quality of data collected.

To try to overcome this, the foundry association, SAIF, was approached to communicate the value of participating in this study to the industry. Despite this effort, the number of respondents still remained relatively low. Added to this limitation, a number of family-owned foundry companies expressed disinterest in taking part in the study and so, their views regarding the topic understudy could not all be captured. Efforts were made by the researcher to share the questions beforehand, to assure respondents that the study was purely academic with no invasive (trade secret) questions being asked.

All the data collection efforts for the two phases were carried out online using SurveyMonkey and MS Teams platforms. Creating rapport with the participants was not easy, especially during the interview phase, as in most instances, despite telephonic conversations in preparation for the interviews, this was the first visual engagement with the participants. As a result, this left little time for both the researcher and the participant to acclimatise with the environment and to create a "more trusting" environment conducive for qualitative interviews (Qu & Dumay, 2011; Bonde, 2013). Efforts were made by the researcher to create an environment comfortable to the participants, by allowing them to select the times when they were available and choosing whether they wanted to show their faces (video option) or not. In all instances, the researcher ensured that he was visible to the participants, in order to give them a sense of comfort in knowing whom they were in conversation with.

As mentioned in chapter 4, the study was conducted as a cross-sectional study, which did not provide the researcher with an opportunity to conduct data collection over an extended period of time, in order to better understand the effect of the drivers for SCA overtime (Saunders *et al*., 2016:200).

7.9 RECOMMENDATIONS FOR FUTURE RESEARCH

This study was motivated by the need to develop a framework for SCA of the foundry industry in South Africa. Based on the outcomes of the study, several recommendations for future research are proposed:

i. This study focused on the foundry industry in South Africa. It would be interesting to establish if the drivers identified both as important and critical for this industry would also enhance the SCA of a different industry in and outside South Africa.

ii. Comparative research could also be conducted in other countries such as the BRICS countries, which include Brazil, Russia, India and China in order to understand the micro and macro drivers influencing foundry industry SCA, and to establish whether the decrease in the number of foundry companies in Brazil and Russia (see section 2.2.1) is due to similar economic circumstances facing South African foundry companies.

iii. The study together with the appraisal of other foundry industry related research in South Africa, found that there was a general scepticism or hesitancy by family-owned foundry companies to participate in this type of industry related research. Future researchers could explore the reasons behind this scepticism and how this could be overcome.

7.10 SUMMARY OF THE STUDY OBJECTIVES

As indicated in chapter 1 (see section 1.5) as well as in section 7.2, the study's objectives were clearly articulated and succinct. These provided direction for the study in the development of the SCA framework, identification of the micro and macro-economic drivers influencing SCA for the foundry industry, benchmarking the perceptions of stakeholders on SCA within the foundry industry against the drivers found in literature, as well as making recommendations on SCA strategies.

This study was successful in meeting the set objectives. Table 7.3 illustrates the research problem and the objectives, as well as the different sections in this thesis, where the objectives of the study, the research deliverables as well as the recommendations of the study were addressed.

Table 7.3: Research objectives addressed

Research Problem	Objectives	Section(s) where the research objectives are addressed
The problem is that metal casting foundries in South Africa are closing down because of micro and macro-economic circumstances (Davies, 2015; Jardine, 2015b; the DTI, 2015; SAIF, 2015; Mkansi *et al*., 2018; Lochner *et al.*, 2020)	**Primary Research Objective**	
	To develop a framework for the sustainable competitive advantage of the foundry industry in South Africa	Chapter 3 (Refer to figure 3.8 and 3.11)
		Chapter 5 (Refer to figure 5.21)
		Chapter 7 (Refer to section 7.6 and figure 7.6)
	Secondary Research Objective 1	
	To identify from literature the micro and macro-economic drivers influencing the sustainable competitiveness of foundries in South Africa.	Chapter 3 (Refer to tables 3.8; 3.9; 3.10; 3.11 and 3.12)
		Chapter 5 (Refer to tables 5.4; 5.5; 5.6; 5.7; 5.8; 5.9; 5.10; 5.11 and 5.12)
	Secondary Research Objective 2	
	To benchmark the perceptions of stakeholders within the foundry industry on sustainable competitive advantage against the macro and micro-economic drivers identified from literature.	Chapter 5 (Refer to section 5.8)
		Micro drivers (Refer to table 5.16 and table 6.11)
		Macro drivers (Refer to table 5.17 and table 6.13)
		Critical drivers are indicated in Chapter 5 (Refer to section 5.6.3, figure 5.12 and figure 5.13) and Chapter 6 (Refer to section 6.9, table 6.15 and table 6.16).
	Secondary Research Objective 3	
	To make recommendations on strategies to enhance the sustainable competitive advantage for foundries in South Africa.	Chapter 6 (Refer to table 6.17, table 6.18 and table 6.22)
		Chapter 6 (Refer to section 6.10)
		Chapter 7 (Refer to sections 7.3.4 and 7.6.1)

The next section provides a summary of the outcomes from this chapter.

