Exploring the effects of BRICS partnership on mineral beneficiation in South Africa

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31 AUGUST 2018

DECLARATION

I, the undersigned, declare that this thesis is my own work, except where otherwise indicated, and has not been submitted in candidature for any other degree or examination at any other institution.

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ABSTRACT

Since South Africa (SA) joined the BRIC countries in 2010 to form the BRICS partnership, there has not been an agreed-upon mineral beneficiation model for the partnership. Co-operation among the BRICS countries requires the partners to embrace collaborative synergies for international business integration.

The aim of this study is to explore the effects of the BRICS partnership on mineral beneficiation in SA. Four objectives were assigned: first, to explore the influence of BRICS partnership on mineral beneficiation in SA; second, to identify the implementation challenges of BRICS interventions in SA; third, to explore the possible outcomes of BRICS influence on mineral beneficiation; and lastly to develop a model for mineral beneficiation in the context of BRICS in SA.

Theories on international trade and co-operation as well as mineral beneficiation form the basis of the research and are explored along with theories that emphasise the significance of risk, trust and uncertainty in co-operative arrangements. The investigation adopts a three-phase study model. First, an exploration was conducted in order to discover the basics about the research problem. Communications directed to the target population and one-on-one meetings held on the field were instrumental in gathering preliminary information. Second, two measurement instruments were developed and examined by experts. This stage culminated in the actual survey and interviews. Third, literature was further reviewed with the aim to benchmark SA with BRIC countries in terms of best practices in mineral beneficiation.

Data was collected through the administration of questionnaires and semi-structured interviews. A census was conducted due to the fact that the population was small (79), consisting of 69 companies and 10 representatives from three different departments/organisations. For the quantitative part of the study, 69 questionnaires were sent to mining companies online and as hard copies. Of those questionnaires, 21 were returned with information. This constitutes a 30.4% response rate. In addition, eight interviews (out of ten initially planned) were conducted for targeted government departments and for the umbrella organization representing mining companies. Thus, an 80% response rate was achieved for the predominantly qualitative study.

The quantitative data was analysed with SPSS version 24.0. 58% of responding companies extract strategic minerals such as coal, diamond, gold and platinum. To

achieve objective one, the perceptions of participants on the influence of BRICS partnership on mineral beneficiation in SA were collected. A total of 90% of representatives stated that mining skills training is a factor for downstream mineral beneficiation, suggesting the need for skills transfer. Amongst the BRICS countries, SA was thought to have democratic institutions as a competitive advantage (67%). To achieve objective two, the research instruments were designed for respondents to identify implementation challenges of BRICS interventions in SA. It was established that respondents thought that BRICS activities could be improved by "Collaborative synergies" (84%); "Financial resources provision" (81%); and a "Favourable fiscal policy" (75%). To achieve objective three, the perceptions of responding companies' representatives and insights provided by government officials proved to be instrumental. The highest levels of disagreement were on whether responding companies should prioritise secondary mineral recycling; co-operate on mining projects or embark on mining exchange programmes. All participants viewed beneficiation as important, although the views on how to embrace it differed significantly. To achieve objective four, "SABRICMB" model, which is proposed to help SA achieve synergies with BRICS on mineral beneficiation was developed.

In summary, it was established that the current beneficiation policy provides insufficient guidance on mineral beneficiation promotion, job creation initiatives and economic growth. Efforts should be made for further consultation and public-private partnerships on mineral beneficiation in particular, and on the mining charter in general, in order to harness BRICS promotion of both downstream and upstream beneficiations in SA on a gradual basis.

While this study contributes to the bulk of knowledge on beneficiation, and attempts to bridge the *lacunae* in existing research, it also provides important pointers for a future research agenda.

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"Those who are wise will shine like the brightness of the heavens, and those who lead many to righteousness, like the stars for ever and ever."

– Daniel 12:3 (Bible).

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DEDICATION

To my children:

Enos, Justine, Monica, and Lukendobonga

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ACRONYMS AND ABBREVIATIONS

AIIB : Asian infrastructure Investment Bank

ASE : Amsterdam Stock Exchange

AVM : Automated Voice Messaging

BBBEE : Broad-Based Black Economic Empowerment

BEE : Black Economic Empowerment

BRICS MBM : BRICS Mineral Beneficiation Model

BRIC : Brazil, Russia, India, China

BRICS : Brazil, Russia, India, China, South Africa

CI : Creative Industry

CM : The Chamber of Mines

CME : Chicago Mercantile Exchange

DC : Developed Countries

DIRCO : Directorate of International Relations and Cooperation

DMR : Department of Mineral Resources

DRC : Democratic Republic of Congo

DUT : Durban University of Technology

EAC : East African Community

EU : European Union

FDI : Foreign Direct Investment

FIG : Foreign Investment Grant

G20 : Group of 20 countries

GDP : Gross Domestic Product

GFI : Global Financial Integrity

HR : Human Resources

HSC : Heaven Sent Capital

ICG : International Crisis Group

IDI : Inwards Direct Investment

IFC : International Finance Corporation

IMF : International Monetary Funds

IPAP : Industrial Policy Action

ISO : International Organisation of Standardisation

IT : Information Technology

ITC : Information Technology & Communication

JSE : Johannesburg Stock Exchange

KZN : KwaZulu-Natal

LDC : Least Developed Countries

MBAP : Mineral Beneficiation Action Plan

MPRDA : The Mineral and Petroleum Resources Development Act

MVS : Mineral Value Chain

NDP : National Development Plan

ODI : Outward Direct Investment

PESTEL : Political, Economic, Sociological, Technological, Environmental and Legal Framework

PGDP : Provincial Growth and Development

PGMs : Platinum Group Metals

R & D : Research and Development

RSA : Republic of South Africa

SA : South Africa

SABC : South African Broadcasting Corporation

SABRICMB **:** South Africa-BRIC Mineral Beneficiation

SADC : Southern African Development Community

SMS : Short Message Services

SWOT : Strength, Weaknesses, Opportunities and Threats

TFA : Trade Facilitation Agreement

UK : United Kingdom

UN : United Nations

UNSC : United Nations Security Council

USA : United States of America

VOC : Vereenigde Oast-Indische Compagnie

WGP : World Gross Product

WTO : World Trade Organisation

WTOITC : World Trade Organisation International Trade Centre

ZAR : South African Rand

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Re: EXPLORING THE EFFECTS OF BRICS PARTNERSHIP ON MINERAL BENEFICIATION IN SOUTH AFRICA
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In the Faculty of Management Sciences * Department of Entrepreneurial Studies and Management
At DURBAN UNIVERSITY OF TECHNOLOGY (DUT)

I would like to confirm that I have carefully inspected the entire version of the final draft of the above dissertation. Some suggestions were made to the author only on a grammatical, stylistic and mechanical accuracy level. The dissertation now conforms to and meets the requirements of (academic) writing at level 8 (PhD/EdD) in English-speaking academy. The language as well as the linguistic apparatus used is lucid, transparent and accessible to an academic reader. I hope this document is sufficient for your purposes.

Thank you, kind regards.

Mark Krzanowski

Thursday, 15 February 2018

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CHAPTER ONE

SYNOPSIS

"Start organization improvements with a focus outside not inside" – Paul Sohn,

March 21, 2014.

1.1 INTRODUCTION

This chapter introduces the thesis by summarising the research. The study explores the effects of BRICS partnership on mineral beneficiation in South Africa (SA). The chapter starts with the background of the study followed by the definition of key terminologies before tackling the question of community trade. Important to this chapter are sections about the rationale and the context, the research problem, the aim and the objectives as well as the research methodologies used during the exploration. Mixed methods were used owing to the nature of the study. However, it is worth noting that, this research by design is predominantly qualitative.

1.2 BACKGROUND TO THE STUDY

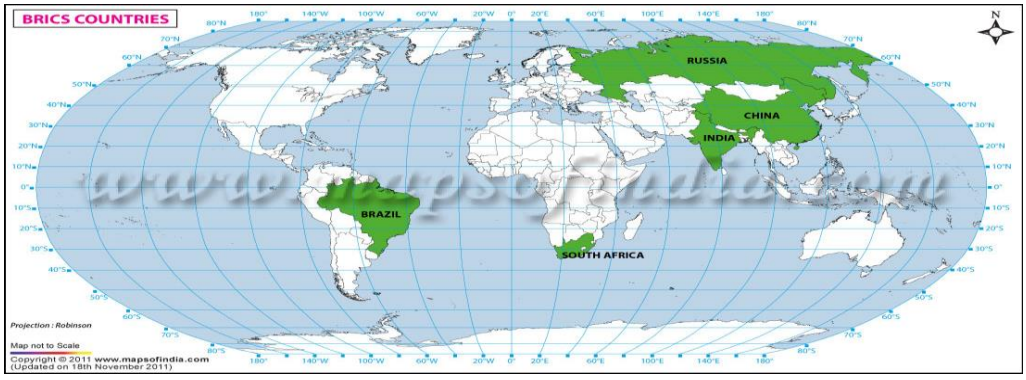
There has not been much research on this topic yet in SA because BRICS partnership is a relatively new concept in this country, let alone at Durban University of Technology (DUT) as SA only joined BRIC to form BRICS on 24th December 2010. However, Jones (2012: 1-2) comments that a vast online literature is available on Brazil, Russia, India, China, South Africa (BRICS)'s financial and economic development, especially addressing the business of global multinational corporations (MNCs). Sumru and Yildirimci (2015) elaborate on MNCs and put an emphasis on their globalized approach to trade. There are initiatives and synergies underway between BRICS states but efforts need to be furnished to accelerate mineral beneficiation practices.

According to Vickers (2013: 673), there is an economic power shift occurring in the world economy as a result of the Brazil, Russia, India and China (BRIC) partnership coming together. The world's economy itself has been affected by

the recent economic crisis that impacted negatively on the European Union as well as the United States of America (USA)'s economies (United Nations 2015: 1-2). As a result, certain countries opted for austerity measures to deal with the economic crisis (Blyth 2013). BRICS leaders noted the continuous slow pace of the normalisation of the global economy as unemployment remains high and challenges such as poverty, service delivery, and inflation persist (Fabricius 2013a: 2*).*

Of significance amongst the other initiatives, is the establishment of the BRICS Business Council, think tanks and the famous New Development Bank, also known as the BRICS Bank (Abdenur 2014). Knowing that global trends are to a fair extent influenced by changes in BRICS markets and by the loss of value on the stock exchange, acquiring information on the state of the market in a timely manner would but be an advantage to both the citizens and the leaders of involved countries. The BRICS Business Council has identified mineral beneficiation as one of the priorities for the partnership engagement in SA – other priorities include infrastructure development and mining (Fabricius 2013). Knowing the precedent, synergies should be taken to ensure smooth multilateral or bilateral co-operation between BRICS states in the mining sector. The location of BRICS on the map is hereafter presented.

Figure 1.1: BRICS countries geostrategic position



Source: http://www.mapsofindia.com/maps/india-and-the-world/large-brics-countries.html (BRICS countries 2011).

As in Figure 1.1 above, the BRICS represent regional or continental superpowers in the world, except for Europe and North America. Their geo-strategic situation is a catalyst to more conducive synergies for bilateral and multilateral cooperation on socio-economic development.

Mineral beneficiation practices will be more beneficial to the national economy if a holistic approach to infrastructure development is taken into account (Baloyi 2014a: 44). The recent involvement of SA in BRICS should benefit the country and, as a result, positively impact on its socio-economic situation.

1.3 RESEARCH PROBLEM

Currently SA exports its raw materials and in turn procures assets that have been manufactured from the exported raw materials, at a high price. The current infrastructure has arguably been developed to favour export of raw material such as metals and minerals. It is not surprising that a few metal and mineral business shareholders oppose efforts to locally beneficiate citing the lack of capabilities as one of the reasons (VUT 2010). However, it is possible to develop the infrastructure and build up the necessary capabilities or upgrade those existing already in order to promote, where necessary, mineral beneficiation (Fabricius 2013a; Fasheun 2010). Mineral beneficiation would enhance the national economy through the increased flow of goods produced and services awarded. Consequently, unemployment and poverty could be reduced through the creation of higher economic activities.

The mining industry remains very volatile as it is affected by inflation, global economic recession, strikes and at times violent protests. These effects are a cause of concern when certain companies in the industry resolve to reduce personnel or to cut off production by closing down unproductive branches (Faku 2017: 13; Mchunu 2017: 13; Riseborough, Nair and Biesheuvel 2017: 15). Mineral beneficiation would be one of the palliative initiatives to curb the ever growing job losses in the mining industry. Mineral beneficiation is also an alternative for diversification of production when the demand for certain commodities is at minimum.

In his comments on the worldwide market, Brookes (2009: 12) states that financial turmoil has led to significantly reduced demand for commodities which has caused a severe deterioration of trading conditions (Widmer 2009: 10). South African mining communities still have unresolved issues 20 years down the line after the establishment of the new dispensation. Testimonies to the preceding statement are the recurring labour unrests that sometimes disturb the industry. It is hypothesised that mineral beneficiation, rather than being a problem, could actually add value to the mining sector.

Whereas Fasheun (2010) advocates for beneficiation, Davies (2014: 33) comments that the practice signals the lack of innovative ways to boost the economy. Since the South African government promotes the Minerals & Petroleum Resources Development Amendment Bill in order to impose it on mining enterprises, from 20% to 26% allocation of the total production for beneficiation, it is obvious that the government is in favour of mineral beneficiation practices. Whether the 26% advocated for by the legislation is sufficient remains to be seen. However, more voices from pro-beneficiation lobbying group agree with the view herein expressed that more needs to be done. Solomons (2014: 28), while promoting beneficiation, concedes that it is indeed a controversial subject in SA, since the beneficiation policy would not promote real entrepreneurial activities if it was forced onto mining companies. Research has also shown that a whole scale industry beneficiation for every resource mined is not a good idea because of fierce competition with China, India and the likes.

Another problem in the mining sector arises as the result of the new mining charter being rejected in theory by certain role-players. South Africa is affected by a R51 billion loss in share value following the announcement of the new charter (Du Preez 2017).

1.4 RESEARCH AIM

The aim is to explore the effects of BRICS partnership on mineral beneficiation in SA.

1.5 RESEARCH OBJECTIVES

- To explore the influence of BRICS partnership on mineral beneficiation in SA;
- To identify implementation challenges of BRICS interventions in SA;
- To explore the possible outcomes of BRICS influence on SA mineral beneficiation; and
- To develop a model for mineral beneficiation involving BRICS in SA.

1.6 CHALLENGES IN THE SOUTH AFRICAN MINING SECTOR

There are still, however, a number of challenges in the mining sector that stakeholders need to address for better operations and synergies. South Africa now has a new mining charter and this is seen by many as a challenge (Van Rensburg 2017; Omarjee 2017), and stakeholders need to ponder on its implications and agree with the government on its implementation. Failure to take ownership of the new mining charter and any delay on public-private cooperation for its implementation can be disastrous for SA as dominantly a mining economy. It is held that:

> *Capital expenditure overruns are another significant reason for mining capital markets breaking down. Statistics show that over the past five years, there has been an average of 56% in capital overruns in the mining industry […] Research indicates that certain fungi have the ability to break down and liquefy coal that has been exposed to the elements (Kotze 2014: 10).*

The fight of corruption is a serious challenge for the Chinese (Xi 2014: 78). It is similarly a growing problem in SA both in public and private enterprises, according to Transparency International (2008) as cited by Olawale and Garwe (2010). The source indicates that SA ranks 43rd in the world in the Corruption

Perceptions Index. Njobeni (2017a: 13) agrees about the corruption allegation. The BRICS as a partnership is not immune either.

There is a shortage of financial resources allocated for mining operations, despite the fact that SA has unique challenges requiring greater need for beneficiation. One of the greatest rehabilitation challenges for mining innovation remains the humic and fulvic acids important to health (Kotze 2014: 15; *Fulvic Acid Cures* 2017). While there are challenges in the mining sector, BRICS partnership and its activities have been highlighted as opportunities for economic growth in SA (Zuma 2014).

1.6.1 Current commodity trade

Copper and gold remain the two commodities that are targeted for inbound deals across the continent, but in SA coal mining takes the lead with 49% value-based deals. This can be explained with the shortage of electricity triggering the need to invest in alternative power projects. Countries such as China, India, and Brazil are doing their best in terms of using other energy sources (Kotze 2014: 11).

It is time for SA to invest in more mining infrastructure, just as it has to invest in other resources as well (Fabricius 2013a; Njobeni 2017: 17). As a country, SA needs to maximize metals and minerals value addition if it has to develop economically. Jones (2012: 46) states that risk assessment should be priority number one for investors from developed countries planning to do business across emerging markets such as the BRICS countries. It is suggested that the situation differs from one country to another in terms of the risk associated with doing business or investing in emerging economies. South Africa has laid the foundations for more investment as the country increased expenditure, improved social services and reduced both cost and risk. It has become much cheaper and easier to start off a business in SA according to Doing Business Report 2014 (as cited in *Doing Business in KwaZulu-Natal* (2013: 8); Lockwood 2016).

Table 1.1: Exports from SA to BRIC in million US$

Commodities	Brazil	Russia	India	China	All countries
Exports					
Stones, Precious Metals, Metals clad & Articles, Imitation jewellery, Coins	1 356	118	70 069	248 273	20 822 200
Mineral Products	2807	51 763	2 015 253	5 780 285	17 289 474
Base Metal & Articles of Base Metal	-	18 033	353 233	1 364 162	12 587 162

Source: Adapted (*BRICS joint statistical publications* 2013: 189-190).

The stones, precious metals and imitation jewellery are among the main commodities exported by SA to BRIC partners with a total value of 20 822 200 million US$ (Table 1.1 above). Mineral products come second and are valued to 17 289 474 million US$ for all the countries, once again the biggest export going to China. With this in mind, there is no doubt that China is the biggest trade partner of SA nowadays. This explains some measures of preferential treatment of political nature towards China, despite the SA government's denial. Table 1.2 presents mineral and mining imports by SA from the BRICS countries.

Table 1.2: Import by SA from BRIC in million US$

Commodities	Brazil	Russia	India	China	All countries
Imports					
Stones, Precious Metals, Metals clad & Articles, Imitation jewellery, Coins	186 709	2	21 641	56 230	683 004
Mineral Products	38 250	503	66 634	101 077	1 273 196
Base Metal & Articles of Base Metal	16 911	11 018	6 422	914	833 935

Source: Adapted (*BRICS joint statistical publications* 2013: 189)

It is evident from Table 1.2 that China supplies a lot to SA when it comes to mineral products. A total value of 101 077 million US$ originates from China while import from India comes second and accounts for 66 634 million US$ as far as the mineral products are concerned. Despite the fact that Russia's contribution in the mineral sector seems to be insignificant import-wise, it is however going to play a crucial role in boasting the energy provision for the mining sector and, by so doing, it could contribute to the industrialisation of SA. This perception is based on the recent agreement of cooperation between Russia and SA for the nuclear energy cooperation. Aspects of interest in the Department of Trade and Industry (DTI) are summarised below:

- Metal fabrication;
- Small and medium enterprises management;
- Share services for the African continent; business process services;

- Development of the long-term advanced capabilities;
- Downstream mineral beneficiation;
- The mineral value chain strategy (MVS); and
- Nature and intervention thereof (VUT 2014).

VUT (2014: 52-54) elaborates on localised beneficiation and calls for the amendment of Mineral and Petroleum Resources Development Act (MPRDA): "Producers ought to offer beneficiaries a certain percentage as prescribed." *The beneficiation strategy* (2015: 6-7) touches on the strategy legislations and policies. The MPRDA 2002 (Act no. 28 of 2002) – aims to enhance employment opportunities in order to advance the socio-economic wellbeing of the citizens of this country.

1.7 RATIONALE AND CONTEXT FOR THE STUDY

According to Sorensen (2011: 625-649), there are 50 different minerals extracted from the South African (SA) soil every day from 1420 mining sites. There are 53 different types of minerals mined in SA on a daily basis currently (South Africa's Mineral Industry 2014: 1). Some mining sites of note include the Kimberley Diamond Field, the Bushveld Igneus Complex and multiple coal mines in the provinces. It is well known that SA is leading in mining of platinum group metals (PGMs) and gold.

In addition, the production of ferrous metals such as manganese and chrome is of world class quality. The iron ore exports in the country have been reported to be incremental. Despite electrical shortages for industrial activities and the load shedding as a possibility, SA could still use its own coal and uranium as one of the major alternatives or supplementary sources of energy. It has been reported that by mid-2015 the load shedding had cost the metal and engineering sector an estimated six billion Rand (The News 2014).

Since 1994, the contribution of the mining sector to the South African economy has been around 10% of the GDP with the lowest being during the 2008-2009

global economic recessions. It has now dropped slightly. Decrease in demand for commodities within the BRICS is a major cause of concern nowadays as it results in shock waves being sent globally affecting even other sectors as during the last global economic recession. It falls within the ambit of this research to develop a model that fosters South Africa BRIC Mineral Beneficiation synergies.

1.8 EXPLORATORY RESEARCH METHODOLOGY

This research is designed as an exploratory study because such an approach renders possible the discovery of the last occurrences as they unfold. Rofianto (2011: 4-5) explains that an exploratory research seeks to gain insights into and knowledge of a situation. This allows, largely, to use a small sample and to be flexible in using predominantly qualitative methods such as experts' surveys, representatives' interviews and focus groups. Denzin and Lincoln (2002: 91) state that an exploratory study allows to identify challenges while, at the same time, grasp the opportunities that exist in a situation. It is from this perspective that the study seeks to also identify past, current and future challenges pertaining to mineral beneficiation.

Qualitative methods are useful to collect an opinion while quantitative methods measure the proportion of a population who reasons or behaves in a specific way (Keegan 2009: 11). Whereas qualitative methods study phenomena in their natural settings in order to understand their meaning or to provide a sound interpretation (Barbour 2008; Flick 2007), quantitative methods emphasise the use of questionnaire and tools that enable statistical analysis (Erikson and Kovalainen 2008: 141-155).

The study, therefore, uses mixed methods to collect data in order to harness all the benefits. A mixed method is defined as the use of more than one method in research to allow the triangulation of information. Firstly, a questionnaire will be distributed to mining companies found on the Chamber of Mines' (CM) list. Secondly, semi-structured interviews will be organised with departments concerned with BRICS initiatives in SA. Mixed methods present

a number of advantages which allow the information to be sourced in many ways using different tools (Gibbert, Ruigrok and Wicki 2008: 1465-1474).

1.8.1 Research phases

The research process follows next.

Table 1.3: The research process

Exploration process	Actions	Results
Phase 1	Initial review of literature and observation of phenomena	First contact with experts. Redefining the topic
Phase 2	Survey and semi-structured interviews	First hand data-turned information
Phase 3	Complementary review and data analysis	Data analysis, synthesis, interview transcriptions and write up

Source: Tabled by the researcher.

Table 1.3 is a tabular representation of the research phases. The table indicates the research instruments which were used, and the outcome.

1.8.1.1 Phase one: Initial review of literature and observation of phenomena

This research followed a three-phase approach. Due to the newness of the South African involvement with BRICS, an exploratory methodology was used for primary and secondary data collection. This led to the discovery of the basics, putting facts together as well as to refining the topic, revisiting research questions and even adding up sections to the already reviewed literature. This was enabled by personal communications, face-to- face or one-on-one meetings with the Department of International Relations and Co-operation

(DIRCO) representatives, Chamber of Mines (CM) officials and mining company managers. Information collected at this level was classified not only in terms of importance but also in terms of priority for SA.

In addition, the researcher scrutinised the mining industry, studied mining policies, learned about companies involved in this research and determined the mission of the DIRCO BRICS directorate, the challenges as well as the initiatives/opportunities of the BRICS partnership in SA. The role of the Department of Mineral Resources was also studied in terms of promoting upstream and downstream mineral beneficiation. The Chamber of Mines was contacted so that mining policies could be understood and informed decision taken about the way forward for this investigation. This stage consisted as well of a more comprehensive review of available literature on the theme of study.

1.8.1.2 Phase two: Survey and semi-structured interviews

The second phase consisted of an examination by experts of the measurement instruments to be used for data collection purposes. At this stage, efforts were made to consult with a statistician and experts to discuss the instruments. This stage culminated in a survey being conducted in the mining industry to a representative sample as advised by both the supervisor, experts and the statistician. In this case, mining companies' and departments' representatives responded to the questionnaire or were interviewed.

Prior to this phase, a pilot study will have been done for approval of the research instrument. Corrective measures were taken where applicable in order to mitigate both the adverse consequences of unwarranted results and increase the advantages of having a positive response.

1.8.1.3 Phase three: Complementary review of literature and data analysis

At this stage, a more comprehensive review of literature was conducted with 'an inquisitive mind'. A thorough study of other regional socio-economic partnerships was conducted as a benchmark to the BRICS ambitious

endeavour. Of significance to the study were organisations such as the Southern African Development Community (SADC), the East African Community (EAC), the African Development Bank but also the European Union (EU), the African Union (AU), the International Monetary Funds (IMF) and the World Bank.

Furthermore, a model which is novel for BRICS mineral beneficiation in SA was created based on existing models such as the proposed BRICS Plus model aimed at incorporating selected emerging economies in the partnership (Huanhuan 2017). It was at this level that the thesis was written up with the aim of presenting the approved version to the examiners.

1.8.2 Target population

The population for the study would be the mining companies and organisations registered with the Chamber of Mines, that is 69 companies (Quantitative data) and 10 representatives (Qualitative data) of government departments and mining experts. In total, 79 participants. For survey purposes, one representative per company was approached and for the structured interviews all ten were expected to participate. For the quantitative survey, 69 companies' representatives received the questionnaire. According to Sekaran (2006), for a small population size, it expected that the sample will be representative at 99% confidence value and 1% margin of error. Since the population is small, taking into account all of them ensures that the study is representative.

1.8.3 Sampling methods

Mining companies registered with the Chamber of Mines as members were selected. In addition to that, government departments with BRICS-related initiatives were included. The study targeted mining companies' management and government's officials. Any person who does not take part in the company's decision-making process did not participate. This study adopted a purposive sampling method.

1.8.4 Measuring instruments

Two measuring instruments were used: a questionnaire and an interview schedule (Appendices C and D). Questionnaires were distributed to participants in the mining sector to the members of the Chamber of Mines. The questionnaire included the Likert scale type of questions, open-ended and close-ended questions (Appendix C). While Likert scale questions provide more information for analysis, open-ended questions liberate the respondent who opens up his or her mind as he or she writes the answer. Where necessary, the participant was asked to explain his or her opinion. The same questions were asked to all participants.

The literature review informs the questions in the questionnaire (Brian 2000). Other questions were derived from the aims and objectives of this research as well as from critical questions the researcher sought to address. Likert scale type questions were predominantly asked. These questions are easier to analyse and statistical data can be drawn for interpretation. A section included biographical questions to allow for comparisons across the 'divide'. The questionnaire was administered to the respondents in English. An interview schedule was developed for data collection purposes. Semi-structured interviews were conducted with representatives, allowing for comparisons to be made between different participants. Later on, the interview themes evolved and analysis and interpretation of the qualitative data were conducted.

1.8.5 Data collection method

1.8.5.1 Qualitative data collection

As per above, data was collected mainly by interviewing government departments' representatives. The information feeding this research study was sourced from primary and secondary data. A voice recorder was used for interviews. After a written or a telephonic arrangement, semi-structured interviews were conducted. Semi-structured interviews allow, thereafter, the questions to appear as subheadings in the literature review. Out of ten interviews planned, eight were successfully conducted. A qualitative design was predominantly used in this study although it was intertwined with a survey in order to enhance quality (Flick 2007: 37).

1.8.5.2 Quantitative data collection

As mentioned above, a survey questionnaire was administered to 69 mining companies' representatives mainly online or via emails. Mining companies are listed in Appendix E. At times, it required that a hard copy be handed to the potential respondent. Of the targeted companies, 21 returned questionnaire on time and with information.

1.8.6 Data analysis

Data was analysed using SPSS 24.0. Graphics such as bar charts or histograms were used to present information as analysed. These and other tabular presentations form part of descriptive analysis, whereas Cronbach Alpha was utilised for inferential analysis.

1.8.7 Delimitations

According to McClain (2014), delimitations are the scope of the study. For the purpose of this study, only governmental departments interested in BRICS trade and cooperation as well as mining companies operating in SA were included.

1.8.8 Limitations

Limitations refer to factors beyond the researcher's control which, however, influence the course of research (McClain 2014). It is, therefore, within these limitations that the current research is confined. It is hereby acknowledged that the research was conducted within cost (in this case, a limited budget), time and space (that is SA) constraints.

1.8.9 Validity and Reliability

1.8.9.1 Validity

Validity refers to the extent to which a measurement instrument does the work it was meant to do (UCLA 2007). As a measurement instrument, a questionnaire for example should provide the information needed to understand an identified problem and come up with a possible solution. This should also apply to interview schedules. In order to enforce validity, efforts will be made to ensure correct statements are made throughout the thesis. A

pilot study served the purpose of introducing all the necessary corrections prior to using the instruments for data collection. The accuracy of information was not compromised.

1.8.9.2 Reliability

Reliability refers to the evidence of output recurrence should the research be conducted once again (Bush 2007). In case the equivalent research is undertaken another time, can similar findings be obtained? Findings are reliable when they can be reproduced under the same circumstances. As mentioned earlier on, a Cronbach Alpha test will be conducted to ensure reliability of data. Bias was avoided to ensure the findings are reliable. Participants were encouraged to remain anonymous and to work independently throughout the research. Should any participant opt to withdraw at any stage, permission was going to be granted to this effect.

1.8.10 Ethical considerations

A letter has been issued by the Research Supervisor and Research Administrator to present to the targeted population. An ethical clearance has also been issued by the University (Appendix A) and the proposal was accepted. Authorisations by the DIRCO – BRICS directorate and CM have been secured to allow access to information for the study, The Department of Mineral Resources also authorized the study (See letters under Appendix B). Harmful information, obscene facts and any other unprofessional conduct were excluded in the investigation. A letter to the respondents to explain what to expect in the questionnaire, interviews and even at site visits was read to parties involved (See letters under Appendix B). The data obtained and any other information and the subsequent interpretation thereof were treated with utmost confidentiality as per the regulations befitting a research institution of this calibre. Participants were reassured that their anonymity would be guaranteed at all times throughout the research.

1.9 DEFINITIONS OF KEY TERMINOLOGIES

The following terms are explained below: BRICS, mineral beneficiation, investment, mineral recycling and synergy. Mineral beneficiation and recycling can be promoted to boost green economy.

1.9.1 BRICS

BRICS is an acronym first coined by O'Neil to denote Brazil, Russia, India, China (O'Neill 2001; MacFarlane 2006; Kregel 2009), and SA (Marten *et al*. 2014). It afterwards became the brand name for the five emerging economies' partnership for socio-economic development. Originally, the partnership involved only four countries: Brazil, Russia, India and China, thus it could be then referred to as BRIC or BRICs. Jones (2012: 1-2; Marten *et al*. 2014) explains that the "S" in BRICs first stood for a mere plural before it was decided that it represents South Africa only after this country joined the partnership in 2010. It is held that BRICS and beyond is referred to when relating the affairs of the rest of the world to those of Europe, perhaps indicating a possibility of having other countries join the BRICS partnership. Under this study though, it is important to note that BRICS will exclusively refer to the five partners as per above. Fabricius (2013a) and Huanhuan (2017) are consistent with Jones (2012) on the definition and etymology of BRICS.

1.9.2 Mineral beneficiation

Mineral beneficiation is defined as: "value-added processing, involving the transformation of a primary material (produced by mining and extraction processes) to a more finished product, which has a higher export sales value" (Department of Mineral Resources 2011; Mungoshi 2011). Ways to beneficiate minerals include, but not exhaustively, the following: smelting; sophisticated refining plants; craft jewellery; metal fabrication as well as ceramic pottery (Baartjes 2011), to name but a few.

1.9.2.1 Downstream beneficiation

Downstream beneficiation is about large scale capital intensive activities such as smelting, refining and labour intensive activities such as craft jewellery and metal fabrication (*Beneficiation strategy* 2015; Department of Mineral Resources 2011: ii).

1.9.2.2 Sidestream beneficiation

Sidestream beneficiation focuses on value-added inputs namely capital goods, consumables and services into the value chain (Mungoshi 2011).

1.9.3 Investment

Straney (2011: 10) defines investment as "participation in a company that infers a long-term goal of profit". An investment often requires the existence of a contract or legal agreement whereby the parties commit to do their 'bits' in order to succeed in their undertaking. In African emerging markets, investors are more interested in junior mining space. Many investment providers with focus on mineral resources plan to acquire more mines, maintains Hlophe (Kotze 2014: 10). Investment in manufacturing operations can support mineral beneficiation as it takes a largescale work to do so (Mifflin 1984).

1.9.4 Mineral recycling

The process of converting mineral waste into reusable material or returning material to a previous stage. In other words, it is the practice of recovery of waste materials for original or innovative use (IMA Europe 2013). Researchers identify mineral recycling among the additional activities linked to mineral beneficiation.

1.9.5 Synergy

The interaction or cooperation of two or more organisations, substances or even other agents to produce a combined effect greater than the sum of their separate effects (Webster 2017). In the context of BRICS, co-operation on beneficiation requires the partners to synergise their efforts.

1.10 THE PHILOSOPHICAL FOUNDATION OF THE STUDY

It is important to understand that, there are two worldviews about research that form its philosophical foundation: positivism and interpretism. Both positivism and interpretism are used in this research as part of its epistemological basis although the study was predominantly interpretist in nature, especially on its qualitative aspect. Researchers believe that it is either one approaches research from the positivist or an interpretist angle but nowadays it is possible to use mixed methods in research to harness the benefits of both school of thoughts, as it has been the case here. Suffice it to reiterate that the study was mostly interpretist in its approach (*Philosophical foundation of research: epistemology* 2015). These theories and the above-mentioned are applicable.

1.11 OVERVIEW OF CHAPTERS

Chapter one is in fact an overview of the whole investigation presenting almost all the major parts of this study. It also represents well the major contents of the study proposal at its embryo stage with additional information. However, as the literature did not fall within the ambit of this section, further down, aspects of chapter one are summarized.

Chapter two is the main literature review for this study. It focused on mineral beneficiation and revisited theories and literature. The chapter presents a critique, a comparison and an analysis of different school of thoughts on the topic under investigation.

Chapter three further reviewed the literature applicable to the study, namely international trade and co-operation theories. It was deemed important to put information related to this aspect of the study in this chapter for better structure and clarity. More critique, comparison and analyses applicable to the literature survey are provided.

Chapter four reviewed the opportunities and the challenges faced by the BRICS as a partnership using an economically sound framework, namely, the

PESTEL. In a way, the chapter presented an overview of the difficulties the BRICS must surmount for its own sustainability.

Chapter five is all about research methodology. It presented the mixed method used in this study and explained why the combined approach was chosen. Research instruments applicable to the study are discussed before tackling the issue of delimitations and limitations that the researcher took into consideration.

Chapter six provides in-depth critique and analysis of data-turned information. Quantitative data was interpreted in line with applicable policies and theories reviewed in the study. In this way, the positivist tendency of the quantitative data was at play. It is here that also the predominantly interpretist approach to knowledge presentation prevailed on the qualitative part of the study.

Finally, chapter seven addressed the discussed topic conclusively and came up with the way forward in terms of recommendation. In doing this, the literature reviewed, the output of research and the field information were crucial.

1.12 CONCLUSION

This chapter outlined the plan under which this research was conducted. In order to give a clear orientation, it has laid the foundations for the study by explaining the background and outlining the rationale for the study within the mining context. It has further portrayed the picture of what the investigation will entail by stating the aim and objectives together with a summary of major concepts of methodological importance. Finally, yet importantly, the introductory chapter has confirmed on the adherence to all ethical issues in accordance with academic and institutional regulations. The following chapter reviews the literature on mineral beneficiation.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

"The value of a produced economic good can be measured objectively by the average number of labour hours required to produce it…And economic change leads to social transformation", Karl Marx in Capital (1867).

2.1 INTRODUCTION

This chapter starts with a historic perspective on beneficiation in Africa, looks at examples of beneficiation in Europe before tackling the issues of coal and uranium beneficiation in SA and introducing the theories of beneficiation (economic and political theories). Beneficiation in BRICS countries is also examined. Of importance to this chapter are aspects such as the legal framework, the mineral value chain, the impact of beneficiation practices on electricity (or alternatives). Equally important are other issues such as nuclear power initiatives, mineral recycling and its impact on the green economy. Towards the end, the chapter inspects the influence of certain BRICS countries and the issue of black industrialists towards the fourth industrial revolution.

2.2 MINERAL BENEFICIATION: A HISTORICAL PERSPECTIVE

Lynch (2015) revises the mining history and explains how mineral beneficiation came into being citing for example the smelting of certain commodities as it happened long time ago. The origin of this work was to be traced in Armenia (central Turkey) and in the Sinai Peninsula. It is estimated that at least 8000-year old copper implements were found in Turkey. Smelting activities also took place in Sub-Saharan Africa, South-east Asia, Western Europe and Northern China. Habashi (2006) agrees with Lynch (2014) on the place Africa, and the rest of the world, occupied in beneficiating minerals manually and by using metallic hammers in ancient time. It is recorded that the people of those days observed the effects of experiments, and decided whether it was appropriate to add minerals in order to produce alloying. In the process, they

discovered tin ore and bronze/alloy. In contrast, illustrations are used to depict a holistic picture of beneficiation history which is a very old story.

Tylecote (2015, cited in Lynch 2015) states that silver must have been known by about 2000 BC. Other indications suggest that silver existed 5000 BC, and that by 1500 BC it was used as money in Mesopotamia. Iron influenced the other epoch after the Bronze Age. It is hypothesised that China had borrowed the art of beneficiating using iron, and thereafter, they perfected it only to be surpassed by the Great Britain. It is stated that the Chinese mining affairs were badly managed back then. Robinson and Von Below (1990) posit that beneficiation has always been a complex process.

As far as SA is concerned, mineral beneficiation could be another practical way of increasing the chances of producing more black industrialists for example by upholding the B-BBEE requirements (Eunomix 2012). Beneficiation and industrialization are a must for SA (*37th ordinary session of the SADC summit* 2017). Historically, the inefficiencies of and the shortage in beneficiation-related policies impacted negatively on SA as a mining economy (The Department of Trade and Industry 2014).

2.3 SOUTH AFRICA AND THE NATIONAL BENEFICIATION ENDEAVOUR

Faku (2015a: 15) observes that in SA, the mining charter compels firms to sell 26 per cent of their belongings to the citizens in order to ensure mining activities benefit all, and that the inequalities of the past are redressed. Other than that, mining companies would be better off if they focused on operational efficiency. This encompasses as well beneficiating minerals just as the Chinese Heaven Sent Capital (HSC) would by investing in the energy and jewellery sector. South African mineral production is among the best in Africa and the world.

In SA, mineral beneficiation is the government policy (Eunomix 2012: 3), and not the nationalisation of the mines as some wished it were. However, more needs to be done for developing the infrastructure so that value-addition and

finished products can take place in the country. The disadvantage though had been that the current infrastructure in general was mostly in favour of export activities: roads led to airports or harbours for ease of shipping of raw materials while little infrastructure was meant to develop the skills of the people where extractive activities took place.

To begin with, the existing national policy on beneficiation can assist in putting together a policy that allows for synergies between BRICS member States. Although the current legal framework caters for mineral beneficiation promotion, it is not sufficient to foster a culture of efficient beneficiation practices for economic development (The Department of Trade and Industry 2014).

2.4 MINERAL BENEFICIATION IN BRICS COUNTRIES

Russia is an industrialised economy in which minerals and petrol are found in industrial quantities (Llewellyn, Rae and Thompson 2014). While India still imports some raw materials, this country is powerful on ITC (Chandrasekaran 2017) and ensures the domestic market benefits from beneficiation initiatives. Brazil with its Marco Polo and agro-industrial activities is also in favour of promoting beneficiation going forward, despite the political uncertainty following the impeachment of President Dilma Rousself and the allegations of corruption against those who initiated her ousting (BBC News 2017).

BRICS firms can be cost-effective and efficient in productivity when investing in the western economies, although certain observers criticise them saying that the BRICS have embarked on a reverse economic colonisation alluding to what India does in the UK. However, tying up with western firms can improve the diversification approach adopted by certain BRICS companies. Similarly, it is known that western countries while investing in BRICS countries copy from them certain strategies just as the BRICS reciprocate, notwithstanding the fact that strategic alliances implicating the BRICS and western super-powers “can be a reluctant better-the-devil-you know kind of relationship” whereby even though they are in adversity, they still need each other (Jones 2012: 214).

2.5 STEEL PRODUCTION AND COMMODITIES' CONSUMPTION

The per capita consumption of base metals and steel depends on the buyers' income. In 2005 China had 10.7% economic growth while India had 9.0%. Although China has the fastest developmental growth, the country is still among the poor countries when it comes to the GDP per capita. India makes no difference on the same criteria. While the USA has a GDP per capita of USA $16 000, China is lagging behind with only USA$ 6000. However, the speed with which China is developing, as it consumes 30 percent of world's steel, has influenced the recent mineral products' boom. It is in fact more than the consumption of steel in USA and EU combined (*Beneficiation strategy* 2015: 7-8). China and India are therefore poor countries as far as their per capita GDP terms are concerned (Jones 2012: x), but these countries should also be encouraged to face the realities creatively (Xi 2014: 47). The following section presents the two major theories of beneficiation.

2.6 THEORIES OF BENEFICIATION

Two theories of beneficiation fall within the ambit of this study: the economic theory of beneficiation and the political theory of beneficiation (De Beers 2014: 4). The author refers to them as the two rationales behind beneficiation.

2.6.1 Economic theory of beneficiation

The economic theory stipulates that there are benefits from the emergence of a downstream beneficiation in that beneficiation creates more jobs and allows for the use of advanced technologies. This ultimately leads to a broader economic growth of the country involved.

Beneficiation is one of the rarest opportunities for SA to continue a sustainable growth of its economy beyond mining, considering the fact that mineral resources are finite (*The beneficiation strategy* 2015: 9-10). Beneficiation is promoted in all the provinces in South Africa. For example, two zones were set aside for primary metal investments. While zone 6 is for ferrous metals cluster and has 1051ha (it attracts iron, steel and ferro alloy (FeMn, Fecr and

FeNi) and stainless steel manufacturers), on the other hand, zone 5 is small and used for non-ferrous activities and has 758ha (Van der Merwe *et al*. 2013: 38).

According to Fasheun (2010), the promotion of beneficiation of metal and mineral products is good for the South African economy for the creation of locally sustainable jobs. In order to achieve this, companies, departments and organisations must be capacitated to allow them to process, produce or recycle metal and mineral in SA and ensure some final output is made in SA rather than in Europe, Asia, Australia or America as it has been the case for centuries.

2.6.2 Political theory of beneficiation

The political theory of beneficiation, on the other hand, states that beneficiation is a means to prevent the exploitation of countries' resources by foreigners who may cause a particular country become just a cheaper supplier of raw materials (De Beers 2014: 4). Mining research proves that there are other theories, such as the theory of constraint, applicable for beneficiation (Hearne 2015). Suffice is to say that they did not fall within the scope of this study.

It is possibly in cognisance of the political theory, which Khama (as cited in De Beers 2014: 4) argues that two conditions should be met for a proper beneficiation to take place:

- The government must engage the citizens at large in deciding on beneficiation practices prior to its implementation in order to avoid socio-political unrest; and
- The government must allow a partnership to be forged between them and the industry since beneficiation is also an industrialisation and a trade policy issue. The policy of beneficiation is supposed to also be timed well for sustainable results.

Theory links the problem to the leadership poor decisions. Nationalism comes at a price! As an economist puts it:

> *"from Deng Xiaping until the current Xi administration, China has been ruled by an economically liberal philosophy emphasizing economic growth, global integration, and harmonious relations with other countries. With the Xi administration however, the social compact has become conservative. Nationalism, not economic liberalism, now seems the driver of policy decisions" (Kopits 2016).*

2.6.3 Sino-African trade and co-operation: a mixed theory

Jones (2012: 27) is of the opinion that China's activities in buying up mines in the African continent should be seen as both a political and an economic move to secure its presence in Africa. In spite of this being an issue, developed countries still need China even more today than before. The rest of the BRICS countries also do.

In SA, the surprise is that the government seems to think that beneficiation is about natural resources, and therefore it should only be the responsibility of the Department of Mineral Resources (DMR) to get involved, hence the execution of beneficiation becomes limited on reliance to legislation in place. It is stated that: "poorly conducted beneficiation could result in value destruction" (De Beers 2014: 2).

BRICS cultural and social diversity should be considered to be wealth as they are a major economic development factor even in times of a decade-long national recession aftermath just as it has been in China. It is better to set "Key Action Plans" in order to implement the beneficiation strategy successfully (*The beneficiation strategy* 2015: 11).

Shaban and Vermeylen (2015: 70) allude to the fact that India has embraced industrial beneficiation of minerals. The Indian strategy has been to import materials, add value, and then export manufactured products, especially jewel products, to other countries. It is reported that there have been significant increases in jewellery and other architectural products in India.