7.11 CHAPTER CONCLUSION

The outcome of this study directly addresses the primary objective of developing a framework for the SCA of the foundry industry in South Africa. Chapters 3, 5, 6 and 7 provided a roadmap into the formulation and development of the framework, which identified micro and macro-economic drivers deemed as important or critical for enhancing SCA.

In chapter 3, a number of macro and micro-economic drivers influencing SCA were identified from various academic and industry literature. These drivers were narrowed down to 20 micro drivers and ten (10) macro drivers on the basis of the drivers that appeared frequently in different sources of literature and were considered important in enhancing SCA. As further guided by literature, the drivers were grouped into five constructs, which included assets/resources, firm performance, institutions, and government policies, supporting and related industries and clusters, as well as processes. These were used as the basis for developing the SCA framework.

In chapter 5 and chapter 6, the study "tested" the drivers identified, in order to determine (benchmark) whether these were also regarded as important to the South African foundry industry. Sixteen (16) out of the 20 micro drivers (identified in literature) were deemed to be important in enhancing SCA for South African foundries. On the other hand, all ten macro drivers identified as important in literature were also deemed important in enhancing SCA for the foundry industry in South Africa. The study went on to further establish which drivers were regarded as critical for competitiveness. As indicated in the framework (figure 7.6), a total of four micro drivers and four macro drivers were identified as critical in enhancing SCA. This chapter (section 7.6) also provided recommendations on the strategies that foundry companies in South Africa could adopt, in order to enhance SCA on the basis of literary findings and outcomes from the data collection and analysis processes.

The closure of foundries in South Africa should be a concern for industry leaders and policy makers. Yet, despite statistical evidence of the declining numbers, owing to lack of competitiveness among other reasons, there has been a paucity of research on how this industry can become sustainably competitive. The SCA framework developed in this study contributes to the body of knowledge as it integrates scientific findings with industry data and experiences in order to address the study problem. The framework also presents an opportunity for academics, managers, industry leaders, related stakeholders, and policy makers to identify the relevant drivers enhancing competitiveness and formulate strategies and policies that will seek to further promote the development of this industry, halt any further closures, and ensure the foundry companies are competitive. It is also hoped that the findings and recommendations from this study will provide the South African foundry industry and other related industries with an impetus to addressing the various micro and macro-economic challenges that have hampered their ability to gain sustainable competitive advantage.

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ANNEXURE A – QUESTIONNAIRE FOR QUANTITATIVE PHASE

UNISA

A FRAMEFORK FOR THE SUSTAINABLE COMPETITIVE ADVANTAGE (SCA) OF FOUNDRIES IN SOUTH AFRICA

A Quantitative Survey

Thank you for taking the time to fill out the survey and provide your opinion! It is really appreciated. There are only 10 questions in which you select your response from the options provided and 1 where you are requested to provide a free form response.

Before commencing with this survey, please confirm that you have read and understood the Participant Consent form sent to you together with the link to this survey. By ticking (√) the checkbox below, you acknowledge that you willingly provide your consent to participate in this survey.

☐ I have read and understood the Participant Consent form

☐ I provide consent for my participation

☐ I do not provide consent

1

UNISA

A FRAMEFORK FOR THE SUSTAINABLE COMPETITIVE ADVANTAGE (SCA) OF FOUNDRIES IN SOUTH AFRICA

A. DEMOGRAPHIC VARIABLES - *Participant's role in organisation*

Please indicate your role within your organisation

- ☐ Top Management
- ☐ Senior Management
- ☐ Middle Management
- ☐ Junior Management
- ☐ Non Management

B. DEMOGRAPHIC VARIABLES - *Participant's area of focus within the organisation*

Please indicate your area of focus within your organisation

- ☐ Strategic Management
- ☐ Finance and Administration
- ☐ Operations / Manufacturing
- ☐ Projects Management
- ☐ Sales and Marketing
- ☐ Procurement / Buying / Tendering