The Indian government has decided to stop exports of raw materials such as iron ore in order to give a chance to locals to also make profits on that. It is then not surprising that local people who live in places where valuable

commodities are extracted become savvy about the value of their treasures and what the impact can be if used for their benefit (Jones 2012: 230; 233).

Outside BRICS, Botswana is, for instance, a success story when it comes to beneficiation in general, and as the first producer of diamond, copper and nickel, giving the country the highest GDP in Africa (De Calan *et al*. 2010: 229). The secret has been the implementation of a 50/50 partnership between the government and the company (Pongsiri 2002), De Beers, a leader in extractive activities. The important factors for a successful beneficiation include motivation; collaboration between government and the private sector; and continuity as opposed to only having a single event beneficiation (Limi 2006). However, Gapa (2017) expresses a parallel view to Pongsiri (2002) and posits that there has been a manipulative relationship between the government of Botswana and De Beers as the company is accused of political interference in that country.

South Africa is envisaging new forms of beneficiation that will be energy effective. Public private partnership can give this initiative an impetus in generating energy and alternative sources of energy. In order to achieve this coal-to-liquid technology and research are needed to get to know-how for the nation to benefit even more. Beneficiation has proven to increase the value of minerals and metals thus contributing to economic growth, job creation and above all adding to the country's skill base (*The beneficiation strategy* 2015: 8).

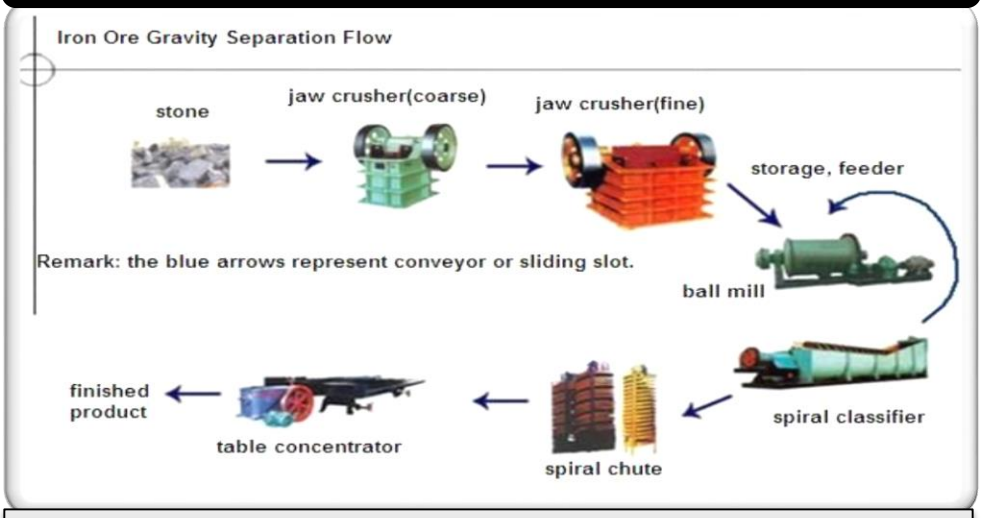
A joint venture type of collaboration between the governing board and private companies is the way to go for efficient beneficiation. In Botswana alone, the following were known as direct or indirect benefits of synergies between the country and De Beers in December 2013 as far as beneficiation is concerned:

- Media attention was created as a result of the international interest in the success story; and
- In total, 150 000 people benefited from the 350 new jobs created throughout the beneficiation process (De Beers 2014: 4).

Shaban and Vermeylen (2015: 70) concur other research on the need to involve other ministries or departments in forging synergies and taking industrial initiatives.

In order to achieve sustainable development, research and development, education, firms, talent and ideas as well as the intellectual property, together with an active state are the force behind value added initiatives and wealth generation (Davies 2014:33). Figure 2.1 illustrates the separation process.

Figure 2.1: Iron Ore Gravity Separation Process



Source: *Iron Ore Gravity Separation Flow* (2015).

The illustration above is relevant in that it exemplifies the processes of transforming raw materials (stone) in finished products. Value-addition is possible when raw materials are processed as in Figure 2.1 above. However, beneficiation requires quite a number of mechanisation of labour whereby specialised machinery and other equipment are to be used for a desired output to be obtained. Trained workforces are still needed especially in the case of SA, and it is envisaged that local beneficiation will create more job opportunities.

Whereas Fasheun (2010) advocates for beneficiation, Davies (2014: 33) thinks that the practice signals the lack of innovative ways to boast the economy. While reconciling the two positions, one comes to the realisation that beneficiation on its own would not be the solution of the countries many socio-economic challenges. Solomons (2014: 28), while advocating in favour of beneficiation push, agrees that it remains a controversial subject in SA. It was further explained that if forced, the beneficiation policy will not promote real entrepreneurial activities.

In view of the above, a whole scale industry beneficiation for every resource mined is not a good idea. It is indisputable though that it is not easy to cost effectively beneficiate all the minerals in a global market because of fierce competition with China, India and the likes. Cloete (2014: 7) shows that SA is looking into learning from the World Trade Organisation's (WTO) rules and strategic approach in addressing the issue of beneficiation. This means that beneficiation ought to add value to the industry for the practice to be significant.

Solomons (2014: 28) contends that a costly beneficiation will not be profitable to the industry as mining investors may opt not to invest. Aspects of interest are summarised below:

- Metal fabrication (VUT 2013: 6; VUT 2014);
- Small and medium enterprises management;
- Share services for the African continent; business process services (BPS);
- Development of the long-term advanced capabilities;
- Downstream mineral beneficiation;
- The mineral value chain strategy (Baartjes 2011); and
- Nature and intervention thereof.

South Africa has been partnering with 12 other African countries (Mali, Ghana, Tanzania, Madagascar, DRC, Angola, Namibia, Egypt, Zimbabwe, Nigeria and Senegal) to put together the Mineral Beneficiation Framework since 2009 but the plans have not yet yielded concrete results (Department of Mineral

Resources 2011). Even when the framework is ready, for example, the BRICS specific needs will not have been taken into account, thus the impetus to research towards addressing the partners' needs in beneficiation endeavour is justifiable.

The VUT (2013: 52-54) elaborates on localised beneficiation as follows: "the amendment of Mineral and Petroleum Resources Development Act is necessary to determine the percentage and the price in respect of the mineral percentage to be rechanneled for local beneficiation. Producers ought to offer beneficiaries a certain percentage as prescribed." Currently, the onus is with the Minister only to decide what minerals to beneficiate in SA. Moreover, firms that score high on BEE may see their mineral beneficiation duties by law exonerated. On the basis of this volatility, it is argued that more is yet to be done for effective mineral beneficiation strategy to occur in SA.

2.7 BENEFITS OF BENEFICIATION

Turok *et al.* (2014 cited in Naidoo 2014: 8) found the following in a consultation on mineral beneficiation:

- Critical factors include technology advancement, research and development;
- Forward, backward and lateral linkages of beneficiation cause the developmental benefits of the practice together with the multiplier effects thereof which need to be stimulated for maximal profit for both the industry and the communities;
- Significant opportunities may arise from beneficiation in terms of job creation, community development as socio-economic spin-offs instead of giving mere donations; and last but not least:
- Foreign markets still need to be identified for processed and local beneficiation. In this case, the objective would be to allow a level of expansion and diversification of SA's export basket and cover

large geographical territories with more value-addition than it is the case currently.

2.8 SUCCEEDING IN BENEFICIATION

South Africa has opted through the Minister of Mineral Resources to beneficiate 10 strategic commodities. The successful materialisation of the SA beneficiation strategy is said to depend on intensive coordination across the government institutions: minerals and energy; trade and industry; science and technology; public enterprises and finance; and other stakeholders such as business and labour (SAMDA 2015).

It is the prerogative of the minister of mineral resources to decide on which minerals to beneficiate in the territory. Botswana is another good example of successful beneficiation (Limi 2006). In SA, beneficiation is not a new practice although the legal framework is still undergoing influential consideration only recently under the new dispensation. Power stations in SA are known to consume 50% of the coal production in the country. Despite the consumption, beneficiation is known to have benefited the country through job creation and economic growth in the past (*The beneficiation strategy* 2015: 1-4).

In *Mineral Resources and Beneficiation in Africa*, De Beers (2014: 2-3) states that beneficiation is effective when viewed as a long-term policy which depends on the country's infrastructural development prior to its implementation. Where this factor has not been taken into account, the consequences are known to have been negative. This is for example the case of the Democratic Republic of the Congo (DRC) where in addition to the lack of proper innovative and industrial infrastructure, the system fell short of good governance and reliable institutions.

2.9 INHIBITIVE FACTORS TO EFFECTIVE IMPLEMENTATION OF BENEFICIATION

If electricity is a problem, then SA must find alternative source of energy to supply additional electricity for industrialisation purposes including beneficiation. Other inhibitive factors hindering the smoothness of a beneficiation programme include:

- Limited access to raw material for local beneficiation, as raw materials are exported abroad;
- Shortage of electricity as from 2008 in SA: the bulk of beneficiation consumes electricity in big and uninterrupted quantity;
- Limited exposure to breakthrough research and developmental programmes: these schemes would help create new jobs;
- Lack of access to international markets for beneficiated products; and
- Lack of infrastructure and distal locality (*The beneficiation strategy* 2015: 10-11).

In keeping with beneficiation practices, coal is playing a major role in SA just as in providing energy. It is for sure true that many emerging economies are reluctant to open up more to the developed countries, especially considering their past experience with colonialism or imperialism whereby the poor were just being ‘milked’ for raw materials and ended up buying for alarmingly expensive price the very products manufactured out of their resources thus “keeping the national engine of economic growth going to the colonizer” (Jones 2012: 228).

2.9.1 Kyoto Protocol compliance: coal mining

If SA wants to comply with the spirit of the Kyoto Protocol (Sustainable Development Goals), then the country must ensure that gas is only captured at source and sequestrated in rocks; this is truly a geological formation at depths. It is held that this can be a mitigation factor contributing to global warming (*China Military Strategy* 2015).

Table 2.1: Beneficiation examples

Operations	Location	Minerals
Specialist cylinders developed from the aluminium industry	Johannesburg	Aluminium
Smelting processes	Nationally	Steel
Craft jewellery	Nationally	Gold, Diamond, Platinum
Metal fabrication	Johannesburg	Copper, HMS, LMS
Car parts	KZN	Steel, Iron, Silver
Metal finished products/recycling	Nationally	Metals & Minerals

Source: SMC Corporation (n.d: 2-3); *The beneficiation strategy* (2015: 1-4). Adapted by the researcher.

Table 2.1 indicates that there are many ways to beneficiate. Although the location and the minerals are not exhaustive, the purpose was to provide an example of the activity. As a country SA must elaborate on her strategy to incite the entrepreneurs and the companies to beneficiate. "The total net beneficiation of minerals or metals is maximised by a combination of downstream and sidestream linkages" (*The beneficiation strategy* 2015: 1-4).

2.10 COAL BENEFICIATION

Although the beneficiation activities are power consuming, SA coal is a factor in electricity provision for industrial purposes. South Africa needs to curb the dependency to coal even further, the country has to deal efficiently with sustainable developmental issues. One way to do that is to continuously improve its energy consumption structure and the efficiency thereof. China planned to do just that in 2016. Practically, it is the ratio of consumption of non-fossil fuel which must be lifted up. It means that a country like China is to lift it to 13.2 percent in 2016 from 12 percent in 2015, while coal usage was to be reduced from 64.4 percent in 2014 to 62.6 percent in 2016 (Bekri 2015).

In SA coal attracts Foreign Direct Investments (FDI) more than any other mineral and therefore plays a central role in economic development especially in power generation activities.

The use of coal for sustainable power generation is questionable because of its implication in undermining green economy initiatives. It is, however, still the case that power generation in SA (and to some extent in China) is dependent on coal operations. Alternative sources of energy are available and being used except that coal is still taking the lead as the major FDI attraction and the source of energy.

2.11 IMPACT OF ELECTRICITY IN SOUTH AFRICA

South Africa experienced the load shedding effects on the mining industry in particular and the economy in general in 2008. There is a need for alternative sources of energy to avoid negative effects in the future. Khuzwayo (2015: 19) predicted that the energy crunch in the country will shave 0.3% off economic progress in 2015 and it happened. Another aspect with effects to the mining activities was the wage negotiations in the gold and coal sectors as the growth development from 2015 to 2018 depended on how faster the solutions for these problems were found. Authors who oppose beneficiation often cite energy consumption as one of the reasons why more beneficiation is risky. Issues that evolve around wage negotiations, for example, in gold and coal, would influence growth in 2015 to 2018 provided they do not lead to prolonged strikes like Marikana. South Africa seems a bit far from reaching the 10 percent economic development needed to deliver just as China did in certain aspects of development (Borg 2015: 14).

2.11.1 Alternative energy

In another initiative to produce alternative power, Anglo American Platinum (Amplats) plans to assist by putting in place the infrastructure for hydrogen fuel cell-based products. The production will make use of precious metal to generate electrical power. Currently, it is reported that the platinum prices

have decreased significantly, that is 40 percent down since August 2011 (Faku 2015: 15).

In order to meet SA's electricity demand, a plan has been put in place. It is all about a coordinated schedule aiming at generating, expending and intervening, taking into consideration numerous criteria. In addition to existing power plants, i.e. 10 GW committed to coal, the IRP plan caters for 9,6GW of nuclear; 6,3 GW of coal; 17,8 of renewable energy and 8,9 dedicated to other generation sources. Therefore, 42% of power generated in SA should come from renewable sources as far as the IRP 2010-2030 is concerned. This plan is to be verified every two years to incorporate some improvements when necessary. In 2013, in total, SA's value of renewable energy was nearly R80 billion (Van der Merwe *et al.* 2013: 66).

2.11.2 Uranium beneficiation and electricity endeavour

Uranium exported by SA could be used for energy generation. It had been processed before during the old dispensation, but in 1991 a non-proliferation Treaty was signed by SA. The uranium beneficiation was stopped in SA in 1991 (*The beneficiation strategy* 2015: 9-10). There have been many publications on the state of uranium in SA to date such as Albright (2015), Ashman, Fine and Newman (2010) and others. South Africa has much experience over many years in beneficiation, using uranium for power generation.

Thorium is another alternative fuel for reactors and is currently being investigated while estimates show that thorium is three times more abundant than uranium underground (*The beneficiation strategy* 2015: 9-10). Recently, American scientists discovered that it was possible to clean up polluted groundwater at mining sites even when uranium ore had been an issue because of nuclear procession. Scientists demonstrated how soil bacteria discovered at an old uranium ore in Riffle, Colorado, managed to lock up radioactive element that leached into the soil, polluting water resources (Jasmasmie 2015).

Uranium is a much needed mineral for military purposes. For example, the uranium from Shinkolobwe mine in Katanga in the Democratic Republic of Congo (DRC) was used by Albert Einstein to produce the atomic bomb that destroyed Hiroshima in Japan (The Center for History and Physics 2004; Van Reybrouck 2012). It is imperative for the world to make sure that minerals are used in a way that preserves the environment and protects humanity now and for generations to come. To this effect mining activities must be regulated both nationally and internationally including for the purpose of beneficiating minerals.

2.11.3 Nuclear power

It is known that the nuclear energy is needed to diversify power supply and guarantee electrical security (*China's Military Strategy* 2015). It is to this end that SA plans to invest in nuclear energy in the future (Gigaba 2017). Jones (2012: 27) argues that although energy sources could be seen as having an impact on how risky a particular country is viewed, it is mainly the availability of all basic raw materials that makes a difference in economic progress. Suffice it to mention that there are many voices being heard against nuclear power projects. It is beyond the scope of this study to elaborate on nuclear power processing.

2.11.4 Waste management and waste energy

Recycling is one way to reduce air pollution by incineration and water pollution by land filling mechanism. Better results are obtained by reducing the need for conventional waste removal but also by decreasing greenhouse gas emissions from landfill. It is thus evident that waste management contributes to the green economy. In SA, the industrial recycling strategy aims to conduct an exploration and to enable development and industrialisation (Van der Merwe *et al*. 2013: 84).

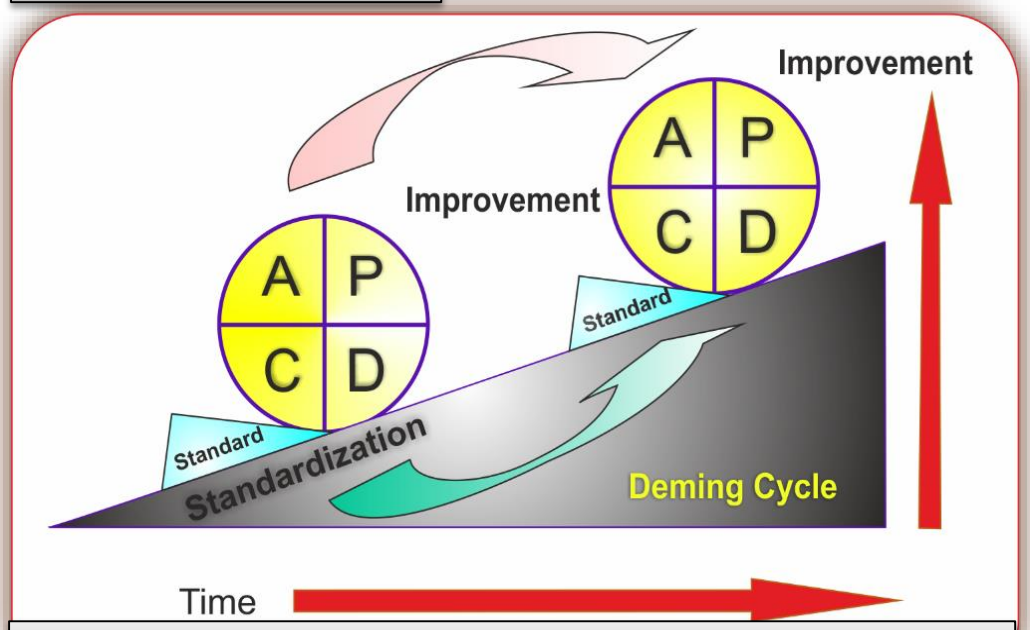
As a country SA could be facing water shedding in the near future if precautions are not taken to recycle water that otherwise could be used for construction and consumption purposes. Water is scarce in SA thus mining companies ought to use this resource sparingly as the mankind survival as

well as the ecosystem depends on it. One way to deal with the threat is to reduce consumption of water by half the quantity currently used especially in those areas where the shortage is reported to be threatening and adopt innovative ways of harvesting and conserving water resources during the desludging mechanism affecting the dam (Ntuli 2015: 6).

The findings of Zondo (1998: i-ii) who advocates for water recycling corroborate the above statement about the scarcity of water resources in SA but add that the threat also comes from the fact that industrial water sludge is contaminated, and therefore should be treated before reuse or disposal via known, proven and innovative sewage mechanisms. Efforts to use water resources effectively require effective planning.

The PDSA model (also known as Deming cycle) is depicted in Figure 2.2 below.

Figure 2.2: Deming Cycle



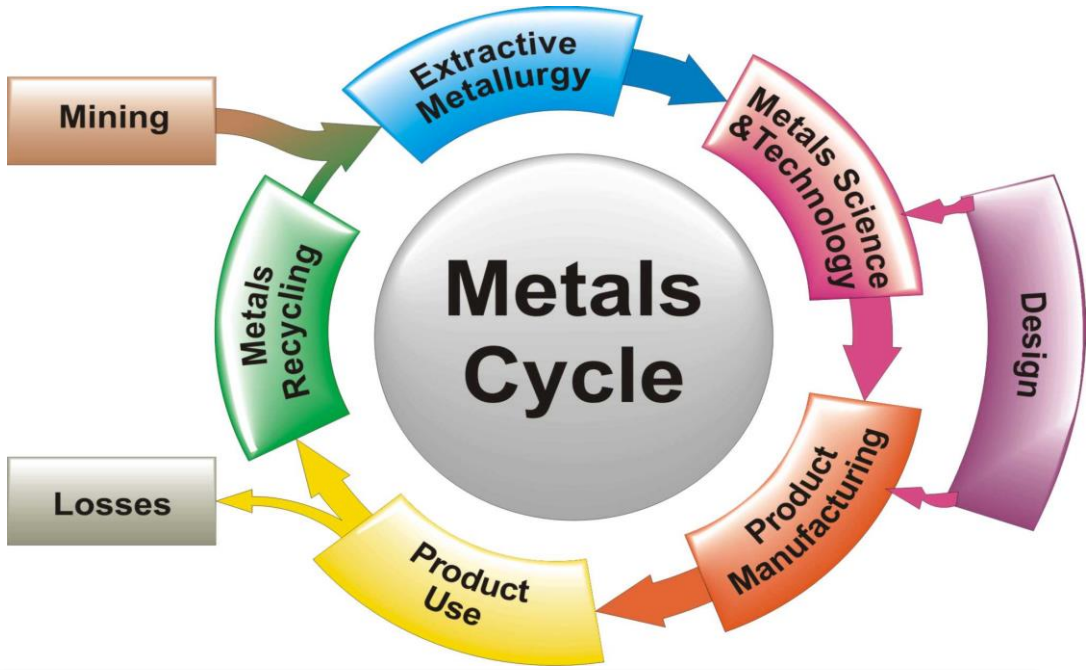
Source: Syed (2009) and Wernham (2014: 68).

Figure 2.2 stipulates that one needs to act with the aim to introduce the much needed change in an organisation, and in doing so, the incumbents must make

sure 100% of deadlines (rather than 100% of specifications) are met (Wernham 2014: 92). The Plan, Do, Check, Act (PDCA) model is sometimes referred to as PDSA -Plan, Do, Study and Act (Deming 2017). Whereas the PDSA (or PDCA) model and its varieties are recommendable when an agile approach is being followed. The perception that upfront planning can be an excuse for later replanning is a misleading one. The Waterfall Life Cycle is thus the same as the Define Process Control Model (DPCM). Improvement according to Deming, just as quality adherence, is a continuous activity. Bulsuk (2009) agrees with Deming (2017) on the continuity of quality betterment as a requirement.

Just as the USA and the UK experiment difficulties in the implementation phase of the agile system, the BRICS as a partnership or respective member countries are to experience some difficulties at different stages if they are to adopt the agile project management in their initiatives (Wernham 2014: 98).

Figure 2.3: Metals cycle



Source: Graedel *et al*. (2011).

Figure 2.3 depicts the picture of recycling of metals in beneficiation and manufacturing practices. It is evident that the cost factor must be taken into account as well as the cost of electricity if beneficiation is to be carried out (Wernham 2014: 234). Wernham (2014: 243) further explains that "the risk of not gaining the expected business benefits cannot be transferred – it always remains with the government, and having over-long periods without any proof of concept increases the cost of failure". It is argued here that, it is the government's responsibility to prevent the business risks of failure. Graedel *et al*. (2011) demonstrate how beneficiation and industrialization go hand in hand.

2.12 Paris 2015 and the terrorist threat

In keeping with international protocols and laws, SA must be careful in mining co-operation that seek to promote beneficiation at all costs. Care must be taken to ensure international laws are not infringed. After the recent terrorist attacks in Paris, many people were skeptical about the environmental conference to be held in that City. Prior to the coward attacks, already the opinion was informed as to the failure of the Kyoto Protocol to meet the expectation. It is now expected that the Paris forum will come to the rescue of the previous environmentally friendly international protocols.

China in particular and the BRICS in general are aware of the threat posed by terrorist movements around the world. At OBOR conference, the delegates were told in 2015 that China is prepared to work with SA and other countries in preventing terrorist attacks against the people (2015, pers. comm. 19 November, - Chinese anonymous). While SA prioritises beneficiation as the government policy, the country needs to ensure a strict observance of international protocols, especially if the BRIC will be involved. The BRICS countries can work together in improving the health and safety in underground mining, fighting terrorism and exchanging IT and information. Subsequently, beneficiation activities could be conducted in an environmentally friendly manner.

2.13 BENEFICIATION LEGAL FRAMEWORK

The beneficiation strategy is said to promote the application of related legislations in the country such as Growth, Minerals and Petroleum Resources Development Act, Broad Based Socio-economic Charter, the Precious Metals Act, the Diamond Amendment Act, energy growth plan and even trigger compliance with the Kyoto Protocol (*The beneficiation strategy* 2015: 1-4).

In SA a due process was not followed to pass a carbon tax into law or the whole process was deliberate and unnecessarily delayed owing to the fact that the process responded to international pressure on the bureaucracy rather than domestic interests. It is explained that the tendency to help business over dealing with poverty is really problematic. Consequently, the SA's carbon tax is just a climate policy and not a revenue mobilising policy. However, the dates of implementation have been pushed three times from 2014, 2015 and 2016 (McCoy 2015: 17-57).

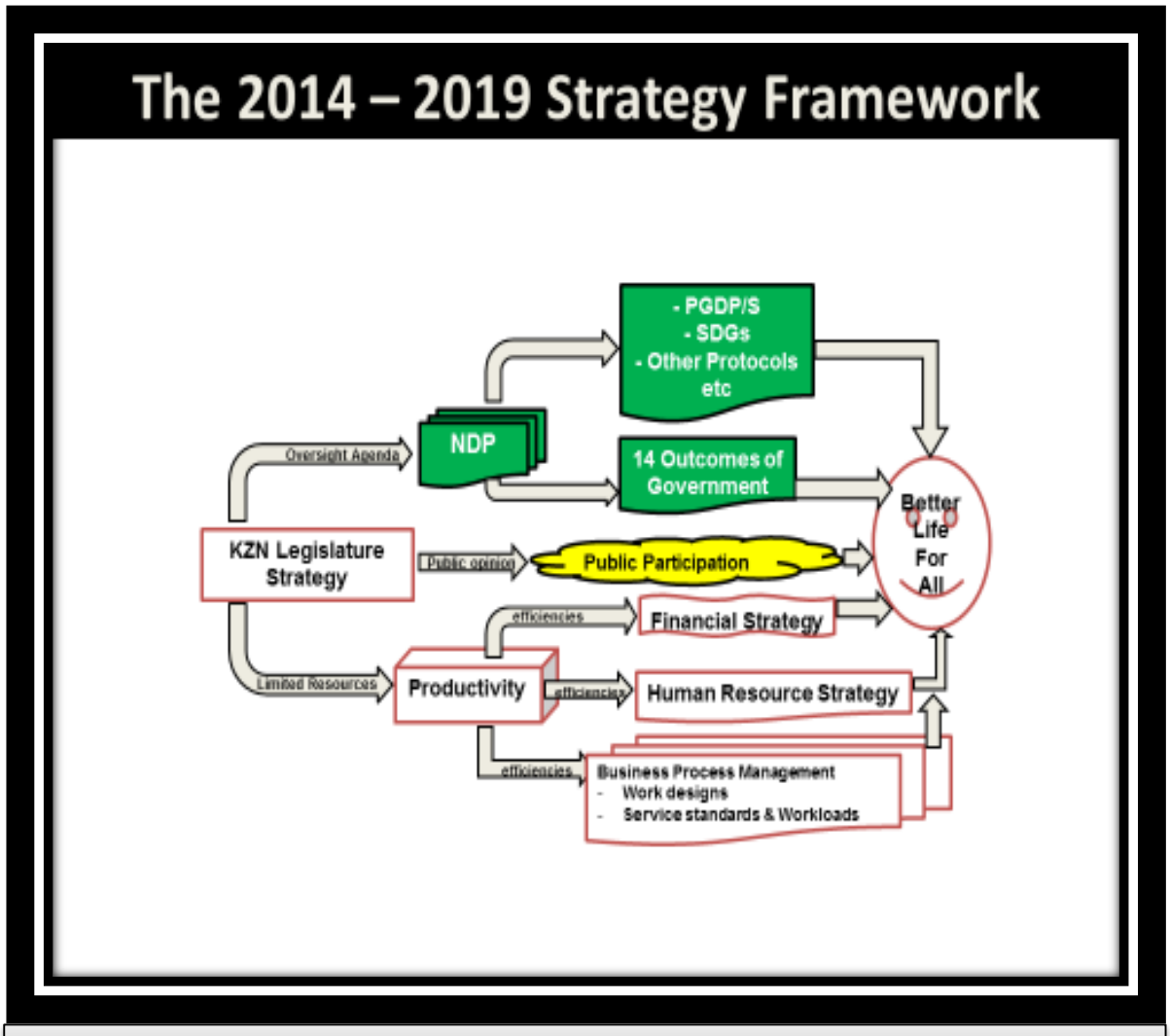
2.13.1 The Mineral Beneficiation Action Plan (MBAP)

The Mineral and Petroleum Resources Development Act 28 of 2002 as stipulated in the Mineral and Petroleum Development Amendment Act 49 of 2008 demonstrates that the MBAP aims to advance local value-addition through the prioritisation of 5 mineral value chains, i.e. iron ore and steel, platinum group metals, polymers, titanium and mining inputs. It is hoped that as the priorities have been set, the MBAP will become incrementally achievable. Upon completion, the MBAP will allow stakeholders to identify major policies and mining projects thus enabling them to harness the comparative advantages of mineral resources susceptible to contribute to dynamic industrial economy.

Certain sections of the beneficiation strategy enshrined in the above plan will be incorporated in the mineral section of 2015/2016 Industrial Action Plan (IPAP). In order to fully understand the many processes involved in mining as well as in mineral beneficiation activities, a thorough study of the South African Mineral Value Chain (MVC) would be an advantage.

In the spirit of the National Development Plan (NDP) 2030, the economy ought to serve all the citizens of this country. Mining contribute in growing investments in SA but also in export related activities. It also is a major contributor to the country's GDP and job creation (*South Africa's Mineral Industry* 2014: i-1). There is no doubt that it helps in industry creation. The NDP is placed in context in the Strategy Framework below.

Figure 2.4 Strategy Framework



Source: Khumalo (2016: 24)

Khumalo (2016: 1-26), shows how the National Developmental Plan (NDP) fits in the bigger picture for socio-economic development (Figure 2.4). South Africa

as a hybrid (participatory and representative) democracy is taking the lead as the most democratic country of all the BRIC partners. Whether democracy translates into a better life for all in line with the Vision 2030 and the NDP going forward remains to be seen. More needs to be done on service delivery and accountability of public servants for the dream to be a reality; nevertheless, South Africa is on the right track. However, education is to play a key role in shaping the future of the youth of this country and preparing them to take the helm of leadership tomorrow, if SA is to protect its institutions.

The purpose of the National Development Plan (NDP) is to put in place mechanisms that serve all who live in SA, black and white (*South Africa's Mineral Industry* 2013/2014: i). What is needed to attain the NDP objectives is "a political will to align with the NDP" (*Mid-term budget cost of borrowing* 2017). The strategy framework could be instrumental in planning for action.

Three million data collectors were tasked to collect data for a census in China in 2014 nationwide. This research revealed that China has known an improved economic structure between 2008 and 2013, even in the midst of economic crisis. China has since embarked on the formulation of their equivalent of the National Development Plan (NDP) known as 13th Five-Year Plan (2016-2020), a planning tool for economic reforms going forward (Ma 2015: 38).

2.13.2 The Mineral Value Chain (MVC)

Currently the MVC can be summarised in seven levels as follows:

a) Geological assessment and data processing;
b) Mine development, order of magnitude studies, techno-eco assessments and LED studies;
c) Mining activities and policy development (MVC);
d) Concentration, efficiency assessment and natural resources lifecycle assessments (energy, water and waste);
e) Extraction (resource management strategies, commodity trends analysis and cluster assessments);
f) Refining (energy efficiency studies, downstream beneficiation assessments); and

g) Semi-and-final fabrication (market development and trend assessments, supply chain studies, policy reviews as well as business plan development).

For the purpose of this research, although all the points are relevant, an emphasis will be placed on specific aspects such as point (d), (f) and (g) for their rapport with mineral beneficiation practices. It is therein shown how significant energy is to enable the industry to focus on mineral beneficiation (Mineral and Petroleum Resources Development Act 28 of 2002). After the involvement of SA with BRICS the need arises to take into consideration the economic aspirations of other partners, especially if they are to get involved themselves in mining-related activities with SA. The BRICS intervention must respond to the needs of local mining industries as well to be effective. The following table lists some interesting figures in the mining industry.

Table 2.2: The mining industry in figures and facts

Facts or figures	Findings
2nd	SA is the second major emerging country on the continent.
3.2%	Increase in export volumes in 2013 in the first nine months
4%	Increase in mining production in 2013 due to strong fourth-quarter recovery.
32	The number of derelict and ownerless mines to be rehabilitated.
34,2%	Increase in unit labour costs in mining over the last three years.
2013	In this year, growth volatility was obvious because of disruptions such as industrial action and maintenance.
6 million	Job opportunities to be created over the next five years.
R180 million	For upgrading informal settlements in mining towns.
R3.6 billion	For value-added exports and jobs creation in economically poor areas.
R35 billion	For industrial development in order to boost the economy, accelerate transformation and generate jobs.
R36 billion	Investment in Africa.
R844 billion	To be spent for infrastructural development and maintenance over the next three years.

Source: Gordhan (2014 cited in Naidoo 2014: 8)

Table 2.4 depicts the impact of mining related activities in SA. The most appealing aspect is the R844 billion allocated for infrastructural development and maintenance. It is in line with BRICS Business Council's priorities in SA which include infrastructure development, mining and mineral beneficiation (Fabricius 2013a). Infrastructural development also implies the putting in place of electrical facilities.

Not long ago, SA regained its first position in Africa as the biggest economy, after a short-lived Nigerian advance. Nigeria experienced developmental challenges due to the lack of economic diversification in the oil-rich economy

in addition to terrorist threats (Uzonwanne 2015), thus allowing SA to bounce back and reclaim its status of being the first economy in Africa.

2.14 BLACK INDUSTRIALISTS

According to Mokgokong (2015: 18), black industrialists are needed for SA to sustain an impactful economic growth. The legislation in SA insists that 26% of companies beneficiating prove to be owned by black industrialists or black entrepreneurs. Therefore, at that rate, the B-BBEE policy is justifiable to some extent. In addition, these industrialists could become a catalyst for further innovation and prompt the creation of more meaningful and formal jobs through an industrialised economy. With a little bit of vision this could stem a socio-economic development in SA.

A government-private partnership or something similar is needed to spark a glimmer of hope for sustainable development. The government has planned to develop 100 black industrialists in three years as part of a dynamic economic up-turn agenda deemed to have a multiplier socio-economic and developmental effect for the entire country.

However, it is warned that it takes a higher degree of cooperation of all to ensure that the government plans are not taken for granted, and that there should not be restrictions from government institutions as factors such as corruption and incompetence by the people who hold offices may have a negative effect along the lines.

Productivity can be hampered by delays due to slow traffic, especially when raw material or inputs could not be delivered because trucks were caught in traffic jam somewhere. To solve such problems in the future, a Dutch company (Volker Wessels) is currently planning to create prefab plastic roads that are joinable together just like lego bricks for the Rotterdam urban use. It is stated that such roads will be more environmentally friendly owing to the fact that asphalt accounts for 1.6 million tons of carbon dioxide emissions every year across the countries, and this amounts to two percent of all transport-related

emission globally. It is further believed that the discovery will be time and cost-effective as well as of quality (Business Report 2015). The BRICS have nothing to lose in taking similar initiatives going forward, and if supported by the BRICS, local and continental beneficiations can benefit the people across sectors.

2.15 THE EFFECTS OF INFORMATION TECHNOLOGY CHALLENGES

Physical change is one of the effects of a typical technological advancement (super-fast processors, bandwidth development, online collaboration tools, drones, 3D printing, automatic devices, artificial intelligence etc.), but where challenges arise such as complaints by customers, it is advisable to take advantage of human beings' ability to bring about negotiated solutions (Heisten 2015: 18).

In the future, it will be advisable to train miners to look beyond traditional man-machine techniques to systems-based mechanisms. Simulation is but one-way to train miners although it is not always easy to perfect. In this regard as well, safety and profitability go hand in hand to ensure the sustainability of mines. Today Wits University leads globally in connection with education in Mechanised Mining but SA is lagging behind in terms of mining productivity (Pickering and Porter 2014: 52-53) because of labour, union and government incoherent interactions.

Xi (2014: 55) unlike Diniz and Gilbert (2013: 19-34) is of the view that continuous innovation is the way to go for socialism for the benefit of young people. There is no doubt that mechanization is aligned with the need to innovate the mining industry, although careful human resource planning is required for alternative jobs and scare skills transfer.

Currently, the economy of China is more driven by innovation rather than investment and partners such as South Africa should know that. Industries and resources such as minerals are among the distinctive factors whereas "a

favourable environment denotes among the other things propitious industrial development, sufficient human resources and good credit" (He 2015).

Willis *et al*. (2004: 117) propose a framework for the mechanization of mining in South Africa. It is argued that owing to the fact that SA has unique societal and socio-economic conditions inherited from the imbalances of the past, it would require smart considerations of aspects such as job opportunities, monitoring and evaluation and the legislation before introducing a large scale mechanization of mining operations. Cook (2014) agrees with Willis *et al*. (2004) on the uniqueness of the challenges faced in the South African mining sector and the proposed mechanization of mining operations.

Reform or transformation as in the context of SA is paramount to any participative nation-building, and it has to be taken seriously if efforts deployed in that regard have to pay off. At first, the country may try to explore and gain some practical experience but reform and opening-up are to be viewed as continuous initiatives done for the people and by the people. This is in line with the call for transformation in SA by the president (Zuma 2017). Africa will have to promote cooperation to ensure the people enjoy a share of their resources (Little 2015: 22-23).

Bai, Lu and Tao (2007) studied the impact of privatization on China and found that privatization of SOEs was successful with insignificant compromise on the society's life account. On the other hand, it is the society at large that benefited from firm performance under the private structure. Based on this truth, labour is to be indispensable and the workers' interests must be protected while the incumbents' rights are also allowed.

In this regard, the socialist system needed to ensure fairness and justice by allowing workers to participate in the country's economic development, and ensuring their well-being (Xi 2014: 49). This resonates with the situation in South Africa where due to an incremental inequality between the rich and the poor, miners seem to have resolved to take it to the streets in protests against their conditions. In the same manner, attention is being drawn to the legalistic aspect of the system, i.e. how to operate within both domestic and international

legal requirements, and how to uphold the rule of law and respect of human rights (Marikana Report 2015; Willis *et al*. 2004).

In the same vein, in an article titled "*Technology advances challenge business",* Rob le Pair ((a Netherlands-born intellectual who researched into digital communication), as cited in Heisten 2015: 18), found that the negative impact of online expression of dissatisfaction can only be redressed through subtle tools to highlight the human ability to solve communicational problems. Even though SA has the fastest growth in the world in terms of smartphone accessibility and usage (27.1 per cent in 2014), the country must not neglect the importance of adding a human touch to what technology can do (Heisten 2015: 18).

2.16 THE INFLUENCE OF CHINA

Chen *et al*. (2016) talk about a population of 1.37 billion in China. In order to accelerate economic development and sustain their economic growth, the country needs to fight effectively counter values such as corruption and mismanagement. Work appears to be at the Centre of socialism with Chinese characteristics just as the citizens are (*China's Military Strategy* 2015). "work has shaped the Chinese nation and its glorious history, and it is work that will shape its bright future" (Bai, Lu and Tao 2007). Apart from socialism, there are eight non-Communist political parties operating in China (Yuan 2015: 28).

Research reveals the role of government in giving incentives to investors, the market liquidity and risk taking behavior by maintaining that lower interest rates are associated with lower degree of risk aversion and smaller government bond spreads. This is true in euro area, and can help researchers in studying the phenomenon in BRICS countries.

Xi (2014: 52) elaborates, *inter alia*, on the core socialist values as it is discussed that these include prosperity, democratic values, civility, living a harmonious life, enjoying freedom and ensuring freedom for others, equality, making sure justice prevails, the rule of law, a patriot conduct, dedication,

integrity and friendship. Other researchers talk about the supremacy of labour over capital; organization of production cooperatives; respect of work and sociability as well as land as a common property as part of socialist values. They also state that socialism is an alternative to capitalist work and property relations.

However, the president Xi's book seems to also contain some rhetoric that political adversaries would not hesitate to call party political propaganda, for example, when it is clear that no chance is given to other political system or when socialism is said to be the only way to go for the Chinese people. How true this will be in the years to come remains to be seen. A minor critique about the current system is seen in the book despite some regret. It stated that: "their industrial structure is unbalanced and the growth mode remains inefficient". The development gap between urban and rural areas and between regions is still large, and so are income disparities.

2.17 THE WORLD AND ANOTHER DEVELOPMENT BANK

Fabricius (2015) reveals that: "there was an estimated global shortfall of one trillion US dollar of infrastructure, so the New Development Bank's (NDB) – as the BRICS bank is known – capitalisation of US $100 billion would only meet one tenth of that". It is, therefore, in order to respond to the global financial need that the NDB was founded, and by April 2016 BRICS countries started to see the bank responding to some of their financial needs. The Indian financial guru goes on to emphasise that it is only after the intervention of designated experts in finance matters who are supposed to indicate how the requested loans will be processed that the resources will be made available to the member countries in home currencies as opposed to rendering the loans in hard currencies such as dollars - as it is the case with the aid from the IMF or the World Bank. The measure is seen by some as a measure susceptible of valorising BRICS currencies (real, rouble, rupee, renmibi and rand).

A good example of the BRICS bank –known as the New Development Bank - opening up to other countries to join would be the Asian Infrastructure

Investment Bank (AIIB). Currently, the Allies of the USA have joined the AIIB including Australia, Britain, Germany, Italy and South Korea, despite the opposition of Washington, while the Philippines is preparing to be added to the group. One of the strengths of the AIIB is that it does not put restriction to procurement of products and services from any state, and the organisation plans to focus on infrastructural development. In another move, the People's Bank of China (POBC) injected $20 billion into the Chinese money market. This intervention by political authorities in an attempt to halt the renminbi's rapid depreciation could bring suspicion to whether the Chinese favour market reforms of liberal economy (Chandran 2016).

The Chinese economy was negatively affected as activities in the manufacturing sector contracted for a fifth straight month, pushing the government to possibly step up policy support in order to avert a worse slowdown. The Chinese economy in 2016 is growing at its slowest pace in a quarter of a century despite the fact that the service sector still ended 2015 on a positive note (Reuters 2016).

Furthermore, in order to manage effectively the BRICS Bank, provisions will be taken to hold larger reserves and at the same time reduce the sum of money lendable to member countries. As far as Africa in general, and SA in particular, is concerned, Nhlanhla Nene was promised to be appointed to manage the African Regional Centre of the NDB in Johannesburg in late 2016, and this possibly led to him being fired as national minister of finance in SA. Unfortunately, the promise was not fulfilled. It has been interesting to see how the rand negatively responded to the mismanagement of former president Zuma by devaluating even further and reaching the historic R16 against the US dollar and in a few days picking up upon the reappointment of former minister Pravin Gordhan at the finance portofolio four days after the firing of Nene (Rondganger and Wolhuter 2015: 1; Maqhina 2015: 1; Dodds 2015: 2).

As cited earlier on, SA is the smallest economy of the BRICS. In order to get a relatively equal portion of the loan grant, the country has positioned itself as a conduit for the African continent. It is in this perspective that the Durban

summit hosted by SA gathered many African presidents with the BRICS leaders under the same roof in 2013 in an attempt to allow Africa to voice out its infrastructural needs. This move has opened up to non-member countries the possibility joining the NDB provided they become regular contributors to its capital even though the five of BRICS will still retain at least 51% of all shares (Fabricius 2015). It is unquestionable that the move could trigger the attempt by other countries to join the BRICS in the future if the partnership proves to be a sustainable global platform. The effects of globalization could prompt the BRICS to adjust their activities going forward in order to network at international scale (Cuterela 2012).

There has been opposition from Western diplomats and American scholars when it comes to criticising not only China but also the entire BRICS moves (Xi 2014). Some detractors likened SA's position in the BRICS to that of Greece in the EU when this country found itself in a dangerously poor state but surrounded by richer countries. However, Kamath disagrees with Western diplomats, arguing that the rand is only volatile when compared to hard currencies and not necessarily against other BRICS currencies. For him the rand will benefit more from future currency swap and by default SA as the country will harvest the best fruits. While the renmibi was stable, all the other BRICS currencies were also negatively impacted like the rand. Therefore, the situation is not so critical within the BRICS when it comes to the rand fluctuations.

The above views demonstrate that, to some extent, it is understandable why the volatility of certain currencies fluctuates as the hard currencies are directed onto the path that favours their home countries. There have been measures put in place by Western countries for the easing of their currencies or economy and recently what the world has experienced is a tendency to keep on tightening economic activities. In both cases, there are shock waves sent by those Western measures to the detriment of currencies such of those of BRICS, hence the current monetary devaluation (Fabricius 2015). However, be it as it may, political leadership and expert decisions need to be taken in order to control the impact of any economic recession and its aftermath effects

if the economy is to play a key role in job and industry creation in the long run. Unfortunately, it has not been the case in SA with recent poor decision-making records both in the economic sphere, trade union matters and politically motivated cadre deployment. An effective banking facility could be used by SA to promote mineral beneficiation.

2.18 YUAN AS A TRADE CURRENCY

The "One Belt One Road" initiative is meant to promote trade between Asia, Europe and Africa and to allow more investment opportunities abroad. In this regard, SA should seize this great opportunity and ready itself to amass Yuan capital to supplement its domestic liquidity and funding gaps (Qiu 2015: 39).

Frabricius (2015) indicates that, in addition to swapping currencies being made possible in the future, and under the provisions of the BRICS Contingency Reserve Arrangement (CRA), BRICS leaders catered for a solution to rescue member countries suffering from the balance of payment related problems and currency fluctuation and exchange risk, of the like of rand, by connecting the NDB CRA to the IMF. This proactive measure will ensure a 15-20% cost-saving rate by both developing and emerging countries as opposed to what had been the loss all these years.

Research postulates that:

> *"Data from the Society for Worldwide Interbank Financial Telecommunication shows that the Yuan became the second most used currency in trade finance – letters of credit and collections, the fifth most popular payment currency and the sixth most used foreign exchange currency in the world in December 2014"* (Zhou 2015: 34-37).

Arguably, the future currency swap will not only give the rand its once renowned stability but most probably it will strengthen the rand against the dollar, especially if the dollar is substituted by the BRICS currencies in financial transactions between member states. In this case, the problem is said to be eliminated for several years to come. In short, as Kamath (cited in Fabricius

2015) puts it and as first published by the Institute for Security Studies, trying to shake off the shackles of the dollar will be the first big test in practice of the wider ambition of the BRICS countries to counterbalance the global dominance of the West.

Furthermore, it is hypothesized that the yuan will also be in favour of more economic cooperation between China and South Africa as it lays the foundation for an integrated beneficial relationship in Africa. Moreover, the yuan's globalisation is more significant than just Sino-African trade and investment, it is a way of guaranteeing global industrial influence for the currency. China has become the most important trade and capital partner of Africa. Its currency, the yuan, is said to possibly come to the rand's aid as the Chinese currency (the fifth largest trade settlement currency in the world) continues to have considerable influence across the borders and to position itself as both an ideal financial tool for multilateral trade and investment in the continent (Qiu 2015: 38).

The globalisation of yuan will further be influenced by the Asian Infrastructure Investment Bank and the construction of the Silk Road Economic Belt as well as the Maritime Silk Road Initiatives. Surprisingly, yuan clearing banks initiatives lag behind in Brazil, Russia, India and South Africa (Zhou 2015: 34-37). Ma (2017) also elaborates on how globalization affects trade.

The economic recession has so badly affected South Africa that the country is deemed to be on a downward spiral by some commentators (Isheloke 2013). It was remarked that South African overhauled policies were part and parcel of the overall plan to counter the aftermath of the economic recession, although analysts agree that the whole situation was complex and difficult (Marrais 2009).

For others, the overinvestment in China's infrastructure, housing and manufacturing could be just another cause of problems in the economy, hence a call by proponents of this view to restructure the Chinese economy. Cowen (2016) as cited in Kopits (2016): "China's GDP is headed rapidly to zero", that is to say that a recession is underway. In conclusion, investors must know that

China's days of growth could be over. Apart from economic problems, nationalism is said to be the cause of some territorial conflicts witnessed today in the world. China and Russia have made territorial claims to the dismay of their neighbours.

It is the collapse of the commodity prices from 2014 leading to an oil supply surge which could be one of the major causes. In addition, there had been a poor decision taken by the Chinese when they fail to devalue the yuan in line with the yen, won and euro – a mistake which impacted negatively on its export activities by causing incremental demand for commodity imports. If this last hypothesis is true, then all that China needs to recover is a proper devaluation of its currency.

Weak demand has been singled out as the main cause of low oil prices, and because China accounts for most demand in the world for commodities, weak prices must therefore be the chief cause of the weakness in the current Chinese economy. In fact, Chinese economy has migrated from what had been known as an investment-oriented economy to a consumer-led economy, and as a result the gradual slowdown in China's underlying growth rate impacts on the global economy. Above, the law of demand is contrasted to the law of one price.

It is held that: "Since the European debt crisis and the quantitative easing (QE) policy adopted by their central banks to stimulate the economy, the competitiveness of the U.S. dollar and euro as a reserve currency has been significantly reduced" (Qiu 2015: 39), thus the yuan is positioned as the more logical choice and alternative for SA in the future in order to provide the economy with more liquidity and the much needed funding. As China overtook Germany as SA's largest trading partner, settlement of deals in yuan as well as investment between the two countries in the same currency will not only be more convenient and efficient but also cost-effective as it will make it possible to avoid or reduce the share of dollar and euro as foreign exchange reserves and national debt issuance. As the former leading currencies seem to decline slowly but surely, the yuan appears to be the currency of choice for the future

and an alternative especially for SA (The BRICS Post 2016) as a member of BRICS.

Transforming its economic structure from a goods-exporting system to a capital-exporting one has benefited China as a prospective investment country rather than being a trade champion. However, the yuan as a currency is yet to challenge the powerful US dollar as it manages to survive amidst competition and the reality remains that it is way too early to even think of becoming equal to the dollar or to over perform it. At the moment the bank is playing its 'bit' to ensure a cross-border use of the currency, and this is going to contribute to the economic integration in their region (Zhou 2015: 34-37).

South Africa, a country that was the continental powerhouse as far as the economy was concerned, accounting for one third of Africa's GDP while being home to only six percent of the African population, was in 2013 surpassed by Nigeria (Chibelushi 2016; Hinshaw and McGroarty 2014). Fortunately, SA has regained its position as Africa's number one economic powerhouse due to the diversification of its economy and owing to problems in Nigeria.

Josie, Ncwadi and Siswana (2017) explore the use of a common policy under the BRICS banner. As if a common currency would be the panacea to the aftermath effects caused by the 2007/8 global financial crisis, they pave the way to a robust debate in academia. BRICS countries had a different experience of the recession. Countries such as Brazil, Russia and SA were weakened by the crisis, while China and India coped well. The BRICS finance has been negatively impacted by the continuous use of foreign currencies such dollars and euros, especially in inter-BRICS trade and financial transactions. Josie, Ncwadi and Siswana (2017) state that it was in view of the above that the BRICS established its own bank, and is now envisaging the introduction of its own credit rating institutions and currency. It is being proposed that the renminbi, Chinese yen, be adopted by all as it outperforms the other currencies within the BRICS. Provided this can boast beneficiation, SA should not fear.

2.19 SINO-INDIAN CO-OPERATION

Even though the two last years have made it possible to improve the Sino-Indian co-operation (as both economies mutually supported each other and allowed more productivity to be possible), there are some border disputes that still must be resolved for the two countries to carter for a more sustainable economy, said Ashok Kantha (an Indian ambassador in China). Prosperous China and India are a prerequisite condition for the Asian and global development according to the same source (Huaxia 2016a). This is because the two countries are the most popular, thus influential in their neighbourhood. The socio-economic role in the BRICS is also a factor and should be one of reasons why they need each other. The two countries could further co-operation for beneficiation purposes.

2.20 AGING PROBLEM IN CHINA COMPARED TO OTHER COUNTRIES

China is confronted with the ageing problem unlike SA. The country has been trying to introduce reforms to deal with age dilemma. Reforms included the review of pension schemes and other support given to senior citizens of China. There has been, however, an improvement on the birth policy recently, and the Chinese can have two children these days (Huaxia 2016b).

Life expectancy in China at birth was 70 for male and 74 for female in 2004 (Flatherty *et al*. 2010). By 2050 more than 30% of the citizens of China will be 60 or older, and this may have economic consequences especially if the current 15-64 young-old ratio is decreased (Banister *et al*. 2010; Flatherty *et al*. 2007: 1295-1300). However, suffice it to mention that the aging problem is not unique to China. It is common these days to see in Europe a retired couple live 30 to 40 years more after their formal retirement (European Commission 2002: 73).

China has the strongest percentage of gross saving to GDP (48%) while India has 32%. However, China's social security (pension and medical care) is not sophisticated and needs to be sustained as it deals with a large number of

aging population who save more to secure their old age pension. The country's saving rate has reached four trillion US $ in the second quarter of 2014 impacting on the foreign exchange rate (Chu 2007 cited in Lung 2015: 15).

The challenge that SA and the continent face is that of skills shortage (or the hemorrhage of the much-needed skills towards the developed countries), especially that of scarce skills in the mining sector. Unlike China, the population in Africa in general and in SA in particular is very young. This augurs well with the choice of Africa in general and SA in particular as an investment destination that could promote beneficiation.

2.21 APPLIED THEORIES OF BENEFICIATION

Dwyer *et al*. (2012) studies applied beneficiation theories namely bioflotation and bioflocculation. Biotechnology was found to be environmentally friendly and could alleviate the negative impact of certain resource exploitations. Microorganisms and their metabolites proved to be efficient in metal leaching. It was submitted to others that, certain bacteria could help beneficiate minerals using bioflotation and bioflocculation methods. Sulphide from medium and low grade minerals have benefited from research and it is now recommended to consider oxide minerals beneficiation (ion ores).

To this end, genetically modified bacteria, achievable with the help of chemists' expertise, could be instrumental as an Australian case study posits. Other theories include high gradient magnetic separation adding value to the finished products (Order 1976). Song and Lu (2000) reviewed theory and applications of hydrophobic flocculation for fine minerals and coal beneficiation. It is theorized that particle hydrophobicity, kinetic energy input and non polar oil are integral part of hematite, sulfide minerals and coal beneficiation process. It is possible to recover valuable minerals using hydrophobic flocculation. Suffice it to mention that other theories are sector specific such as microwave treatment of coal (Kingman and Ramson 1998; Xinhai n.d) and require

infrastructure investment. Lockhart (1984) demonstrated that water shortage affects beneficiation practices thus dry beneficiation becomes an option.

2.22 CONCLUSION

This chapter discussed mineral beneficiation in depth from a managerial perspective. It elaborated on the theories of beneficiation, i.e. the economic and the political theories. In addition, it questions whether the current Sino-Africa trade and co-operation model follows any of the above-mentioned theories or is it a mixed theory that emerges from those interchanges. The benefits and the inhibitive factors of beneficiation were identified. The chapter also addresses economic issues affecting the BRICS. The next chapter looks into international trade and co-operation.

CHAPTER THREE

INTERNATIONAL TRADE AND CO-OPERATION

"The invisible hand of the markets is a guide to good conduct…and the tendency for discussions among people of the same trade…to end up conspiring to raise prices" – Adam Smith, in his 1776 classic: The Wealth of the Nations.

3.1 INTRODUCTION

South Africa is very rich in minerals. It is well known that SA is rich in the mining of Platinum Group Metals (PGMs) and gold. In addition, the production of ferrous metals such as manganese and chrome is of world class quality (De Lange 2014; Rodriguez 2012). When it comes to iron ore exports this country comes first as well. Despite electrical shortages for industrial activities, SA uses its own coal and uranium as an alternative or supplementary source of energy. Since 1994, the contribution of the mining sector to the SA economy has been around 10% of the GDP with the lowest being during the 2008-2009 global economic recessions. It once reached 14% but unfortunately decreased to eight percent currently. This could also be due to the fact that, South African economy is now very diversified. A competitive advantage to that of Nigeria and DRC for example is that SA is not dependent on oil and minerals. Having said that, during the hard times, South African economy suffered and the country ran the risk of becoming de-industrialised.

This chapter reviews the literature bearing in mind the field of study: international business integration. It revisits the literature about the South African mining industry in the context of BRICS and critique theories applicable to this research. International trade and co-operation theories are reviewed to start, followed by aspects important to BRICS as an organisation. A special contribution of this chapter is on the elaboration of the South African mining industry and matters important to BRICS partnership.

3.2 INTERNATIONAL TRADE AND CO-OPERATION THEORIES

Nafzinger (2012: 571-572) reviewed international trade theories and linked them to liberalisation of commerce. Parikh (2004, as cited in Nafzinger 2012: 572) concurs with the last on the fact that trade liberalisation develops economic growth on the supply side via a better resource allocation, vital competition and a greater flow of constructive ideas and the impartation of knowledge.

Ranzau (2009) elaborates on international trade theories. The following theories fall within the ambit of this study:

- Mercantilism;
- Absolute advantage;
- Comparative advantage; and
- National competitive advantage.

The above theories are important because they deal with commerce and co-operation. There are valuable trends in international trade and finance worth noting. It is held that theories can be explained and enriched (Xi 2014: 32). The pros and cons of international trade are listed on the next page.

Table 3.1: Advantages versus disadvantages of international trade and co-operation

Advantages	**Disadvantages**
-More economic use of natural resources	-Countries may exhaust the resources
-Diversified commodities	-Negative effects on domestic industries
-Scarce commodities are found elsewhere	-Imports may harm domestic market (consumption)
-Rise of competition	-In case of emergency, it may become problematic to intervene abroad
-Speedy industrialisation	
-Competitive price	
-Transport means are developed	
-Countries depend on each other to develop the economy	

Source: Pandare (2012), Tabled by the researcher.

Whereas Muthumani (2010) puts an emphasis on the effects of globalisation, Pandare (2012), as depicted in Table 3.1, discusses the benefits and the demerits of international trade and co-operation. It transpires, from the two authors that globalisation and international trade represent almost the same concept considering the fact that they have the same benefits and near-misses. The possible advantages of international trade and co-operation include more economic use of resources, speedy industrialisation, development of transport and the dependability of partners in co-operation.

However, Pandare (2012) as in Table 3.1, comments on the possible adverse effects enumerating factors such as the exhaustion of resources, negative effects on domestic markets as well as the difficulty to intervene abroad in case of emergency.

Muthumani (2010) also reviews the advantages and the disadvantages of an international or global organisation. The findings of the study in question reveal that the benefits could be more jobs and increased incomes. The transfer of mineral was identified as one of the demerits. BRICS being an international partnership, the benefits and demerits of similar organisations will also apply. Irungu (2011) found that the benefits of the East African Community (EAC) regional integration are applicable to other regions in Africa. The following were identified as efficacy of regional integration: economic growth; development opportunity; increased investment and trade, and the fact that a country may inspire another to improve its business systems. In another instance, the South African Development Community (SADC) has followed the example of the World Trade Organisation (WTO) protocols to make its own.

Globalisation influences international trade and is said to have a positive impact on trade as it allows countries to have more access to resources that otherwise would have been scarce locally. It is argued that these raw materials can help companies in their bid to become more productive and efficient in what has become a highly competitive trade environment (Matjie and Zamo 2012: 16).

Parallel to Ranzau (2009), Morgan and Katsikeas (1997: 69-70) contend international trade theories with foreign direct investment theories. For example, SA has put in place the National Empowerment Fund (NEF) in order to boost Black Economic Empowerment (BEE). In *Advantages and disadvantages of international trade* (2014), the pros and cons of international trade are given. The positive aspects are as follows:

- Productive resources are used to the full and, where necessary, savings are allowed;
- Diverse products are more available on the market;
- Scarce commodities are attended to as imports supplement supplies; and

- Reasonable prices are proposed for a variety of products in the midst of international competition on resources, services and finished goods available on the market.

Yeaple (2004) also reviews international trade and cite amongst the other aspects, information technology, manpower preferences and exports as contributing factors to growth. In addition, speedy industrialisation through international trade, and countries learning from each other new skills while acquiring machinery and other equipment from the advanced economies, are important. Preventative measures should be taken to avoid price drop as the country access new markets abroad. Effective communication is extended as well as organised products shipping allowing customers to get their merchandise; and the economic interdependence becomes a catalyst for peace and stability among nations (Parikh 2014). Congruent to international trade theories are co-operation theories discussed below.

Table 3.2: International co-operation theories

Scholar/s	About	Some findings
Helen Milner	International cooperation article review	• A developed concept of cooperation distinguishes between a behavior that counts and a futile behavior; • Conditions that favour cooperation were identified; • Domestic influences on cooperation need to be studied.
Terrence L Chapman, Johannes Uperlainen & Scott Wolford	International cooperation	• Good strategies and accountability mechanisms are needed in times of domestic constraints; • Special interests need to be controlled; and • The relative strengths of accountability across countries need to be understood by partners.
Anna Espiniola-Arredondo	International environmental agreements	• Information-sharing is very important for meaningful

Source: Milner (2011: 466-496); Espinola-Arredondo and Munoz (2011), tabled by the researcher.

Barrett (1999) concurs with Milner (2011: 466-496) about international co-operation theories. Espiniola-Arredondo (2011) concurs with Barrett (1999) as far as international theories are concerned, as they discuss the applicability of those theories nowadays and how important those theories have become. Barrett (1999) further developed a coherent theory of international co-operation based on intertwined assumptions about individuals and groups. The networking nature of a partnership between either two or 200 partners will determine the sustainability of their co-operation.

As far as the BRICS are concerned, co-operation will permit countries to share success stories and address near misses or pitfalls in their endeavours. Jong-wha (2013: 10) shows, for instance, that, as China is making reforms on various economic issues, there is no guarantee of success for the deleveraging and structural reform. Factors beyond control due to international intermingling are unpredictable and risks may occur at any time. Policy mistakes and political instability could deter even best-laid trade and development initiatives.

3.3 INTERNATIONAL TRADE WITHIN BRICS

International trade has been on the rise in countries such as India, and so have been aspects that relate to mineral beneficiation, for instance, jewellery or glassware. It has been India's strategy to import, add value before exporting finished products. This may lead to a paradigm shift in terms of the beneficiation culture of the company or the country, and it is known as putting in place cultural industries. In China alike, such initiatives have been said to be the backbone of the country's future economic development (Shaban and Vermeylen 2015: 70-74).

BRICS countries have improved conditions for trade and business in their countries. China, for example, developed its credit information system through the introduction of credit information industry regulations, guaranteeing borrowers the rights to inspect data. It is in addition easier to enforce contracts in China as from 2014. On the other hand, the Russian Federation also scored

as the Doing Business report demonstrates it. Russia made it easier to start a business or to open a business bank account now, just as it is also easier to conduct business within its borders. The Russian state reduced the actual number of physical inspections that had to be taken previously.

In *Doing Business* (2013), it is revealed that in SA, it is the tax that has been made easier as secondary tax has now been replaced with a dividend tax borne by shareholders. In China, the government controls or at least influences companies' strategies – even if they are private. Brazil is also concerned by this factor: for instance, despite the attempt by China to export finished products while importing raw materials from Brazil, the last does not want to co-operate in that regard but instead Brazil pleads for a win-win deal with China (Jones 2012: 181-182).

As far as the traditional theories of international trade and investment are concerned, joblessness is said to be a significant departure, as an influence on taxation and policy on tariff. Structural unemployment is therefore also a concern for the BRICS. Lung (2015) differentiates between investment types, writing about Outward Direct Investment (ODI). Another type of investment would then be Inward Direct Investment (IDI).

It is stated that the oligopolistic markets have two advantages:

- The economy of scale;
- The superiority in terms of IT and knowledge (Lung 2015: 21-43).

International trade also encompasses theories such as FDI explained above and the theory of multinational corporations which could fall out of the current scope of research (Brander and Spencer 1985: 158). From what transpires from the source above, if the firm chooses to make an investment in mineral beneficiation for example, a decision must be taken on the needed capital for the country before choosing a tariff. Thereafter, it is the responsibility of the company to set output. Should the firm opt to export, almost the same decision will follow suit as the organisation selects capital for the offshore facility and

the importing country. The Table 3.3 below illustrates the process of investment and that of export decisions.

Table 3.3: Investment versus export decision-making process

Stage		Decision		Agent
1		Investment regime	Export regime	Multinational firm
2	Capital	Capital	Capital	
3	Tax	Tariff	Host government	
4	Output	Exports	Multinational firm	

Source: Adapted from Brander and Spencer (1985: 260).

In Table 3.3 above, it is evident that the onus is on the firm, in this case whether it is going to invest locally (beneficiation) or to export abroad. In doing so, it becomes a question of either tax or tariff to the government or whether there will be an output or exports by multinationals. Mkrtchyan (2010) examines a plurilateral agreement eliminating important tariffs on a number of items. Nielsen (2017) studies international strategic alliances, multinational corporations (MNCs), and is of the opinion that collaboration is a strategic choice.

It is argued that non-Chinese investment is also welcomed and "encouraged to offset the perceived stranglehold by China". China does not necessarily give important jobs to Africans; instead Chinese citizens are 'imported' to do even odd tasks. There are, therefore, "issues with retaining sovereignty" (Jones 2012: 193). BRICS partnership, as a result, contains an element of risk and uncertainty going forward, especially considering the disparity between member countries.

Trust, risk and uncertainty (TRU) augur well with the context of BRICS, especially if the partnership is going to promote beneficiation in SA. Nickel and Vaesen (2012; Coleman n.d: 3; Watson and Moran 2005) agree that trust is needed for the benefits of co-operation to be harnessed. A collective

approach to trade agreements involving different stakeholders is advocated for by Grossman and Horn (2012: 1-7), and the BRICS.

The issue of leadership as well as the need for 'economic' transformation came to the fore (Coleman n.d: 3). Beneficiation could enhance economic transformation endeavor if promoted gradually and cautiously in a manner which does not keep away important investors. The following section elaborates on mercantilism.

3.4 MERCANTILISM AS A THEORY

The impact of mercantilism is seen even today at the local level. The rich get richer and the poor poorer. In order to ensure local beneficiation, a country needs better access to cash resources for the benefits of the majority of its population (Hilton 2013), including the previously disadvantaged categories.

Mercantilism states that countries accumulate monetary wealth by exporting commodities while discouraging imports (Ranzau 2009). Trade surplus, government interventions and colonisation made the mercantilist theory useful across sectors. In this system, states made sure they amass wealth by promoting commercial exchanges across the borders. As seen above, the system favoured exports. It also aimed at increasing gold and precious metals stock in the country. It is this 15th-18th century school of economic thought that saw the government move away from agriculture as the major system of the economy.

As the country strives to stimulate economic growth, it is important for decision-makers to promote export activities (Matjie and Zamo 2012: 5). This does not mean that it has to be done to the detriment of beneficiation as it is often better to export finished goods than to ship raw materials for processing in foreign countries. In the same source as per above, Zamo Gwala and Michael Mabuyakhulu agree on the role of export in shaping the country's economic growth for the better. They said that: exports generate growth, create employment, attract foreign investment and earn foreign currency. This is

consistent with Thirlwall (2016) who also linked exports to economic growth. Needless to say once again that it is hereby advocated that the export of finished products or value-added commodities should be prioritised. In order to do that, the industry or the country needs to put global strategies in place.

The mercantile system also encouraged theorists who supported the exploitation and the colonisation of others by the western powers. South Africa and India were colonised by Britain; China was a colony of Japan and Brazil of Portugal. Russians were involved in many political struggles that led to the Russian socialist revolution.

The fear of neo-colonialism and more exploitation by foreign mining companies (or their states for that matter) make it imperative for the BRIC partners to clarify their *raison d'être* – even though these countries were not necessarily colonialists in the African context when embarking on long-term natural resources projects. With SA as a BRICS member, the problems detailed above are exacerbated. However, there have been fair claims that foreign multinationals have played a negative role in exploiting Africa in the past, if one is to consider the neo-Marxist point of view on the issue (Kabongo-Nyandu 1997: 30).

3.5 THE ABSOLUTE ADVANTAGE THEORY

The absolute advantage theory is the ability to output goods or services more efficiently than any other nation with the same quantity or even fewer resources. Unlike mercantilism, here trade was not restricted by tariffs. The advent of global market makes the use of such theories a possibility in the BRICS partnership (Eaton, Kortum and Kramarz 2009: 53). If, for example, secondary metal and mineral products produced locally are processed locally, more jobs will be created. This is known as local beneficiation (Fasheun 2010).

3.6 THE COMPARATIVE ADVANTAGE THEORY

Nafzinger (2012: 572) elaborates on comparative advantage and agrees with Ranzau (2009) on its relevance. The first author explains that a country is said to have a comparative advantage when trading the commodities it is producing cheaper to people for whom it is costly or even impossible to produce for themselves. In exchange, "the country gets what it produces expensively at the other country's cheaper cost" (Nafzinger 2012: 572). It is thus in view of these principles that international economists still use the doctrine of comparative advantage as created by Adam Smith and David Ricardo (English classical economists of the 18th - early 19th centuries). Leemer (1984) also reviews the theories of international trade and elaborates on the comparative advantage.

In view of the above, it is understandable that the BRICS seek to prioritise trade and co-operation for the development of member states. International trade theories emerged over many years, and today there is a possibility of more theories (and models) to be deduced as a result of many trends occurring in the global economy but also as a result of research (Huanhuan 2017). Shaban and Vermeylen (2015: 1-8) examined the growth of international trade, and link that to transactions between India, Brazil and China. They observed that international trade is on the rise in India.

3.6.1 Beneficiation as a comparative advantage for SA

The beneficiation strategy (2015: 9-10) elaborates on the comparative and competitive strategies. This source indicates that SA gets a comparative advantage when practicing downstream beneficiation. This leads to SA ensuring technological excellence in mineral related industries. Competitive advantage on the other hand relates to value-addition occurring by transforming raw materials and processing minerals and manufacturing from them. South Africa aims to promote beneficiation by investing in "construction of large-scale resource-based investment projects such as Columbus stainless, Saldanha steel, and Lion ferro-chrome smelter". The advantages of SA include the following:

- There is a constant political will to upgrade mining infrastructure;
- The country has a well-established financial and banking system; and
- The requirements for industrialisation exist: IT and training institutions (*The beneficiation strategy* 2015: 9-10; Department of Mineral Resources 2011).

Training and education are necessary for socio-economic development. Countries such as China and Turkey are well ahead of SA concerning digital teaching, said the South African Minister of basic education Ms. Angie Motshekga (*Digitisation of education* 2015). In addition, Vahed (2014: ii) found that students learn better when games are used in teaching.

3.6.2 The national competitive advantage theory

This theory implies that a country's competitiveness in a certain industry depends on the ability of that country to innovate and upgrade that industry (Ranzau 2009). This is consistent with the findings of Ngcobo (2012). International trade and cooperation are affected by multi-sectorial factors. These factors include factor conditions such as mineral resources, infrastructure and the know-how in the country (the usage of which is equally paramount for the nation to be really competitive; demand conditions: home demand should take precedence over foreign demand for a meaningful national competitive advantage to take place; related and supporting industries for example, through beneficiation. Last but not least, firm strategy, structure, and rivalry play a role in shaping the national competitiveness of a country. Competition brings in the culture of innovation and as a result boosts the economy.

Jayasuriya (2012: 230-234) maintains that the private sector needs to be supported in order to reduce poverty and achieve sustainable development. This is in support of the Asia 2020 strategy which envisages the private sector's development funding increase. The International Finance Corporation (IFC) which is part of the World Bank group and is a sister organisation of the

International Monetary Funds (IMF) plays a key role as it promotes sustainable economic growth by financing developing countries' private sector, mobilising capital and providing technical support to enterprises and the State.

3.7 BRICS: SWOT-ANALYSIS AND PESTEL FRAMEWORK

For the purpose of this study, aspects related to SA in the context of BRICS are discussed. Suffice it to note for example that all BRICS countries are rich in mineral deposits. This strength however doesn't stop countries from looking for more resources abroad. In this context, SA need to ensure there is a win-win agreement with any country interested in minerals. A weakness would be that the BRICS evolved from a top-down initiative taken by the politicians. If this culture is not controlled, the partnership may experience problems based on the political agenda by the leaders (Jones 2012).

In order to have a brief overview of the macro-economic factors that play a role in trade exchange between BRICS states, a Strength, Weaknesses, Opportunities and Threat (SWOT) analysis was conducted (Table 3.4).

Table 3.4 BRICS as a partnership: SWOT-analysis

Strengths	**Weaknesses**
- Huge human resources/popularity (Jones 2012) - Emerging economies (Jones 2012) - Huge mineral/natural resources (Jones 2012) - Cross-continental positioning - E-business/IT - Import-Export/trade exchanges (Matjie and Zamo 2012:14) - Huge think tank (Tan, Shi, Buarque, Gelbukh, Das and Engelbrecht 2015) - Fast growing economy (Jones 2012) - Strong/stable institutions (SABC 2) - BRICS Bank/liquidity (Fabricius 2013:2)	- Top-down initiatives/partnership (Bond 2013) - Relatively new/ inexperienced deployed workers - Insufficient emancipation of women (Kotze 2015:9) - Not enough funding compared to FMI/WB - Limitations to entry into the partnership - Distance between partners (Jones 2012) - Lack of a democratic common language (Praga Manifesto 2000) - Lack of independent/external audit - Limited resources (Kotze 2014:10) or depletion
Opportunities	**Threats**
- Bottom-up approach in the future (Bond 2013) - Alternative to FMI/WB - Possibility to open up to other countries (Matjie and Zamo 2012:4-5) - Economic development (United Nations 2015:31-32; Jones 2012: ix-x) - Mineral beneficiation initiatives (Fabricius 2013) - Lobby for climate change MDG/SDV - Research/Development (5th Brics summit 2013) - Military cooperation (Jones 2012) - Globalisation/global initiatives - Esperanto experiment (Praga Manifesto 2000) - Triggering world reforms (Notshulwana 2012:8) - Citizens' solidarity and social diversities (Shaban and Vermeylen 2015:70)	- Negative competition with FM/WB - Disunity at UNSC over Libya… (Kedze 2015:18-19) - Excessive nationalism/selfishness - Economic recession/aftermath (5th Brics summit 2013) - Ageing population – China (Jones 2012: ix-x; 2012:20-21) - Insufficient democracy in China (Jones 2012) - Uncertainty about the future - Unequal financial capabilities (Jones 2012) - Unemployment (Jayasuriya 2012:230-234) - War from non-members: physical/ideological/economic (Jones 2012:188) - Neo-colonialism/dominance (Pandare 2012)

Source: Compiled by the researcher.

As far as opportunities and threats are concerned, a bottom up approach as advocated by the civil society is yet to be seen. The more the citizens get involved, the better. What is threatening the BRICS is the unpredictability of the global economy as a result of commodity prices' fluctuations. During the recession, the BRICS were also affected although they outperformed the western countries.

South Africa experiences problems with its service-delivery system. However, SA has become the port of entry of the African continent. In SA, investors are usually beneficiaries of Foreign Investment Grant (FIG) aiming at compensating deserving entrepreneurs of foreign origin to cover some costs incurred in moving identified new machinery and work equipment from overseas to SA excluding motor vehicles (*A guide to the DTI incentive schemes* 2012/2013: 1-19). Table 3.5 lists certain initiatives of interest to the BRICS.

Table 3.5: BRICS initiatives in South Africa

Number	Initiatives in SA
1	BRICS and Africa Partnership, Integration and Industrialisation/BRICS summit
2	BRICS Science, Technology and Innovation (STI) Information Exchange
3	Downstream Mineral Beneficiation
4	Investment (energy) and Export Promotion Activities
5	BRICS/New Development Bank Branch
6	BRICS Think Tank
7	BRICS Business Council
8	Marcopolo deals with Brazil
9	BRICS/Russia energy project in SA
10	BRICS Academic Forum

Source: *5th BRICS summit 2013*; IPAP 2016 (Adapted by the researcher).

As discussed before, mineral (downstream and upstream) beneficiation is now a priority for the BRICS Business Council. It is expected of the member states to uphold this principle going forward.

Another tool that enabled information gathering about the BRICS is the PESTEL framework. In corroboration with Johnson, Scholes and Whittington (2006: 68-69), the PESTEL-framework classifies influences beyond the organization's control from the natural setting into six major categories: Political, Economic, Social, Technological/Technical, Environmental and Legal.

Table 3.6: BRICS as a partnership: PESTEL FRAMEWORK

Political Factors	Economic Factors
- Different political regimes (Jones 2012) - Conflict of interests at UNSC - The burden of historical heritage: Apartheid for SA, communism for Russia and China, cast system in India, issue of cultural diversity in Brazil (Jones 2012) - Danger or fear of re-colonisation - Military joint-venture for peace-building/conflict resolution (Kedze 2015:18-19) - Democratic institutions/stability (Notshulwana 2012:1-8)	- Recession (Li 2011:63; Steyler and Powel 2010:2; Brookes 2009:12). - Investors' friendly regulations in SA (Doing Business in KwaZulu-Natal 2013:8) - BRICS bank liquidity (Fabricius 2013:2) - Mining dependent economy (SA) - Search for natural resources/raw materials (Russia, India, China) - Dynamics of newly established pro-free-market system in China and Russia
Social Factors	**Technical Factors**
- Unemployment in BRICS countries (Fabricius 2013:2) - Inequality in SA (Faku 2015:15), poverty in BRICS (Jones 2012) - Ageing societies – China (Jones 2012) - The communication/language challenge (Praga Manifesto 2000) - Nationalism vs. internationalism	- The mechanisation of mining jobs - IT infrastructure in mining/RFID (Bond 2013:1; Baloyi 2014:44) - Beneficiation infrastructure (Fabricius 2013:2; Fasheun 2010) - BRICS think tank/Knowledge hub (Notshulwana 2012:8-9)
Environmental Factors	**Legal Factors**
- Climate change issues (Xi 2014) - Effects of mining on the environment (Kotze 2015:9) - The danger/benefit of nuclear technology (Jasmasmie 2015)	- Freedom of expression in China/Brazil - Human rights violations in BRICS - Lawyers in Brazil not allowed to team up with external legal agents for action in Brazil (Jones 2012) - Legal matters (Republic of South Africa 1996)

Source: Adapted and tabled by the researcher. Spicer (2014: 172); Matjie and Zamo (2012: 4-5).

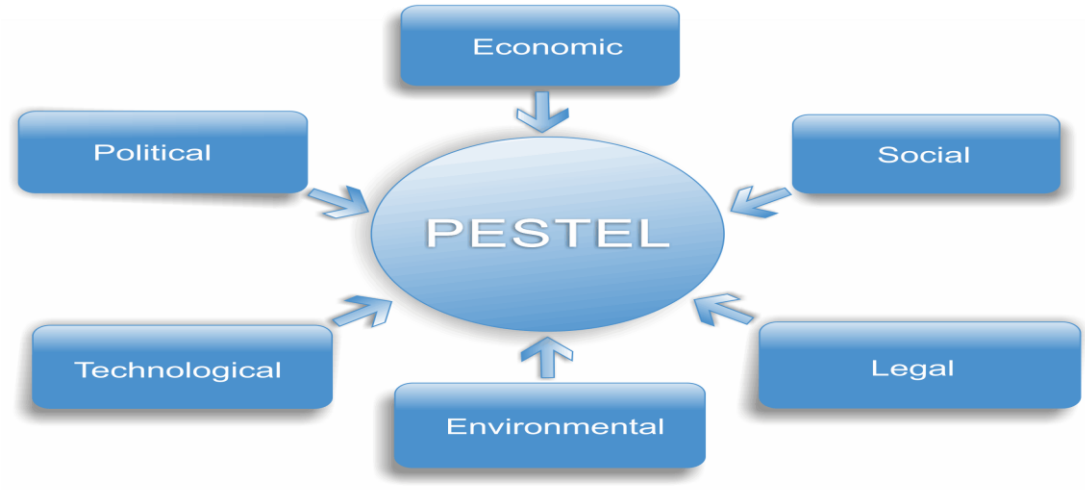
The framework seeks to provide guidance only in terms of where to start in analysing a macro-economic situation such as the BRICS environment (Table 3.6). The framework is one of the tools that prove to be of importance when

studying the impact of influential factors in the macro-economic context. Moreover, environmental factors remain a continuous challenge for mining beneficiation in SA.

According to Spicer (2014: 172), the PESTEL framework is suitable to supplement the SWOT analysis by providing a micro-economic and macro-economic background to potential investors and/or interested parties. It enables the understanding of a situation in a holistic manner. In general, the PESTEL framework addresses factors external to the organisation. As a technique, the PESTEL framework can be commendable for planning purposes for BRICS' joint projects in mineral beneficiation.

Having said the above, PESTEL and SWOT-analysis are tools that SA leaders can use to identify difficulties that necessitate the involvement of the people and areas where leaders should lead by example. The PESTEL-framework is presented below:

Figure 3.1: PESTEL framework



Source: Adapted from Hutchins (2017).

How PESTEL affects the BRICS in general and SA in particular has been explained earlier on. The PESTEL tool also allowed identifying the strengths and weaknesses (SWOT-analysis) so that the partnership can cope with the multi-dimensional, multilateral socio-economic environment.

3.8 GLOBAL TRADING STRATEGIES

Having used instruments such as PESTEL to analyse the international arena, BRICS states will be prepared to tackle global trade with more confidence and economic muscles. Countries may want to adopt either a bandwagon strategy or a balancing strategy depending on whether they are economically strong or not. Bandwagoning is defined as the seeking of protection by a relatively weaker country with a stronger country in order for the former to preserve its national interests (Cheng & Hsu cited in Notshulwana 2012: 1). Balancing is defined as the paradigm shift that occurs as a result of changing the *status quo* in such a way that the dominant country finds its advantages shared with emerging as well as other countries in the global economy (Brooks 2008; Desker 2008). As an umbrella organisation, it is pertinent that BRICS put in place collaborative initiatives hereto referred as BRICS synergies in order to strengthen the organisation.

3.8.1 The importance of synergies within the BRICS

The formation of profitable partnership is not unknown in the world. What is unique about the BRICS though is its influence in the making of the new economic order and balance of power in the world (Notshulwana 2012: 1-8; Vickers 2013: 673). In order to ensure a win-win situation between the BRICS member states, a number of synergies need to be introduced through bilateral, multilateral or collective economic programmes.

Corradi, Gherardi and Verzelloni (2010) look at the issue of synergy or bandwagoning from a different angle. The synergies can be used in a form of “aggregate power” exerted to change and transform the global economy. In

order to do this, member states will either bandwagon or balance with each other and vis-à-vis the rest of the world.

In addition, BRICS' mediation discourse is important. South Africa, for example, has positioned itself as a go-between for continental integration. BRICS expansion is also in order. The question being asked is: Can other countries join the BRICS and if so what will be the effects on the partnership? Huanhuan (2017) asked the same question, and aligned the proposal with BRICS Plus proponents. It is being proposed that countries such as Sri Lanka, Mexico and Pakistan should join the BRICS. On China's extension or expansion, other questions have been raised: Will the south Asian countries prefer to bandwagon with China rather than to call upon the protection of the USA? Roy (2005) is consistent with Huanhuan (2017) on the question raised above.

Bearing in mind the problem discussed above, the following need to be addressed by the BRICS:

- Conceptual gap: this presages the definition of state interests in details. To do this, the country needs to address national development; regional integration, and African agenda;
- Preference aggregation: priorities need to be decided upon, and key objectives of developmental programmes set; in addition, intra-BRICS collaboration needs to be based on policy preferences and institutional framework; and
- Coordination equilibrium: the partnership needs to ensure there is equilibrium between its institutions and the world; human rights enforcement as well as equilibrium with United Nations Security Council (UNSC); equilibrium in trade, monetary as well as resource extractive activities; how to ensure there is a balance with a preponderant state such as the USA (Notshulwana 2012: 8-9).

3.9 IMPORTANT SYNERGIES FOR POLICY COORDINATION AND CO-OPERATION

In order to mitigate the risk, it is pertinent to strengthen relevant macroeconomic policies by creating productive jobs, diffuse geopolitical tensions while dealing with the issues of health (Ebola) and disasters. Already G20 countries want to raise their GDP to more than 2% increase by 2018 as projected in 2013, a measure which is commendable for the economy. In the same vein, the IMF and the World Bank plan are to raise investment in energy infrastructure with reverberating effects to the economic growth both in the short and long terms (United Nations 2015: 33-34). In SA, the BRICS Business Council announced plans to revamp the infrastructure (Fabricius 2013a).

For BRICS to implement developmental programmes, the partners need to develop a systematic way of doing synergies across the countries (Mazenda 2016). Although this would seem to be a daunting task, owing to the many disparities among states, there are parameters in place which can help the BRICS to go about synergising its trade activities (Hogg 2016). One way would be to benchmark other international partnership, learning from their experience and achievement as well as from their mistakes. This could also happen through trial and error type of exercises owing to which the countries will become confident in implementing policy coordination.

In conclusion, it is suggested that reforms culminate in a transition from Millennium Development Goals (MDGs) to the newly propelled Sustainable Development Goals (SDGs) in order to meet climate change targets, socio-economic and environmental goals (United Nations 2015: 34).

3.10 SADC AND BRICS CO-OPERATION

It is now eight years since the South African foreign trade relations were enforced in order to promote development and economic co-operation. On and above that, there is the South African Development Community Trade Agreement that aims at eliminating barriers to intra-SADC trade (SADC 2017);

and removing quantitative export limitations (*Doing Business in KwaZulu-Natal* 2013; EDTEA 2014).

The BRICS countries invest more in Europe than they do in USA. One of the reasons could be the welcoming approach adopted by European countries towards the BRICS partnership. The hostility of America *vis-à-vis* China is in fact to date counter-productive (Cheng 2016; Jones 2012: 188; O'brien 2017). Although Africa is targeted for her abundant natural resources, BRICS are also focusing on other continents apart from Europe. Whereas China dominates the rest of the BRICS emerging economies, in Western Europe it is India that leads investment-wise. Surprisingly, SA is lagging behind in her own vicinity when it comes to investment compared to other BRIC countries (Jones 2012: 191-192). It is however noted that SA invited other African countries for a special summit with BRICS leaders in Durban in 2013 where trade and investment opportunities were discussed.

3.11 ECONOMIC INTERDEPENDENCE BETWEEN THE BRICS

Usually there is limited economic interdependence between countries. Carlsson, Oxenstierna and Weissmann (2015) indicate however that weapons trade and IT transfer are still vital and developing as well as energy co-operation. It is known that the more China introduced economic reforms the faster it became the haven of economic development with prospects surpassing the USA in the future.

BRICS interaction is being checked as members' trade on Chicago Mercantile Exchange (CME). Although developing or newly industrialised countries, BRICS have strong economies in their respective regions and considerable influence to their neighbours, also maybe because BRICS countries are all members of the G20 group (Chang and Fang 2015: 134-146).

Assumptions hold that it is difficult for foreign nationals to integrate including into BRICS member countries because of factors such as racism, xenophobia

and other forms of socio-economic discrimination (European Commission 2002: 73).

3.12 GLOBAL FINANCIAL INSTITUTIONS AND REGIONAL INTEGRATION

Jan Huyghen Van Linschoten is arguably the most important personality in global financial history (Straney 2011). Although not a theoretician, Linschoten succeeded in pirating important trade secrets and is credited with the creation of the first multinational venture, the Dutch East India Company or *Vereenigde Oast-Indische Compagnie (VOC)* in Dutch. The VOC was very innovative back in the 13th century. This company was also the pioneer of the Amsterdam Stock Exchange (ASE), established owing to the contribution of Van Linschoten.

CGTV (2017) informs that globalization is good because it allows multilateralism and even small businesses can breathe. In addition, ordinary people can get new business opportunities. Arguably, it can be said that people of the caliber of Alibaba founder (Jack Ma), cannot represent loyally the interests of the marginalized. Arguably again, globalization works against the interests of small companies, but in favour of multinationals and other big corporations. Exchange programmes and synergies are however to benefit from globalized trade (Lu 2017).

3.12.1 World Trade Organisation

During the ninth ministerial conference of the World Trade Organisation (WTO) which occurred in Bali, a Trade Facilitation Agreement (TFA) was signed by member countries to decrease the cost of doing business to 15%, and at the same time to furnish efforts to increase global exports to possibly one trillion US dollar. The Trans-Pacific Partnership (TPP) and Transatlantic Trade and Investment Agreement (TTIA) affect the lives of ordinary people through international trade (United Nations 2015: 32).

Quality is a prerequisite for accessibility in international market especially when the increase of exports' revenue is the goal. In this regard, the

International Organisation for Standardization (ISO) is responsible for developing international standards for the mining industry (*Doing Business in KwaZulu-Natal* 2013: 50).

Jones (2012: 194) states that TATA is an important player in the Indian economy as a multinational with cars and steel conglomerate that led to the group earning $67.4 billion USA in revenue from 2009 to 2010. As a multinational, TATA drives globalisation in India, makes use of beneficiated products outperforming western firms in certain aspects and is more engaged in people's development.

3.12.2 The Bretton wood institutions and the BRICS Bank

The most important financial organisations competing with the BRICS Bank in 2018 are the Bretton wood institutions (The World Bank and the International Monetary Fund). Founded in 1945, the IMF is all about promoting financial stability and monetary co-operation.

According to a broadcast on the eighth day of July 2015 at 7:4am by Lee-Ann Manas of the SABC 2, BRICS countries finally launched their bank in 2015 Ufu, seventh BRICS summit in Russia, and envisaged to work in co-operation with other banks and financial institutions. This corroborates with the spirit of European Commission (2002: 101-102) which poses the following conditions for sustainable development:

- Putting in place of a new economic model;
- Developing new sets of socio-economic policies; and, last but not least,
- Establishing new sets of international institutions.