C. DEMOGRAPHIC VARIABLES - *Participant's period of employment with current organisation*

Please indicate your period of employment with your current company

- ☐ Less than 1 year
- ☐ Between 1 and 5 years
- ☐ Between 6 and 10 years
- ☐ More than 10 years

D. DEMOGRAPHIC VARIABLES - *Participant's period of employment within the foundry industry*

Please indicate your period of employment within the foundry industry

- ☐ Less than 1 year
- ☐ Between 1 and 5 years
- ☐ Between 6 and 10 years
- ☐ More than 10 years

1. DRIVERS OF SUSTAINABLE COMPETITIVE ADVANTAGE

Drivers are factors within a firm that influence sustainable competitiveness. These drivers influence how the firm gains and maintains a competitive advantage within the sector or industry and can be divided into *micro* and *macro* drivers.'

The following sections seek to measure participant opinions in relation to the Sustainable Competitive Advantage of foundry companies (Section A) and the foundry industry (Section B) in South Africa.

A sustainable competitive advantage is defined as a pro-business superiority strategy that allows a company to out-compete rivals by offering goods and services to customers in a manner that is difficult to replicate within the same window period of incessant advantage.

Section A

1.1 Participant's rating on level of importance of micro drivers

This section identifies micro drivers (*which are specific to the firm*) that influence the Sustainable Competitive Advantage at company level.

In your opinion, how important are the following drivers in providing a Sustainable Competitive Advantage for foundries in South Africa? (*a higher level of importance signifies a higher level of contribution towards the foundries' Sustainable Competitive Advantage*).

	1. Not important at all	*2. Slightly important*	*3.Moderately important*	*4. Very important*	*5. Extremely important*
1. Investment in plant infrastructure	○	○	○	○	○
2. Cluster membership (e.g. South African Institute of Foundries)	○	○	○	○	○

3

	1. Not important at all	2. Slightly important	3.Moderately important	4. Very important	5. Extremely important
3. Employee skills development (Human capital)					
4. Product (service) differentiation					
5. Organisational culture					
6. Governance					
7. Price competitiveness					
8. Product quality					
9. Ability to innovate (research and development)					
10. Technology (equipment) upgrade					
11. Production (raw material input) costs					
12. Firm capacity (size)					
13. Exposure to export market (degree of internationalisation)					
14. Socio-cultural responsibility (corporate social investment)					
15. Certifications (ISO standards, product certifications)					
16. Possession of intellectual property					
17. Managerial choice (decision making process)					
18. Bargaining power over suppliers					
19. Possession of unique resources (inimitable to competition)					

4

1.2 Participant's identification of the most critical micro drivers

Please select (*without ranking*) any three (3) micro drivers that you consider to be the most critical in providing a Sustainable Competitive Advantage for foundries in South Africa.

A 'critical driver' is one that an organisation cannot achieve a Sustainable Competitive Advantage without.

- [ ] Investment in plant infrastructure
- [ ] Cluster membership (e.g. South African Institute of Foundries)
- [ ] Employee skills development (Human capital)
- [ ] Product (service) differentiation
- [ ] Organisational culture
- [ ] Governance
- [ ] Price competitiveness
- [ ] Product quality
- [ ] Ability to innovate (research and development)
- [ ] Technology (equipment) upgrade
- [ ] Production (raw material input) costs
- [ ] Firm capacity (size)
- [ ] Exposure to export market (degree of internationalisation)
- [ ] Socio-cultural responsibility (corporate social investment)
- [ ] Certifications (ISO standards, product certifications)
- [ ] Possession of intellectual property
- [ ] Managerial choice (decision making process)
- [ ] Bargaining power over suppliers
- [ ] Possession of unique resources (inimitable to competition)

2. DRIVERS OF SUSTAINABLE COMPETITIVE ADVANTAGE

Section B

2.1 Participant's rating on level of importance of macro drivers

This section identifies macro drivers (which are specific to the industry) that influence the Sustainable Competitive Advantage at industrial level.

In your opinion, how important are the following drivers in providing a Sustainable Competitive Advantage for foundries in South Africa? (*a higher level of importance signifies a higher level of contribution towards the foundries' Sustainable Competitive Advantage*).