Most intentions and interventions by the IMF to its members are what the BRICS states envisage in the future. The financing of banks is one way to support institutions in the developing countries. BRICS forum leaders had agreed to invest two and a half trillion Rand into the BRICS development bank during the G20 summit in Russia (Fabricius 2013a: 2; Fabricius 2013b). The

World Bank and the IMF work in agreement and together are in competition with the New Development Bank (NDB), also known as the BRICS bank, although some officials are persistently in denial about the issue.

3.13 GLOBAL ECONOMIC SLOWDOWN

Financial recession was an issue in 2010 in spite of efforts to alleviate its effects (Jones 2012: 3; Muthumani 2010). There has been a drop in people's consumption owing to the increase of tax despite the fact that quantitative easing introduced in UK and USA raised inflation expectation (United Nations 2015: 10-11). Joyce *et al.* (2012) explain the use and abuse of quantitative easing (QE) in times of crises. In Africa, the refinancing of external debt is still a stumbling block for emerging nations where monetary policies failed to be as accommodative as in developed countries. Joyce *et al*. (2012) agree on the impact of unconventional interventions of the economy.

The global economic recession presents a number of risks and uncertainties also applicable to the BRICS:

- Interaction between weaker growth countries poses a problem under tightened financial conditions;
- Increase in the private sector debt as observed in many fast-developing economies;
- Slower economic productivity affects exports of commodities as it did when German economy saw a recession in the 2nd quarter of 2015 thus reducing the amount of car components towards Russian federation (United Nations 2015: 14-30).

Tong and Wei (2011: 2023) found that the companies which depend more on external finance were severely affected by the liquidity crisis. This finding support the view that FDI plays a crucial role in alleviating the crisis' effects. From 2008/2009 till today, the economy of the world has yet to recover as countries continue to experience sporadic effects of the pre/recession

hardships. These prospects compensate for job creation initiatives needed for sustainable development (Shaban and Vermeylen 2015: 74).

The following were the causes of socio-economic crisis:

- Decrease in growth;
- Near misses across the institutions;
- Exposure to numerous risks; and
- Epidemics such as Ebola - a threat to international peace and security – (United Nations 2014; Chan 2014) and other public health catastrophes.

The epidemic has caused disruption in travel and trade affecting the BRICS countries in general and SA in particular. Critics argue that biological experiments could be behind the then Ebola dilemma in Western African countries (Connolly *et al*. 1999).

The BRICS bank has a charter capital of $50 billion USA (32.5 billion pound; 45.5 billion euros) in 2015 with prospects of reaching $100 billion USA once increased by members' contributions (Sridharan 2015). Matthew (2015) agrees with Sridharan (2015) on the capital allocated for the BRICS bank. Matthew (2015) further notes that BRICS plays an influencial role both in politics and economics. An open policy to incorporate other emerging economies into BRICS, is in line with BRICS Plus model being proposed by some (Huanhuan 2017; Sridharan 2015).

Muthumani (2010) reviewed the advantages and the disadvantages of an international or global organisation. Although it was found that the benefits could be more jobs and increased income, it was stated that the transfer of mineral is one of the demerits. BRICS being an international partnership, the benefits and demerits of similar organisations will also apply. Research identified as efficacy of regional integration: economic growth; development opportunity; increased investment and trade, and the fact that a country may inspire another to improve its business systems.

3.14 SOUTH AFRICAN BORROWING PROBLEM

Researchers confirm that saving contributes to economic growth and matters for entrepreneurial or innovative initiatives (Aghion *et al.* 2009). Unfortunately, over-borrowing is a reality in certain sectors of SA. It is reported that debt acquired in a very insecure way amount to a 30% compound rate increase a year, making South Africans the biggest borrowers of cash globally, according to statistics revealed by the World Bank in Global index Database study (Booysen 2015: 6; Wason 2017). In dealing with the NDB, SA should ensure it does not over-indebt itself unnecessarily.

Empirical studies' findings in Botswana (a SADC country) corroborate with Aghion *et al*. (2009) that saving would be a factor in growing a mining economy and enhancing beneficiation. According to the acting chief executive of the South African Savings Institute (SASI), Mwandiambira (cited in Booysen 2016: 6), SA makes only slightly over two percent savings of all the disposable household income. Too little to boast internationally, and therefore, it is a key message that savings must happen even while servicing debt. South Africa could use additional savings to promote beneficiation initiatives.

3.15 DETERMINANTS OF FOREIGN DIRECT INVESTMENT

Purchasing an emerging market is the dream of western investors and a reliable form of Foreign Direct Investment (FDI) than a wide spread of stocks and shares type of investment. It is the attraction of westerners and Asian giants to use abundant raw materials back home and in the meantime try to find job opportunities for their citizens while concurrently trying to supply the BRIC with a very big market (Jones 2012: 223-227).

In order to address pertinent issues around the importance of Foreign Direct Investment (FDI) in the context of BRICS, one needs to look at how important tariff jumping has become nowadays as a received theory of FDI. Before multinationals embark on investment, they look amongst the other things at tariff structures of a targeted country as they have a major influence on direct

investment related decisions. Needless to say that it is important for multinationals to take potential taxation into account before investing in the host country. It is worth noting that FDI plays a crucial role in reducing unemployment as local productivity is enhanced by the action of multinationals (Brander and Spencer 1985: 257-279), although it is argued that multinationals are also a factor to under-employment of national human resources.

Motsepe (2013: 6) stated that governments are being encouraged in Africa to conduct reforms on fiscal, legal, anti-corruption and good governance in order to align African economies for global competition, and by so doing attract more FDI.

3.16 THE CHALLENGE OF BRICS

Geography-wise, BRICS with 25% of the world's landmass is extremely bigger than European Union (Van Agtmael 2012: 76-79). In terms of trade and cooperation however, the fact that all the countries of the EU Zone are in close vicinity to each other facilitates transnational or international transactions hence a greater benefit to the population at large. BRICS, however, consists of disparate states which on top of that are located far from one another. Transactions, except on line, take hours and even days depending on the means of communication or exchange used for that specific transaction. If commodities are to be shipped by sea for example that would take many weeks to reach China or Brazil from SA and vice versa. Flight as a means of voyage is the best for carriage of products for urgent delivery. Internet, however, has revolutionized the way business deals are conducted.

3.17 THE EFFECTS OF CHINESE DEMOGRAPHICS ON ECONOMIC GROWTH

Kasnauskiene and Michnevic (2015: 70) concur with Basu, Barik and Arokiasamy (2013) that BRICS' demographic determinants, especially skills formation capacity, play a positive role in economic growth.

> *"Long-term estimates about the effects of demographic trends on the economy in academic literature are frequently based on a plethora of behavioural assumptions, making them susceptible to being altered in the presence of shocks. It limits the utility of currently available models"* (Kasnauskiene and Michnevic *(2015: 70).*

China being the most popular country of the BRICS partners is in an advantageous position over the rest because in terms of human resources the country does not fall short of skills including scarce ones. Kasnauskiene and Michnevic (2015: 70) and Basu *et al*. (2013) corroborate that demographics have a significant impact on macroeconomic variables.

Connections and exchanges between China and other countries are encouraged and, for example, foreign countries are invited to give China support in times of need. The Chinese diaspora is said to amount to tens of millions of overseas Chinese across the world. By enforcing people-to-people cooperation, the diaspora is believed to have played a positive role in nation-building and an economic revolution (Xi 2014: 66-67). Knott and McLoughlin (2010) review the diaspora phenomenon tackling the concepts, intersections and identity issues and touching on the situation of Chinese diaspora.

3.18 THE RESILIENCE OF THE CHINESE ECONOMY

To the disbelief of many commentators, the Chinese economy reached seven percent in GDP growth (owing to growth in the countryside) but failed to redress the effects of the economic downward spiral in the second quarter of 2015 as the government struggles to deal with the situation. What the government has done was to increase bank lending to factories. The slowing growth in trade, investment and domestic demand has been a concern for Beijing for quite a while now despite efforts to solve the problem. It is the domestic consumption which accounts for 51.2 percent to GDP in China in 2014 while it allowed 60 percent of the Chinese economy in the first half of 2015 including 35.7 percent for capital formation and 4.3 percent from net exports. China has been trying to shy away from its dependence to an export-

oriented economy to promote a domestic demand driven growth (Yao and Sweeney 2015: 23).

Western companies are doing their best to try outperform China in certain aspects. It is argued that Western firms seek to prove that they can stand up to Chinese competition, and that is seen as a great achievement for the company (Jones 2012: 220).

3.19 BRICS INVOLVEMENT IN CONFLICT RESOLUTION

The politics of BRICS have not been proven to be effective in terms of resolving conflicts opposing its members and the rest or between non-member countries. When Africa wanted a seat in the United Nations Security Council, China did not bother to support Africa. Kedze (2015: 18-19) indicates that although the BRICS favoured the two-point initiative proposed by the International Crisis Group (ICG), and aimed at breaking a ceasefire agreement before replacing the then Libyan government with a more responsible and law-abiding government, there was not sufficient involvement or by the BRICS leaders to stop the abusive bombing of Libyan military (themselves accused of repression) including the civilian population.

Based on the failure of the NATO attack on Libya which has left a far-reaching negative impact on the country's socio-economic conditions, it is common to see commentators referring to Libya as a failed state, and regretting the precarious conditions of life soon after the bombing and even today. This is why some critics argue, to the dismay of others, that an African solution to an African problem would be a better choice (Mensa-Bonsu 2016).

3.20 INTELLECTUALS' CONTRIBUTION TO BRICS

BRICS academics and practitioners can exchange experience and come up with ways to develop Member countries technologically (Tan *et al*. 2015). Technology is key to any economic development in this century. Information

technology and communications (ITC) in the mining centre within the BRICS need to become the backbone of partners' interchange if they are to keep with the current economic and developmental pace.

For example, "Russia has a unique geopolitical position, sufficient military power, with significant technological, intellectual and ethical potential" (Shakhmurzova 2015). Tarrosy (2015: 244-246) alludes to the academic debate that took place about not only the re-emergence of global south actors but also about the need to return to principles of a political economy of the 1970s. Despite all these advantages, there are a number of challenges that must be surmounted. These challenges include putting an end to hostilities around Russia, adhering to human rights even in favour of ethnic Russians, and Russian-speaking people in the region (Shakhmurzova 2015).

3.20.1 Civil society organised activities: Esperanto in the BRICS countries

A group of intellectuals from "BRICS countries and beyond" promotes the use of Esperanto language for international co-operation, and initiatives have been taken by civilians and academics to propose an Esperanto language project to BRICS' governments as revealed on 27 August 2017 in an email communication by Corsetti, the leader of Esperanto in BRICS countries. Esperanto, a language created in 1887 by Dr. Ludwik Lazarus Zamenhof has ever since become a living language taught in certain Western Universities, in the East and even in Africa; used by eminent personalities and most importantly, it has been adopted by some national, international and global organisations, at least as one of the languages into which the resolutions of meetings would be translated. UNESCO resolutions would be a good example in favour of the use of Esperanto in bringing together different nations (Despiney 2017).

One of the challenges of the BRICS partnership which is equally important could be associated with the lack of consensual common language of work or the existence of an arbitrary "super-language" or "super-languages" for interpretation purposes. Unfortunately, using another country's language

excessively could be viewed as undemocratic, and have an unexpected negative impact such as a complex of inferiority for some while others boast for the superiority of their language.

Experts demonstrate that interpretation and translation services are very costly and it would be more cost-effective to use one shared language as a business lingua franca or opt for a multi-linguistic structure provided the participants are at approximately the same level of proficiency. This has proven to be almost impossible in most cases for international and global organisations, as often interpreters are 'half-baked', incompetent or outnumbered (Memmott 2013; Nicolson, 2013).

Moreover, Esperanto has an advantage of being the proven easiest language to learn. It is often viewed as a language of international brotherhood although it's 'democratically' utilised for any other reason (Despiney 2017). The amount of time it would take to learn and master Esperanto is only a fraction of plenty of time needed to understand Mandarin, Portuguese, Tamil, isi-Zulu, English, French, Afrikaans, Russian, Swahili or any other BRICS' language for that matter. Therefore, Esperanto would not be a bad idea at an experimental level. However, Bock and Mheta (2013: 351) state that it is important to address the issue of "language ideology" before sharing own belief about the ideal language policy.

Last but not least, it is worth noting that the international Esperanto community is not trying to annihilate the use of local, regional or consensual languages but enforces their use while promoting Esperanto when linguistically different groups meet. The BRICS language policy could be enhanced to promote co-operation for beneficiation.

3.21 BRICS POSSIBLE INTERVENTIONS IN THE MINING INDUSTRY

The BRICS partnership is willing to play a more strategic role in the global economy (Notshulwana 2012: 1). The economic power and capabilities of the BRICS member states are unequal. While China is the most robust economy,

SA is known to have the smallest economy of them all (BRICS trade and exchange 2013). Whereas India boasts about Information Technology (IT) and communication capabilities, SA and Brazil have the advantage of cultural diversity. Russia and China have a huge landmass (Van Agtmael 2012: 79), but still they need to balance their influence in the region and with the BRICS partners.

Although China boasts about a massive infrastructure development programme in Africa, many critics argue that the once-communist country continues to turn a blind eye to corruption and other human rights violations (Emmott and Taylor 2015: 19).

3.22 SOUTH AFRICAN MINING CHARTER

The government regulations (mining charter) compelled extractive companies to sell 26 percent of their goods to locals so that the benefits can reach all in the society, and by so doing, address the imbalances and imperfection of apartheid. The New Mining Charter requires a 30 percent black ownership as opposed to 26 percent of the past (*eNews Direct* 2017). This is consistent with section 100 (2) of the mining charter which planned that 26% equity participation must go to blacks (SAMDA 2015: 30-33). For future and sustainable growth, the mining industry needs to focus on operational matters. It is because of this that the electricity is to be treasured. Suffice it to note that the current mining charter is disputed by many including the chamber of mines. President Ramaphosa promised to adjust the current mining charter in order to promote development (Ramaphosa 2018).

Anglo American Platinum (Amplats) assisted investors in setting up local production of hydrogen fuel cell-based products which use this precious metal as a catalyst to electrical power generation (Faku 2015: 15). The responsibility lies with the government to put in place conditions that are conducive to growth by the private sector's actions. According to Jonas (2015, cited in Ana (2015:16)), initiatives taken by the local government have a direct effect on economic development.

Beneficiation is reflected in the current mining charter as the governmental policy, unlike the nationalisation of the mines. However, the charter is deemed a failure owing to the refusal of the private sector to buy in its prerogatives. Heeding to the cry of the Chamber of Mines, the newly elected president Ramaphosa promised during the recent State of the Nation Address (SONA) to re-discuss the mining charter with the stakeholders in an attempt to find a win-win solution to the dispute (Ramaphosa 2018).

A peaceful conflict resolution evolving around the mining charter dilemma could be instrumental in building trust, and is a prerequisite to an excellent public-private partnership in the mining sector, following the path of Botswana. Private mining companies, constituting an overarching majority of mining organisations in SA, complained about the lack of or insufficient participation during the process of putting together the new mining charter that seeks to promote beneficiation at all costs.

Table 3.7: Some minerals extracted in South Africa

Allumino-sillicates	Antimony
Chromium	Fluorspar
Iron ore	Phosphate rock
Gold	Titanium
Manganese	Zirconium
Platinum-group metals	Diamond
Vanadium	Copper
Vermiculite	Coal

Source: Van der Merwe *et al*. (2013: 37).

South Africa has a unique advantage in minerals and metals as depicted in Table 3.7 above. It is for example the world's leader in a variety of minerals and should take advantage of that for beneficiation purposes. The country's economy has been built on mineral deposits it possesses. South Africa can boast of 90% of platinum metals produced in the world, 80% of manganese, 73% of chrome, 45% of the vanadium and 41% of gold extracted on earth. The diversification strategy is increasingly being adopted by the biggest South American conglomerates (Jones 2012: 198-199). Jones (2012) further indicates that "acquiring businesses is one route to going for gold – gaining market share and increased profits though attracting customers is another".

South Africa has a variety of key resources (Van der Merwe *et al.* 2013: 37-38) and is only to be surpassed by the DRC in Africa. There is still huge mineral deposits in areas yet to be exhaustively explored and beneficiated.

3.23 STRATEGIC APPROACH TO SUSTAINABLE MINING

Solomons (2014:28) adds mining legislation on beneficiation as well as industrial actions among the challenges encountered in the mining sector. However, these difficulties are surmountable if stakeholders put efforts together.

In relation to this, Mavuso (2014: 18) suggests putting in place new mining business models as well as embarking on cost effective activities coupled with more access to funds, as palliative actions for sustainability. Thus, developing a Mineral Beneficiation Model (MBM) is aligned with this a legitimate endeavour.

BRICS will see the energy projects being implemented by next year. The coal being energy oriented will therefore find a fertile ground for prioritisation. Kotze (2014: 21) highlights five focus areas of the Coal Supply Strategy, including:

- Continuous supply of coal;
- Change of policy in the coal industry;

- Promotion of cutting edge coal mining technology;
- Promotion of a 50% rate of black ownership in mining supplies; and
- Partnership with public mining companies as well as finance organisations.

The Provincial Growth and Development Plan (2014) enumerates among goals for development: strategic infrastructures and job creation. South Africa has signed an agreement with Russia recently for nuclear cooperation destined to produce more energy for industries in the country (*SABC 2 News* 2014). Russia and the rest of the BRICS, except SA, are known to have historically beneficiated their minerals. If this experience includes beneficiating for energy generation, it could be helpful for this country.

3.24 BLOOD DIAMOND

Diamond extractive activities in Africa have not served the community as conflict diamonds are known to have contributed to civil war and other forms of human rights violation for decades (SAMDA 2015: 9). Even though in certain areas the commodity has allowed certain progresses to be recorded, the problem is still there. Efforts have been made to make sure that only ethically responsible sourcing of diamonds takes place (*Partnership to launch scholars programme* 2014: 7) but sometimes those efforts do not yield good results.

According to Naidoo (2012: 18-20), “diamond evaluation expertise is perhaps the most critical need in developing countries. Companies can supply this service to those in the supply chain who need it most, for mutual benefit as development is not just the initiative of governments and aid agencies, but of industry too”.

3.24.1 The Kimberley process

It is “an international initiative involving governments, miners, and non-governmental organisations to prevent rebel groups using diamonds to funds

their operations" (Campbell 2014: 16-17). The diamond and platinum markets are among the very interesting ones. Areas of co-operation include discussing and allowing exchanges of experiences regarding smuggling, illegal immigration into diamond exploration areas and, for example, fighting fraud and money laundering.

Diamond marketability has been outstanding as from 2014 (Odendaal 2014: 8). While diamond is more used in jewellery, platinum could contribute to the energy sector. South Africa must take advantage of the 80% of the world's reserves of platinum that its soil possesses.

3.25 THE BRICS AND THEIR PARTICULARITIES

3.25.1 Brazil and its influence in the Latin American region

According to Vigevani and Ramanzini (2010 cited in Notshulwana 2012: 7) Brazil has outperformed other territorial players and is now part of the World Trade Organisation (WTO) decision-making team, just as India. Brazil as a G20 leader wants to accelerate regional integration in South America. It has been successful in not only partnering with the BRICS but also becoming a key player in the Mercosur, the economic harbor of the South. This implication and many other engagements of the country demonstrate how robust its economy has become in the Latin American region.

3.25.2 Russia in the post-Soviet era

Russia has been a key player in the economic affairs of the world. It has before the cold-war era provided the balance in the international socio-political as well as economical decision-making. Although the country is a rival to the United States in many instances, Russia has proven to be supportive in its relations with liberation movements of the African independence era. Post the fall of the Berlin wall, signaling the end of the cold war, the paradigm shifted to a war altogether different. The dismantling of the Soviet Union, although a weakening factor of the countries' influence abroad, could be viewed as an opportunity for economic engagement with countries that were not of the left,

more than 20 years ago (Notshulwana 2012: 7). Compared to South African economy, the Russian industrial economy is by far a robust one. According to Kuchins and Weitz (2008), Russia want[s] the normalization of relations with the United States of America (USA). However, many Americans do not believe in this.

3.25.2.1 Russians' foreign policy

BRICS is a proper picture of what a multipolar system of international cooperation is all about. While Russia strives to accelerate the implementation of its foreign policy, there are many barriers to the country's cooperation with EU, Asia, and USA. Only legislation, active engagement with politicians as well as the implementation of existing good economic policies will help improve cooperation with international community (Shakhmurzova 2015).

Security is one of the preoccupations of the Russians as far as their foreign policy is concerned. They, firstly, want to protect and strengthen safety with the borders of the Republic and ensure there is high standing in favour of the people of Russia in the international community. Secondly, it is another priority for the country to put in place a sound policy for economic development. However, it is imperative for Russia to prevent conflict by promoting friendly and peaceful neighbouring relations. As it is known, this is not always the case. The situation in Ukraine is unfortunately a counter-example of good neighbours' relations. Thirdly, the Russian foreign policy aims to develop mutually beneficial collaborations with other countries. It is in this light that SA could present beneficiation to Russia as the priority for mining co-operation between the two countries.

3.25.3 India in the BRICS

Goldman Sachs Global Economics Group (2007) estimated that India could reproduce its then efficient annual growth rate of around 8% until 2020. The reality is that India already failed to do so. The global economic slowdown and its aftermath pitfalls have affected the industries in India, and as a result, the forecasts were not met in certain sectors of the economy. Furthermore, it was

foreseen that the country could surpass the USA by 2050 as far as the gross domestic product is concerned. This is yet to be seen.

However, India's economic growth a few years ago can be associated with its cautious strategy during international partnerships and business. India prioritises technological development, i.e. information and communication technologies (ICT). The place of China in the economy is hereby discussed.

3.25.4 China as a significant player in the global economy

According to Likenberry (2011), "China will have the greatest GDP in the world, will be the globe's largest emitter of carbon, will have the greatest standing military and will be the world's second largest population by 2050." However, Buckley (2017) states that China is already the most populous country in the world. All the assertions propel the view that the country will play a very significant role in the global economy. Of the BRICS, China is also the most robust economy. Notshulwana (2012: 6) states that China has taken a constructivist approach in dealing with other BRICS members. Its approach seeks to introduce new thinking, fresh ideas as well as values in the system. This is undertaken in order to foster a more inclusive and democratic business-friendly environment. South Africa supports the view of China on cooperation between global decision-makers.

The following table depicts the interactions and co-operation among the BRICS countries. Table 3.8 on the next page offers statistics about the BRICS.

Table 3.8: Some statistics about the BRICS

Brazil	Russia	India	China	South Africa
- 60% of Amazon rainforest. - Most FIFA soccer World cups. - 4.5% economic growth in 2010.	- Supplies 80% of military products to China and India. - Problematic transition towards democracy.	- 3rd largest army of the world. - 10% growth in military expenditure. - Ongoing naval arms operations in the Indian ocean. - Amasses troops in the northern border. - With China, India imports 15% of military products across the globe.	- Ageing population. - In the midst of rural-urban transaction. - More than 2 million troops; the largest army in the world. - 624 billion Yuan or 95 billion US$ spent on law and order.	- Transition towards democracy has been anything but perfect. - supplies some military products to China and India. - Challenges include inequalities, corruption and crime.

Source: Jones (2012: ix-x; 2012: 20-21).

Table 3.8 above highlights some interactions between BRICS countries and provides some statistics. It is for example evident that SA and Russia share something together: their transition to democracy has been anything but perfect. Of all the BRICS countries, however, SA ranked at number 43 by the World Audit ahead of India, Brazil, China and Russia, is said to be the most democratic out of 230 countries surveyed. In another study, one hundred and fifty countries were surveyed by the Freedom Institute where SA was ranked 29th in terms of democracy (The DTI 2013-2013: 5-8).

3.25.5 South Africa and the national beneficiation endeavour

Last but not least, SA or the "S" in BRICS is discussed. South Africa is by far the smallest economy of the BRICS partners. However, its banking system as well as its speedy recovery from the world economic recession has been applauded (*5th BRICS summit* 2013).

The DTI (2013: 1-7) reviews more achievements by SA as a country in a variety of sectors. The publication also outlines numerous investment

incentives and opportunities in this country. Among the accomplishments, SA records following accolades:

- The tax revenue has increased from R100 billion in 1994 to R724.7 billion in 2011/2012;
- The debt to GDP ratio was 32% in 2013 whereas the USA had a 100% debt to GDP ratio, Japan 200% and UK 90%. It worth noting however that the World recommends 60% as a ratio;
- The stock market increased to 16.09% in 2010 and is ranked number eight of the G20 countries, and therefore is ahead of the G7 nations; and
- The Johannesburg Stock Exchange (JSE) is ranked 16th for market capitalisation.

3.26 WEAKNESS IN CHINA-RUSSIA RELATIONSHIP

Russia forged partnerships just like other nations in order to effect economic transactions and implementation. This is also one of the reasons why its involvement with BRICS is taken seriously. A weakness in China-Russia relationship is that their foreign policies focus more on the USA than any other country (Carlsson, Oxenstierna and Weissmann 2015). This leads to competition, possible tension and rivalry as each country seeks to protect its economic interests.

3.27 NATIONAL THREAT IN SOUTH AFRICAN MINING

South Africa lost seven and half billion rand to illegal mining, scourge posing and issues related to health and safety. Illegal mining is a threat and priority for SA (Kotze 2014: 9). It is argued as well that the lack of beneficiation or the lack of industrialisation could be seen as another reason for xenophobia as it enforces neo-colonialism in Africa (SAMDA 2015: 9).

It is imperative for the mining sector to address the needs of mining workers for significant breakthrough to occur in terms of stability and productive operation ability. It is costly to the mining company to undermine the plight of miners in a country where the constitution gives more rights to labour. With 25.2% unemployment rate in the country, it is irresponsible to think of just retrenching workers before exhausting other solutions as the regulations in place suggest. Water and power challenges must be sorted out before embarking meaningfully onto job-creation beneficiation activities in SA (Naidoo 2012: 40-41).

3.27.1 Illegal mining value chain

According to the Finance Minister, Nhlanhla Nene, it is time to fight financial leakages because they rob the economy of billions of rand through fiscal theft, profit shifting and illicit cash flows (SAMDA 2015: 13). The Global Financial Integrity (GFI) revealed that illegal capital flights are done by firms to hide from record books and on purpose any profits and illegally earned cash. South Africa for example loses R147 billion annually to illegal cash flows directed towards foreign countries by perpetrators. Generally, the continent loses even more. Former President Thabo Mbeki once said that Africa as a continent loses $50 billion USA every year through illegal activities, and that is money that could have been used for development.

It is important for SA to avoid being used for the legalisation of stolen goods in other States through the refining of the ore. Moreover, illegal mining impacts of many other infringement of law including human trafficking and smuggling. In this perspective, statistics show that illegal immigrants from Lesotho and Zimbabwe constitute 70% of miners without identity documents (ID) papers in SA. This must be taken as a matter of urgency or else it may degenerate in children's under age labour or young women's prostitution (Kotze 2015: 9). This unfortunately has been the case in certain African countries such as the DRC.

3.27.2 Marikana massacre

It was stated that:

> *SMS and automated voice messaging (AVM) questions to send employees cell phone numbers had indicated that most striking employees wanted to return to work. AVMs 20 000 Lonmin workers in lower categories, three to nine indicated that 67% wanted to return to work and 6500 SMS responses gave the reason for staying away from work as intimidation (Campbell 2014: 16).*

Glencore, a Swiss mining company also operating in SA, said that it is going to resell its shares in Lonmin which represents (24%) in the platinum mine in Marikana where the police had brutally killed 34 striking miners in 2012 (Le Bec 2015). The June 2015 commission report announced by former President Jacob Zuma attested to the brutality and unprofessionalism of the police who were deployed to deal with the crisis in the Marikana mine (*Marikana Report* 2015).

Suggesting solutions to the social instability in the mining industry, Le Bec (2015) reports that it would be preferable for bigger and smaller mining companies to merge, even if it entails working with an international corporation in order to help companies in dire situation move forward. The impact of extractive activities on the economy is given in Table 3.9. The mining activities represent the following:

Table 3.9: The impact of extractive activities on South Africa's economy

Percentage of GDP	Description
17%	GDP (direct & indirect)
38%	Merchandise exports (primary & beneficiated mineral exports)
19%	Investment in the private sector
11.9%	Total economic investment
50%	Transnet rails and ports volume
16%	Employment in the formal sector (direct & indirect)
94%	Electricity generation through coal power plant
40%	Demand in electricity
37%	The country liquid fuel via coal

Source: Adapted from SAMDA (2015: 28-29).

In Table 3.9 above, extractive activities make a major contribution to the economy of SA, for example, it makes 17% of all gross domestic products (GDP). Mining also attracts 11.9% of investment in the country which is very significant in terms of the contribution to the economy and to promote beneficiation.

3.28 ENERGETIC COAL MINING IN BRICS

The BRICS envisaged implementing an energy agreement. Hickson (2014) as cited by Vermeulen (2014:20) states that coal markets growth and development of new coal mines are influenced by the growth rate in the world's population expected to reach 115% in a decade. As a result, this will require a 20% increase in energy demand, of which coal mining has a stake as a

contributor. In Africa and particularly in SA, coal-fired power stations still play a significant role for energy generation. Baloyi (2014b: 44-45) agrees with Vermeulen (2014) and Pienaar (2014:39) about the deficit of power supply in African mining and the need to generate power to ensure mining expansion in Africa.

3.28.1 Problems with coal mining

South Africa is not alone, China and India also rely on the very coal for electricity. The importance of coal is multiple. It can be used alternatively for synthetic gas (a new alternative) and it is useful for cement fabrication.

However, coal mining also produces too much noise during the extractive operations, blasting, drilling as well as coal handling with severe impairment to the miners. Above all, it is the greenhouse gas (methane and carbon) contribute to global warming once released into the air. The temperature rises and the climate is affected as a result of coal operations, and the removal of the mountain top to extract coal bears very negative consequences as the environment is damaged (Azad 2015: 11-15).

Two hundred thousand mine-workers were reportedly suffering from lung damage (Kotze 2015:14). Mining pits and coal discard can and should be rehabilitated in SA. Azad (2015) indicates that a high concentration of coal dust is a health hazard. It affects the miners in many ways: routine headache, irritation in throat, problems with eyes or nose, drowsiness, difficulty in breathing, nausea, pseumoconiosis, tuberculosis, chronic obstructive bronchitis, heart problems, respiratory irritation, asthmatic problems and even lung impairment and lung cancer difficulties. In addition to the range of diseases one could get should he or she be exposed for a long time to coal mining activities without precautions such as wearing protective equipment.

3.29 SOLUTION TO THE STATE-ENTERPRISE ENGAGEMENT

Turton (2014: 6) reveals that parameters of geology were passed off even when they could contribute to turning mineral resource into mineral reserve.

Creamer (2014: 6) explains that the toughness of the industry propelled people to bring their projects to the market in a hurry provided some cash is given. The following are the ethos of mining enterprises: risk identification; value preservation; project value creation; mineral title; exploration; geology; mineral resources; strategic mine planning; mineral reserves; process engineering; and metallurgical studies; techno-economic modelling and the coordination of project development studies from scoping to feasibility level.

Figure 3.2: Mining map of South Africa

Source: VOA. See also the provinces: https://www.google.co.za/search?q=map+of+south+africa+provinces&biw=1024&bih (6 January 2017).

The map above shows where certain minerals are mined in SA. South Africa as a country has sizeable deposits of strategic minerals (see Figure 3.2). Certain sources cite SA as the richest mining constituency in the world (Tom 2015: iv), while others cite the DRC, although the latter has only potential wealth. Like other African countries, SA lags behind on mineral beneficiation policy and practices.

It will be interesting to see how the current practices of trade and investment as perceived by BRICS states fit in the logic of local, regional or continentalised beneficiation, and if unnecessary conflict of interests does not arise between, on one side, BRICS countries, and their respective multinationals on the other, or across considerations. Table 3.10 presents some of the achievements SA can boast about as a country.

Table 3.10: Strengths of South Africa and investment opportunities

Position	Achievement/criteria
1st	Out of 142 countries in terms of security exchange regulations in 2012
1st	Best country in the world to obtain business credit
1st	And only in Africa to be among the G20 countries
3rd	Efficient financial market development
10th	Best country in terms of investor protection
16th	As the largest market capitalization
19th	In terms of largest gains obtained
27th	Largest population in the world
43rd	Most democratic country in the world

Source: *Doing Business in KwaZulu-Natal* (2013: 24); The DTI (2013: 5-7); adapted by the researcher.

South Africa is also ranked in the lower 50s by *the World Economic Forum's Global Competitiveness Report* 2013/2014. In many other aspects, the country occupies excellent positions in global ranking. Table 3.9 shows that in terms of security exchange and business credit the country is among the best in the world. With regard to the BRICS' involvement, despite some problems with the level of crime and uncertainty in mining-labour relations, SA is still the most democratic of the BRICS, and is ranked 43rd globally.

Fortunately, the BRICS bank based in China and which is possibly to be relocated to SA where a regional branch is located as informed by Corsetti (Pers. comm. 8 August 2017; SAPeople Staff Writer 2016) is going to palliate the gap when it comes to activities of interests to the BRICS.

3.30 CONCLUSION

It is paramount to adopt a universal approach to global, legal, operational framework of understanding co-operation between the mining industry, governments, the community and law enforcement agencies to effectively deal with illegal exploitation of mines and the criminal relations between illicit trafficking in precious metals, organised crime and financial intervention of criminal and terrorist operations to stop effectively any illegal practices at local, regional and global levels. This chapter reviewed relevant international trade and co-operation theories. Applicable to this study were theories such as mercantilism, absolute advantage, comparative advantage as well as national competitive advantage. Of importance to this chapter is how the BRICS relates to these theories in general and SA in particular. The next chapter discusses BRICS partnership, its challenges and proposes new perspectives.

CHAPTER FOUR

BRICS PARTNERSHIP: CHALLENGES AND PERSPECTIVES

"Be the change you want to see in the world" – Mohandas Karamchand (Mahatma) Gandhi.

4.1 INTRODUCTION

The previous chapter elaborated on the mineral beneficiation aspect of this study. It laid out the foundation for discussions on mining activities in South Africa (SA). This chapter looks at the other face of the same coin as far as this study is concerned. It is now clear that two major themes would attract the attention of the readers in this academic work: the first being mineral beneficiation and the second being BRICS. This chapter, therefore, seeks to elucidate the role of BRICS in encouraging or discouraging mineral beneficiation, and the challenges faced by SA in trying to redefine or reposition its mineral beneficiation policy within the context of BRICS. The partnership does not have a particular policy on mineral beneficiation but would depend on country-specific policy frameworks for decision-making. In short the chapter uses the Political, Economic, Social, Technological, Ecological and Legal (PESTEL) model (Professional Academy 2017) in presenting the challenges the BRICS face before addressing available perspectives.

4.2 BRICS CHALLENGES

As from 2010, China overcame a triple challenge: world economic downturn, developmental sustainable issues and reform-related difficulties. In 2013, its GDP amounted to 58.8 trillion yuan almost nine and half trillion dollars. Weak demand of commodities has been as well a reality in the Chinese market. "Mixed-ownership and private economies have both experienced rapid growth, while state-owned enterprises (SOEs) have seen their vitality boosted, although the SOEs slightly declined in numbers. The SOEs however still make 41.9% of the total assets of industrial enterprises in China. In order to thrive,

China must push the transformation agenda forward for instance by elevating growth quality. South Africa has nothing to lose in following the same pattern. The major trend in China is that the service industry is in the boom as it is replacing the traditional manufacturing industry. Instead of the government to decide on market related issues, the market itself is now on top of the commercial game.

Other challenges included over-capacity of the manufacturing sector, the lack of innovation capacity and low production efficiency, especially in the service industry. For the purpose of this study, one way to classify the pitfalls the partnership faces can be achieved by using a Political, Economic, Social, Technological and Legal (PESTEL) Framework.

4.2.1 PESTEL Framework

The PESTEL Framework allows not only to classify the information in terms of studied aspects but serves also in organising the imparted knowledge as follows: an example of PESTEL framework for BRICS was previously provided under 3.7 far above.

4.2.1.1 Political influence

By definition, a policy is a purposive course of action or lack of action that one follows or that is followed by a group of people in order to solve a problem or a dilemma. The focus therefore should be on what is actually happening rather than on what is being proposed. It is a responsibility of public officials to put in place policies, although a third party can also influence policy formation or the implementation of one (Anderson 2015: 6-7). The Chamber of Mines (CM) acts as the principal advocate of the major policy positions endorsed by mining employers. The CM also liaises with other policy-making institutions nationally and internationally. It is a business-oriented chamber (*South Africa's Mineral Industry* 2014: 2). A variant of policy analysis is evaluation research, which assesses how well policies attain their goals and the other societal effects that they may have.

It goes a long way for some to understand policy and delivery responses but it is always a cause worthwhile if one intends better relationships between public and private enterprises. In order to do that, it is imperative to build and sustain trust in society. New socio-economic models are impacting the way business is done across the world. In this regard, CEO's of state owned enterprises can play a crucial role, according to a study conducted in which 1409 companies participated globally as well as fourty-one government officials (PricewaterhouseCoopers 2016: 3). The BRICS model can be classified under this hypothesis.

According to Anderson (2015: 2), "Policymaking process is an inherently political process involving conflict and struggle among people" (namely public officials and private citizens). Mazenda (2016:18) gives a number of recommendations for BRICS policy consideration with the aim to boosting FDI in and out flows. Government policies aim at redressing the imbalances of the past and to alleviate poverty in this land are to be enforced. Such initiatives can make use of existing expertise and the ability to raise capital for economic development. The secondary mineral and metal industries benefited a lot from public-led initiatives in the mining sector (*South Africa's Mineral Industry* 2014: 1).

China is a pacifist country willing to forge friendship with African countries to enhance South-South cooperation with Africa. This move will be essential as an impetus for common socio-economic, security and political development (Chinafrica 2015: 8). Political problems often affect developmental initiatives and investors are discouraged in the long run.

The social unrest such as what happened in Marikana and violent strikes are an indication of the vast disparities and misery that the population of this country endured during the Apartheid era and continues to face in the aftermath of democratisation. As it is now certain that the B-BBBEE Act of 2003 and the 2013 amended B-BBBEE Act of 2007 will not solve once and for all the socio-economic mayhem of this country, businesses are tempted to

focus on a more Carrot approach rather than embracing the Stick approach once preferred (Rachelson and Theunissen 2016: 75-76).

The mining charter was introduced to solve the equation of historical disparity between black and white in this country (*South Africa's Mineral Industry* 2013/2014: 2). During the states of emergency, it may happen that certain rights are not fully enjoyed as the governing board or the conditions have to limit them. However, people's rights can never be taken away permanently (KwaZulu-Natal Legislature n.d: 3).

Group theory teaches that public policy is the result of continuous struggle by a set of people (Anderson 2015: 21) whereas the elite theory stipulates that the policy document contains the quality and preferences of the leader (Anderson 2015: 23). Surely the BRICS situation falls into this category. The masses have less influence on the elites who usually take the lead. There is literature that attests that small committed groups are more effective in leading the nation (Mosengo 1991 as cited by Missa 2015: 283). In contrast to that, "Obama said that Africa does not need a strong man, Africa needs strong institutions" (Obama 2009). The same could be said about the BRICS.

In an attempt to develop a BRICS friendly policy, the members have put in place institutions such as the BRICS Business Council and the Think Tank in 2014 amidst a number of hardships that hampered smooth interchange between countries. The following needed to be studied going forward if the partnership is serious about putting in place a policy:

- Investment framework;
- Legislative framework; and
- Rules and regulations.

The above will contribute in intra-BRICS investment if peer support is guaranteed (Mazenda 2016: 19). Good governance is another aspect worthy of discussion, according to Mokwena (2016: 8) who surmises that, the economy should be structured from being mineral-based to knowledge-based. Such restructuring can only be effective and easy to execute if good

governance principles are adhered to by public officials. In so doing, the legislations, rules and regulations put in place by institutions must be observed.

The current linear "take-make-consume-dispose" economy is unsustainable. There is a need to reduce over-reliance on raw materials (coal or oil) whilst the environment impact of emission is also dealt with. It is time the world learns to use less and less raw material, electricity, and by so doing impact the environment positively (Davidson 2016: 28-29).

During the Durban BRICS summit, the presidents had a chance to speak to their counterparts from neighbouring countries. During the summit in South America, Latin American leaders were also invited to attend the BRICS summit (Niu 2016).

The BRICS have neglected Asian geopolitics and instead focused on Africa and South America. Asian socio-economic and security issues have never come to the fore front of the BRICS discussions, notwithstanding the importance and weight of Asian countries in that organisation (Niu 2016: 16-19). But is transpacific trade being ignored by the BRICS? Many would not think so. This is in contrast with what many observers in Africa think. The Sherman Act stipulates: thou shalt not monopolize or attempt to monopolize or act to restrain trade" (Anderson 2015: 14-15). In the same way, beneficiation should not be viewed as a monopoly. Instead, the private sector should thrive to meet the government halfway to promote beneficiation and to strike the balance between beneficiation and minerals' export.

4.2.1.2 Economic factors

This research is a socio-economic study of the BRICS seen from the South African perspective. In that regard, the Economic implications of the BRICS partnership are of paramount importance to the stakeholders. "The BRICS States represent 40 % of the world's population and their economy is rapidly growing" (*Esperanto in BRICS countries* 2016).

Aspects of economic importance include the factors of production that are paramount to any economic sustainable development. The factors of production include labour, Capital, enterprise and land to name but a few. For economic development to take place, electricity is needed in industrial capacity. In SA, electricity shortage is as a reality just as the shortage of water. This has been evidenced by the series of load shedding the country had two years ago and the lamentations by the public officials recently over the shortage of potable water, let alone water for industrial use (Skibsted 2016: 2). Shortage of these commodities affect the industrialisation initiatives in this country in one way or another. Multi-nationals and super powerful countries envy the mineral resources in Africa (Missa 2015).

Tarboton (2016: 84-85) states that, facing comparative challenges to South Africa's water recycling, filtration and distribution systems in the 1980s Tokyo replaced 27 000 km of pipe with non-corrosive stainless-steel piping nationally, reducing leakage and losses from 15.4% down to two percent in 2013. Total cost reductions in Tokyo's water distribution system have now reached the US$480m mark with additional CO_2 cost reductions in energy required for water recycling and water filtration pumps. The study also confirms that national stainless-steel pipe replacements installed 30 years ago show no corrosion relating to chemical components such as chloride concentrates in localised soils. Similar studies show total reduction in leakage rates for Seoul by as much as 30%; Vietnam, which has reduced its leakage rate from 13% down to seven percent; and Egypt from 29% down to 15% through the implementation of stainless steel piping.

Sperko (2014) studies the conditions under which stainless steel can rust. It is proven that in case of contamination of the exterior surfaces, when there is contact with iron or steel during fabrication rust occurs. The study suggests cleaning and proper storage mechanisms as part of palliative measures to prevent stainless pipes rusting.

Saving electricity through maintenance and recycling can help a great deal if practiced in any BRICS country. A total of four percent of electrical power is

used for pumping water. It will also reduce the cost of maintaining water infrastructure and improve water preservation. Water is a scarce resource in South Africa, and all possible efforts need to be made in the context of public-private partnership to ensure that it is not wasted. A water demand management system is proposed by researchers in that regard (*eNews direct* 2017; Naidoo 2016: 34-36). Owing to the shortage of water in SA, it is vital to detect leakage early and improve conservation mechanisms, as this will have a bearing on water availability and the survival of humanity and other creatures. A leakage reduction saves water, and stainless steel is said to be up to the task for that if used. (Tarboton 2016: 84-85).

Currently, SA uses PVC and polyethylene piping with estimated lifespan of 20 years or about. This leads to the country facing the ongoing challenge of replacing pipes with the costs implication which go with it. Up to 40% of Johannesburg's water is unaccounted for, costing the city over one billion (by June 30, 2015). Reports indicate that R851- millions of water was lost to leaks. There are various explications as to why it is so happening, smaller pipes versus larger pipes scenario being one of them, especially when the smaller pipes have to pump water into a high-density area. The leakage problem cannot be underestimated as well going forward (Tarboton 2016: 84-85). This is consistent with the findings of European experts (Zurich 2015: 1-2).

Initially, the BRICS wanted to reform major international financial institutions in 2009 but soon after embraced other visions: international security and developmental initiatives such as the international business integration (Niu 2016: 16-19). The Bank of China has given loans to certain African countries for infrastructure development. Whereas Western economies refuse to take part in certain capital projects for fear of the environmental impact and the displacement of locals, China does not hesitate to embrace novel business opportunities given to them. It was projected that:

> *"The Gerd dam on the Blue Nile River will be Africa's largest with 6000-MW generating capacity. China's economic development model is said to be a benchmark for Ethiopia"* (Shide 2016 as cited by Meseret 2016: 36).

South Africa as a member country of BRICS can surely do the same as it seeks to invest more on infrastructure development. Mazenda (2016: 19) states that the newly formed BRICS New Development Bank must invest more in infrastructure development but this is not news at all as obviously the BRICS leaders had identified that as a major priority long before. The link between infrastructure development and beneficiation industries within the countries is part of a bigger plan to promote value-addition. It was recently announced that SA has the most sophisticated banking systems and capital market credentials than any of the BRIC countries (Dimmer 2014: 12).