	1. Not important at all	*2. Slightly important*	*3.Moderately important*	*4. Very important*	*5. Extremely important*
1. Energy costs (electricity rates)					
2. Geographical location					
3. Industry entry and exit barriers					
4. Customer bargaining power					
5. Government incentives (subsidies)					
6. The market perception of the foundry company					
7. Localisation (local content enforcement)					
8. Regulatory instruments (import tariffs, import quotas)					
9. The number of foundry companies in South Africa					
10. The availability of substitutes for casting products					

2.2 Participant's identification of the most critical macro drivers

Please select (*without ranking*) any three (3) micro drivers that you consider to be the most critical in providing a Sustainable Competitive Advantage for foundries in South Africa.

A 'critical driver' is one that an organisation cannot achieve a Sustainable Competitive Advantage without.

- [ ] Energy costs (electricity rates
- [ ] Geographical location
- [ ] Industry entry and exit barriers
- [ ] Customer bargaining power
- [ ] Government incentives (subsidies)
- [ ] The market perception of the foundry company
- [ ] Localisation (local content enforcement)
- [ ] Regulatory instruments (import tariffs, import quotas)
- [ ] The number of foundry companies in South Africa
- [ ] The availability of substitutes for casting products

3. THE IMPACT OF COMPETITIVE FORCES ON SUSTAINABLE COMPETITIVE ADVANTAGE

Please rank the following competitive forces in order of the impact each has on the Sustainable Competitive Advantage of foundries in South Africa - 1 signifying the greatest impact in your opinion.

- Intensity of rivalry among foundry companies
- Number of competing foundries
- Ease of entrance of new competitors into the industry
- Bargaining power of foundry customers
- Substitutes for casting products (e.g. thermoplastics, forgings)
- Bargaining power of foundry companies over raw material suppliers

4. MARKET, RESOURCE AND CAPABILITY BASED APPROACHES TO SUSTAINABLE COMPETITIVE ADVANTAGE

'The competitiveness of firms can be determined from the perspective of its market, resources and capability approaches'.

In your opinion, please rank the following approaches in order of influence on the Sustainable Competitive Advantage of foundries in South Africa. 1 signifying the greatest influence.

- The ability of the foundry to understand industry factors (*external market orientation*)
- The ability of the foundry to obtain unique resources (*inimitable to competition*)
- The ability of the foundry to allocate internal resources effectively (*dynamic capability*)

5. MEASURES TO IMPROVE SUSTAINABLE COMPETITIVE ADVANTAGE

In your opinion, how else do you think the Sustainable Competitive Advantage of the South African foundry industry can be improved to ensure sustained competitiveness?

ANNEXURE B – INTERVIEW SCHEDULE FOR QUALITATIVE PHASE

Before commencing with this interview schedule, please scroll to the Participant Consent form on page 5 of this document. Read and complete this form and then check/ tick (☑) *the* ***box on the right*** (area highlighted in yellow) *to confirm that you understand and provide your consent to participate.*	I have read and understood the consent form. I agree to participate in this study ☑

1. Reasons for foundry closure	**Q1**	Research on foundries in South Africa has shown that there has been a **decline in the number of foundries** from 213 to 123 foundries over a period of 17 years (2003 – 2020) due to permanent closures. In your opinion, what could be the likely reasons for the closing down of foundries in South Africa?
2. Drivers for SCA	**Q2a**	Research focusing on Sustainable Competitive Advantage shows that there are various **macro and micro drivers** for competitiveness. Micro drivers relate to the factors internal to the firm which determine its strengths, weaknesses and responses to threats and opportunities. *Refer to Annexure C* In your opinion, what 5 micro drivers would you consider as important to the sustainable competitive advantage of foundry companies in South Africa and why?
	Q2b	Macro-economic drivers are those factors in the external business environment for which the firm has little control over. *Refer to Annexure C* In your opinion, what 5 macro drivers would you consider as important to the sustainable competitive advantage of foundry companies in South Africa and why?

3. **Critical drivers**	**Q3a**	Which **3 micro drivers** would you regard as **CRITICAL** for the sustainable competitive advantage of foundries in South Africa and why? *A '**critical micro driver**' is one that a firm cannot achieve a Sustainable Competitive Advantage without.*
	Q3b	**Which 3 macro drivers** would you regard as **CRITICAL** for the sustainable competitive advantage of foundries in South Africa and why? *A '**critical macro driver**' is one that a firm cannot achieve a Sustainable Competitive Advantage without.*
4. **Strategies for enhancing SCA**	**Q4**	Various scholars view a **competitive strategy** as *the firm's roadmap which shows how a company can gain a Sustainable Competitive Advantage*. Literature identifies 4 main strategies. **<u>Cost Leadership strategy</u>** *A cost leadership strategy represents attempts by firms to generate competitive advantage by achieving the lowest cost in the industry. The focus of firms implementing a cost leadership strategy is on stringent cost control and efficiency in all areas of operation.* **<u>Differentiation strategy</u>** *A differentiation strategy involves creating a market position that is perceived as being unique industry-wide and that is sustainable over the long run.* **<u>Focus strategy</u>** *A focus strategy is a strategy in which a firm concentrates on a specific regional market, product line, or group of buyers.* **<u>Hybrid strategy</u>** *A hybrid strategy represents the simultaneous adoption and implementation of at least two of cost leadership, differentiation or focus strategies.*

<table>
<tr><td></td><td></td><td>In your opinion, which strategy or strategies do you think foundry companies should implement to enhance their Sustainable Competitive Advantage within the South African context and why?</td></tr>
<tr><td>5.

Management Challenges</td><td>Q5</td><td>Several scholars argue that management faces strategy implementation challenges which include political interference, limited resources and global economic situations that may be beyond the firms’ control in their quest to enhance Sustainable Competitive Advantage.

In your opinion, what are some of the managerial challenges facing South African foundry managers today with regards to implementing Sustainable Competitive Advantage strategies?</td></tr>
<tr><td>6. Competitive forces</td><td>Q6</td><td>Which of the following competitive forces would you regard as having the most influence on the Sustainable Competitive Advantage of foundries in South Africa and why?

<table>
<tr><th colspan="2">Competitive forces influencing Sustainable Competitive Advantage</th></tr>
<tr><td>1</td><td>Intensity of rivalry among foundry companies</td></tr>
<tr><td>2</td><td>Number of competing foundries</td></tr>
<tr><td>3</td><td>Ease of entrance of new competitors into the industry</td></tr>
<tr><td>4</td><td>Bargaining power of foundry customers</td></tr>
<tr><td>5</td><td>Substitutes for casting products</td></tr>
<tr><td>6</td><td>Bargaining power of foundry companies over raw material suppliers</td></tr>
</table></td></tr>
</table>

7. Competitiveness approaches	**Q7**	Literature identifies three **competitiveness approaches** that influence Sustainable Competitive Advantage. In your opinion, which competitiveness approach would you regard as having the most influence on the Sustainable Competitive Advantage of foundries in South Africa and why?
8. Other strategies for SCA	**Q8**	How else do you think the Sustainable Competitive Advantage of South African foundries **can be enhanced** either by the foundry companies themselves or through other institutions/bodies.

Competitive perspectives influencing Sustainable competitive advantage
Resource based approach – Foundry uses its physical resources to gain competitive advantage
Capability based approach – Foundry uses its process capabilities to gain competitive advantage
Knowledge based approach – Foundry uses its intellectual property to gain competitive advantage

Thank you for your participation!!!

ANNEXURE C – MICRO AND MACRO DRIVERS FOR SCA

Micro and Macro drivers for Sustainable Competitiveness Advantage (Identified in literature)

	Micro drivers for Sustainable Competitive Advantage		***Macro drivers for Sustainable Competitive Advantage***
1	Investment in plant infrastructure	***1***	Energy costs (Electricity rates)
2	Cluster membership (e.g., South African Institute of Foundries)	***2***	Geographical Location
3	Employee skills development (Human capital)	***3***	Industry entry and exit barriers
4	Product (service) differentiation	***4***	Customer bargaining power
5	Organisational culture	***5***	Government incentives (Subsidies)
6	Governance	***6***	Market perception (Brand loyalty) of the foundry company
7	Price competitiveness	***7***	Localisation (Local content enforcement)
8	Product quality	***8***	Regulatory instruments (import tariffs, import quotas)
9	Ability to innovate (research and development)	***9***	The number of foundry companies in South Africa
10	Technology (equipment) upgrade	***10***	The availability of substitutes for casting products
11	Production (raw material input) costs		
12	Firm capacity (size)		
13	Exposure to export market (degree of internationalisation)		
14	Socio-cultural responsibility (corporate social investment)		
15	Certifications (ISO standards, product certifications)		
16	Possession of intellectual property		
17	Managerial choice (decision making process)		
18	Bargaining power over suppliers		
19	Possession of unique resources (inimitable to competition)		
20	Value-add for the customer		