Tarboton (2016: 85) invites businesses to come on board to plan to invest in stainless steel water distribution system. This will alleviate the burden too soon for the government to bear on its own, and thinks that companies could still yield benefits and recover costs in the long run and they pay less for water bills and maintenance. Also, beneficiation practices can be developed as SA as a country has the required technology to manufacture the specified stainless-steel pipes – an opportunity to boast business incubation and stainless steel commerce.

In 2014, China enjoyed a seven point four percent economic growth. Certain African countries, such as Kenya, Ghana and Rwanda, have, more or less, similar achievements but SA finds it difficult to get one percent growth currently. This country therefore finds itself in a zero growth economic situation. In South-Saharan Africa, the economic growth has been four and a half percent, that is a better achievement than certain emerging economies (Chinafrica 2015: 8-9).

Private/public partnerships are meant to be a supporting structure for SMEs as the development of infrastructure in the land is enforced. In such partnerships, companies seek to protect their reputation. Incentives are often given to employees who excel in the private sector whereas public servants seldom get incentives as the government takes credits for most achievements. A good demarcation of roles and risks between the public and the private sector with the view to carry out capital projects can be a starting point in

harnessing the benefits of a public/private partnership (Pienaar 2016: 44-45). This is applicable in the context of BRICS initiatives in SA.

Parvu and Voicu-Olteneau (2009: 189-198) elaborate more on public private partnerships' positive and negative effects. Whereas the benefits include substantial saving to the budget, IT transfer and more transparency; the disadvantages are known to be the risk factors such as financial and political risks. It is held that the public partner may lose money and the private may be politically influenced.

Africa's SMEs need the economic infrastructure to thrive as imbedded in the vision of the New Partnership for African Development (NEPAD). The global failure rate for new businesses is 50% at the speed of eight out of ten SMEs within the first three years, an indication that "enterprises struggle to stay afloat against corporates". A private/public partnership can then serve a palliative initiative to a problem of old (Pienaar 2016: 46). The country has price-sensitive consumers of products and users of services even at a time when the economy is on the brink of another recession. Commodity price awareness remains very high (*The annual Nielsan study of South African Shopper Trends* 2015/2016:63-64).

There are numerous research reports verifying that certain SADC countries and mining companies in those countries have been involved in illicit mining activities (Batware 2011: 1-18; Missa 2015: 97-227). South Africa (also a key SADC member) has been in connection with the African Union Peace-Keeping Mission in the eastern Congo. It is as if the war of minerals, the "blood diamond" war has been commercialised by the countries involved. Even when the SADC countries called for a peace-deal, Mandela tried to help Mobutu and Kabila the father to find a common ground for establishing peace and stability in the Congo. South Africa had been rewarded by easy access to petrol business given to designated South African businessmen, and is now expecting the concretisation of a power deal concerning the Grand Inga dam supposed to supply electricity to SA in the years to come (Missa 2015: 231). The DRC has the poorest human development index that is 0,43 in 2015 below

the average in Sub-Saharan Africa despite being a geological scandal because of vast mineral resources the country possesses (*Conférence Avenir Mbondo* 2016: 1).

In order to find solutions to some of the problems mentioned above, SA developed the National Development Plan (NDP). Other African countries can do the same. The purpose of the NDP is to put in place mechanisms that serve all who live in South Africa, black and white (South Africa's Mineral Industry 2013/2014: i). It takes a political will for the NDP to be aligned with the country's vision of economic development and to reverse the current non-growth economy (*Mid-term budget cost of borrowing* 2017).

The BRICS have achieved a stellar economic development and growth demonstrated by its bouncing back from the mayhem of the 2008/2009 financial recession. It has become clear that the financial crisis benefited the citizens of the member countries unequally as it sent shockwaves to some while creating opportunities for piling stock for others. Arguably so, income inequality grew in China, India and South Africa (Vandemoortele, Toit, Liu, Sen and Soares 2013). Is this not the nature of market economy and capitalism the countries of BRICS have embraced to a greater extent? Vandemoortele *et al*. (2013), only studies the market conditions in the three countries namely Brazil, China, India and South Africa. The author found that the four main aspects that influence the economic well-being or are at the centre of its problems are: the people; investment; social transfer as well as political economic context where inclusion is a norm and not exclusion.

Beyene (2015: 4-28) examines the possibility of economic integration of BRICS member states especially within their own region via trade. An example of BRICS and Sub-Saharan Africa business integration is provided to illustrate the case. It was found that the BRICS enjoy a comparative advantage in exporting manufactured products whereas the partnership lags behind on mineral beneficiation practices and on the exportation of raw material, ores and other minerals.

According to Mazenda (2016: 19), the financiers of BRICS FDI should be the State-Owned Enterprises (SOEs), Multinational Companies (MNCs) as well as Small Medium and Micro Enterprises (SMMEs). Adu, Alagidede and Karimu (2015) posit that: “The distribution of stock returns for the BRICS exhibits peakedness with fatter and longer tails, and this is invariant to both the unit of measurement and the time horizon of returns”.

Efforts are being made by the Angolan government to make sure the mining sector contributes significantly to the economic development by creating jobs. It is held that: “In order to contribute more to the national GDP, we have to know the geological potential and develop thematic mapping, launch new projects and observe the rules contained in minerals code” (Campbell 2015: 16). South Africa can benchmark itself to success stories in Africa and the BRIC.

4.2.1.3 Socio-cultural interactions

BRICS cannot be about businesses or economic progress first without putting the people at the centre of everything. It is important to involve the people at all levels of interactions. People’s culture, language and life matter and must therefore be taken into consideration to avoid abuse of power and other forms of imperialism going forward as far as the BRICS are concerned. The BRICS countries apart from being different and distant, they also embrace different communication styles and languages.

In Brazil, they use Portuguese, Russian is spoken in the former Soviet Union Socialist Republic, In India they have a plethora of languages just as in South Africa with the 11 official languages, if not 12 with the sign language arguably (Bocks and Mheta 2014). Lastly, China has made Mandarin its official language for ease of communication thus leaving behind the many varieties of dialects and languages of natives’ clans, informed the Mandarin Lecturer Susie (pers. comm. 2016). But are there any democratic principles observed by the states in using those imposed or arbitrary languages? Can the BRICS in general, or SA in particular, be bold enough to suggest a paradigm shift in the sphere of culture conservation, interchange and diversity celebration? Is the

policy in place useful in addressing linguistic human rights in the BRICS countries and beyond? The following lines explore the issue of language and experiments with Esperanto as a proposed alternative.

Esperanto can be the bridge joining the Western, the Eastern parts of the world in general (Ŝevĉenko and Striganova 2016: 58) and the BRICS in particular. Linguistic interchange can be instrumental in bringing people together in a community in which various races and nationalities live together. It allows for the people involved to understand each other's' role nationally and internationally. Roux (2016: 29) is of the opinion that:

> *"All require knowledge of foreign languages to create a world-minded attitude in order to engage in the kind of international relations, be they (sic) diplomatic, political, commercial, business, economic or cultural, that will be beneficial to the world at large. Learning a language is hard work" (Roux 2016: 29).*

Neologism may make language learning an ever-ending process but CD and video tools can help a great deal in achieving some progress. "To know more than one language will always stand one in good stead" (Azar-Luxton 2016: 1).

According Derrick (2016: 24), "outsourcing become a very hotly debated topic in SA, which came to the fore following the protest action and "Fees Must Fall Campaign" at a number of our Universities". Outsourcing can be practiced in field of language translation and interpretations but at what cost?

Apart from the language as a challenge, good health is a prerequisite for socio-economic development in the BRICS countries. The last Ebola epidemics have shaken the world, just as the Zika virus did. The BRICS countries have not stayed indifferent to those threats despite the fact that the Ebola was not found in any of the member states and the Zika only shook Brazil among the BRICS. Instead, China and SA just as the rest of the member states offered to help affected countries and helped indeed. China has vowed to help other nations as they did for the West African countries during the plight of Ebola (*China Cures Ebola Patients* 2015: 7).

The degradation of quality land and the impact of drought is another challenge the BRICS can help alleviate in the context of SA and India. "Africa suffers from the triple threat of land degradation, poor yields and growing population. A total of 65% of African land is too damage to sustain viable food production". Climate change is also a factor to be taken into account for any sustainable development involving the BRICS states. As a rising superpower (Niu 2016), the BRICS platform must do the right things in its climate change programme development.

The COP17 and the Paris agreement made some progress – the agreement signed at the UNSC recently is a testimony to this achievement- but much needs to be done to secure the future away from the fear of climate change and emission susceptible of destroying the planet earth. Environmental protection is as important as safety (Li 2015: 44). In one local company, they had one-billion-yuan profit in 2014 (Jiangsu Yonggang steel factory) and the company has invested the same amount since 2013 to tackle the environmental hazard by building protection infrastructure. The company will transform itself into a garden factory which is good for an industry seen as one of the heavier polluter of the environment.

There are a number of risks being raised by greenhouse gas emissions, at times, by a factor exceeding 10. It has been a very hot half-decade, and the hottest being 2015. Usually what happens is that when it is very hot the sea water level also rises gradually. For the first time, the temperature reached one degree Celsius above pre-industrial times because of the effect of *El Nino* amongst other things. The 2015 Paris Agreement set an overriding target of limiting global warming below two degree Celsius above pre-industrial times, ideally it was supposed to be just one and a half degree Celsius (Reuters 2016: 5).

4.2.1.4 Cutting edge technology and BRICS

Digital communication is required for better initiatives to reduce the distance between BRICS member countries. Amongst the other information, environmental protection tools can be shared between BRICS member

countries. Social media, especially Facebook, has taken the digital world by storm. It is reported that the world has 800 million users of Social media today. As far as SA is concerned, five million users are active. The average person spends an hour a day on Facebook in this country (*Storage direct* 2015: 290). This is in keeping with the fourth industrial revolution in which Africa wants to be on par with the rest of the world.

Black industrialists could become the pioneers in technology development, use and sharing. According to Gumede 2016 cited in Pillay (2016: 2), black industrialists can help by supporting political actions, legal framework and funding developmental projects for effective transformation to take place. These projects can even be in the technological sphere.

4.2.1.5 Environmental concerns: BRICS going green

Policymakers should consider more structural transformations of the BRICS to ensure policies or programmes conducive to better environmental impact of the climate change if guaranteed (Beyene 2015: 4-28).

BRICS countries could invest in the green economy and promote activities that are environmentally friendly such as renewable energy, responsible mining, recycling as well as mineral beneficiation. There are many similarities among the BRICS countries just as there are dissimilarities. Resemblance includes the economic structures that allow less value addition and beneficiation in such a way that intra-BRICS transactions are diminishing with the impact of failing FDI which has become rare (Mazenda 2016: 19).

Recycling and waste management are key to promoting the green economy. To manage waste effectively and to recycle secondary metal or minerals are some of the ways to really make a difference in industry (*Storage direct* 2015: 189-190). China for example has a problem of air pollution to an extent that it is rare to see clear skies. Industrialisation can therefore come at a cost but countries such as BRICS partners can see into it that they limit the impact of climate change and emission by abiding to protocols such as the Paris Agreement or the Kyoto protocol as well as the related COP.

4.2.1.6 Legal aspects

The most important legal framework is the constitution of this country. It is SA's highest (supreme) law and sets out the founding values on which the country is based. In addition, the constitution puts an emphasis on human rights and the rule of law. It also sets out the roles and functions of state institutions to protect democracy and human rights. The constitution of SA holds that no one is above the law. In the spirit of the constitution of the Republic, "democracy is the government of the people, by the people and for the people" (KwaZulu-Natal Legislature n.d: 1-5). Therefore, if the BRICS strive to run the affairs of the partnership democratically, a bottom up approach supported by a top-down vision is the way to go.

South African constitution puts an accent on the enforcement of gender equality in the affairs of the country. Gender violence has reached unacceptable heights. It is alleged that the patriarchal system, the attitude and the soft laws of SA could be the factors explaining the escalation of violent crime against women and children. A coherent strategy, that is a collective response, involving all the stakeholders (including religious leaders) as well as the change of mindset are some of the solutions to the crisis (*News on SABC 2* 2017; *SABC 2 News* 2017). The BRICS as a partnership is lagging behind when it comes to women being tasked with strategic decision taking, although SA can claim some improvement on this ground.

South Africa is a promising constitutional democracy and a country of law that embraced the free market system and the private enterprise model of economic development, offering the citizens equal opportunities and treatment (KwaZulu-Natal Legislature n.d: 3; *South Africa's Mineral Industry* 2013/2014: 1). Albeit in theory, because many testify to socio-economic inequalities even today. Regulating mining companies' mineral beneficiation activities under such models and in a free market system isn't an easy task for SA in the context of BRICS.

Even illegal immigrants have rights as human beings although they will not be entitled to vote as part of "fair discrimination" enshrined in the constitution of

SA. Affirmative action is also one of those accepted positive discriminations justified by the laws (KwaZulu-Natal Legislature n.d: 5-6). Although affirmative action was practiced in America as well, certain academics view it as being counterproductive in the long run (Akhtari and Bau 2016: 1); especially if it benefits only a few.

Vulnerable people such as children and older people need special protection during political instability and war (*SABC 2 News* 2017). It is, however, not always easy to protect women and children in times of war. The right of minority groups is a concern when it comes to enforcing their linguistic rights (Parker 2017). Although similar to the right to language and culture, this right is meant to protect the rights of smaller language and religious groups in society, to enjoy their own culture, practice their own religion and use their own language (*Bill of Rights* n.d).

Another aspect of the rules and regulations applicable in the context of BRICS partnership, is the King IV Report. This report promotes good governance principles in SA and sets guidelines for benchmark with international laws.

In SA, one of the challenges has been the eradication of racism and discriminations. In the society which are yet to be witnessed. Although the country has one of the most liberal and democratic constitution, there are still aspects that need to be addressed on the issue of equality, equity or the lack of the two rights. Mogoeng (2016) as cited by Germaner (2016: 4) said that: “institutions across the board are failing to uphold their constitutional obligations to eradicate racism in South Africa”.

The advent of migrants in SADC is a challenge for SA but can also be beneficial to the economy if they are regularised and controlled within the legislation of this liberal country. Migrants have made a contribution in developing their host countries as they offered their labour for cheap rewards and meagre earnings (Missa 2015: 283). The laws that prohibit discrimination of migrant workers and refugees should therefore be enforced and the people should be made aware of such to prevent xenophobia in the future. For example, companies that invest in mining activities must be careful not to fall

into a trap of greed leading to infringement of the law. They can benefit in the right way and should not seek easy and quick profits while disregarding the legislation in the host countries.

Organisations that form part and parcel of the International business integration, as a field of study, needs to look at legislation not only from their country but also across echelons.

South Africa and its BRICS partners have entered into a number of bilateral and multilateral agreements including of legal nature. A memorandum of understanding between China, SA and Brazil was signed in Pretoria in August 2015, involving the Law Society of SA (LSSA), the Brazilian Bar Association and their Chinese counterparts (Whittle 2015).

4.3 BRICS POTENTIAL AND PERSPECTIVES FOR INDUSTRIALISATION

Whereas the West are sceptical about the chances of the BRICS to succeed, the member states of this optimistic umbrella organisation, researchers in member countries argue that the partnership is going from strength to strength (Joshi 2016; Sengupta 2016). The following are some of the State-Owned companies Alexkor, African Exploration Mining and Finance Corporation (Pty) Ltd (AEMFC) and the Industrial Development Corporation (IDC) (*South Africa's Mineral Industry* 2014: 1).

A potential business that can be integrated in the BRICS initiatives is Recycling. Recycling and waste management can be beneficial and have been beneficial in BRICS countries. Waste can easily be transformed into a useful resource once again by conducting recycling activities (Peng 2015 as cited by Li 2015: 44-45; *IMA Europe* 2013). However, waste heat treatment is electricity consuming and expensive. There has been an overlap of agricultural and industrial cycles as circular economy embarked on green initiatives, and this is another way of promoting urban-rural economic integration (Li 2015: 45).

Minerals are important if used for a good cause. When abused they become a problem not only to the people who utilise them but sometimes to the entire world. A good example is the use of uranium in manufacturing dangerous weapons or nuclear bombs. The first American atomic bomb used to destroy Hiroshima and Nagasaki was made of Congolese uranium, DRC is today a SADC member country. The communist system has almost been dismantled in the world and monopoly capital remains the domineering factor trapping countries to embark on operations that seek to secure their supply of strategic minerals (Missa 2015: 57-81). Coltan abuse is another cause of concern for the global mining business, and SA could play a role here (aimed at bringing the perpetrators to book) as it was the case with the Kimberley process.

South Africa can learn from Brazil, China and India in decentralising its renewable energy plans as those countries are good in photovoltaic energy and related systems. If SA does the right thing, it can surely become a leader in the SADC region in renewable energy initiatives and even among its BRICS partners (Chien 2014: 39). Within the BRICS it's China that strives in 2016 to also produce 13.2 percent of energy consumption for its domestic use as non-fossil fuels (Bekri 2015).

The BRICS contributed more than 25% to the global GDP despite the criticism that the partnership is more of a rhetoric than it is of a substance. Nations can struggle to reach understanding and remain within the same balance of power (Dimmer 2014: 10-11).

Despite the economic crisis, SA's mineral exportation increased by four percent to R278.7 billion in 2013 from R269.1 in 2012. Retrenchment and industrial actions affect the mining industry as thousands become unemployed as a result. There is a need for SA to promote mineral beneficiation and develop projects such as those that aim at adding value to domestically produced products. The policy of beneficiation remains one of the priorities of this country and is believed to be a comparative advantage for SA. In addition, beneficiation is able to become a competitive advantage as well. Beneficiation is also going to play a crucial role towards settling the country's growth

trajectory on a production led growth path. South Africa extracts about 53 different minerals from 1712 mining sites and quarries, as was the case in 2013. While gold was produced from 53 mines, PGMs from 43 mines, diamonds from 388 sites and coal from 143 mines, all being primary commodities. South Africa's state owned mining company is reportedly doing well. Other companies include Alexkor, African Exploration Mining and Finance Corporation (Pty) Ltd (AEMFC) and the Industrial Development Corporation (IDC) (*South Africa's Mineral Industry* 2014: i-1).

The possibility of continental initiatives or at least of regional beneficiation –in the Southern African Development Community (SADC)- for example should not be ruled out.

Table 4.1 The global growth compared to BRICS

COUNTRIES	**2016**	**2015**
USA	39%	38%
CHINA	**34%**	**34%**
GERMANY	19%	19%
UK	11%	11%
INDIA	**9%**	**9%**
BRAZIL	**8%**	**10%**
JAPAN	5%	8%
RUSSIA	**5%**	**6%**
MEXICO	5%	-
UAE	5%	-
INDONESIA	-	6%
AUSTRALIA	-	6%

Source: PricewaterhouseCoopers (2016: 9).

Highlighted in the Table 4.1 are the BRICS countries' economies but in context of global growth. The study of growth must be multi-dimensional because

growth emanates from different countries. Understanding growth origin does require the understanding of geopolitical environment of the source of growth. The CEO's survey demonstrates that as far as the overall growth is concerned, the USA is the only country that surpasses China. As indicated in Table 4.1 above, the BRICS countries occupy a very good position statistically in the world except for SA, with China, India, Brazil and Russia doing well in the survey. The question posed was to cite any three countries, beside where one is, which are the most important growth wise over the next 12 months (PricewaterhouseCoopers 2016: 9).

Research revealed that over-regulation poses a threat to business globally. In this regard, 79% of CEOs from 1409 companies responded to a survey indicating also that geopolitical uncertainty as well as the exchange rate volatility account for 74% and 73% of threat feeling respectively.

4.4 CONCLUSION

This chapter examined the challenges facing the BRICS partners and the available opportunities. The pattern allowed the Political aspects, the Economic constraints, the Social factors, the Technological innovations, the Ecological environmentally friendly practices and even the Legal framework to be elucidated. It is known that, the industrialised countries such as the BRIC have made tremendous progress on mineral beneficiation over the years, a win-win exchange programme in mining projects or mineral trade would benefit SA in the long run if promoted by the government. This effort could enhance beneficiation on a gradual basis.

CHAPTER FIVE

RESEARCH METHODOLOGY

"Triangulation is the mixing of data or methods so that diverse viewpoints or standpoints cast light upon a topic…the mixing of methodologies – use of survey data with interviews- is a more profound form of triangulation" – Wendy Olsen, 2004.

5.1 INTRODUCTION

This research, as mentioned earlier on, is exploratory in nature. The following section elaborates on exploratory research design. It expands on the use of mixed methods as in triangulation. The population, sample size and research techniques are explained. The researcher proceeds by explaining the values and the ethics important to this study according to institutional regulations, and how the researcher intends to uphold those values and ethical principles in collecting, analysing and interpreting data. This also entails that other sources of relevant information are found as the study unfolds.

5.2 EXPLORATORY RESEARCH DESIGN

According to Sekaran and Bougie (2013: 94), the blueprint for collection of data as well as that of data measurement and analysis is called research design. Research designs elaborate on issues of importance to the purpose of the study, the strategies used as well as the following: location, the extent of researcher's interference, time horizon and the unit of analysis. Sekaran and Bougie (2013: 96-97) further elaborate on exploratory studies as they emphasise the importance of such studies when factual information is available. The review of literature thus constitutes the first step of exploratory research (chapter 2, 3 and 4 are all research reviews). Exploratory studies use predominantly qualitative methods.

Qualitative techniques are used both in informal and formal ways. Informal approaches include discussions with managers or representatives of

organisations participating in the study, and formal approaches were followed by interviewing the very people on matters of paramount importance to this research. Manerikar and Manerikar (2014: 95-96) and Wyk (n.d: 8) state that an exploratory study is undertaken on condition that the situation presages insufficient information on a theme of study or non-existence of known solutions to current research issues.

Rofianto (2011: 4-5) explains that an exploratory research seeks to gain insights and knowledge on a situation. This allows the researcher, to a greater extent, to use a small sample and to be flexible in using predominantly qualitative methods such as expert's surveys, representatives' interviews and focus groups. Of pertinent consideration is the fact that an exploratory study of this magnitude allows flexibility and makes it possible for the researcher to narrow down aspects of the study as the investigation proceeds (Sekaran and Bougie 2013: 96-97).

Two main categories of research designs are usually noted: qualitative and quantitative research. Whereas some researchers choose a specific type of research design, many opt to use mixed methods in research as it is the case in this study. While quantitative research design allows reliance on data analysis, the findings of which lead to statistics (Creswell 2009: 149), qualitative research design is suitable for the study on behavioural or societal relationships (Johnson and Christensen 2008). The following section discusses aspects of the two types of research design.

5.3 MIXED METHODS (QUANTITATIVE AND QUALITATIVE)

According to Johnson and Christensen (2008:34) and Tracy (2013: 24-25), quantitative and qualitative research are different. Qualitative research deals with understanding and interpreting social interactions while quantitative research tests hypotheses or studies the cause and effects relationship of variables. There is also a difference between qualitative and quantitative research in terms of focus. While the first focuses on the breadth and the depth of studied phenomena, the latter seeks to narrow down the phenomenon by

examining specific hypotheses. Whereas qualitative methods study phenomena in their natural settings in order to understand their meaning, quantitative methods emphasise the use of questionnaires for statistical analysis (Flick 2014).

Firstly, a questionnaire was distributed to mining companies enlisted by the Chamber of Mines (CM). Secondly, semi-structured interviews were organised with organisations dealing with BRICS in SA. A coding and numbering of organisations were used to ensure they remain anonymous during the analysis of results. This is in corroboration with Tracy (2013: 299-300) who posits that pseudonyms should be used instead of business or personal names in research reports.

The study, therefore, uses mixed methods approach defined as the use of more than one method and aimed at getting better results by combining two different perspectives (Creswell 2015: 4). Mixed methods present certain advantages which allow different types of data to be collected in different ways (Williams 2015: 70). Mixed methods also allow the mixing and engagement of qualitative and survey information (Gough, Oliver and Thomas 2017: 60).

5.4 RESEARCH DESIGN

Keegan (2009: 11) discusses research designs and elaborates on the nuances of research methods. This research has been designed in such a way that both quantitative and qualitative methods were used in line with Creswell (2015: 4) who posits that the yielded quality will be superior. The study is however predominantly qualitative owing to the purpose of this research. Qualitative methods are found to be explorative and inquisitive in nature (Visagie 2010), and are congruent with the topic.

The BRICS institutions are relatively new especially in SA where the BRICS Business Council and the BRICS Think Tank are all post-2013 institutions (Bawa *et al.* 2014). With this in mind, care was taken to design this research in such a way that data can be garnered using different techniques. Blumberg,

Cooper and Schindler (2011) define research design as an outline developed and followed by the researcher with the aim to achieve the research objectives. Research design indicates the methodology as well as the techniques which the researcher is intending to use throughout the study.

Qualitative and quantitative research designs can be integrated in a study (Williams 2015) and this constitutes mixed methods (Creswell 2015: 204). The type of study and the output of the inquiry are equally important to this study. The research design plans to collect and analyse evidence susceptible of helping the researcher in his or her bid to answer the questions posed in the study, and in doing so, aspects such as data collection and analysis techniques are explained.

This study focused on 79 participants (that is 69 mining companies and 10 interviewees in SA). The study included a pretested questionnaire, and thus allowed quantitative data to be collected. The use of more than one method of research is advocated by many writers in corroboration with what Keegan (2009:14) had to say when emphasising the need to have complementary research methodologies. Friese (2014: 17-173) is in favour of using qualitative methodologies in explorative studies such as this in corroboration with Mora (2010: 55).

5.4.1 Triangulation in research design

One way to integrate research designs is to triangulate multiple types of research, sources of data, multiple methods, theoretical frameworks and even researchers (Tracy 2013: 40-41). Triangulation may refer to the combination of several qualitative techniques and the use of both qualitative and quantitative approaches (Trafford and Leshem 2012: 160-165). Sekaran and Bougie (2013: 104) posit that triangulation is usually subject to the use of two or more methods, and this helps in building up the confidence of the researcher, especially, when the findings obtained by the use of different methods are similar. Reseachers are expected to be versed in both quantitative and qualitative methods (Creswell 2015: 17). In this study, data, theoretical and methodological triangulations were achieved respectively

through the use of two samples, beneficiation and trade theories as well as mixed methods.

5.5 RESEARCH PHASES

As briefly presented in the first chapter, this study followed a three-stage path; that is, an initial review of literature on beneficiation amongst BRICS partners was conducted in the first stage, a survey and semi-structured interviews followed in the second, and finally a complementary review of literature and the data were analysed. The following section elaborates on the three phases.

5.5.1 Phase one: Initial review of literature on beneficiation amongst BRICS partners

In the early stage, a review of the literature was done. The reading material included e-books, hard copies such as books (including newspapers and magazines) and a variety of academic articles. The information obtained in this phase allowed the writing of the research proposal and assisted in posing relevant research questions as well as in iteratively thinking about the research topic, the field of study and the title.

In this stage, it was found that it is possible to obtain relevant information about extractive activities on companies' websites since financial, operational and administrative reports are accessible online and treated as information in public domain for transparency. The realisation that Statistics SA is a trusted source of research data also was very informative. However, first-hand information remained a priority thus the next phase had to logically deal with survey and interviews.

5.5.2 Phase two: A survey and semi-structured interviews

In addition to the administration of questionnaire, semi-structured interviews were conducted. Writing to companies and sending them the gate-keepers letters and permission to conduct research did not yield an adequate response compared to site visits and face-to-face contacts. Initially 69 letters were sent

to the companies listed by the Chamber of Mines (CM), thereafter arrangements were made for interviews. In total, 21 companies returned completed questionnaires and eight out of ten targeted representatives were interviewed. This makes up 30.4% response rate for the survey (Quantitative data) and 80% participation for the interviews (Qualitative data).

Table 5.1: Combined response rate

Methodology	Target population	Response rate	Response rate %
Quantitative	**69**	**21**	**30.4**
Qualitative	**10**	**8**	**80**

Source: Self-generated

Table 5.1 shows the response rate for the mixed methods. Suffice it to say that the study was predominantly qualitative owing to its focus and purpose. Site visits took the researcher to many provinces many times including Johannesburg, Pretoria (Gauteng), Richards Bay and Pietermaritzburg (KwaZulu-Natal), Phalabora (Limpopo), Bloemfontein (Free State), Kimberley (Northern Cape), Stellenbosch and Cape Town (Western Cape) for data collection, training and conferences (Appendix F). This was done in order to improve the response rate and for research purposes.

5.5.2.1 Questionnaire

The questionnaire comprised of dichotomous, Likert scale, close and open-ended questions, a combination of which provided relevant information (Appendix C). Data on demographics were obtained by asking questions such as:

- When was the company or organisation established?
- Where is the company or organisation located?
- What is the socio-economic status of the respondent? and
- How many years of experience does the participant have?

The biographical information was also obtained using a dichotomy. The inquiry continued by asking about the activities of the extractive firms, and whether they could fall under downstream or upstream beneficiation. Care was taken to ensure the questions were aligned with assigned research aim and objectives as follows:

- To explore the influence of BRICS partnership on mineral beneficiation in SA;
- To identify implementation challenges of BRICS interventions in SA; and
- To analyse synergies suitable for implementing BRICS interventions in SA.

The information allowed developing a model for mineral beneficiation in the context of BRICS in SA. This was the fourth objective of this research. In order to cover the relevant issues, respondents were allowed to make suggestions for improvement and to propose additional information that was supposed to be part of the inquiry. The length of the questionnaire (seven pages) can be explained by the fact that this is a doctoral study and therefore the depth of inquiry needed a holistic approach.

5.5.2.2 Interview schedule

In average, it took 30 to 45 minutes to interview participants, depending on the amount of information the participant was willing to provide.

Questions were asked to the interviewees on the following:

- General information about the respondent (demographics/biographical);
- Aim and objectives related questions on information derived from the purpose and goals of this study; and
- An inquiry to prevent Zika and Ebola virus to enter the mining sector in SA. On this type of questions some participants were grateful it was

incorporated in the study as they were of the opinion that it was a question of critical importance.

The research questionnaire and the interview schedule were appended (Appendix C and D). The interview schedule followed a methodological approach and as a result, care was taken to include the purpose it served, the motivation of the researcher and time aspects. Usually, officials take into account the time factor of the interviews before agreeing to participate. Equally there were precautions taken at the end of the interview to make sure the closing section included a summary of what had been discussed, the expression of gratitude to the respondent and last but not least the request to allow future communication between the researcher and the respondents.

5.5.3 Phase three: Complementary review and data analysis

Due to the need to follow the research design, data was further collected by administering more questionnaires to mining companies' representatives. Hard copies of questionnaires were posted or handed to companies' managers. Later on, in order to increase participation, electronic versions of the questionnaire were constructed, making a website link available for use to those who would rather prefer to respond online. As a result, this allowed more respondents to be found, improved the number of responses.

The researcher recorded the collected data as the study unfolded. Recording devices were used including a mini iPad, a smart phone and even a Canon Photo camera. These devices were useful in allowing data to be revisited later on for transcription and analysis purposes. The use of multiple recording devices was instrumental in minimising the risk of losing data, as additional copies would be available for later consultation. The use of information from Statistics SA and other sources complemented the information in terms of relevance. The data obtained at this stage allowed the researcher to revisit specific themes of importance in the literature review and thus the rewriting of certain sections.

5.6 POPULATION, SAMPLE AND SAMPLING METHOD

5.6.1 Target Population

The population consisted of 79 participants as follows: 69 representatives of mining companies and associations whose organisations are members of the Chamber of Mines (Quantitative part of the study); ten decision-makers from government departments (Qualitative part of the study). The target population for the interviews consisted of seven representatives of the BRICS directorate from the Department of International Relations and Cooperation (DIRCO) in SA, two representatives of the CM and one representative of the Department of Mineral Resources (DMR).

5.6. 2 Sample and sampling method

For the quantitative aspect of the study, the probabilistic sampling method was used and the sampling size was as determined above. As the sample size was small, 69, a census study was conducted. Everyone had an equal chance of participating. Thus, the sampling strategy was probabilistic in nature.

For the qualitative aspect of the study, a purposive sampling method was used. This entails the setting of criteria before selecting suitable participants. Only the respondents who meet the requirements were included (10), mindful of the fact that the findings cannot confidently be generalised (Sekaran 2013: 252). In this case, government departments' delegates who are custodians of beneficiation practices or policies and BRICS affairs in the DIRCO were interviewed. Eight out of ten participants were involved in the interviews.

Table 5.2 Research methodology and methods

Exploratory research		
Mixed methods		
	Quantitative	**Qualitative**
Sampling strategy	**Probabilistic**	**Purposive**
Sampling size	**69**	**10**
Research instruments	**Questionnaire**	**Interview schedule**
Data collection	**Census study/Survey**	**In-depth semi-structured Interviews**
Data Analysis	**SPSS Version 24.0**	**Excel spreadsheet & Thematic analysis**
Response rate	**21**	**8**
Percentage	**30.4%**	**80%**
Findings: Comparison of Quantitative and Qualitative results		

Source: Tabled by the researcher.

Table 5.2 presents the research methodology and the methods. While the quantitative study made use of the SPSS version 24.0, the qualitative data were captured on a spreadsheet (Excel) before a thematic analysis could be conducted. The criteria used for selecting participants also included dealing with BRICS or expressing interest in BRICS affairs.

5.7 RELIABILITY AND VALIDITY

5.7.1 Reliability of this study

Whether there is evidence of replication should the study be undertaken again is the matter of how reliable the research is. Would the respondents provide the same answers should another person or organisation ask them the same research questions? In this study, the researcher took precautions to enhance reliability by being objective and testing data collection instruments in a pilot.

5.7.2 Validity of this study

According to Gilbert, Ruigrok and Wicki (2008:152-153), internal validity finds its support in thorough review of the literature. Does the questionnaire measure what it was supposed to measure, and to what extent? In this research validity was guaranteed by asking questions that posit the issues of importance to the BRICS as a partnership as well as to mineral beneficiation related questions in the mining sector. The supervisor, experts in the field as well as BRICS officials verified the questionnaire and the interview schedule thus enhancing the validity of the findings.

5.8 ETHICAL CONSIDERATION

The research as an academic project avoided plagiarism in all its forms by the use of in-text reference as well as a bibliography. To this effect, the whole thesis was put on turnitin and the result met institutional requirements, proving its originality beyond any doubt. Quotes were used sparingly and where it was necessary to quote directly inverted commas were then employed. Apart from these instances, the researcher paraphrased the information. A letter to the respondents included what the participants had to expect in the survey and described the requirements for participation. Participants were repeatedly told that the research was voluntary. Confidential information was not disclosed, and care had been taken to keep information as a secret if compelled to do so. It was indicated that information will be used only for research purposes.

5.9 PILOT STUDY

A pilot study was conducted. A questionnaire was distributed to 10 percent of the respondents not included in the final sample. The research instruments were later on approved by officials at the University. The interview schedule was also subjected to the same procedure with inputs or suggestions being given by professionals. The information obtained through the pilot study demonstrated that some clarifications needed to be made. For example, beneficiation by hydraulics had to be replaced by beneficiation using water in some instances, owing to the fact that a semi-structured interview schedule was used. Relevant changes were made allowing the investigation to continue uninterrupted.

The pilot study also verified the effectiveness of communication (language); the usefulness (validity) of the survey questionnaire, the interview schedule, and whether they would allow meeting the aims and objectives of this research. It also checked that questions and responses were not biased as far as the culture, gender, traditions and policies of the organisations were concerned. The combined benefits of the two methods of data collection (qualitative and quantitative techniques) translated into converged lines of inquiry allowing the results to be cross checked. Triangulation thus has taken place at this stage as well (Sekaran 2013: 104; Tracy 2013: 40-41).

5.10 DATA ANALYSIS

As noted in the synopsis chapter and far above, an analysis of data was conducted using the Statistical Package for Social Sciences version 24.0. The system generated charts and tables rich of information and insights. The findings were interpreted, and derived both descriptive and inferential statistics. The latter were possible through the use of Cronbach Alpha.

5.11 DELIMITATIONS

This research is a case study of SA, a BRICS member country. Due to the fact that the study focuses on mineral beneficiation in the context of BRICS, only organisations (including companies and government departments) with interests in beneficiation policies and BRICS activities were included. Thus, the findings cannot be generalised to other regional enterprises (Sekaran 2013: 252). Nevertheless, the findings open up interesting avenues for similar research around the globe as well as in other sectors.

5.12 LIMITATIONS

There were a number of limitations to this investigation. These include constraints such as cost implications, geographical space and time issues. The findings can be justified within the confine of the limitations herein indicated. The cost factor affected the study, as it was imperative to visit other provinces for research purposes. Given that SA is a vast country, covering all the mining sites was not aimed at. From the commencement of this research in late 2013, the time factor could not be ignored. Those limitations affected the research as it would have been beneficial to have more resources and more time, and to be able to get the respondents to return all the questionnaires.

5.13 CONCLUSION

This chapter presented the research methodology used for data collection. The study is of an exploratory design. This entailed the use of mixed methods. Quantitative and qualitative methodologies proved to be effective in garnering information on the topic of study during the data collection. The manner in which the different triangulations were achieved was also outlined. Validity and reliability were among aspects that required explanation. Matters of ethical consideration included the anonymity of participants, the confidentiality of information as well as the consent by respondents to participate in the study

without fear or pressure. Last but not least, the research instruments were presented and their usage proved to be effective. The next chapter analyses the collected data and provides an interpretation of the findings.

CHAPTER SIX

DATA ANALYSIS AND INTERPRETATION OF FINDINGS

"I like friends who have independent minds because they tend to make you see problems from all angles" – Nelson Mandela.

6.1 INTRODUCTION

This chapter presents the results and discusses the findings obtained from both the questionnaires and the interviews. The first part of this section elaborates on the conducted survey whereas later on the interviews are also analysed. A pre-designed questionnaire was used to collect data and was distributed to management of selected mining companies. The data collected from the responses was analysed with SPSS version 24.0. The results present the descriptive statistics in the form of graphs, cross tabulations and other figures. Used inferential statistics include the use of correlations and chi square test values; which are interpreted using the p-values. The analysis considers the policy and legal implications in SA; especially on mineral beneficiation practices and the BRICS' interventions in mining. After the quantitative data presentation, a thematic analysis of the qualitative data will follow. In line with mixed methods requirements, common issues discovered will be discussed with reference to the literature (Gough, Oliver and Thomas 2017: 60).

6.2 FINDINGS, INTERPRETATION AND DISCUSSION OF THE PRIMARY DATA

6.2.1 Reliability Statistics

The two most important aspects of precision are reliability and validity. Reliability is computed by taking several measurements on the same subjects. A reliability coefficient of 0.70 or higher is considered as "acceptable". Table 6.1 below reflects the Cronbach's alpha score for all the items that constituted

the questionnaire. Whilst more information is found in Appendix G and Appendix H, only significant variables are presented below. Multiple responses have been used. Kirk (2016) and Wagner III (2010) informed aspects of this chapter on data visualisation.

Table 6.1 Cronbach's alpha

		Number of Items	Cronbach's Alpha
Q1.8	Downstream mineral beneficiation	12	0.707
Q2.2	Involved with BRICS	5	0.828
Q2.3	Project management issues	5	0.835
Q2.4	BRICS networking	7	0.740
Q3.1	Challenges Experienced	9	0.771
Q3.2	Mechanisms are in place to overcome mining challenges in SA	5	0.669
Q4.1	Advantages for the BRICS partnership	17	0.903
Q4.2	Collaboration between BRICS partners	8	0.856

The reliability scores in table 6.1 above approximate or exceed the recommended Cronbach's alpha score. This indicates a degree of acceptable, consistent scoring for these sections of the research questionnaire.

6.3 DEMOGRAPHIC AND BIOGRAPHICAL INFORMATION OF THE RESPONDENTS

In the following sections the structure is that of the questions as found in the questionnaire (Appendix C).

The demographic and biographical information was obtained in response to question one as follows: "Positions held by the respondents", "Years of experience at work", "Company involvement in the mining", "What commodities does your company import from BRICS?", "What commodities does your company export to BRICS?", and "Downstream mineral beneficiation".

6.3.1 Position held by the respondents within the organisation

The table 6.2 indicates the positions that respondents held (Appendix C 1).

Table 6.2 Positions held by respondents

	Frequency	Percent
Admin Controller	1	4.8
Delegated Worker	1	4.8
Director	1	4.8
Engineer	1	4.8
Finance Officer	1	4.8
General Manager	2	9.5
Legal Advisor	1	4.8
Manager	3	14.3
Manager Stakeholder Relations	1	4.8
Mine Manager	1	4.8
Mine Superintendent	1	4.8
Process Engineer	2	9.5
Project coordinator	1	4.8
Project Manager	2	9.5
Senior Process Engineer	1	4.8
Site Manager	1	4.8
Total	21	100.0

Managers formed the largest grouping of respondents, split into various levels (See Table 6.2 above). In certain instances, management preferred to be represented by a knowledgeable or experienced person. In short, 52% of the participants were employed either at top management position or at middle management position. Only 14.3% were employed at directorship or senior managerial position. This is due to the fact that, the higher the position occupied, the less one is willing to participate in research, especially if the study is not an internal project (Information Resource Management Association 2013). This finding was echoed by researchers and mining industrialists at Trade, Industrial, Policy and Strategies (TIPS) conference at the University of Johannesburg, when they complained that mining companies

are reluctant to participate in research conducted by outsiders (Person. comm. at *TIPS conference* 2016 on 15 June 2016 with anonymous).

At least 33.3% of the respondents were mining engineers or directly involved with engineering aspects of the mine. This responds to the need to provide precise and concise information reflecting the situation of the mining company in question.

6.3.2 Number of years of experience at work

The table below indicates the number of years of professional experience (Under Question 1).

Table 6.3 Number of years of experience

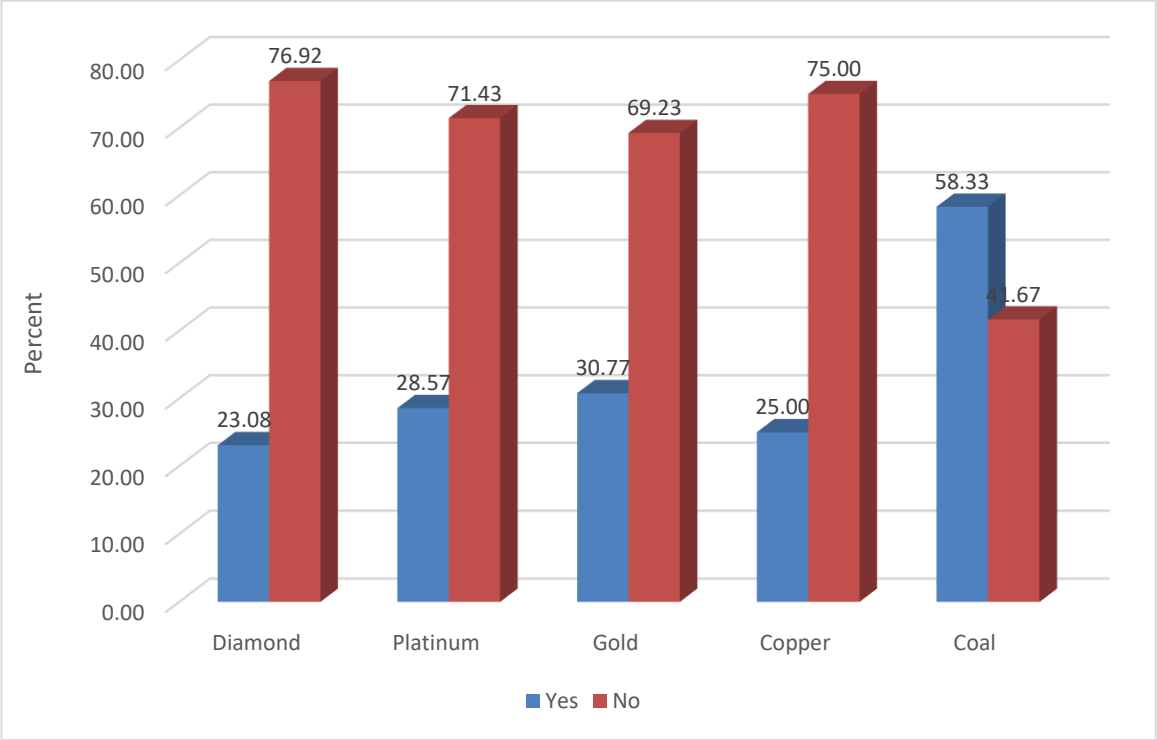
Mean	12.57
Median	10.00
Mode	10
Std. Deviation	8.582
Minimum	1
Maximum	30

The average employment period is 12 and a half years, with a minimum of 1 year and a maximum of 30 years (See Table 6.3 above). Labour turnover is frequent and permanent employment is becoming scarce in the mining sector, therefore, employment in the mining sector is only safer and long-term at managerial position (Anglo American 2012). The benefit being that permanent positions offer job security to incumbents than part-time and low-paid positions.

6.3.3 Company involvement in mining

The figure that follows depicts the involvement of the company in mining (Appendix C; Question 1).

Figure 6.1: Company involvement in mining activities



More than half of the companies (58.33%) were involved with coal mining, with an average of 26.9% involvement with the other metals (See Figure 6.1 above). Except for copper, it was found that the mining companies were also involved in extracting or trading strategic minerals such as coal. As far as South Africa is concerned, strategic minerals include coal, gold, iron ore, manganese, diamonds, platinum group metals, chrome, vanadium, titanium, nickel and uranium. The South African Mining Development Association (SAMDA 2014:15) suggests four additional strategic minerals: phosphate, limestone, shale gas, and oil. This can be explained by the fact that coal mining has been in the spotlight at the COP17 and the Paris Agreement; thus, companies involved and interested in dealing with climate change issues and alleviating the impact thereof were more than willing to participate.

The other minerals extracted in SA included almenite, aluminium, coal, fuel, manganese, uranium, petroleum, sand, titanium, slag, pig iron and the list goes

on. Among those, 23.9% of respondents represented companies involved in petroleum, fuel and oil activities. A total of 19% of companies thought it was not applicable to cite other activities they do whereas 9.6% stated aluminium or related activities as part of other activities. However, only 4.8% extract uranium, a strategic mineral demanding stringent regulations' observance and presenting both advantages and danger to the international trade, if otherwise national and international related laws are not followed (SAMDA 2014: 15). It is known that up to 53 different types of minerals are exploited in South Africa every day from 1700 mines and quarries (Zwane 2017: 1).

Role-players had embraced the mercantilist approach in the post-Apartheid era as they tend to export more than they beneficiate, and this is what the study seeks to address amongst the other things (Ranzau 2009).

6.3.4 Commodities imported from BRICS countries

What commodities does your company import from BRICS? (Under Question 1).

Alumina and gold are imported from BRICS. This can be explained by the fact that SA is rich in mineral and extract a variety of quality minerals enough for its needs and for exports (Ranzau 2009; Zwane 2017: 1).

Import of commodities from Russia are also hardly mentioned. Oil and working materials were mentioned by a few as well for the same reasons as indicated above. From India, 23.8% indicated that coke (including petroleum coke) was imported from India and 9.6% indicated that IT material was imported. While 19% indicated that they do not import from India, the majority of the respondents either didn't know or thought the question was not applicable. Working materials and equipment were also imported to SA from China as indicated by 14.4% of the respondents. Coke, including petroleum coke was also imported from China according to 9.6% of the respondents.

6.3.5 Commodities exported by SA to BRICS countries

What commodities does your company export to BRICS? (Under Question 1).

Exports to Brazil was indicated by less than 30% of the respondents. Exports included diamond, gold, and iron. This is due to the fact that all BRICS countries are mineral rich emerging economies (Shaban and Vermeylen 2015: 74; Jones 2012; *BRICS joint statistical publications* 2013: 189-190; Sorensen 2011: 625-649; Zwane 2017: 1).

Exports to Russia included coal, diamond, and 9.5% of the respondents cited uranium as another commodity exported to Russia. Russia is interested in energy generation projects and is in bilateral agreement with SA for that matter.

India receives coal, copper, diamond and iron coming from SA to supply its industries. A total of 19% of the respondents are of the view that SA exports coal to India. Last but not least, coal, diamond, platinum, copper, gold, iron, platinum group metals, titania slag, pig iron, zircon, titanium, chloride and zinc were mentioned by less than 20% as exports to China. It can however be concluded that a variety of mineral products are exported to China from SA more often than they are to the rest of the BRICS countries.

6.3.6 Downstream mineral beneficiation

Dwyer et al. (2012) spoke of the need to alleviate the negative impact of resources exploitation. Local beneficiation could help in that regard. Applied theories/methods of beneficiation such as magnetic separation could help (Order 1976). Song and Lu (2000) were interested in coal beneficiation.

The section that follows analyses the scoring patterns of the respondents per variable per section. The results are first presented using summarised percentages for the variables that constitute each section. Results are then further analysed according to the importance of the statements.

Table 6.4 Downstream mineral beneficiation

Your company addresses downstream mineral beneficiation by doing the following (Under Question 1):

	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Gainsharing	7	36.8%	1	5.3%	8	42.1%	1	5.3%	2	10.5%
Distributing monetary incentives	6	30.0%	7	35.0%	4	20.0%	2	10.0%	1	5.0%
Organising mining skills training	10	50.0%	8	40.0%	1	5.0%	0	0.0%	1	5.0%
Doing beneficiation by hydration	2	10.0%	7	35.0%	5	25.0%	4	20.0%	2	10.0%
In-country cutting and polishing of mineral	1	5.3%	3	15.8%	4	21.1%	6	31.6%	5	26.3%
Promoting better waste management	11	55.0%	5	25.0%	4	20.0%	0	0.0%	0	0.0%
Local grading of mineral	5	26.3%	4	21.1%	3	15.8%	6	31.6%	1	5.3%
Smelting locally	8	40.0%	2	10.0%	3	15.0%	4	20.0%	3	15.0%
Refining plant	5	25.0%	6	30.0%	2	10.0%	4	20.0%	3	15.0%
Making craft jewellery or ceramic pottery	1	5.0%	2	10.0%	7	35.0%	5	25.0%	5	25.0%
Investing in metal fabrication	4	21.1%	2	10.5%	2	10.5%	7	36.8%	4	21.1%
Protecting the physical environment	12	60.0%	6	30.0%	2	10.0%	0	0.0%	0	0.0%

The findings in table 6.4 above are discussed below (it's about strongly agree and agree combined and in ascending order):

- Organising mining skills training (90%);
- Protecting the physical environment (90%); and
- Promoting better waste management (80%).

The literature shows that mining companies are compelled to comply with the laws of SA with regard to skills transfer, environmental protection and safe disposal of waste (*The beneficiation strategy* 2015; The Mineral and Petroleum Resources Development Act 28 of 2002).

Most importantly, the findings below substantiate the focus of this study:

- Smelting locally (50%);
- Doing beneficiation by hydration (45%);
- Local grading of minerals (47.1%);
- Gainsharing (42.1%);
- Investing in metal fabrication (31.6%);
- In-country cutting and polishing of minerals (21.1%); and
- Making craft jewellery (15%).

The above findings are consistent with previous results by Zondo (2005) that gainsharing is a motivation factor, that mining activities contribute to the economy (seven percent of the GDP at the beginning of 2017).

On the question whether their companies were “distributing monetary incentives”, the majority of the respondents just agreed with the statement (35%), while another 30% strongly agreed with same. Those who strongly disagreed with “distributing monetary incentives” were just a few (five percent). There is a significant disparity among those who agree about “organising mining skills training” and those who disagree with that. The combined agree and the combined disagree scored respectively 90% and five percent. The number of those who strongly disagreed is equal to that of the people who chose to remain neutral (five percent).

On doing beneficiation by hydration, there is a parity of scores between those who strongly agreed and those who strongly disagreed (10% each), suggesting that more needs to be done for mineral beneficiation to prevail (Dludla 2017: 10); and this can be achieved when there is political will to do more (Mokati 2017: 2). Those who are neutral could be the real “king makers” or a determining factor should there become skewed towards either side.

About “in-country cutting and polishing of minerals”, the highest scored disagreed with the statement (31.58%), combined with those who strongly disagreed with the same statement, the score is approximately 58%, once

again suggesting the need to encourage local beneficiation (Mchunu 2017: 15; Dludla 2017: 10), in order to bridge the gap; and this would be another job creation opportunity (Dludla 2017: 10). Promoting better waste management and protecting the physical environment were the only two statements to score twice zero percent on strongly disagree and disagree.

Local grading of mineral is one of the scores that didn't present many disparities, although 31.58% of the respondents disagreed, meaning that the grading of mineral product just as the pricing of commodities is taken care of by others, and is not the sole responsibility of miners or mining companies. This is consistent with another finding according to which the pricing method is to be determined abroad by the buyers and this defies any logic and economics theory (Interview no.5 2016); especially the law of supply and demand.

One can also see that there are trends when it comes to the environment and training relating to the environment.

The following statements show high levels of agreement:

- Organising mining skills training (90.0%);
- Protecting the physical environment (90.0%); and
- Promoting better waste management (80%).

Respondents clearly identify that the environment needs to be protected, and this is consistent with Mtshali (2017: 3) who advocates the need to protect the environment. Amongst the ways to do this are improved training and better waste management. Mtshali (2017: 3) states that the combination of solar, wind and gas energy is a factor in environmental protection. Metal and mineral recycling are but two of the beneficiation practices required to promote effective waste management (Isheloke 2013).

6.4 COMPETITIVE ADVANTAGE OF BRICS COUNTRIES

This section aims at achieving the research objective 1: To explore the influence of the BRICS partnership on mineral beneficiation in SA. The table below summarises the scoring patterns. The counts were based on multiple responses (Under Question 2, sub-question 2.1; Appendix C).

Table 6.5 BRICS competitive advantages

Identify the competitive advantages of BRICS partners

		Brazil		Russia		India		China		SA	
		Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Q2.1.1	Democratic institutions	5	23.8	3	14.3	7	33.3	3	14.3	14	66.7
Q2.1.2	Information Technology	4	19.0	5	23.8	12	57.1	9	42.9	9	42.9
Q2.1.3	Natural resources	7	33.3	11	52.4	7	33.3	6	28.6	14	66.7
Q2.1.4	Manpower	6	28.6	5	23.8	8	38.1	9	42.9	11	52.4
Q2.1.5	Industrial development	10	47.6	6	28.6	10	47.6	12	57.1	12	57.1
Q2.1.6	Support of the market economy	4	19.0	4	19.0	8	38.1	8	38.1	10	47.6

For Brazil, the competitive advantage is found to be “industrial development” and “natural resources” in line with the previous findings (BRICS joint statistical publications 2013: 189-190) with respectively 47.6% and 33.3% of scores (See Table 6.6). Information technology and support of the market economy held the lowest scores for Brazil (19% for both) in terms of competitive advantages as identified by the respondents. Only 23.8% of the respondents identified democratic institutions in Brazil as another competitive advantage for that Latino-American country. The instability and the allegation of corruption (about the leftist popular leader Lula da Silva) that shook this country recently (Bloomberg 2017: 8) also saw the country’s involvement in BRICS affairs weakened; raising the question of the sustainability of the partnership.

Persisting instability in Brazil and negative perception in the public opinion (if unresolved) is a danger to BRICS (Pandey 2016) as it may trigger actions similar to Brexit.

For Russia, the competitive advantage that scored more is “natural resources” with 52.4%; followed by “industrial development” with 28.6%. The lowest competitive advantage for Russia was “democratic institutions” with only 14.3% of scores. The political opponents are allegedly not treated fairly in Russia and eminent politicians of the oppositions are at times under pressure (Roberts 2012: 1-9).

China and Russia scored low on “democratic institutions” (only 14.3%) as competitive advantage, of all the BRICS countries. This can be explained by the fact that freedom of ideology is not highly achieved in these countries. In China, the government proclaims communism as the way for the nation, despite embracing capitalistic economic policy slowly but surely (Xi 2014). In Russia, the rough tactics against the opposition by the current administration can be one of the reasons of such a low perception on the democratic institutions in that country (Roberts 2012: 1-9).

Only 19% of respondents found Russia to support the market economy. Of the BRICS countries, Russia and China were the two major communist countries that influenced the socialist world. Although embracing the market economy through a number of reforms (Jong-wha 2013: 10), Russia just like China is still facing some of the challenges of the old dispensation and the previous socio-economic policies’ legacy. This can explain the low score for support to the market economy for that country as perceived by the respondents.

India is identified as having IT as its biggest competitive advantage with 57.1% of scores. Industrial development scored 47.6% as the second competitive advantage for India seen by the respondents. It is strange though that only 38.1% of the respondents found “manpower” to be another competitive advantage for India, although it is the second most popular country in the world after China!

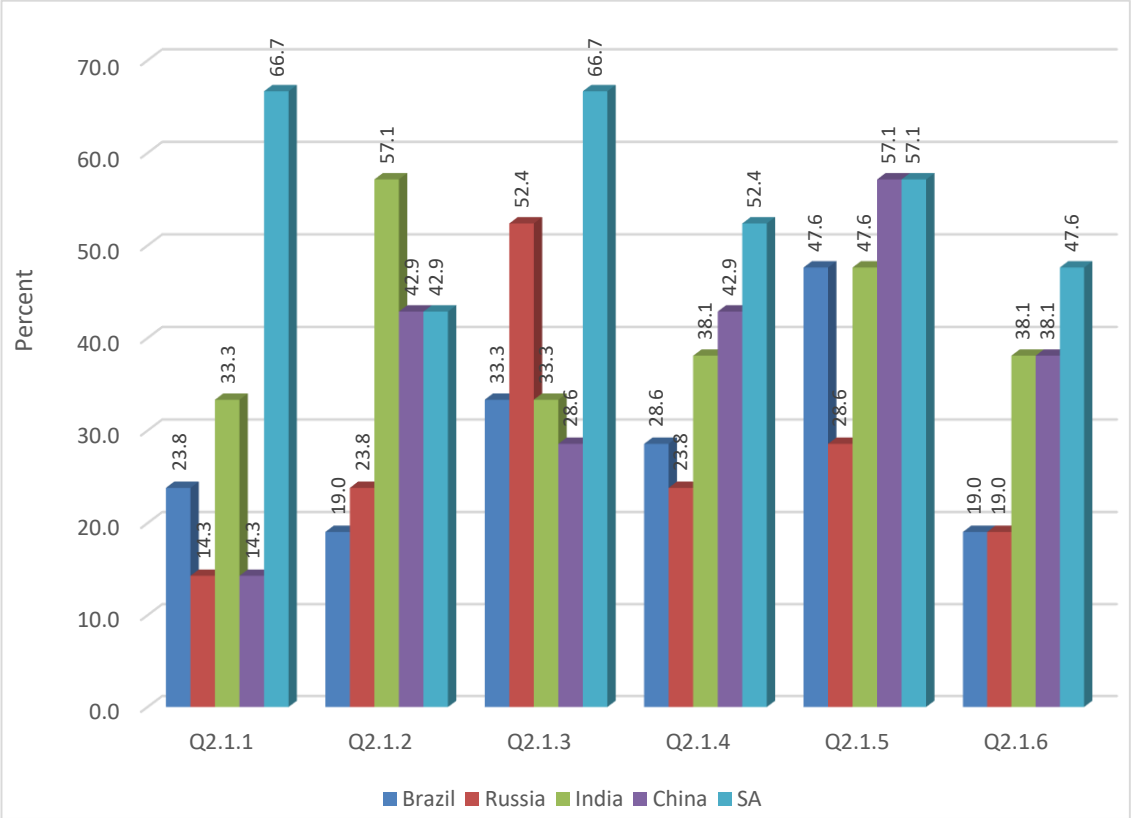
The biggest competitive advantage for China has been found to be industrial development (Jones 2012) with 57.1% of scores, followed by “manpower” and IT scoring 42.9% equally. A total of 38.1% of scores is attributed to the support by China to the market economy (Jong-wha 2013: 10). This is an important improvement for a country which was extremely communist more than three decades ago.

The highest competitive advantage for SA was found to be “democratic institutions” with 66.7%, despite the fact that the current conflict the country is witnessing in the Parliament (Mtshali 2017: 3) is a cause of concern (to say the least); equally so, “natural resources” scored the same percentage. Secondly, industrial development scored 57.1% and “manpower” 52.4%. Support to market economy scored 47.6% for SA. The lowest competitive advantage was IT with 42.9%. Relating this finding to beneficiation, suffice is to note that IT affects beneficiation practices. As SA seeks to prioritise infrastructure, mining and mineral beneficiation (Fabricius 2013a), IT infrastructure is to be included. Lagging behind in ITC is a concern in times of fourth industrial revolution as it is known today.

6.4.1 South Africa and BRICS scores

The figure below presents the involvement of the mining company with BRICS. Suffice it to reiterate that BRIC means Brazil, Russia, India and China without SA. This is simply what the organisation was called when it was founded.

Figure 6.2 South Africa and BRICS scores



South Africa scores highest for all but one. This was of course, in most instances, a mere perception of the respondents. In reality SA is lagging behind in certain aspects compared to other BRICS states (See Figure 6.2 above).

BRICS countries, although sharing certain challenges of poverty alleviation, rich versus poor income inequality or disparity, they have other country-specific problems still (Mosoetsa 2017: 10; Khumalo 2017: 13).

Table 6.7 below summarises the scoring patterns. Mindful of the fact that the counts were based on multiple responses, they do not therefore tally to 21 as it would have been the case otherwise.

6.4.2 BRICS Involvement in extractive activities

The section below indicates to what level BRICS countries are involved in mining activities in South Africa. (Under Question 2, sub-section 2.2; Appendix C). Here, mining companies in SA were asked to disclose their activities in Brazil, Russia, India and China.

Table 6.6 BRICS involvement in mining activities

The company is involved with BRICS in:

	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Mining innovations	3	16.7%	3	16.7%	5	27.8%	5	27.8%	2	11.1%
Mining exchange programmes with the BRIC states	1	5.6%	4	22.2%	5	27.8%	5	27.8%	3	16.7%
Research information-sharing	4	23.5%	4	23.5%	6	35.3%	2	11.8%	1	5.9%
Mining projects	4	22.2%	0	0.0%	5	27.8%	6	33.3%	3	16.7%
Secondary mineral recycling	1	5.3%	2	10.5%	4	21.1%	6	31.6%	6	31.6%

The following statements show higher levels of agreement (or a strong agreement):

- First, research information sharing (23.5%);
- Second, mining projects (22.5%); and
- Third, mining innovations (16.7%), see Table 6.7 above.

The lowest agreement is recorded on secondary mineral recycling, despite the fact that this could be, just as other metal recycling activities, another form of job creation initiative and part of mineral beneficiation practices (Dludla 2017: 10).

On the other side, as shown in table 6.6, the highest levels of disagreement are found in the statements below:

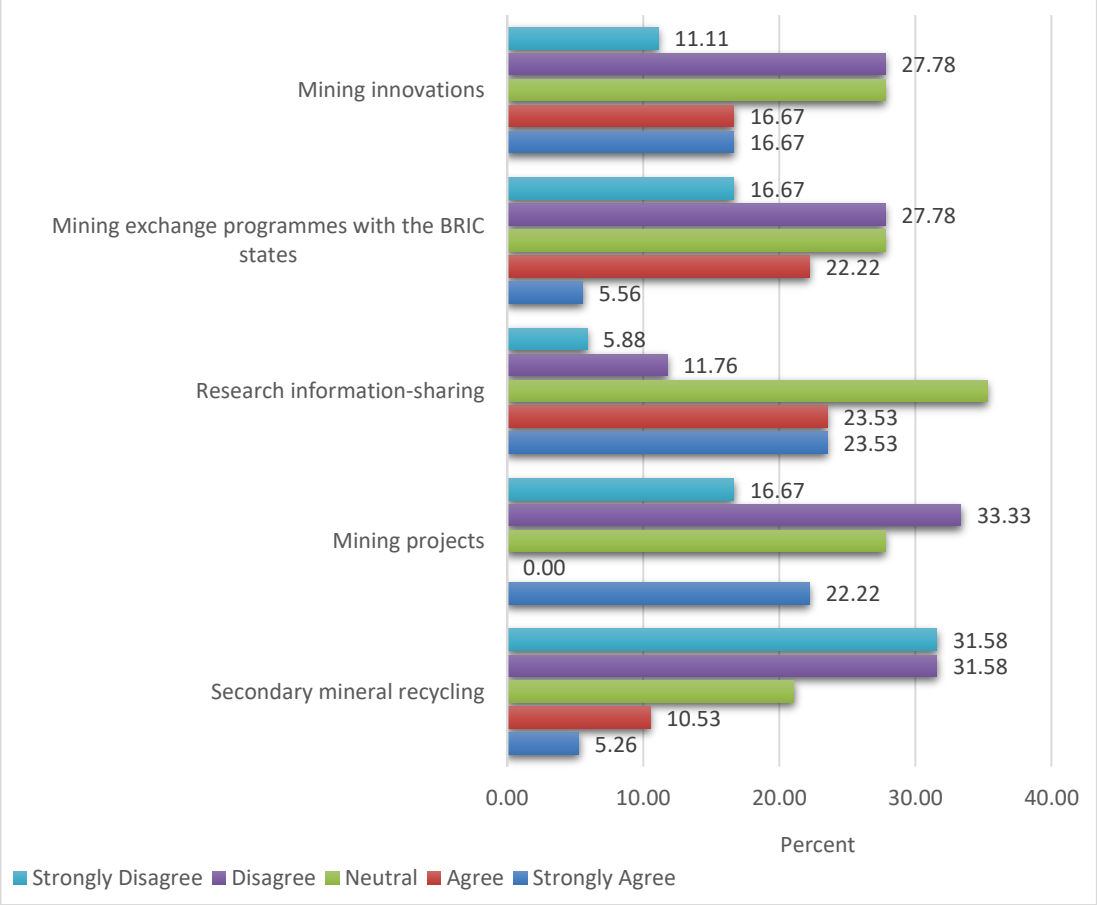
- First, secondary mineral recycling (31.6%);
- Second, mining projects (16.7%); but also
- Mining exchange programme (16.7%).

BRICS partnership does not have mining projects going on for all member states; and it is on bilateral level only that countries engage in mining deals at this an embryo phase. This alone explains why there is a strong disagreement on this aspect to some extent. Research information sharing scored the lowest of all the strongly disagreed statements with 5.9%.

6.4.3 The company gets involved with BRICS in the following mining activities

The findings related to mining activities are presented (Under Question 2, sub-question 2.2).

Figure 6.3 Mining-related activities involving the company with BRICS



The lowest score in table 6.3 was “strongly agreed” with 5.26% on whether the company does “secondary mineral recycling”. A total of 33.34% is obtained by adding the positive scores about mining innovations which is less than the sum of negative scores on the same statement. Mining exchange programme with BRICS states show similar patterns with scores on mining innovations in that disagree and neutral score 27.78% each. There also the negative perception wins over the positive as far as “mining exchange programme with BRICS states” is concerned.

A total of 47.06% is obtained by adding up positive scores about research information sharing, far beyond the sum of negative scores. This is an indication that mining companies are keen to sharing quality information with sister organisations within the BRICS partnership. This is further demonstrated by the fact that most valuable reports and other information are in the public domain for all to see (Chamber of mines 2017).

In this particular case, neutral statements are more likely skewed towards the agree or strongly agree scores than the opposite. "Mining projects" is the only statement with a zero percent score on the simply "agree" aspect of the statement, whereas "strongly agree" scored 23.3% showing that there is no doubt on whether the company has mining projects in corroboration with Mtshali (2017a: 3), despite the fact that the negative scores are heavier. It is visible that more people disagreed with the statement indicating to some extent the need to reinforce mining projects in the future.

A total of 63.16% of the respondents either strongly disagreed or just disagreed on whether secondary mineral recycling is taking place in their midst. The 21.1% of respondents who were neutral about secondary mineral recycling could easily reinforce the pool of those who disagree, judging by the recurrent patterns as per the chart.

6.4.4 Additional information about the involvement of the company with BRICS

The information was obtained in response to an open-ended question (Question 2, sub-question 2.6) as follows:

Are there any other activities your company get involved in with BRIC?

On the statement above, the following emerged:

- 23.8% of the respondents opted for a "not applicable" choice;
- 9.5% of the respondents wrote "none" for the answer;
- 4.8% of the respondents had "no idea" for the answer; and
- 4.8% of the respondents had "not that I am aware of".

These scores indicate either a high level of uncertainty or a non-existence of other activities involving the company with their BRICS counterparts. This can be understood by the fact that BRICS is still at its relatively early stage (Zhenbo 2013). The remaining 4.8% of the respondents, who added information in support of the statements below, represented the minority group of the respondents. Another 4.8% of the respondents' additional information was not

proper for this study, although games can be understood as important in terms of educating learners and workers at the entry level for example in an industry (Vahed 2014: ii). Zuma (2017) stated the importance of investment for SA in corroboration with the other 4.8% scores in favour of investment.

6.4.5 Project management issues experienced by the company

The table below presents the difficulties experienced by the company vis-à-vis project management (Question 2, sub-question 2.3).

Table 6.7 Project management issues experienced by the company

Are the following Project management issues a problem in your firm?

	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Project ownership	1	4.8%	2	9.5%	4	19.0%	8	38.1%	6	28.6%
Funding allocations	1	4.8%	5	23.8%	6	28.6%	4	19.0%	5	23.8%
Implementing plans	1	5.0%	1	5.0%	9	45.0%	6	30.0%	3	15.0%
Monitoring & Evaluation	2	9.5%	2	9.5%	4	19.0%	9	42.9%	4	19.0%
Sharing of responsibilities	3	14.3%	1	4.8%	5	23.8%	7	33.3%	5	23.8%

The highest score was 28.6% combined score for “Funding allocations” as a problem in the mining firms (Table 6.7). A combined score of 19.1% is for those who viewed the sharing of responsibilities as a problem in the firm. A combined score of 19% is for those who viewed “Monitoring & Evaluation” as another problem in the firm. However, it emerged that more people disagreed with the five statements than otherwise (See Table 6.8 above).

The disagreement combined statements follow (disagree plus strongly disagree):

- More people disagreed in general with the statement “project ownership” is a problem (66.7%);
- Others disagreed with the statement “Monitoring & Evaluation” is a problem (61.9%);

- More than half of the respondents said that the “sharing of responsibilities” is a problem (57.1%);
- Others disagreed with the statement “Implementing plans” is a problem (45%); and
- Finally, less people disagreed with the statement “Fund allocation” is a problem (42.8%).

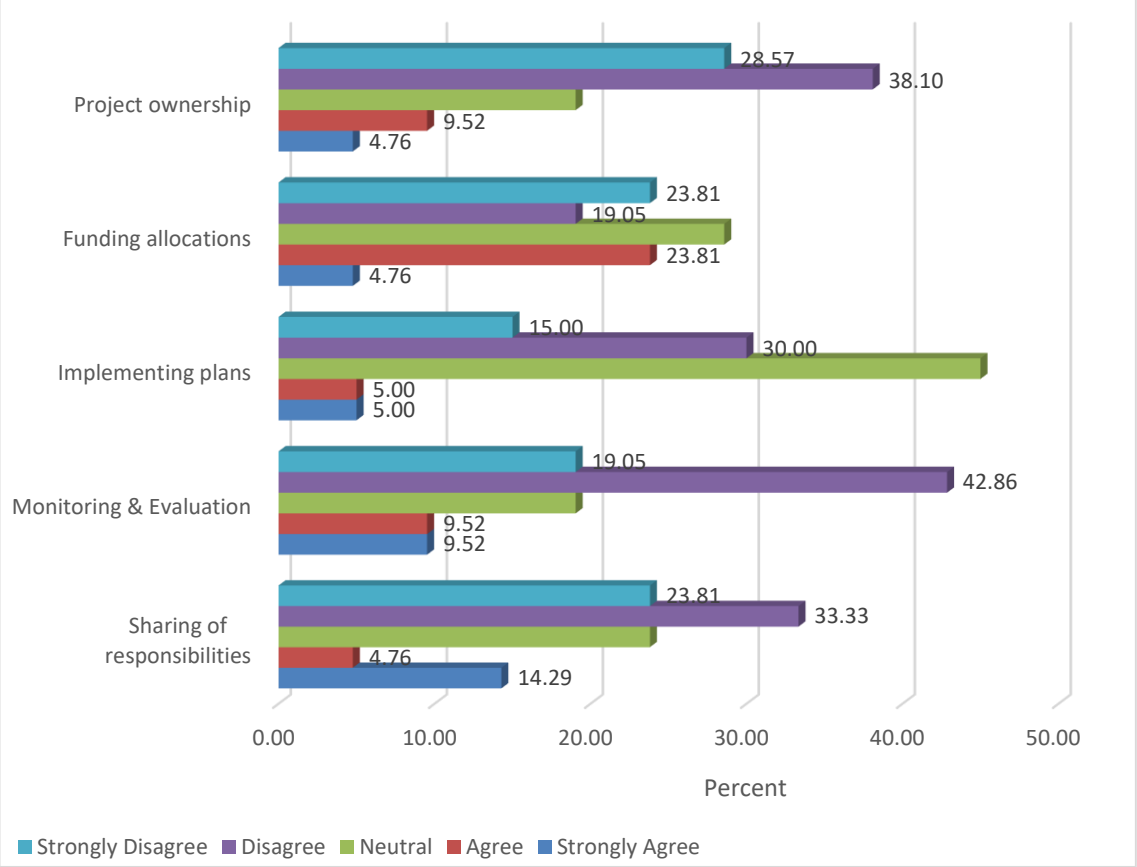
Almost half of the respondents (45%) chose to remain “neutral” as to whether “Implementing plans” is a problem. Considering the fact that more people disagreed with the statement than not, it is logical to suggest that the “neutral” scores express a level of uncertainty but they are more likely to reinforce the views of those who disagreed with the statement, should they be influenced.

From what transpires above, South African mining companies are doing well when it comes to “Implementing plans” in the firm (Khuzwayo and Mchunu 2017: 13-14). Only a total of 10% stated that it could be a problem, whereas a total of 45% disagreed with the statement. This indicates that it is not really a problem for them.

6.4.6 Managerial issues experienced in the company

The figure below depicts the managerial issues experienced by management (Question 2, sub-question 3; Appendix C).

Figure 6.4 Managerial issues experienced in the company



Except for “Implementing plans” where more scores were obtained for “neutral” (45%) and for “Funding allocation” (28.6%), more respondents disagreed with the rest of the statements (See Figure 6.4 above) as follows:

- Project management is not an issue (38.10%);
- Monitoring and evaluation is not an issue (42.86%); and
- Sharing of responsibilities (33.33%).

“Strongly agree scores” were just a few as respondents were trying to be cautious in answering the questions, and except for “sharing of responsibilities” which scored the lowest of them all in this set of questions. Monitoring and evaluation is key in determining how effective public participation is on livelihood status and outcomes (Motala *et al*. 2016: 4).

Table 6.9 below summarises the scoring patterns. Mindful of the fact that the counts were based on multiple responses, they do not therefore tally to 21.

6.4.7 The effects of BRICS networking abilities

The following table represents the abilities BRICS countries can improve by networking (Question 2, sub-question 4; Appendix C).

Table 6.8 BRICS networking abilities

BRICS networking can be improved by

	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Exchange programmes	7	33.3%	9	42.9%	4	19.0%	1	4.8%	0	0.0%
Favourable fiscal policy	4	20.0%	11	55.0%	5	25.0%	0	0.0%	0	0.0%
Financial Resources' provision	4	19.0%	13	61.9%	4	19.0%	0	0.0%	0	0.0%
Human resources' provision	6	28.6%	7	33.3%	5	23.8%	3	14.3%	0	0.0%
Utilisation of company's expertise	7	35.0%	8	40.0%	2	10.0%	2	10.0%	1	5.0%
Improved management systems	7	36.8%	5	26.3%	3	15.8%	3	15.8%	1	5.3%
Collaborative synergies	10	52.6%	6	31.6%	3	15.8%	0	0.0%	0	0.0%

Most people were positive (strongly agree and agree combined) that the BRICS networking can be improved by:

- Collaborative synergies (84.2%);
- Financial resources provision (80.9%);
- Exchange programme (76.2%);
- Utilization of companies' expertise (75%);

- Favourable fiscal policy (75%); and
- Improved management systems (63.1%), see Table 6.8 above.

The above is partially in corroboration with the measures taken to improve European Union's (European Commission 2002: 9-11). The importance of networking cannot be underestimated. In certain instances, not even one person was negative about the importance of having collaborative synergies; financial resources provision; and favourable fiscal policy. This justifies the need to promote synergies as explained in the literature review (Corradi, Gherardi and Verzelloni 2010; Notshulwana 2012: 8).

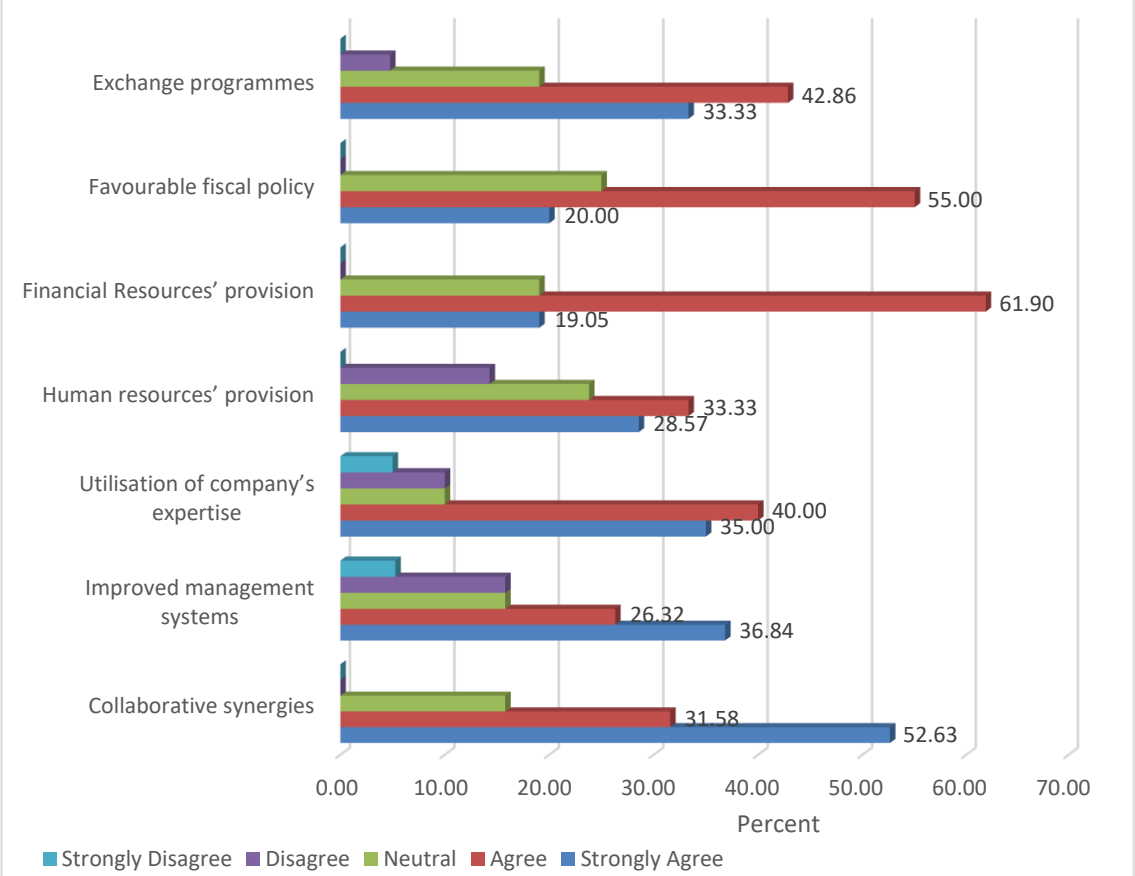
The last point is consistent with Motsepe (2013: 6) who surmises that in order to be competitive, the African economy must introduce fiscal reforms on a large scale. According to Moeller (2017), China believes that multilateralism should be the way to go and thinks it is the reason behind president Xi's visit to UN second important office in Geneva early this year. Collaborative synergies in mineral beneficiation can benefit from multilateral cooperation.

6.4.8 Business opportunities offered by the BRICS in the future

The following figure depicts the possible business opportunities for BRICS countries (Question 2, sub-question 5; Appendix C).

Figure 6.5 Business opportunities offered by the BRICS

What are the future business opportunities does BRICS offer to your company?



"Except for collaborative synergies" where 31.58% of the respondents (second highest score) agreed that collaborative synergies can improve networking of the BRICS' states (See Figure 6.5 above), most respondents agreed that all the other proposed statements were key in improving BRICS networking as shown below:

- Financial resources (61.90%) agreed;
- Favourable fiscal policy also scored (61.90%); and the lowest being
- Improved management systems (26.32%).

Agreed and strongly agreed on collaborative synergies combined score amounted to 84.21% (that is 31.58% + 52.63%) demonstrating the positive attitude towards collaboration with other BRICS partners.

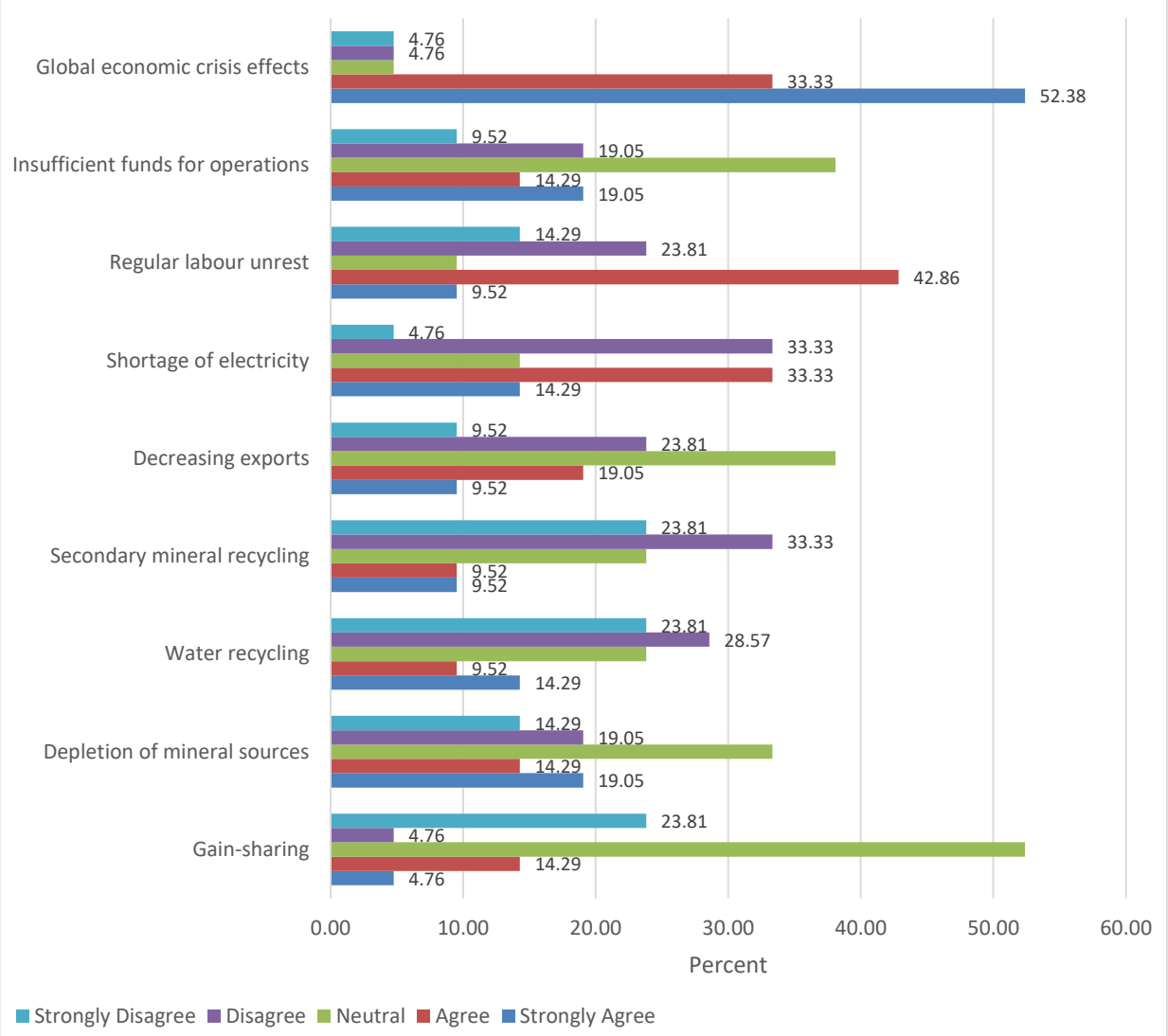
The combined (agree and strongly agree) score is therefore 76.19%, thus showing the pertinence of future BRICS exchange programmes. As far as Human Resources provision is concerned, another 33.33% agreed with the statement whilst only 28.57% strongly agreed. In total, 61.9% of the respondents are positive about HR's provision in the context of BRICS. Hopefully, these provisions will be aimed at promoting mineral beneficiation in line with government policies. Moreover, agreements were noted on "Exchange programme" amongst the BRICS (42.86%). A total of 33.33% strongly agreed with same. In total, 75% of the respondents were positive about the need to use internal expertise within the BRICS, especially if these promote mineral beneficiation.

6.5 IMPLEMENTATION CHALLENGES OF BRICS INTERVENTIONS IN SA

This section looks at the challenges that the mining sector faces. It aims at responding to the second objective of the research by identifying those challenges that hamper the effectiveness of BRICS interventions in SA (Question 3; Appendix C).

Figure 6.6 Implementation challenges of BRICS interventions in SA

The company experiences the following challenges (Question 3, sub-question 3.1; Appendix C).



The bar chart above (Figure 6.6) illustrates what the challenges represent. The highest scores of respondents are given below:

- Global economic crisis effects (52.38% strongly agree);
- Insufficient funds for operations (38.1% neutral);
- Regular labour unrest (42.86% strongly agree);
- Shortage of electricity (33.33% agree or disagree);

- Decreasing exports (38.1% neutral)
- Secondary mineral resources (33.33% disagree);
- Water recycling (28.57% disagree);
- Depletion of mineral resources (33.3% disagree); and
- Gain-sharing (52.4% neutral).

The findings about what are perceived as challenges in the mining sector, match the literature where mining challenges are enumerated (*Gulls on guard* 2017: 8; Khumalo 2017: 13; Khuzwayo 2017; Mkwanazi 2017: 1; Venter 2017: 2; Meyer 2017: 6; De Haas 2017: 6). The fact that employees lost their jobs during the economic crisis explicates that the situation in the mining sector was volatile. This culminated in the violent killing of protesters at Marikana (Farlam, Hemraj and Tokota 2015: 1-660).

Workers were able to raise their grievances whilst companies argued that the shortage of electricity and the lack of business opportunities affected the productivity and the commerciality of the business products of the day.

Arguably, the economic problem is deepening in SA (West 2017:14). Certain sectors like the mining industry are still facing the aftermath effects even today. Nigeria has entered into another recession due to a huge fiscal deficit for this year and difficulties linked to petroleum import (Carsten 2017: 19; Cokayne 2017: 15 Khuzwayo 2017: 13-14).

After the Marikana dilemma that saw 44 miners killed by police in August 2012 (Venter 2017: 2), things seem to stabilize in SA although the challenges raised were not resolved (Faku 2017: 13). Strikes can lead to tragedy as it happened in Brazil (Cambero 2017: 19; Venter 2017: 2). However, the commodity price fluctuations, inflation and tensions related to unfinished economic emancipation of the black majority and the triple challenge of unemployment (a record of 27.1% in 2017; previously it was 26.6%), poverty and income disparity are some of the threats to the stability in this country; and therefore should not remain unresolved (Khumalo 2017: 13; Mkentane 2017: 1; Motsoetsa 2017: 10; Mtshali 2017: 3; Reuters 2017: 19).

The sceptics, who advocate against mineral beneficiation, always do so in the name of electricity shortage, and forget that alternative source of electricity can be part of a green or renewable energy strategy, and part of the solutions in the long run (Dludla 2017: 10; Mtshali 2017: 3).

6.5.1 Mechanisms in place to overcome mining challenges in SA

The following table shows available mechanisms to overcome mining challenges (Question 3, sub-question 2; Appendix C).