ANNEXURE D – PARTICIPANT INFORMATION SHEET AND INFORMED CONSENT FORM

UNISA university of south africa

PARTICIPANT INFORMATION SHEET

Ethics clearance reference number:

Research permission reference number:

Date:

Title: *A FRAMEWORK FOR THE SUSTAINABLE COMPETITIVE ADVANTAGE OF FOUNDRIES IN SOUTH AFRICA*

Dear Prospective Participant

My name is Luckson Phiri and I am doing research under the guidance of Professor A. Tolmay and Dr R. Dirkse Van Schalkwyk towards a PhD in Management Studies at the University of South Africa. I am cordially inviting you to participate in a study entitled: **A FRAMEWORK FOR THE SUSTAINABLE COMPETITIVE ADVANTAGE OF FOUNDRIES IN SOUTH AFRICA**

WHAT IS THE PURPOSE OF THE STUDY?

You are being asked to participate in a study on local content (localisation) implementation and the competitive sustainability of the foundry industry in South Africa. The purpose of the study is to investigate the reasons why foundries in South Africa are closing down as well as examine whether localisation plays a role in improving the sustainable competitive advantage of foundries.

You were selected as a possible participant in this study because you are believed to be information rich on the subject under review. Before you sign this form, please ask any questions on any aspect of this study that is unclear to you. You may take as much time as necessary to think it over.

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www.unisa.ac.za

WHY AM I BEING INVITED TO PARTICIPATE?

Your contacts were obtained from the National Foundry Technology Network (NFTN). There are approximately 196 participants in this study'

WHAT IS THE NATURE OF MY PARTICIPATION IN THIS STUDY?

The study involves completing a questionnaire. It is expected that the time needed to complete the questionnaires should not exceed 30 minutes.

CAN I WITHDRAW FROM THIS STUDY EVEN AFTER HAVING AGREED TO PARTICIPATE?

Participating in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason.

WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?

The potential benefits of this research to you is that this study will help understand why foundry companies are closing down and what strategies need to be implemented in order to make them competitive. A competitive foundry industry will be beneficial to your company as you will receive competitive pricing, better quality and improved delivery lead times that will also make your company competitive in turn. This will pave way for you to manufacture valves using world class inputs (castings) thereby enabling you to compete within the global space.

ARE THEIR ANY NEGATIVE CONSEQUENCES FOR ME IF I PARTICIPATE IN THE RESEARCH PROJECT?

There are no known risks and discomforts associated with this research and so risk to participants is minimal. Mild discomfort may result from the time it takes to complete the questionnaire as it can take up to 30 minutes depending on the speed with which you respond to each of the questions.

WILL THE INFORMATION THAT I CONVEY TO THE RESEARCHER AND MY IDENTITY BE KEPT CONFIDENTIAL?

Your participation in this research study will be kept confidential to the extent permitted by law. The responses will be assigned code numbers when being analysed and it will not be possible to identify you as an individual from the aggregated information. Your name will not be associated in any publication or presentation with the information collected about you or with the research findings from this study. The researcher will use a study code rather than your name. Your identifiable information will not be shared unless it is required by law or you give written permission. If the results of this study are published in a journal or presented at a conference, your name will not be used. The data collected from this study will be stored in a locked file cabinet and your signed consent form will be stored in a cabinet separate from the data.

You have the right to insist that your name will not be recorded anywhere and that no one, apart from the researcher and identified members of the research team, will know about your involvement in this research. Your answers will be given a code number or a pseudonym and you will be referred to in this way in the data, any publications, or other research reporting methods such as conference proceedings.

The only people who will have access to the data is the researcher and the Statistician who are required to maintain confidentiality by signing a confidentiality agreement. Your answers may be reviewed by people responsible for making sure that research is done properly, including the transcriber, external coder, and members of the Research Ethics Review Committee. Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records.

The anonymous data may be used for other purposes, such as a research report, journal articles and/or conference proceedings. A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report. Confidentiality will be maintained by the researcher to the extent possible and practical.

HOW WILL THE RESEARCHER(S) PROTECT THE SECURITY OF DATA?