Table 6.9 Available mechanisms to overcome mining challenges in SA

Mechanisms are in place to overcome the following mining challenges in SA

	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Exhaustion of natural resources	5	25.0%	5	25.0%	5	25.0%	3	15.0%	2	10.0%
Protection of domestic markets	5	25.0%	4	20.0%	6	30.0%	4	20.0%	1	5.0%
Protection of local mining firms	6	30.0%	3	15.0%	5	25.0%	5	25.0%	1	5.0%
Reduction in domestic products consumption	3	15.0%	2	10.0%	5	25.0%	10	50.0%	0	0.0%
International disaster management protocols	3	15.0%	3	15.0%	11	55.0%	1	5.0%	2	10.0%

On the question whether mechanisms are in place to overcome the challenges, the following combined scores (agree and strongly agree) were found (as in table 6.9 above):

- Exhaustion of natural resources (50%);
- Protection of domestic products (45%);
- Protection of local mining firms (45%);
- Reduction of domestic products' consumption (35%); and

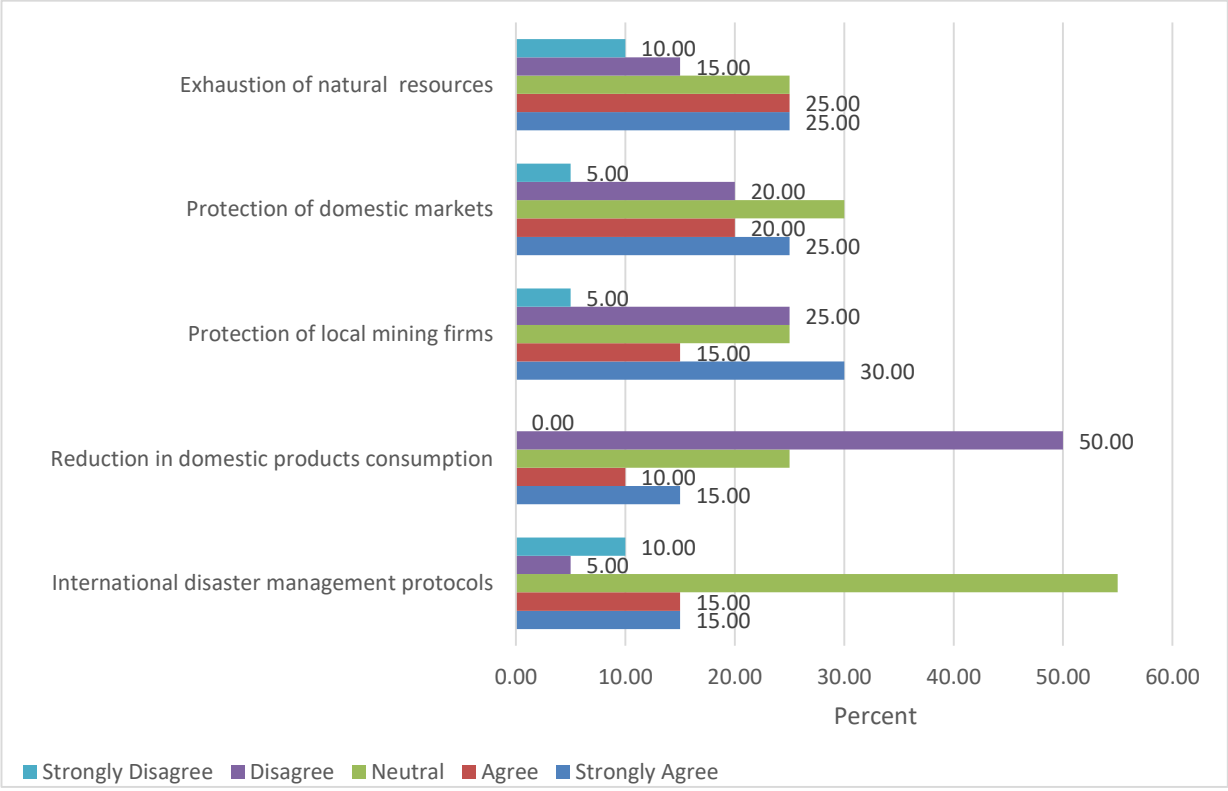
- International disaster management protocol (30%), see Table 6.11 above.

Recycling of both metal and minerals can be some of those mechanisms that help to prevent the exhaustion of other commodities (Isheloke 2013). Mechanisms to support the local market from commercial "predators" are of utmost importance. In addition, one should ask: "how could local mining firms be protected?". Of particular importance to the study is the respect of international treaties and protocols that help shape and reshape the socio-economic landscape affecting the mining sector (Cambero and Esposito 2017: 19).

6.5.2 Macroeconomic challenges the company is experiencing

The information below was obtained in response to Question 3.2 (continued).

Figure 6.7 Macroeconomic challenges experienced by the company



The figure above shows that half of the respondents (50%) surveyed experience problems linked to the reduction in domestic products consumption. Another 55% of the respondents find it difficult to comply with international disaster management protocols. This study mentioned a few international protocols to which SA is signatory *inter alia* The Kyoto Protocol, COP17, and the Paris Agreement (*Fact sheet: The Kyoto Protocol* 2011: 1-8; *Outcome of COP17/CMP7* 2017: 1-18; *Adoption of the Paris Agreement* 2015: 1-32). The rest were scores between 0-30% as shown above (See Figure 6.7 above).

The second point is consistent with Cambero and Esposito (2017: 19) who states that mines are to adhere to environmental protocols; thus alluding to Kyoto Protocol and the Paris Agreement. Interestingly, three different statements scored 25% each about exhaustion of natural resources.

Certain minerals are in huge deposit over many years, others happen to diminish; certain countries have more mineral reserves than others. South Africa is number one in platinum, and the precious metal is a good catalyst to clean-up car emissions (Roelf 2017: 18), Chile has the number one deposit of copper in the world (Cambero and Esposito 2017: 19). Other patterns are also found:

- 20% of the respondents agree that there are mechanisms in place to protect domestic markets; and another
- 20% of the respondents disagree about protecting local mining firms.

6.5.3 Additional challenges the company is experiencing

In response to an open-ended question (Question 3.3; Appendix C):

Are there any additional challenges the company is experiencing?

Suffice is to mentioned that there were no additional challenges, other than those mentioned above.

6.6 FORESEEABLE ADVANTAGES OF BRICS PARTNERSHIP

This section investigates the possibility of putting in place synergies suitable for BRICS interventions in SA in line with the third research objective. In other words, it is about the perceived advantages of BRICS partnership in the SA's economy.

Table 6.10 Foreseeable advantages of BRICS partnership

The following advantages are foreseeable for the BRICS partnership. Rank them in terms of importance (Question 4.1; Appendix C).

	Very Important		Important		Neutral		Not Important		Not very important	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
More sustainable operations	7	33.3%	8	38.1%	4	19.0%	2	9.5%	0	0.0%
Business expansion	7	33.3%	10	47.6%	4	19.0%	0	0.0%	0	0.0%
Expertise complementarity	5	23.8%	9	42.9%	5	23.8%	2	9.5%	0	0.0%
Increased international trade cooperation	10	47.6%	9	42.9%	1	4.8%	1	4.8%	0	0.0%
Better regional integration	5	23.8%	7	33.3%	7	33.3%	1	4.8%	1	4.8%
More profitable mineral trade	9	42.9%	8	38.1%	3	14.3%	1	4.8%	0	0.0%
Better usage of resources	5	23.8%	8	38.1%	6	28.6%	2	9.5%	0	0.0%
Greater exchange of information	10	47.6%	6	28.6%	4	19.0%	1	4.8%	0	0.0%
Better transport infrastructures	5	23.8%	6	28.6%	7	33.3%	3	14.3%	0	0.0%
Mutual developmental dependence with BRIC	3	14.3%	6	28.6%	8	38.1%	3	14.3%	1	4.8%
Increased capital inflow	8	38.1%	6	28.6%	6	28.6%	0	0.0%	1	4.8%
Technological innovation	10	47.6%	8	38.1%	2	9.5%	1	4.8%	0	0.0%
Speedy industrialisation of new zones	7	33.3%	5	23.8%	8	38.1%	0	0.0%	1	4.8%
Price decrease	4	19.0%	4	19.0%	10	47.6%	2	9.5%	1	4.8%
Job creation	16	76.2%	1	4.8%	4	19.0%	0	0.0%	0	0.0%
Better living conditions	13	61.9%	2	9.5%	6	28.6%	0	0.0%	0	0.0%
Economic growth	15	71.4%	5	23.8%	1	4.8%	0	0.0%	0	0.0%

The most important activities foreseeable for the BRICS were found to be:

- Job creation (76.2%);
- Economic growth (71.4%); and
- Better living conditions (61.9%), See Table 6.10 above.

The statements corroborate what the literature contains (Mtshali 2017: 1; Harmse 2017: 17; Dludla 2017: 10; Khumalo 2017: 13). The total score (combined scores) of other (important and very important) foreseeable advantages of the BRICS partnership are as follows:

- Economic growth (95.2%);
- Increased international trade cooperation (90.5%);
- Technological innovation (85.1%);
- Job creation (81%);
- More profitable mineral trade (81%);
- Business expansion (80.9%); and
- Greater exchange of information (76.2%).

The findings above are consistent with the economic theory of beneficiation which links the practice to economic growth and to job creation (De Beers 2014:4; *The beneficiation strategy* 2015: 9-10). Combined scores “very important and important” reveal other interesting information:

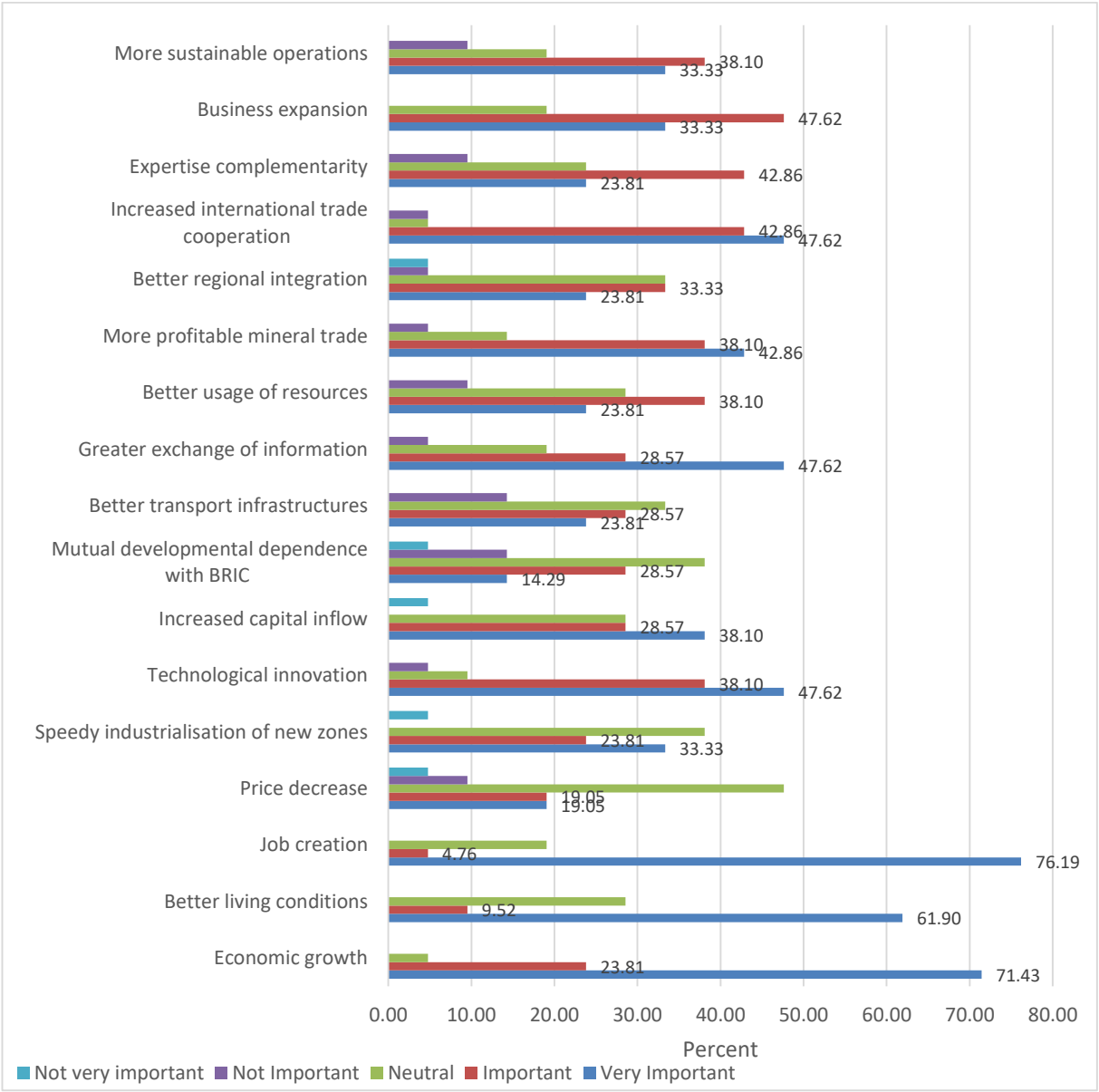
- More sustainable operations (71.43%);
- Better living conditions (71.42%);
- Expertise complementarity (66.67%);
- Increased capital inflow (66.67%);
- Better usage of resources (61.91%);
- Better regional integration (57.14%);
- Speedy industrialization of new zones (57.14%);
- Better transport infrastructure (52.38%);
- Mutual development dependence with BRIC (42.86%); and
- Price decrease (38.1%).

At the bottom of the list, there is “Price decrease” which the respondents also found to be important, in corroboration with qualitative data (Mkhwanazi 2017: 1; Khuzwayo and Mchunu 2017).

6.6.1 Collaboration between BRICS partners could lead to the following

The following figure shows the possible outcome of BRICS collaboration (Question 4.2).

Figure 6.8 Collaborations between BRICS partners could lead to the following



Not even one respondent viewed any of the following statement as “not very important” (See Figure 6.8 above). It means the assertions are alarmingly important to all, and all benefit from activities such as (Faku 2015: 15; VUT 2013: 6; Gordan 2014 cited in Naidoo 2014: 8): more sustainable operations; business expansion; expertise complementarity; increase international trade co-operation; more profitable mineral trade; better usage of resources; greater

exchange of information; better transport infrastructure; technological innovation; job creation; better living conditions; and economic growth.

Previous research indicated that Brazil scored low on support of the market economy (a mere 19%), whereas on industrial development and natural resources respectively it realized 47.6% and 33.3% (*CGTV* 2017).

In agreement to the model which is novel is the BRICS Plus model advocated by the proponents of Sri Lanka, Mexico and Pakistan into BRICS, although SABRICMB does not specify which countries to consider. An open policy going forward may benefit from the activities cited under Figure 6.8 above.

6.6.2 Collaborations among BRICS

The table below shows areas where BRICS countries can collaborate (continued from the question above).

Table 6.11 Collaborations among BRICS

Collaboration between BRICS partners could lead to the following

	Strongly Agree		Agree		Neutral		Disagree		Strongly Disagree	
	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %
Exploitation of miners	3	15.0%	6	30.0%	5	25.0%	5	25.0%	1	5.0%
Increased unemployment rate	2	9.5%	5	23.8%	4	19.0%	7	33.3%	3	14.3%
Decline in domestic mineral products demand	0	0.0%	3	14.3%	9	42.9%	7	33.3%	2	9.5%
Introduction of non-democratic systems	0	0.0%	3	14.3%	7	33.3%	9	42.9%	2	9.5%
increased environmental mining disasters	1	4.8%	4	19.0%	5	23.8%	9	42.9%	2	9.5%
Initiation of conflict or war	0	0.0%	3	14.3%	8	38.1%	8	38.1%	2	9.5%
Increased Illegal migration of miners	1	4.8%	5	23.8%	5	23.8%	9	42.9%	1	4.8%
Increased failure to cooperate internationally	0	0.0%	4	19.0%	7	33.3%	9	42.9%	1	4.8%

The consequence of SA BRICS' involvement can be interpreted in different ways. Here are the views of the respondents on the issue ranked in terms of "strongly agree and agree" combined:

- Exploitation of miners (45%);
- Increased unemployment rate (33.3%);
- Increased illegal migration of miners (28.6%);
- Increased environmental mining disasters (23.8%);
- Increased failure to co-operate internationally (19%).
- Decline in domestic mineral products demand (14.3%);
- Initiation of conflict or war (14.3%);

- Introduction of non-democratic systems (14.3%), combinations derived from Table 6.11 above.

These scores are low in general because more respondents disagreed with statements whether the assertions present a danger in the future. However, the highest fear is that miners could be exploited (45% of the respondents think so) in the midst of BRICS' involvement in the SA mining sector. Other projections are a cause of concern although they scored very low. These include the decline in international cooperation (according to 19% of the respondents).

This can be exacerbated by the current Trump's administration which not only opposes international (transpacific) trade, but also threatens to stop the emerging Chinese global trade effects by signing controversial treaties, tweeting and causing chaos, in disfavour of the BRICS agenda and the World Trade Organisation tax reforms (Stoddard 2017: 16; Bergin and Morgan 2017: 19; Harmse 2017: 17). The importance of international trade cannot be overemphasised as foreign trade and investment have the capacity to offset the problems that hinder the economy (Reuters 2017: 13).

If the rapprochement with Russia is envisaged, why then the provocation to China is mounting? Recently, even the Australian Prime disagreed with president Trump (Washington Post 2017: 2).

There have been a number of disasters hitting the mining sector internationally and even in SA (Mathunjwa 2017: 1-5). A combined score of "strongly disagree and disagree" would give a clear picture of the disagreement in question. The highest negative combined scores of 52.38% were increased environmental mining disasters (52.38%) and introduction of non-democratic systems (52.38%). The following negative answers (combined) scored the second highest (47.62%) each increased unemployment rate; increased illegal migration of miners; initiation of conflict or war; and increased failure to cooperate internationally.

in addition, the public-private partnership can be beneficial in job creation endeavour and for FDI (*2017 State of the Nation* 2017). Illegal migration is a fact in SA, and has been triggered in the old dispensation by the apartheid regime. This is why in the past miners came from places as far as Malawi, Zambia and Namibia to work in SA (Mathunjwa 2017).

6.6.3 Improvement in mineral trade conditions

The answer to an open-ended question provided the information below (Question 4.3).

What improvement in mineral trade conditions do you foresee now that South Africa is a BRICS member?

It emerged that most respondents didn't think that the involvement of SA in BRICS had any bearing whatsoever with the improvement of mineral trade conditions. Some respondents thought the question was not applicable (9.5% of the respondents) while others said nothing about it (28.6%).

6.6.4 BRICS partnership should benefit African countries beyond SADC

The information below was obtained in response to an open-ended question (Question 4.4; Appendix C).

How should BRICS partnership benefit African countries beyond the SADC region?

A total of 28.6% chose not to express their views on this question. Where suggestions were given, the score was very low and all different at a frequency of one. Almost 10% decided that BRICS benefits were not applicable beyond the SADC region.

6.7 ADDITIONAL COMMENTS WITH REGARD TO BRICS INVOLVEMENT IN MINING

This was the last question in the questionnaire (Open-ended type of question; Question 5, Appendix C).

Is there any other comment with regard to BRICS involvement in the mining sector in South Africa?

The majority of the respondents indicated a negative answer to this question (47.5%) while 33.3 % left the answer sheet blank. Where suggestions were given their scores were very low; and therefore insignificant. All values without an * (or p-values more than 0.05) do not have a significant relationship (See further down in section 6.2.8). A few viewed the BRICS involvement as a risky one. This corroborates the theory of trust, risk and uncertainty (TRU) used in this study and which emphasises the need of understanding TRU in forging strategic alliances (Nickel and Vaesen 2012; Horn 2012: 1-7; Mkrtchyan 2010; Nielsen 2017; Coleman n.d: 3).

6.8 CORRELATIONS

Bivariate correlation was also performed on the (ordinal) data. The results are found in Appendix G: correlations (extract). The results indicate the following patterns:

Positive values indicate a directly proportional relationship between the variables and a negative value indicates an inverse relationship. All significant relationships are indicated by a * or ** as in the Appendix G. Below are significant values and their relationship. In this analysis asterisks have been removed.

For example, the correlation value between “In-country cutting and polishing of mineral” and “Making craft jewellery or ceramic pottery” is 0.539 (See correlations in Appendix G). This is a directly related proportionality.

Respondents indicate that the more cutting and polishing done in-country, the more craft jewellery or ceramic pottery would be made, and vice versa.

It was also found that the more “Monetary incentives” are given the higher the chance of the same organization to invest in “Organizing mining skills training”. The correlation is 0.766.

** The correlation is significant at 0.01 level (2-tailed) and * correlation is significant at 0.05 level (2-tailed) as indicated in the tables appended (Appendix G).

There is a direct relationship between “Doing beneficiation by hydration” and “Making craft jewelry”. The more beneficiation by hydration is allowed, the greater are the chances for “Making craft jewelry”. The correlation is 0.504.

Equally so, there is a positive relationship between “Mining exchange programme with BRIC” and “Mining projects”. The correlation value is 0.793. The more mining exchange programme with BRIC are promoted, the better it is for the overall mining projects in the country.

The correlation value between “Collaborative synergies” and “Exhaustion of natural resources” is 0.566. There is a direct relationship between the two variables. The more collaborative synergies are put in place, the greater the chance to avoid speed exhaustion of natural resources in the land for example through Monitoring and Evaluation.

More importantly again, there is a positive relationship between “More profitable mineral trade” and “Job creation”. The correlation value is 0.515. The more profitable is the mineral trade, the higher the number of jobs can possibly be created in the industry. There is therefore a direct relationship between the two variables.

There is a positive relationship between “Increase in international trade and cooperation” and “Economic growth” (0.514).

There is a positive relationship between “Job creation” and “Economic growth”. The correlation value between the two variables is 0.887. The more jobs are created, the higher the economic growth in the country will be, and vice versa.

Negative values imply an inverse relationship. That is, the variables have an opposite effect on each other. That is, as one increases, the other decreases.

For example, the correlation value between “Local grading of mineral” and “Funding allocations” is -0.821. That is, the more funding, the less grading takes place locally, and vice versa. The correlation value between “Organising mining skills” and “Funds allocations” is -0.488. The more mining skills available, the less funding allocated for training purposes.

The correlation value between “Protecting the physical environment” and “Funding allocations” is -0.552. That is, the more emphasis is put on protecting the physical environment, the less funding will be needed to repair environmental problems, and vice versa. More correlations and Chi-Square test are found respectively in the Appendices G and H.

6.9 QUALITATIVE DATA

Interviews were conducted by the researcher himself with BRICS directorate officials in SA, Government representatives at the Department of Mineral Resources and Chamber of Mines management representing mining companies. In total eight officials were interviewed out of ten initially scheduled; that is five from the BRICS Directorate in the Department of International Relations and Cooperation (DIRCO), two from the Chamber of Mines and one from the Department of Mineral Resources. It amounts to an 80% response rate (Qualitative data). Interviews allow textual information to be gathered to support the literature and the findings (The University of Texas 2012: 3). Themes coding and generation took place through the use of Excel spreadsheet. Each interviewee was assigned a number and the order was not in sequence. This allowed to hide and protect the identity of the participants in data presentation, analysis and reporting.

A content analysis of qualitative data was conducted and aimed to developing new concepts (Gough, Oliver and Thomas 2017: 2). The researcher grouped important and recurrent concepts in themes. This eventually led to a thematic analysis of recurrent themes. The thematic analysis allowed the researcher to engage with the data corpus applicable to the study and was aimed at reducing the amount of data (Ruggunan n.d). Data corpus for this qualitative part of the study consisted of semi-structured interviews (one-on-one in-depth interviews), online information, books and reports, notes taken at conferences and training sessions as well as specialist advice. Themes were grouped for paraphrase, in most instances, rather than quoting *verbatim*. This is in corroboration with Anderson (2010: 3) who suggests a selective approach to using quotes from interview data. According to Casterle *et al.* (2011: 2), it is not easy to transcribe the narrative interview.

Themes were organised in data sets. For example, data set one was all my in-depth interviews, data set two was information from the literature and data set three was other information (notes, training sessions, etc.). Where necessary the theme group name is specified. Only discussed group names of themes are in bold. The findings are compared to quantitative results further down. Important themes are discussed further down.

6.9.1 Mineral beneficiation

According to a participant: “there should be beneficiation of our minerals” (Interviewee no. 4) and beneficiation is South African government’s policy (Interviewee no.5). This finding corroborates Eunomix (2012: 3). Mineral beneficiation is to be looked at both as downstream and upstream beneficiation because they both have a positive impact on the economy (Interviewee no.6). Mineral beneficiation must be approached gradually and responsibly (Interviewee no.5). It is important for companies operating in SA to follow the policies in place but the government should do more on the matter. Whereas local beneficiation was repeatedly recommended, seldom were the instances where participants spoke about or alluded to continental beneficiation. Beneficiation is about value addition but when not planned its

impact on energy demand and job-creation can be arguably questionable (Tom 2015). This is in agreement with the literature (Baartjes 2011; Department of Mineral Resources 2011; Faku 2015c:5; Mungoshi 2011).

> *"Beneficiation is very critical to unlock our economic potential and is essential in our economic policies. In addition, beneficiation is critical to SA developmental agenda aimed at alleviating poverty and unemployment" (Interviewee no. 3).*

The finding above matches the concept of economic theory of beneficiation (De Beers 2014: 4). In addition, themes relating to trade are discussed below:

6.9.2 Trade

Domestic and international trade were found to be contributing to economic gain. Africa however needed to develop its markets at regional level for example to avoid uncertainity. A participant exclaimed: "selling raw materials without beneficiating them in our own country, it has never helped us, it has never helped Africa" (Interviewee no. 4). However, the influence of WTO is not always helping SA in particular and Africa in general, especially on beneficiation practices. At times, countries are forced to export their raw material lest they find their commodities declared unwanted or in certain instances they are summoned to international tribunal by the WTO where it is believed that a regularised open trading system benefits the economy more (Reuters 2017c: 6). Watson and Moran (2005), Grossman and Horn (2012), Coleman (n.d), Nickel and Vaesen (2010) Mkrtchyan (2010) and Nielsen linked the issue of trade to trust, risk and uncertainty (TRU).

6.9.3 Information Technology

Information technology related themes included:

- Cutting edge technology;
- The fourth industrial revolution;

Information Technology was perceived to be the way to go and was one of the key issues in the last BRICS summit (Interviewee no. 4 and Interviewee no.7). This finding verifies what is known in the literature as BRICS initiatives (5th BRICS summit 2013). Africa in general and arguably (the rural part of) SA are lagging behind on Information Technology and Communication (ITC). It is important to note that the government seeks to develop the infrastructure (Fabricius 2013a). This will pave the way for SA to embrace the fourth industrial revolution head on. "The role of technology in BRICS is important because now there is an acceptance that we are moving towards the so called e-commerce" (Interviewee no.4). Pickering and Porter (2014: 52) agree with the interviewee no.4. Last but not least, other themes related to the economy and the challenges thereof emerged as given below:

6.9.4 Socio-economic impact of BRICS and mineral beneficiation

A number of challenges were identified for BRICS involvement in SA including the issue of equity among the members. It was felt by a few that the influence of China is too much. Xi (2013) elaborates on how influential China has become. Furthermore, the burning issue in SA is that of economic transformation. All the participants agree on this one (Interviewee 1 to Interviewee 8). There was a feeling that the country needs to do more beneficiation gradually and responsibly (interviewee no. 4 and interviewee no.5).

Other challenges included the legacy of apartheid and the fact that SA has only one major State Owned Enterprise (SOE) in the mining sector (Interviewee no.5). Ebola and Zika were categorized as not a threat in SA mining but Silicosis, HIV/AIDS and TB. This finding was in contrast to what the international community believes on Ebola and Zika perceived as threats to peace and security of the world (Chan 2014; United Nations 2014). However, preventative measures are in order and more Health Excellence Centres are needed to counteract such pandemics should there occur, or in the future to help countries in need (Interviewee no.5).

On the issue of migration in mining, immigrants used to be recruited from countries as far as Malawi to work in the mines, and this at times had a home-breaking impact and was the cause of other social ills (Interviewee no. 5). Research has shown, however, that refugees and foreign nationals contribute to the economy.

During a discussion with delegates at Pietermaritzburg Provincial Parliament aimed at public participation in the business of the House (under Appendix F), it was emphasized that what SA needs is an integrated approach to public-private engagement. The bottom-up approach wants the leadership to consult with the grassroots or seek their approval and engagement before action (Bond 2013; Bond 2015); and the top-down approach advocates the leadership should take control and lead by example. In the context of SA though, delegates were warned that the public can be politicised or instrumentalised for narrow political gain. On the other hand, the politicians are not immune to corruption (Bond 2014a; Bond 2014b). Therefore, an integrated approach should be the way forward.

6.9.5 Addressing biographical and general information

The following table presents the interviewees' biographical data for three national organisations or national departments that were part of the population:

Table 6.12 Participants' biographical data for interviews

Qualitative Sample size	Gender	Participants or non-participants	Percentage	Number of organisations represented	Longest employment
N=10 n=8	**Absentees**	2	25%	3	30 years
	Male	6	75%		
	Female	2	25%		
	Response rate	8	80%		

Source: Self-generated

It emerged that 75% percent of interviewees were males, that is six out of eight participants (Table 6.12). N=10 stands for the sample size and n=8 is the successful interviews. Interviewees were blacks and whites and were all adults. There was no indication suggesting that gender, race or age influenced the manner in which participants responded. The interview schedule provided answers to three specific questions as discussed below:

6.9.5.1 How long have you been working in this organisation and in what capacity?

As is evident from the question above, there are two components to the question. The first part addresses the duration in the organisation and the second poses the question of capacity. Three organisations took part in the study for interview purposes. Of the respondents, the longest stay in the organisations was in the range 25 to 30 years. The second longest employment was eight years while the shortest was a period of five months.

On the capacity part of the question, it emerged that participants occupied specialist positions in their respective organisations, were experts in the field or employed at different leadership positions. This is congruent to the desiderata of this study which seeks, amongst the other things, to look at leadership issues within the BRICS partnership. The study was designed specifically to reach out to people in leadership position of the targeted organisations. A total of 50% of the respondents were employed at directorship position (Director or Deputy Director). Suffice it to say that participants were South African both black and white.

6.9.5.2 Transformation

In the public sector, transformation has taken place to some extent. Transformation is however seldom happening in the private sector despite the promulgation of` Employment Equity Act almost 20 years ago under the new dispensation. In the report published by the minister of labour (Mr Mildred Oliphant), facts demonstrate that white people occupy 72% of top management positions in the private sector. Black people (including coloureds

and Indians) in top management positions improved by a mere 0.8% and 1.1% increase was noted for women representation at this a decision-making managerial level. The private sector is thus accused of refuting transformation efforts by the government. In contrast is the situation in the public sector where 73.2% of top management jobs are those of blacks. The allegation of reverse discrimination vis-à-vis the politics of affirmative action is not new against the government of the day, emanating from the minority (previously advantaged) communities (ANA 2017: 3). The plight of women in the industry is another disparity requiring transformation.

6.9.6 What is the role of your organisation or department in mining policy-making?

6.9.6.1 Mining policy

66.7% of the respondents were involved with mining policy at one stage or another. Of the respondents, 37.5% of the interviewees worked for an organization concerned with mining policy implementation. It was held that there is no common policy for BRICS partners even on mineral beneficiation issues (Interviewee no.1 and Interviewee no.3). They represented 62.5% of the respondents. BRICS is relatively new, and that is why each and every member country operates according to the laws and regulations specific to its jurisdiction, and more so according to own national mining policies. This presages the need to develop a model suitable for international trade and cooperation within the BRICS in the mining sector. This is consistent with Zhenbo (2013) who suggests that it is too early to disqualify the BRICS for anything, despite criticism by the sceptics. Similar patterns are presented hereafter:

- We are the custodians of SA foreign policy implementing, communicating and coordinating; or
- As custodians, we inform the policy making or policy formulation (Interviewee no.1 and Interviewee no.8).

6.9.7 How do you see the influence of BRICS partnership in the mining sector?

6.9.7.1 The BRICS

Major themes or topic discussed at this level scored very low as far as the frequencies are concerned. However, appealing questions were raised and relevant issues were discussed. These include statements as follows:

- We don't know what the future hold for BRICS;
- Areas of cooperation for BRICS have increased over the years;
- BRICS countries are all resource economies (Interviewee no.6);
- Mining deals are not finalized among the BRICS; and
- China does assets investments but does not invest in procurement. And this is perceived as too bad (Interviewee no.7).

Bond (2013) and Bond (2014a) are generally pessimistic about the BRICS in agreement with the discoveries above.

6.9.7.2 Minerals in BRICS

Minerals such as uranium, coal, oil and gas had a low frequency score. It was noted with regret that although the BRICS seeks to innovate, certain companies are frustrated in the process. Russia has also oil and gas. South Africa and India are rich in minerals just as China, Russia and Brazil are. The last is also rich in petroleum and this is an advantage to the partnership (Interviewee no.5). Zhenbo (2013) seems to disagree with these findings citing how these countries differ to the detriment of the partnership. Minerals in the BRICS countries were extensively reviewed (*BRICS joint statistical publications* 2013: 189-190; Llewellyn, Rae and Thompson 2014; Van der Merwe *et al*. 2013: 37).

6.9.8 Exploring the influence of BRICS in mineral beneficiation in SA

6.9.8.1 How effective are the current mineral beneficiation policies or practices?

6.9.8.1.1 Continental beneficiation and WTO interference

In general, it was established that the current beneficiation policies are not very effective in SA. A number of reasons could explicate this, of which the major one is international and national (external and internal) interference to discourage mineral beneficiation practices (Interviewee no.5). This is consistent with what 25% of the respondents explained. On the other hand, all the respondents were of the view that mineral beneficiation is needed (100%), except one who thought it must be approached with reservation. Another one had a continental approach or rather a pan African approach to beneficiation. The latter respondent mentioned that not only does the exportation of raw materials not benefit SA, it also doesn't benefit Africa at all as a whole (Interviewee no.4). This, the very respondent added, has been so ever since the time of colonization.

6.9.8.1.2 Globalisation and beneficiation

As a striking part, a respondent stated: "Global political environment is not good for beneficiation. This summarises the effects of globalization on mineral beneficiation. Our minerals are not only geared towards the BRICS countries" (Interviewee no.5). CGTV (2017) would disagree with this finding favouring instead globalised deals, and states that there is nothing wrong with globalisation. A gradual and responsible beneficiation, promoting both downstream and upstream beneficiations in the midst of globalisation is advocated in SABRICMB model as a result of this study.

The need to distinguish between the different categories of beneficiation was emphasised, of which the major one is about value addition (or the enrichment of minerals; Interviewee no.6). Of the major themes derived from the statements, five were about the types of definitions. "Beneficiation = value addition = mineral processing = mineral enrichment". This definition was

consistent with Mungoshi (2011); Baartjes (2011) and Department of Mineral Resources (2011) and is the consistent with the economic theory of beneficiation (De Beers 2014: 4).

6.9.8.1.3 European Union versus BRICS

Other themes demonstrated that BRICS is different from EU, SADC, WTO and other regional, continental or global organizations (Interviewee no.5). Several themes focused on EU, raw materials or mineral resources in Africa. In this respect, the following headings reverberated:

- The EU raw material policies are specific;
- The EU approaches the WTO to force countries to open up to raw materials sale if these countries opt for mineral beneficiation;
- The EU refuses processed minerals despite our will as a result BRICS countries are concerned; and
- The EU versus SA needs must be considered before any deal (Interviewee no.5).

6.9.8.1.4 BRICS as a unique alliance

BRICS is a unique alliance of emerging economies. This is in agreement with Zhenbo (2013). In BRICS affairs, it is the president's prerogative to determine what will be the way forward, although he can be guided or advised by experts and officials provide guidance on the matter:

- We should join the BRICS committee, and the president has made that determination; but
- We practically do all that has to do with equipment;
- We have been invited to become the core member.

6.9.8.1.5 State Owned Enterprises

Compared to other BRICS countries, the government of SA owns very little in terms of States Owned Enterprises (SOEs) estimated to be over 700 in general, but in the mining sector, only one major mining company for SA which

is not of course comparable to your bigger companies such as Lonmin, Glencore and others in size and value (Interviewee no.5). The fact that SA as a mixed economy privileges the capitalist market economic system could explain, if need be, the privatization of the majority of undertakings: “The government does not own a factory”. This is consistent with Zhenbo (2013) who surmises that SA is the smallest of the BRICS economies.

6.9.8.1.6 Consumer versus producer countries

The following issues were raised:

- BRICS strategy preparation is important (Interviewee no.1, Interviewee no.2 and Interviewee no.3);
- The Republic of SA is number one in mineral processing;
- We would like to benefit more from our minerals;
- Raw materials don't add value if not processed nationally (Interviewee no.4 and Interviewee no.8);
- Mineral mapping by individual states; and
- Consumer countries are Japan, South Korea, the EU, USA and they have their own mining policies (Interviewee no.5).

In SA, the government has made sure certain departments deal with certain works while others focus on the rest. This was indicated in this statement: “We deal with the scientific part, the technical part of mining. And others deal with trade and industry issues.” This presages a smooth running of mining affairs but Bond (2014a; 2014b), in contrast with that finding, is of the opinion that SA mismanages mineral wealth. Tom (2011) is consistent with the finding according to which SA is number one in mineral processing and goes further to suggest it is the richest country in terms of mineral value deposits estimated to be two and a half trillion US dollars. Other researchers suggest the DRC has the most diverse range of mineral resources, except in this case the resources are under exploited and remain potential.

6.9.9 How can we involve the BRICS partners in promoting local mineral beneficiation in South Africa?

6.9.9.1 Bilateral versus multilateral agreements

It emerged that cooperation was key in involving other BRICS partners in SA. Prior to the meetings, partners are aware that they need to weigh their strengths and weaknesses vis-à-vis their counterparts, before engaging in bi-laterals, tri-laterals, and quad-laterals (Interviewee no.5). One way to do this is to conduct a SWOT-analysis as alluded to by a respondent. A SWOT analysis could help address the lack of capacity for smooth beneficiation practices, and bring them to the attention of other partners. This is in line with the SWOT-analysis performed with regard to BRICS based on Jones (2012). The following examples depict what had happened in the past:

- A MoU Russia-SA on PGM & Palladium was signed;
- In 1977 India SA signed a MoU;
- The EU has gotten in place on emission Euro-standards whereby cars are to be adapted to those standards; and China & SA diamonds works happen to be a reality now (Interviewee no.5).

The latest summit in China is testimony to the above (FP staff 2017). Cooperation could be about the green economy and what interventions are needed in order to achieve that. The previous MoU with Russia allowed to exchange on the new uses of minerals in the advent of new technologies. A participant stated that: “Overtime, technology improves, you receive your minerals and if they are of no use anymore you get into trouble” (Interviewee no.5).

6.9.9.2. The New Development Bank and beneficiation

The role of the BRICS Bank: “the NDB is to fund projects”; and “money is needed”. In summary, themes emerged in response to the question on beneficiation:

- Beneficiation is a key target;
- Beneficiation of coal includes old uses and new uses of minerals;

- Beneficiation target sets are not achieved;
- Mineral beneficiation is capital intensive; and
- Mineral beneficiation has to go hand in hand with Infrastructure development.

In view of the above, the implication of the NDB funding beneficiation practices will have a lasting impact on the economy. This finding corroborates the views of Fabricius (2013a; 2013b) and Naidoo (2014b: 52) who confirm SA's investment in infrastructure.

6.9.10. What need to be put in place to develop a BRICS friendly mineral beneficiation system in South Africa?

The importance of having continuous bilateral and multilaterals meetings was stressed out during the interviews. In addition, capacity building came to the fore as a need: "What they know we should also know in order to move together" (Interviewee no.8). The SWOT-analysis and the PESTEL-framework developed with BRICS in mind identified areas where training would be necessary (Jones 2012; Nickels, McHugh and McHugh 2016: 206).

6.9.11 What is the role of cutting edge technology in mineral beneficiation processes?

6.9.11.1 The impact of technology

It was established by all (100% of respondents) that cutting-edge technology is technically the future, Interviewee no.7 added that it is the way to go and nothing can help the country compete internationally more than embracing IT or Information, Communication and Technology (ICT). As to the question on how far to go with the beneficiation, rest assured by this:

- The key thing is that you don't want an overflow or an underflow; and
- There always have to be a quota or a limit in terms of how much is done and in which country (Interviewee no.7). This is consistent with the SABRICMB model which advocates for gradual and responsible

beneficiation. Authors such as Pickering and Porter (2014: 52) and Kotze (2014: 4) also address the challenge posed by IT.

6.9.12 What suggestions for improvement of cooperation do you have for a better BRICS intervention in mineral beneficiation?

6.9.12.1 Policy and competition

It was suggested that there is a need to set a limit in policies; allow equal competition; and enforce the habit of treating each other equally. Other statements were uttered including:

- We need policies that prevent the exploitation of one country by another; and
- The balance thread will lead to better partnership (Interviewee no.4 and Interviewee no.8).

During bilateral or multilateral meetings, the issue of policy framework which is very important should be discussed. Multilateralism is being advocated for by China (Moeller 2017). Corradi and Verzelloni (2010); Notshulwana (2012: 1-8) and Mazenda (2016) are a testimony to the need to synergise for policy coordination.

6.9.13 Identifying the challenges and exploring possible outcomes of BRICS influence on mineral beneficiation in SA

6.9.13.1 What are the major challenges the mining sector is currently facing in South Africa?

6.9.13.1.1 Challenges in SA are:

- Rich-poor disparity;
- BBBEE is important;
- Beneficiation;
- Marikana massacre was terrible;
- More needs to be done in mining;
- The mining industry: you cannot separate it from our history; and

- Stop the Ebola virus from where it is emerging.
- Help the people who are already affected by the virus (Interviewee no.1, Interviewee no.2, Interviewee no.3, and Interviewee no.4).

The challenges above and suggestions on how to deal with them are consistent with many authors' views (Bond 2013; Bond 2014b; Chan 2014; Jones 2012; United Nations 2014; Solomons 2014: 28; Van Agtmael 2012: 76-79).

6.9.13.1.2 The legacy of apartheid in mining

A very difficult history, the legacy of apartheid, is so much visible in all industries and the mining sector is thus not immune to it. It emerged that: "We have mining as a destabiliser in terms of moving people from the places of origin" (Interviewee no.5). Mine workers were recruited from SADC countries and their human rights were violated. In most instances, the removal of the spouse was a recipe for future broken lives. In addition, mine workers were exploited in their work environment (Interviewee no.5), and that is why companies are expected to take account of the history, and engage in community upliftment activities as an attempt to redress the situation. Mine workers living conditions is an indication of poverty in which they live. The conditions of pay back then and the ever-present conflict between unions (AMCU today and others) caused disruptions in the industry. Bond (2014b: 192-215) explains the divisive nature of unions. For effective mineral beneficiation activities to take place, the cited problems must be resolved to a greater extent.

About the socio-economic impact of mining activities and the challenges thereof: it was explained that the mining sector has the potential of employing more people; and in fact, it is the sector which employs most people in SA. However, mining has also the potential of shedding jobs. For example, the gradual mechanisation of mines, advocated by some industrialists, implies that workers are going to be laid off in the future (Interviewee no.5 and Interviewee no.7). The reviewed literature supports to some extent this view (Pandare

2012; Muthumani 2010). One then is led to ask: do mining companies try to escape their social responsibilities?

6.9.13.1.3 Commodity markets

South African platinum is being sold to foreign countries and this impacts negatively on beneficiation activities. It was in addition argued that, the fact that the producers of minerals do not set the commodity price, economic logic is being defied, and the impact of price abuse prompts the demand in favour of beneficiation in SA (Interviewee no.5). This is in contrast to the assumption that exports lead to economic growth (Thirlwall 2016). Other research indicates that manufacturing regions exposed to China's imports were losing extensively in jobs and earnings, thus affecting the poor (Reuters 2017:6).

6.9.13.2 What can be done to stop Ebola virus from entering local mining industry?

6.9.13.2.1 Health issues

Ebola and Zika have been discussed with all eight participants (100% interest on the topic), although 25% at least thought the two epidemics were not a concern for the South African mining sector (for example Interviewee no.5 and Interviewee no.7). The following were the striking statements about Ebola or Zika in general:

- Ebola and Zika are not a threat or struggle to the mining sector in SA. It was said that there was no impact to SA of those pandemics;
- Ebola/Zika would require the society to raise awareness so that the People should be able to look after themselves;
- The government is therefore being responsible doing through initiatives of that nature;
- Inspection at the border can help a great deal (Interviewee no.5 and Interviewee no.8).

Although arguably true that the mining industry in SA suffers specifically from HIV/AIDS and TB and not from Ebola/Zika threat, efforts needs to be taken

preventively to ensure not only the epidemics do not have a chance to strike SA (Interviewee no.5 and Interviewee no.7) but the rest of the world.

BRICS helped in fighting dangerous pandemics such as Ebola and Zika viruses (Yanzhong 2017). It is worth noting that the BRICS were not indifferent to Africa during the Ebola pandemic. Russia and China for example helped to fight Ebola, according to Interviewee no. 4. This is consistent with Mohaghan (2016) and Yanzhong (2017) who found the same. It is Russians who invented an anti-Ebola Vaccine tested in Guinea (Mohaghan 2016). It was held that BRICS Health Centres for excellence (for terrible diseases) were needed in Africa as the continent has just a few; and SA has only one (Interviewee no.4 and Interviewee no.5). The literature reviewed covered most of the issues on Ebola (Chan 2014; United Nations 2014).

6.9.13.3 What can be done to improve intra-BRICS communication in order to bridge the language gap?

6.9.13.3.1 The language dilemma

It was generally acknowledged that there is indeed a language gap, a language challenge among the BRICS countries whenever meetings take place. This is consistent with the views of Esperanto speaking intellectuals as communicated by their leader Corsetti in an email (Pers. comm. 9 September 2017). The following are attempts to palliate the above-mentioned language gap given by participants:

- BRICS will have a Memorandum of Understanding (MoU) on joint BRICS website to be launched;
- BRICS countries have a special way of communicating among them;
- BRICS has many cultural agreements inter-BRICS including a language policy;
- South African government makes use of different languages for official duties (Interviewee no. 1 and Interviewee no.5).

The language issue is not foreign to the mining sector. Slang and Fanakalo are some forms of communications used in the mining sector in addition to the national languages of SA (Greeff 2016). “Effective communication can actually be useful, for example in order to promote “Expertise exchange for miners' protection in the sector” (Interviewee no.4). According to a participant (Interviewee no. 4; Interviewee no.8):

- We should learn our (African) languages;
- Some people do not want to learn our African languages;
- Learning each other’s languages is good;
- We will learn Mandarin as part of the bigger effort; and
- Language helps to know others.