Hard copies of your answers will be stored by the researcher for a period of eight years in a locked cupboard/filing cabinet at Unit 10 Mowbray Gardens, 64 Mowbray Avenue, in Benoni for future research or academic purposes; electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics

Review and approval if applicable. The information will be destroyed at the end of the period of storage has elapsed. Hard copies will be shredded and/or electronic copies will be permanently deleted from the hard drive of the computer through the use of a relevant software programme.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICIPATING IN THIS STUDY?

Please note that there is no direct monetary benefit to any participants of this study other than the benefits that will result from an understanding of how the sustainable competitiveness of the foundry industry can be enhanced to improve castings supply to your industry.

HAS THE STUDY RECEIVED ETHICS APPROVAL

This study has received written approval from the Research Ethics Review Committee of the College of Economic and Management Sciences, Unisa. A copy of the approval letter can be obtained from the researcher if you so wish.

HOW WILL I BE INFORMED OF THE FINDINGS/RESULTS OF THE RESEARCH?

If you would like to be informed of the final research findings, please contact Luckson Phiri on +27 73 422 7708 or email address luckyluke.p@gmail.com. The findings are accessible for eight years.

Should you require any further information or want to contact the researcher about any aspect of this study, please contact Luckson Phiri on +27 73 422 7708 or email address luckyluke.p@gmail.com.

Should you have concerns about the way in which the research has been conducted, you may contact Professor A. Tolmay on +27 12 429 4739 or email etolmaas@unisa.ac.za, Contact the research ethics chairperson of the CAES General Ethics Review Committee, Prof EL Kempen on 011-471-2241 or kempeel@unisa.ac.za if you have any ethical concerns.

Thank you for taking time to read this information sheet and for participating in this study.

Thank you.

Luckson Phiri

CONSENT TO PARTICIPATE IN THIS STUDY

I, __________________ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet.

I have had sufficient opportunity to ask questions and am prepared to participate in the study.

I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable).

I am aware that the findings of this study will be processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept confidential unless otherwise specified.

I agree to the recording of the interview for analysis purposes

I have received a signed copy of the informed consent agreement.

Participant Name & Surname………………………………………… (please print)

Participant Signature……………………………………………………Date…………………

Researcher's Name & Surname Luckson Phiri

Researcher's signature…………………………………………………Date - 2021

ANNEXURE E – PERMISSION - SOUTH AFRICAN INSTITUTE OF FOUNDRYMEN

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

To: Luckson Phiri

PhD Candidate – University of South Africa

Student Number: 45-25-1665

Date: 19 July 2019

RE: PERMISSION TO CONTACT MEMBER COMPANIES OF THE SOUTH AFRICAN INSTITUTE OF FOUNDRYMEN (SAIF) IN YOUR STUDY.

A FRAMEWORK FOR THE SUSTAINABLE COMPETITIVE ADVANTAGE OF FOUNDRIES IN SOUTH AFRICA

This letter serves as permission to conduct the study indicated above using members of SAIF as your Units of Analysis. Please note that you will be required to provide SAIF with the research instrument that will be used to solicit the information for your study. This instrument will be evaluated by SAIF to ensure relevancy and appropriateness of the questions that will be asked.

You will also be requested to acknowledge that the information collected will be used for academic purposes only and will therefore not be inappropriately divulged within the industry.

Yours Faithfully,

Dikgale

Mr Glen Dikgale (Chairperson-SAIF)

ANNEXURE F – CONFIDENTIALITY AGREEMENT FORM

A FRAMEWORK FOR THE SUSTAINABLE COMPETITIVE ADVANTAGE OF FOUNDRIES IN SOUTH AFRICA

CONFIDENTIALITY AGREEMENT

Parties:

Luckson Phiri of Unit 10 Mowbray Gardens, 64 Mowbray Avenue, Benoni (Researcher)

AND

______________________ of__________________________________ (Recipient)

Purpose:

For the purpose of handling confidential information on the study conducted by Luckson Phiri.

Operative Provisions:

1. The consideration for each party entering in this Agreement is the handling of Confidential Information by the Researcher and the Recipient's agreement to keep the confidential information **confidential**. Each party acknowledges that this is valuable consideration.

2. The Recipient must keep all Confidential Information in strict confidence and use it solely for the **Purpose**.

3. It is not a breach of this Agreement for the Recipient to disclose Confidential Information which it is obliged to disclose by law or court order. If the Recipient is required or anticipates the requirement to do so, the recipient must immediately notify the Researcher and use reasonable endeavours to delay and withhold disclosure until the Researcher has had a reasonable opportunity to oppose/ clarify the request for disclosure by lawful means.

4. The Recipient must destroy or return to the Researcher all of the Researcher's Confidential Information upon request by the Researcher.

1. The Researcher does not make any representation or warranty that the Confidential Information does not infringe the rights of another person or as to the accuracy of the Confidential Information. Neither party is liable to the other for any infringement or inaccuracy in the Confidential Information.

2. Each Party acknowledges that, in addition, to any other remedy that may be available in law or equity, the other Party is entitled to interim, interlocutory and permanent injunctions to prevent breach of this Agreement and to ensure specific performance of the Agreement.

3. The laws of South Africa govern this Agreement.

Signed by the Recipient at________________on this______day of _______20

Researcher____________________________

As Witness

1. ________________________________

2. ________________________________

Recipient______________________________________

As Witness

1. ________________________________

2. ________________________________

ANNEXURE G – ETHICS APPROVAL FORM

UNISA university of south africa

UNISA RESEARCH ETHICS REVIEW COMMITTEE

23 July 2020

Dear Mr Luckson Phiri

NHREC Registration # : (if applicable)
ERC Reference # 2020_CEMS_BM_100
Name : Luckson Phiri
Student #45251665
Staff #N/A

Decision: Ethics Approval from 22 July 2020 to 21 July 2025
(Phase 1)

Researcher(s): Name: Mr Luckson Phiri
E-mail address: 45251665@mylife.unisa.ac.za
Telephone # 071 8379 703

Supervisor(s): Name: Prof Alet Tolmay
E-mail address # Alet.tolmay@unisa.ac.za
Telephone # (012) 429-4739

Working title of research:

A framework for the sustainable competitive advantage of Ferrous Foundries in South Africa

Qualification: PhD degree

Thank you for the application for research ethics clearance by the Unisa Ethics Review Committee for the above-mentioned research. Ethics approval is granted for 5 years.

The ***low risk application*** *was reviewed by a Sub-committee of URERC on 22 July 2020 in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment. The decision will be tabled at the next Committee meeting on 19 August 2020 that this application was approved (Phase 1), on 22 July 2020.*

The proposed research may now commence with the provisions that:

1. The researcher will ensure that the research project adheres to the relevant guidelines set out in the Unisa Covid-19 position statement on research ethics attached.

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2. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
3. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the Ethics Review Committee.
4. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
5. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
6. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no. 4 of 2013; Children's Act no. 38 of 2005, and the National Health Act, no. 61 of 2003.
7. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data require additional ethics clearance.
8. No field work activities may continue after the expiry date 21 July 2025. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number 2020_CEMS_BM_100 *should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Yours sincerely,

D Visser

Chairperson: Prof Thea Visser
Department of Business Management
E-mail: vissed@unisa.ac.za
Tel: (012) 429-2113

Prof RT Mpofu
(Acting CEMS ED)

Executive Dean: Prof. Thomas Mogale
Economic and Management Sciences
E-mail: mogalmt@unisa.ac.za
Tel: (012) 429-4805

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ANNEXURE H – AMENDMENT OF TITLE

V4

AMENDMENT OF TITLE

Student	Luckson Phiri	Student No	45251665

Degree	Doctor of Philosophy

Prof: A Tolmay & Dr Riaan Dirkse van Schalkwyk

Your recommendation regarding the following proposed amended title please

Title:
_________**A framework for the sustainable competitive advantage of foundries in South Africa**

Previous title/provisional title/topic: **A framework for the sustainable competitive advantage of ferrous foundries in South Africa.**

Signature:

Date: 18 May 2022

COD: PROF. SUGANDREN NAIDOO

Signature:

Date: 7 JULY 2022

Prof

For approval by ECC please

Signature:

Date: 10 July 2022

ANNEXURE I – PROFESSIONAL EDITING OF THESIS

Angelina Hendry

English Language Practitioner

Editing, copywriting, proofreading

BA Hons Linguistics

Mobile: 072 4464 364 angelinad404@gmail.com

26 September 2022

To whom it may concern

This is to certify that I, Angelina Hendry, ID no. 7901310038080, a full-time language practitioner, have edited the thesis titled "A FRAMEWORK FOR THE SUSTAINABLE COMPETITIVE ADVANTAGE OF THE FOUNDRY INDUSTRY IN SOUTH AFRICA" by Luckson Phiri.

The onus is, however, on the author to make the changes and address the comments.

ACHendry