They were cognisant of the fact that both SA and India use English as a primary language of communication in official meetings. It was recognised that before SA could engage Russians, the services of interpreters (or translations) were required. Over 6000 languages are classified in the world and the advantages of multilingualism outweigh the disadvantages (Bocks and Mheta 2014). A neutral language should serve as a medium of communication for organisations or among people of different mother tongues (Despiney 2017) such as BRICS in order to bridge the language gap. However, the African Union is of the view that African languages such as Swahili should take the lead. Other aspects relating to communication were recurrent and are discussed below:

6.9.13.3.2 Communication

In general, it was noticed that Mandarin is being promoted in SA (Interviewee no.5; Interviewee no.8). A few participants thought there was a need to diversify language usage (multilingualism) in line with the constitution of SA. There were a few complaints suggesting that the BRIC should also express interests in African languages or at least be courteous about indigenous languages. The services of interpreters in BRICS meetings were appreciated. A few participants seemed to think it’s all the partnership can do. Esperanto in

BRICS-countries members, i.e Corsetti, disagree with the statement above and would propose a neutral language for inter-BRICS communication at least as an experiment (pers. comm. 1 September 2017). The SABRICMB model proposed herein encourages research/experiments.

6.9.13.4 What are the challenges in terms of mineral beneficiation?

6.9.13.4.1 Challenges

A number of challenges were highlighted by the participants. In an email communication, the Director Bond of the Civil Society of the University of KwaZulu- Natal, stated that beneficiation is a challenge because of the demand in electricity it poses (Pers. comm. 7 February 2015) and the issue of common policy which for BRICS is currently non-existent (Interviewee no.3), although it is factual that the policies in other BRICS countries do have an influence on mining projects. A few participants stated that engagement beyond the BRICS should remain the main priority for SA (25% of the respondents only). "We should always be mindful that BRICS is quite new, six or seven years old" (Interviewee no.4; Interviewee no.5); stakeholders need time to address BRICS new development proposals. This is in agreement with what the literature posits on the newness of BRICS (Jones 2012; Vickers 2013).

6.9.13.5 What interactions do you foresee in the near future involving the BRICS partners?

6.9.13.5.1 The issue of raw material and beneficiation

It is in an attempt to deviate from the status quo that African leaders want to introduce changes affecting the raw material procurement and mineral beneficiation. The issue of local beneficiation was brought to the fore although at a lower frequency again. Even worse, the issue of continental beneficiation was only alluded to and not discussed. It was suggested that more needs to be done as far as beneficiation is concerned. Otherwise: "It will only become a cycle and cycle of others using our materials" as one respondent put it (Interviewee no.4). Another participant said that: "negotiation with all our partners should take place, including with

BRICS partners so that they will beneficiate mineral products inside SA" (Interviewee no.8). The mixed theory reviewed in the literature can explain the predicaments of the responses above (Jones 2012: 27; De Beers 2014: 4).

6.9.13.5.2 Transatlantic trade

The USA though remains one of the biggest trade partner for China. In addition, at a very low frequency, the following needs were identified:

- A 'quad-lateral' instrument is needed or a MoU;
- Commodities to strengthen BRICS relations;
- We need to look what are the challenges for the continent;
- Pursue it with much more partnership;
- Interaction is key for any country to remain competitive;
- This is cross cutting sectors including DTI, national treasury, and energy (Interviewee no.5).

Proving the "Importance of BRICS" in international trade and co-operation. Such bi-lateral, multi-lateral or quad-lateral agreements involving the BRICS are however challenged by the current administration in the United State of America (USA) as President Trump plans to stop Trans Pacific trade deals and the dominance of China in international trade and co-operation (Jones 2012; *Sino-Indian cooperation* 2016; Xi 2013).

6.9.13.6 What effects of BRIC's interventions do you foresee on mineral beneficiation in SA?

6.9.13.6.1 Silence and other matters

37.5% of the respondents did not answer the question posed above except to say: "No comment". The variety of responses was obtained by interviewing participants. A few indicated that there is a possibility of synergies among the BRICS on the issue of beneficiation: "We need to engage internally, and structurally to make sure beneficiation happens; and we will need investment and expertise from all member countries. Stakeholders should continue to share ideas but also be allowed to become competitive in the beneficiation

space (Interviewee no.5 and Interviewee no.7; Interviewee no.8). If any challenge arises, then BRICS leaders and support mechanisms in place should address them. The different BRICS fora, think tanks and commissions can help the partnership in this regard (Interviewee no.4).

However, a number of challenges were still identified including the size of the block: “BRICS is a huge market, a huge block with a lot of people”; and the fact that at this an embryonic phase, engagement with the Department of Trade and Industry (DTI) is key (Interviewee no.5). Realistically, and perhaps arguably, a respondent said: “I can’t project the effects for now” (Interviewee no.5). Other research revealed that for one percent increase in trade openness, there is a 1.23% productivity growth (Reuters 2017: 6). This is in keeping with the theory of oligopolistic markets advantages known to be the economies of scale, superior IT and knowledge (Lung 2015: 21-43).

6.9.13.6.2 In terms of policies, are there issues related to mining project management?

6.9.13.6.2.1 Infrastructure and ICT

Again, “Cutting-edge technology” and Information, Communication and Technology (ICT) were announced six times. The ICT has a massive role to play in the mining sector as without it the industry would fall short and would become a victim (Interviewee no.4; Interviewee no.5 and Interviewee no.7). It is also in terms of e-commerce that one needs to comprehend the necessity of IT or ICT for a foreseeable future (Interviewee no.5). The literature addressed the issue of IT and mechanisation of the mining (Pickering and Porter 2014: 52). A participant gave an example of how the fourth industrial revolution is attached to the use of technology nowadays and Africa is said to be a part of it (Interviewee no.4). A different approach to work is needed, a participant said:

> *We need to actually start to work toward implementing what is required so that the people can benefit. The emphasis should be on infrastructure development and mineral beneficiation; and for that there is a high expectation. Even the NDB projects should focus on beneficiation and skills*

transfer. Beneficiation is important because it prioritises own operations (Interviewee no.7).

The finding above is consistent with the benefits of beneficiation as studied in this research (Fabricius 2013a; Naidoo 2014b: 8). The above need of infrastructure corroborates with Kingman and Ramson (1998) as Xinhai (n.d) who advocated for more infrastructure.

6.9.13.6.2.2 Project management

Unemployment remains a concern for the government. Last but not least, a respondent informed that: "The National Development Bank (known as the BRICS Bank and scheduled to have its headquarters in SA as revealed in an email correspondence from Corsetti (Pers.comm. 2017) will start to do what is called ondogram projects". The literature emphasises the need to have agile projects rather than just lean projects (Wernham 2014: xxix).

6.9.13.7 What mechanisms are in place to ensure there is integration of mining companies in other BRIC countries?

6.9.13.7.1 BRICS engagement

A few people answered, "I don't know", and that was the highest frequency for this question. Important contributions in this regard include: "There is an improvement in terms of the engagement, in terms of working together and in terms of cooperation, although it admitted that the relationship between SA and Russia wasn't good in the past (Interviewee no. 4; Shakhmurzova 2015). Putting mechanisms in place for smooth integration was said to be important because otherwise status quo of "mineral manufacturing, producing and selling to others would make us to remain marginalized". This speaks to the political theory of beneficiation (De Beers 2014: 4).

6.9.13.8 What other comments do you have about the BRICS implication in the mining sector?

6.9.13.8.1 Summits

In this section, some of the given comments appeared to be idealistic or extremely nationalistic views. Notably, a respondent expressed the view according to which the BRICS as a partnership can be a dangerous platform for a country like SA especially in the long run. However, 75% respondents emphasized the importance of the BRICS if the countries manage to organize themselves. Amongst the other comments, the following were viewed as important: Poor performance of global economy as most countries try to reduce poverty.

It was found that synergies are already happening at bi-lateral level between the BRICS countries (Interviewee no.5). The responses below indicate cooperation among the BRICS:

- There are a lot of interactions between BRICS companies in the mining sector;
- Russian companies are operating in SA in the mining sector; and
- Projects that Russia wishes to do relate to the nuclear energy project (Interviewee no.3; Interviewee no.5; Interviewee no.7; Interviewee no.8).

In addition, the Chinese people were involved in our South African economy deeply; and for that a participant thought: “We should be grateful that BRICS exists” and the partnership offers opportunities to partner with the most emerging countries. An important aspect of the BRICS was said to be the fact that: “BRICS doesn’t see itself as five countries; it sees itself as a party to its continent” (Interviewee no.4). It is in this perspective that one needs to understand why in 2013: “We held one summit in Durban and invited African leaders. That summit was thus called the outreach retreat for African leaders” (*5th BRICS summit* 2013).

It was found that further interactions or synergies take place among the BRICS (and other global organisations), and these can be competitive or beneficial to both. These interactions were said to include:

- Art and culture BRICS interaction;
- BRICS Business Council;
- Direct interactions with BRICS leaders (Summit);
- Shanghai corporation and Russian deals;
- BRICS Bank meetings; and
- BRICS mining exchanges.

Interactions with global financial institutions were said to engage the BRICS with the IMF and the World Bank. These two institutions should not be taken as competitors vis-à-vis the BRICS. Good interactions should be encouraged by the BRICS. In addition, it was reiterated that SA is rich in minerals just as Russia. On the issue of BRICS bank, the suggestion was that: "BRICS bank should spread funds for projects". This is consistent with FP Staff (2017).

BRICS meetings are of a variety of nature (PTI 2017) as found above, and run by consensus. The department of Mineral Resources was said to be an anchor of BRICS. China supports negotiations and regular meetings (*China's Military Strategy* 2015: 11).

Generally, 50% of the participants expressed reservation when it comes to BRICS partnership impact in SA. The following statements represent a negative perception of BRICS buy a few participants:

- I think in the long run; it (BRICS) is dangerous;
- Chinese investments may cause problems;
- BRICS investment looks good for the time being; and
- Our mineral resources and assets are being exploited (Interviewee no.7).

It was mentioned that: "It might become a problem when we look at the competitiveness of companies among each other. We need to guard against

things that can put us second before others; and we need to be equal in what we do; and for that, equity must be practiced between countries, that is why and more needs to be done as far as the BRICS or mineral beneficiation is concerned" (Interviewee no.4 and Interviewee no.8). Another important theme evoked during the interviews was: "Mineral, trade and creative markets". The literature covered the question of mineral trade extensively (*The beneficiation strategy* 2015: 9-10; Ranzau 2009; SAMDA 2015: 30).

6.9.14 Common issues from the quantitative and qualitative data

A number of discoveries matched the findings obtained under the survey (questionnaire) and those obtained during the interviews. Hereafter, the matching findings are grouped in categories before discussion.

6.9.14.1 Biographically common issues

Managers or decision-makers formed the largest grouping of participants for both the survey and the interviews. All participants were intellectuals with tertiary qualifications, and to a greater extent they were expert in their fields. This facilitated the collection of data as in most instances the questions were understood and the responses were adequate. There were mine engineers among the respondents to the survey questionnaire and the interviewees.

Gender-wise, the study was male-dominated, although there was no indication as to whether or not gender played a role in the manner they responded. This prompts the need to emancipate females in the mining sector, although there was no sign of marginalisation of females in BRICS activities. The policy of the government of SA is gender equality or 50-50% gender parity (Kornegay n.d: i). Of the BRICS countries, SA outruns the rest in terms of women's emancipation although SA ranks 15th globally and fourth in Africa (Hogg 2016). Important statistics about SA and BRICS were covered by the literature (Jones 2012; Naidoo 2014:8).

It was found that the duration of employment for managers or decision-makers for both the surveyed (questionnaire) and interviewed participants was five months to one year minimum and 25-30 years of employment at maximum.

6.9.14.2 Policy formulation

A few participants declared: “We are the custodians; we inform the policy. We help regulate all mining operations in SA in all aspects of mining” (Interviewee no.5). Interviewee no.6 agrees with Interviewee no.5 on the involvement of their organisation in policy formulation.

However, the BRICS operations are based on existing country trade and economic policies rather than on a common partnership policy. There is not an agreed upon mineral beneficiation policy of the BRICS (Mazenda 2016).

6.9.14.3 BRICS as natural resources hub

It emerged from the findings that BRICS countries are rich in mineral resources although at times a country may realise that there it is short of certain commodities. This justifies continual international trade and cooperation to address complementarity among the partners (Mazenda 2016). It is envisaged that this will also promote mineral beneficiation practices in SA with the support of BRICS. In this regard, it was found that BRICS have an interest in strategic minerals such as diamond, platinum, coal and uranium (nuclear for energy purposes). Russia and SA for example are cooperating in this regard. Natural resources were found to be an important aspect of BRICS strategic competitive advantage. Minerals including strategic ones were extensively studied in this work (Van der Merwe *et al.* 2013: 37; Bond 2014a).

6.9.15 Common findings on challenges

It emerged from the two parts of the study that there are a number of challenges SA needs to surmount to strive. These include the following:

- Global economic effects;
- Labour unrests;
- Shortage of electricity; and
- Lack of sufficient gainsharing.

Africa in general and SA in particular did well compared to the western countries in containing the effects of the 2008-2009 global economic crisis (Jones 2012: 2; Muthumani 2010). South Africa however, recorded a poorer performance than its African counterparts in terms of unemployment rate (increased), poverty alleviation (slow-down) and economic growth (less than one percent). This impacted negatively on the well-being of its population.

After the Marikana massacre, labour unrest has slowed down although there are still pockets of conflict or tension in the mining sector at times. Long strikes are always detrimental to the economy as they affect productivity and the standard of living of the people involved if for example prolonged strikes result in retrenchments or dismissals. Bond (2014b: 192; Bond 2014a) studied the Marikana massacre profoundly.

Beneficiation is good but the mining companies involved must be capacitated and proper industrial infrastructures must be put in place. The manufacturing sector, for example, is affected by low and slowing down economic growth in mining (Mchunu 2017: 13) and electricity shortage as it happened during the recent load shedding period was uncalled for and not encouraging at all for the purpose of general beneficiation of minerals in SA. The fact that there are still complaints on the gainsharing aspect in the mining sector or the income disparity level between the haves and the have nots, a gradual beneficiation policy would be better off.

Last but not least, although stated as the future under the fourth industrial revolution (where internet and mobile smart phones will play an important role for development), IT remains a challenge for the majority of the citizens in SA unlike in BRIC countries and the Western world.

6.9.16 Disparities between quantitative data and qualitative data findings

Suffice to mention that there was insignificant difference between the discoveries of the quantitative part of this study and those of the qualitative part. Dissimilarities were due to the fact that questionnaires were limited and interviews schedules were open-ended and allowed the respondents to open up. However, the similarities outweighed the differences in the given

responses. Research shows that there are many other disparities among the BRICS (Bond 2013; Bond 2015; Hogg 2016).

6.9.17 Common findings on proposed solutions to the challenges

Amongst the other solutions, and as a summary, the following were suggested by both the surveyed respondents and the interviewees:

- BRICS activities can be improved through collaborative synergies;
- Gradual and responsible mineral beneficiation is required;
- Capacity-building for beneficiation and industrialisation purposes;
- Mining skills training is paramount; and
- Gainsharing should be accelerated in the mining sector.

It emerged from the findings that BRICS are following bilateralism rather than multilateralism in their collaborations. While bilateral agreements are encouraged, it will be beneficial to the partnership in the future to also promote other forms of cooperation (tripartite, quad-lateral or multilateral projects for example). The benefits will be far greater than the combine effects of the single or two country collaborations as a logical consequence of a synergy (Notshulwana 2012: 1-8).

Furthermore, after 20 years of the new dispensation, SA as a new democracy should stop blaming others for its poor performance, low economic growth, rising unemployment, violent crime and the situation of the previously disadvantaged population (who live below the poverty line), although it is admittedly true that the legacy of apartheid and colonisation played a very negative role, but should get to work and demonstrate competent leadership both in its boundaries, vicinity and within the BRICS. If this is done with the support of others, the prospects will be bright for both SA within, but not limited to, the context of BRICS.

6.10 CONCLUSION

This chapter analysed the research findings and presented an interpretation of data. Both the quantitative and qualitative data (or data-turned information) were used. The researcher made use of graphs, tables, figures and text to make sense out of the voluminous data gathered throughout the research.

Quantitative data was analysed with SPSS version 24.0. Descriptive statistics in the form of graphs cross tabulations and other figures were presented for the purpose of analysis. Inferential statistics were also derived, and this allowed correlations and chi-square test values to be interpreted using p-values (Appendix H). It was found that some statements show higher levels of agreement whilst others were relatively low. The highest levels of disagreement were found on secondary mineral recycling; mining projects; and mining exchange programme. Many variables were found to have significant relationship between them. Qualitative data was coded and themes were generated. Thematic discussions of qualitative data followed and were aimed at reducing the amount of data.

Based on the findings, there is a significant correlation between the findings obtained through the survey questionnaire and the responses obtained via the interviews. This is evident in that similar patterns were found and the qualitative part of the study explains the information collected through the questionnaire that would otherwise be difficult to understand. South Africa could use the findings to plan about implementing effective beneficiation in the context of BRICS co-operation.

CHAPTER SEVEN

CONCLUSIONS AND RECOMMENDATIONS

"Organisations with enduring capabilities survive and thrive." – Paul Sohn, March 21, 2014.

7.1 INTRODUCTION

This chapter concludes the exploration and provides recommendations for key stakeholders such as BRICS institutions, the government, the mining sector and future researchers. The chapter addresses each objective – in addition to the overall aim, and provides a sound interpretation as to whether the assigned objectives were achieved. In doing that, the research problem finds its explication and research questions are answered. Elaborating on what has been stated before, the chapter provides recommendations applicable, in particular, to the organisations that took part in this investigation, to mining/mineral sector, and to the BRICS partnership in general, from the South African perspective. The chapter presents the model devised as a result of this study, a model which identifies a number of factors affecting mineral beneficiation initiatives and which could help the SA and the BRICS going forward. Last but not least, future avenues for research, within the ambit of the field of study, are identified.

7.2 CONCLUSIONS RELATED TO RESEARCH OBJECTIVES

To start, the following conclusions are applicable to the study in general:

Objective 1: To explore the influence of BRICS partnership on mineral beneficiation in SA.

It was established that BRICS partnership is having a very limited influence on mineral beneficiation at present. In SA, for example, the BRICS Business Council has identified mineral beneficiation as one of its priorities in dealing with BRICS in the mining projects. It is also evident that the government with

its numerous departments are supportive to the beneficiation practices and want to see more done it that regard. However, the current beneficiation policy remains an unfinished business, and to many who support beneficiation endeavours, the current policy is not befitting the need for beneficiation for industrial purposes. As mentioned earlier, there is certainly a controversy among academics about the need to introduce more beneficiation or to limit the current beneficiation policy, as the current ruling party administration is heading towards re-discussing the current mining charter (Ramaphosa 2018) in order to solve the disputes.

Objective 2: To identify implementation challenges of BRICS interventions in SA.

The BRICS interventions in SA are currently insufficient owing to the fact that BRICS as a partnership is relatively new, as far as SA is concerned, because SA was the latest country to join the organization. Below are the possible implementation challenges:

- The lack of resources or infrastructure for extensive beneficiation practices;
- The shortage of electricity; although SA has managed to put in place alternative sources of electrical power to respond to industrial need; and
- The limited scarce skills; especially for black industrialists, a target for the government of SA.

In addition, there has been some pressure from the World Trade Organisation (WTO) and Western buyers of minerals who appeal to the international (special) tribunal and lobby against mineral beneficiation whenever a country seeks to score more in that regard. Another challenge is the limitation of the current mineral beneficiation policy which requires ongoing monitoring and evaluation, and which has been found to be insufficient by a wide majority of the participants.

Objective 3: To explore the possible outcomes of the BRICS influence on SA mineral beneficiation

Here are some of the possible outcomes of the BRICS influence on SA mineral beneficiation:

- Enabling SA to have mineral beneficiation among the priorities of the BRICS Business Council;
- Forcing SA to abide by international laws which sometimes are not in favor of more local beneficiation because of peer pressure in the industry; and
- Influencing SA to take drastic measures in favor of more mineral beneficiation within its boundaries.

Moreover, it may prompt SA to co-operate with continental bodies in favor of continental beneficiation in lieu of local beneficiation. Currently, the practice has been to export metals and minerals to Western countries for beneficiation purposes. Only some minerals have been prioritised for local beneficiation in SA. Beneficiation in Western countries or in the Far East (China) has not helped Africa much, let alone bringing more FDI for capacity-building. As a result, BRICS' influence may limit SA's ability to thrive with its current beneficiation policy as it seeks to develop the economy.

Objective 4: To develop a model for mineral beneficiation involving the BRICS partners

A graphical model for this study was developed. This is in line with the specific objective four of this research. Under this model, the predictors are: factors affecting the mining study; the Memorandum of Understanding/Service Agreement Level; principles such as project management and agile principles, sustainability and value-addition, capacity building, research and development, and comparative advantage; in addition, the model promotes both downstream and upstream mineral beneficiations, and seeks to set a path going forward for innovative activities. The graphical model is presented next.

7.3 SOUTH AFRICA-BRIC MINERAL BENEFICIATION (SABRICMB) MODEL

Figure 7.1 SABRICMB Model

Source: Developed by the researcher

7.3.1 Factors affecting the mining industry

The mining industry faces many challenges. These challenges are among the factors affecting the mining sector. The challenge in doing beneficiation is that there is a limited processing knowledge of the practices, especially when it comes to rare earth minerals. On this ground, SA can learn from China which has been doing well for decades despite problems of constriction not long ago (Jordens, Cheng and Waters 2013: 97-114). Other factors include the need to be on a par with technology (the fourth industrial revolution), illegal mining, and macroeconomic phenomena. In order to study these factors, the PESTEL framework can be instrumental as suggested in this model.

7.3.2 Memorandum of Understanding/Service Level Agreement

The model caters for the respect of international protocols by envisaging the use of Memorandum of Understanding (MoU) and Service Level Agreement. Research revealed that the BRICS still has many meetings even currently.

7.3.3 Key principles

Amongst the other principles, agile principles were identified as paramount to project management carried out within the mining sector. Project management in mining is all about managing resources. Project managers not only have to manage people, they also look after other resources in the company including time, equipment, systems and money. For example, they make sure that projects are completed on time, that skilled personnel or qualified employees are there to handle the tasks, and they provide needed equipment for the actual work to be done.

Risk management is therefore another aspect that project managers have to deal with. Information sharing and effective communication are other equally important attributes of project managers. This is consistent with Coleman (n.d: 3) who advocates for effective communication. They must work with a team or individuals to ensure that the smooth operations are not disrupted. The complexities of mining sites and activities make it indispensable to make use of the services as required. Project managers must have both intellectual and

mining skills necessary for excellent work to be done. The benefits of project management include:

- Minimising common mining issues;
- Promoting efficiency; and
- Improving the quality of work (*The importance of project management for mining sites* 2015).

7.3.4 Downstream mineral beneficiation versus upstream mineral beneficiation

Beneficiation is efficient when both downstream and upstream mineral linkages are at play (Interviewee no.6; Figure 8.4). Examples of downstream beneficiation include smelting, refining (capital intensive activities) and craft jewellery, metal fabrication which are labour-intensive activities. The transformation or combination of minerals creates jobs and other opportunities as minerals are upgraded and value-added for local consumption or exportation (Mungoshi 2011: 7-8). Mungoshi (2011) and Jordens, Cheng and Waters (2013) agree on the benefits of beneficiation. The last goes on to provide examples of beneficiating rare earth elements: “sand is typically concentrating using cone concentrator to produce a heavy mineral pre-concentrate.” The former is profound on both downstream and upstream beneficiations.

Hausmann, Klinger, Lawrence (2007: 18-19) agree with both Mungoshi (2011: 7-8) and Jordens, Cheng and Waters (2013: 97-114) on the essence of beneficiation in that it seeks to add value by separating sand minerals, concentrating minerals, recycling or grading minerals so that the final output can be sold at a higher price and in the process creating job opportunities.

The particularity of Hausmann, Klinger, Lawrence (2007: 18-19), however, is that they emphasize that beneficiation practices are part and parcel of many policy initiatives in countries where traditionally minerals were produced for exportation as raw materials. The model advocates gradual and responsible mineral beneficiation activities going forward, one which takes into account

available infrastructure (power plants, alternative sources of energy) and adapts to upcoming capabilities (Fourth industrial revolution; IT innovation).

7.3.5 Agile project management versus government policies

Wernham (2014: xvii) argues that agile principles can be applicable in any big organisation as they are compatible with management control mechanisms. The current study deals with BRICS initiatives, and therefore, governments of member countries are involved. Will they seek to implement an agile approach into government projects? This remains to be seen as the BRICS investment projects mature. Ideally, all governments should adopt the agile approach as a default for initiatives because in this way change can be introduced when necessary as right people are involved at all levels thus providing the organisation with timely feedback. The following section provides a few examples of failure that could have been avoided by agile project management:

- The American department of defence once cancelled a Human Resources Project after trying for 12 good years in vain. One billion USA dollar was written-off which amounted to $100 USA in cost to every taxpayer.
- The British government brought closure to an emergency fire services programme by termination, and £469 was written-off in a single year.
- Vivak Kundra, a chief info officer for the USA government in 2009 inherited $27 billion in IT projects lagging behind in terms of schedule and over budget. A one-billion-dollar cancellation of military HR system was required among the other synergies taken to save $25 billion that were at stake yearly in that country.

Ferreira and Galvao (2017) reviews important documents and studies un/published about the BRICS and provides a comprehensive analysis of the organisation from a political, diplomatic and lay perspectives. Most importantly, the review calls for the upholding of agile principles within the context of BRICS as an organisation. “Agility corresponds to setting short,

realistic targets and reacting fast to changing circumstances" (Wernham 2014: xxviii).

Table 7.1 below confronts the agile manifesto with the old-fashioned way of doing things. Through hard and smart work, agilists have come to value:

Table 7.1 Agile Versus Old ways

Individuals and interactions	Over processes and tools
Working software	Over comprehensive documentation
Customer collaboration	Over contract negotiation
Responding to change	Over following a plan

Source: Wernham (2014: 60-66).

Thus, Table 7.1 indicates that items on the left are more valuable as part of the agile manifesto. BRICS will benefit from the use of agile manifesto statements as part of their organisational culture. This is consistent with Ferreira and Galvao (2017).

There are tools suitable for the implementation of an agile approach in the network and tools that obstruct any improvement making it almost impossible to introduce agile practices in a global organisation such as the BRICS partnership. Efficient tools include SWOT-analysis and Plan-Do-Study-Act (PDSA) model which, as an empirical process control mechanism, emphasise the need to put in place ever changing plans based on the evidence at hand. Coupled with management principles applicable to mining sites (*The importance of project management for mining sites* 2015), these planning tools could be instrumental in managing beneficiation projects.

7.3.6 South Africa-BRICS Mineral Beneficiation (SABRICMB) Model explained

Apart from the significant variables derived from the mathematical (statistical) model namely: (constant), more sustainable operations, global economic effects, involved with BRICS and projects ownership, there are important tools and processes, theories, enablers and challenges applicable to the model, the combination of which was used to develop the SABRICMB model. The model proposes the integration of selected emerging economies into BRICS as it promotes research/experiments, and is in agreement with the BRICS Plus model being proposed by other proponents going forward (Huanhuan 2017). This model, however, does not limit the new entries to those suggested by BRICS Plus proponents, as it prefers an ongoing open policy, considering the fact that countries may exit, and other may enter: making it a more sustainable model. New entries may also be considered in terms of their geostrategic importance, as BRICS is a transcontinental partnership. It is within this ambit that research and development are to be prioritised.

7.3.7 New modified products and services

Ideally, mineral beneficiation should culminate in the production of more proudly South African goods and services. Beneficiation in that way is crucial for SA to be an industrial economy and better off than currently as far as the growth rate is concerned and in a way that translates into a better life for all. It is held that, mineral beneficiation (and mineral recycling) should be undertaken with the aim of promoting the green economy going forward.

7.4 THE SIGNIFICANCE OF THE SABRICMB MODEL

The model promotes mineral beneficiation in SA while calling for more research and development. A number of factors affect the mining industry at a macro-economic level while others affect the company micro-economically. The model is significant in that it presages the need for innovation through

research and development. Both downstream and upstream beneficiations could be promoted for sustainable economic growth.

7.5 RECOMMENDATIONS

In order to solve the current mayhem in international trade and co-operation involving the BRICS, and in an attempt to advise the stakeholders in the BRICS affairs and the mining companies, a number of recommendations are given in the following section. Recommendations are divided into different categories, namely, BRICS partnership, to the mining sector, and others addressed to stakeholders such as government authorities as well as researchers interested in this field of study.

7.5.1 Recommendations addressed to BRICS related organisations

The following suggestions are paramount for a better BRICS performance:

- Accelerate bilateral agreement for socio-economic development of the BRICS member countries where necessary;
- Put the issue of mineral beneficiation at the centre of future negotiations for mining projects in line with SA policies;
- Allow further investment in capacity-building by encouraging more FDI onto that field; and
- Encourage trilateral (tripartite), quad lateral or multilateral agreements on certain mining projects rather to also happen rather than just using bilateral deals as is currently the case.

In addition, it is important to conduct more research/experiments on BRICS and mineral beneficiation. Effective monitoring and evaluation of BRICS initiatives should take place on regular intervals. South Africa should put industrialization, manufacturing (and beneficiation) and more quality services at the heart of BRICS summit to incite socio-economic development. BRICS should consider inviting other countries to join the partnership, especially when they can add value to the organization. Member countries should be loyal to

each other as the BRICS countries, especially during international fora such as the UNSC.

Of importance to this study is the SABRICMB model. It is proposed to the stakeholders in SA in particular and BRICS in general, knowing that it may require some adaptation if taken out of context. South Africa should therefore:

- Consider the use of the newly developed SABRIC Mineral Beneficiation Model, and suggest it to the stakeholders, the BRICs included;
- Experiment Esperanto or another language of choice for effective communication, and to avoid linguistic colonisation or neo-colonisation during BRICS meetings; and
- Allocate more resources on BRICS economic initiatives.

According to Anderson (2015: 2), "policymaking process is an inherently political process involving conflict and struggle among people" (namely, public officials and private citizens). Mazenda (2016: 18) gives a number of recommendations for BRICS policy consideration with the aim to boosting FDI in and out flows. Government policies aim at redressing the imbalances of the past and to alleviate poverty in this land are to be enforced. Such initiatives can make use of existing expertise and the ability to raise capital for economic development. The secondary mineral and metal industries benefited a lot from public-led initiatives in the mining sector (*South Africa's Mineral Industry* 2013/2014: 1).

Policymakers should consider more structural transformations of the BRICS to ensure policies or pragrammes are conducive to better environmental impact of the climate change (Beyene 2015: 4-28).

7.5.2 Recommendations addressed to mining companies

The following recommendations are applicable to the mining sector:

- Allow more independent research to balance own internal research;
- Comply with mineral beneficiation as a policy of the SA government rather than just doing nothing about it as it is the case in certain

instances. This was revealed at the TIPS conference held at the University of Johannesburg (Appendix F); and

- Look at local, regional and continental beneficiation opportunities before maintaining the *status quo*, that is, exporting raw material abroad for beneficiation purposes.

A public-private partnership would be more profitable and would ensure a win-win approach is happening. Mining companies should support the government even more in the mission to develop more black industrialists, and equip them with scarce skills for example. Again, Investment in research and development (R & D) is necessary. On and above that, a gradual local, regional or continental beneficiation is a better option before considering exporting raw materials abroad for manufacturing of finished products.

It is also recommended that, more regular interactions with ordinary South African and other stakeholders take place (the bottom-up approach) rather than maintaining the very expensive Indabas which exclude others such as researchers, stakeholders and ordinary citizens based on participation costs. Investment in IT would be an advantage. More IT and research (education) in concurrently with other BRICS organisations would be an advantage. As far as mining is concerned, the issue of underground mining health and safety should be a priority and hazards can be minimised by planning beforehand, and having in place preventative measures. Farsighted planning is advantageous in this regard (*China's Military Strategy* 2015: 4).

Investment in industrialised new zones, and improvement on mining cities with capacity-building of infrastructure develop the standard of living and the economy. Companies should also balance the mechanisation of productive labour (consistent with the theory of value by Karl Marx as explained in Capital (Ross 2016), by looking at alternative in-house employment opportunities rather than just retrenching or replacing manual workers with machines (robots). In this regard, Marx taught that: "The value of a produced economic

good can be measured objectively by the average number of labour hours required to produce it" (Ross 2016).
In addition, mining companies should abide by international mining protocols, treaties and discourage blood diamond and other minerals from war-torn countries such as the DRC (i.e. coltan or cobalt). In this regard, institutions should promote the Kimberley process even further and put in place innovative mechanisms to fight mineral-related crimes.

As far as electricity is concerned, more investment on alternative sources of energy in SA is needed; parties should work hand in hand with ESKOM (the electricity company in SA) and the government on gradual beneficiation practices. They should also learn from BRICS countries on mineral beneficiation success stories, and allow exchange programmes involving mining engineers and other technicians within the BRICS.

As far as health is concerned, companies should put in place a fund to support research on Ebola, Zika viruses and mining related ills such as TB and silicosis, to name but a few; they should also co-operate with the government, especially when involved with strategic minerals such as uranium, coltan, diamond, coal, platinum, etc. It is also important for companies to consult with African countries (African Union) and countries in possession of strategic minerals such as the DRC, Botswana and Nigeria, and co-operate for the safety of all with the support of the BRICS leadership if need be.

For the new dispensation, SA needs to invest more in HR development, skills transfer and BBEE initiatives. It needs to plough back in the society even more for the communities to benefit and promote peaceful social cohesion for South African and immigrants to live in peace. The following additional recommendations are also useful to mining companies:

- Put advanced equipment at the disposal of miners (mining workers, owners and engineers);

- Co-operate with international tribunal where compensation, retribution and reparation due to previous mining faults is in question;
- More transparency and avoidance of tax evasion, etc.; and
- Redefine mining codes, regulations and legislation where necessary in some public-private negotiations (if need be).

7.5.3 Recommendations addressed to the government of South Africa

The following recommendations are applicable to the government, especially the South African government:

- Speed up national beneficiation policy improvement; and consult for an inclusive mining charter.
- Create conducive environment for more FDI, industry and job creation rather than suffocating private initiatives by enforcing tough immigration policies; this echoes the findings by other researchers (Skinner 2015).
- Encourage a BRICS mining policy development;
- Invest in learning the success stories of countries such as Russia and China in mining; and
- Improved on the State-Owned Companies in the mining, to balance the more reliance on private companies of foreign origin; China can be a good example in this case.

In addition, SA should follow the resolutions of the African Parliament of the African Union on language policy while embracing Mandarin accordingly; in this regard, Swahili and a few more have been proposed by the Pan African Parliament as inter-African language project. South Africa should not refuse to consider an experiment of Esperanto language as an alternative 'neutral' or auxiliary means of communication capable of promoting indigenous languages and protecting them through a variety of ways while allowing BRICS to have a long-term solution to its language problem.

More investment in infrastructure development and capacity-building for responsible mining activities in the future is needed. South Africa should continue to involve other African countries even more, in the context of BRICS

affairs, for Africa's development in the spirit of the Durban 2013 summit. It should discourage xenophobia at all cost by educating the perpetrators and bringing them to book, and in general, also educating the previously disadvantaged population (Skinner 2015; Crush, Chikanda and Skinner 2017; *The Conversation Africa* 2015).

Again, SA should co-operate with industry and other countries on research against Zika, Ebola, TB, HIV/AIDS and Silicosis. More investment on medical research for preventative purposes is appropriate, and is to be approached proactively. Experiments on Ebola have contributed on the knowledge of the virus, and this should continue (Connolly *et al.* 1999). This is consistent with the spirit of *China's Military Strategy* (2015: 11-14).

As far as corruption is concerned, SA should lead by example to fight corruption (tigers then fly or concurrently rather than the opposite), maladministration and other anti-values, social ills (Xi 2014). The country should put in place mechanisms to avoid scandals of the sort of Marikana, and train police on specific issues as emerged from the commission on Marikana killing. The country should also do more on service delivery and economic gain-sharing (transformation) to avoid violent protests and long strikes like those preceding the Marikana killing.

This is to be done responsibly and gradually:

- Provide leadership when necessary on the issue of BRICS and mineral beneficiation practices;
- Be ready to co-operate on strategic minerals and coordinate where necessary for peace and safety of all;
- Encourage at times a bottom-up (grassroots) approach to mineral beneficiation debate, and at times, a top-down (leadership) approach where necessary.

Mineral beneficiation was practiced in Europe for a long time. Mineral beneficiation in that continent was a very important initiative for job creation

and skills enhancement. Retrenched workers, for example, were supposed to transfer their skills (including scarce skills) and developmental initiatives to inexperienced or limitedly experienced former colleagues during mineral beneficiation activities. Beneficiation in Europe was also a precursor of Small and Medium Enterprises' (SMEs) promotion, manufacturing and even industrialisation.

In addition, SA should invest in geology and mining studies and allow more citizens to have access to such education in many institutions. More resources to the BRICS directorate should do good, and to envisage regional/provincial representations would be an advantage; and SA should involve the Parliament of SA (and public participation) where necessary on the issue of BRICS interventions on mineral beneficiation.

South Africa can therefore learn from what happened in Europe on this ground. If SA strives for further industrialisation in the sense of the Western developed countries, then beneficiation is the way to go (SAMDA 2015: 33-43). In dealing with mining, it is advisable for Africa to take precautions as extractive activities may have far-reaching consequences to the society as whole. There are preventative measures in place such as effective waste management and restoration to prevent the above-mentioned problem (European Commission 2002: 67-70).

7.5.4 Recommendations for future research

A joint research involving public-private stakeholders on the same topic of study or a variation of it would be better if undertaken in the future. Furthermore, although mining companies are concentrated in Gauteng, the few companies found in other provinces should be encouraged to participate. Perhaps umbrella organisations where they are affiliated should facilitate the process. A parity of small and big companies in research would be a good thing allowing the researcher to see more trends in the future. It would be also preferable to conduct similar studies in other BRICS countries as this was based on SA. Finally yet importantly, a research of this magnitude demands more financial resources. The availability of adequate resources for such

studies in the future would be an advantage. This research encourages innovation (including an open policy and other experiments) and it also seeks to set a future research agenda.

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APPENDIX A: ETHICS CLEARANCE

DUT DURBAN UNIVERSITY OF TECHNOLOGY

FACULTY OF MANAGEMENT SCIENCES | RESEARCH ETHICS COMMITTEE

MANAGEMENT SCIENCES: FACULTY RESEARCH ETHICS COMMITTEE (FREC)

28 May 2015
Student No: 20619049
FREC No: 27/15FREC

Dear Mr BE Isheloke

PhD IN MANAGEMENT SCIENCES: BUSINESS ADMINISTRATION

TITLE: EXPLORING THE EFFECTS OF BRICS PARTNERSHIP ON MINERAL BENEFICIATION IN SOUTH AFRICA.

Please be advised that the FREC has reviewed your proposal and the following decision was made: Ethics Level 1, Approved Subject to Minor Corrections.

The conditions of approval are as follows:

QUERIES

- See section C of PG2a to be amended as per reviewers.

Please submit the amended proposal with a cover letter to the FREC administrator; this document must reach the FREC as soon as possible but not more than 6 months from the approval date. Please note that research on the proposed project may not proceed until you have received correspondence from the FREC.

Yours Sincerely

[redacted]

Prof N Dorasamy
Chairperson: FREC

APPENDIX B: LETTERS OF PERMISSION TO CONDUCT RESEARCH

DUT DURBAN UNIVERSITY OF TECHNOLOGY

FACULTY OF MANAGEMENT SCIENCES

To : Whom may concern

From : Durban University Technology (Management Sciences)

Date : 6 October 2014

RE : Application to conduct research

Please grant **Mr E Byelongo** (Student no: **20619049**) permission to conducting research that will fulfil his DTech Business Administration qualification.

Research Title: Exploring the effects of the BRICS PARTNERSHIP ON THE South African Mining industry.

Note that the research conducted will only be for academic purposes.

Kind regards

[redacted]

Dr I. Govender

6/10/14

Date

DURBAN UNIVERSITY OF TECHNOLOGY
FACULTY OF MANAGEMENT SCIENCES
06 OCT 2014
P.O. BOX 1334, DURBAN 4000

LETTER OF INFORMATION

Title of the Research Study: Exploring the effects of the BRICS partnership on mineral beneficiation in South Africa.

Principal Investigator/s/researcher: (Byelongo Elisee Isheloke, MTech: Business Administration, ABP/BTech:Management)

Co-Investigator/s/supervisor/s: (Ivan Gunass Govender, Doctor of Public Administration)

Brief Introduction and Purpose of the Study: The aim of this study is to explore the effects of the BRICS partnership on the South African mining industry. It seeks to develop a model that will better facilitate BRICS synergies for mineral beneficiation in the mining sector in South Africa.

Outline of the Procedures:

Questionnaires will be administered to mining companies' representatives whose companies deal with the Chamber of Mines. Representatives from the department of International Relations and Cooperation as well as from the Department of Mineral Resources will also take part in this research. Upon being granted permission and they will be interviewed by the researcher. The researcher will seek permission before distributing the questionnaire or conducting any interview. The relevant explanation with regard to confidentiality will be given prior to the participation in this study. Participants will be encouraged to be anonymous throughout the research.

Risks or Discomforts to the Participant:

Neither risk nor discomfort is foreseen before, during or after the involvement in this research for all the participants.

Benefits:

The research outcome will contribute to the bulk of information on BRICS and the mining activities in South Africa, thus benefiting the country and other stakeholders. A paper will be presented in a conference addressing socio-economic issues and an article will be written on the topic. A model will be developed to facilitate synergies of BRICS cooperation on mineral beneficiation initiatives in the country.

Reason/s why the Participant May Be Withdrawn from the Study:

The participants may decide to discontinue their involvement for any reason and at any time. There will be no negative consequence for any respondents should he or she choose to withdraw from the research.

Remuneration:

There will be no payment or remuneration to involved participants.

Costs of the Study:

The participants will not incur any cost with regard to the study.

Confidentiality:

The data collected and the inferred information will solely be used for research purposes and therefore will be kept confidential. Nobody will be allowed to disclose their names or sensitive information.

Research-related Injury:

There will be no research-related injury or adverse reaction to the participants.

Persons to Contact in the Event of Any Problems or Queries:

Would you please contact Byelongo Elisee Isheloke, the researcher, on 072 597 8754, my supervisor: Dr I. G. Govender on 083 653 2121 or 031-373 5694, or the institutional Research Ethics Administrator on 031 373 2900. Complaints can be reported to the DVC:TIP, Prof F. Otieno on 031 373 2382 or 031 373 2382 or dvctip@dut.ac.za .

General:

Participation in this research is voluntary, anonymous and confidential. Only approximate number of respondents will be disclosed. An information letter will be issued to all participants. This letter and a consent form will be translated in the primary spoken language of participants.

CHAMBER OF MINES OF SOUTH AFRICA
Putting South Africa First

5 Hollard Street
Johannesburg 2001
PO Box 61809
Marshalltown 2107

Telephone: (011) 498-7100
Telefax: (011) 834 1884
Web: http://www.chamberofmines.org.za
E-mail: info@chamberofmines.org.za

31 October 2015

Mr. Byelongo Elisee Isholeke
Durban University of Technology

Email: ebyelongo@gmail.com

Dear Sir

PERMISSION TO CONDUCT RESEARCH IN THE MINING SECTOR

This note serves to confirm that the Chamber of Mines of South Africa supports your intention to conduct an academic research in mineral beneficiation and its effects on BRICS.

The Chamber of Mines will facilitate your gaining access to its member companies for the purpose of this research. Where possible the Chamber will also assist with responding to questionnaires that may be relevant for the Chamber as a policy and advocacy organisation.

We wish you success in your research project.

Yours faithfully

[redacted]

Vusi Mabena
Senior Executive

international relations
& cooperation
Department:
International Relations and Cooperation
REPUBLIC OF SOUTH AFRICA

Private Bag X152, PRETORIA, 0001 • OR Tambo Bld, 460 Soutpansberg Road, Rietondale, PRETORIA, 0084
Tel: +27 (0) 12 351 1000 • www.dirco.gov.za

Byelongo Elisee Isheloke
Doctorate Candidate
Durban University of Technology
Email address: ebyelongo@gmail.com

Dear Mr Isheloke

Re: Permission to administer questionnaires and conduct interviews in the Department of International Relations and Cooperation (DIRCO)-BRICS Directorate

Your letter dated 1 September 2014, requesting for permission to conduct research on BRICS-SA related issues refers.

I'm therefore, writing to inform that the permission to administer questionnaires and conduct interviews in DIRCO's BRICS Directorate is in order.

The department is willing to assist you by responding to questions with regards to BRICS activities in South Africa for research purposes.

I trust that the gathered information will only be used for research purposes and that the confidentiality of participants is guaranteed.

I wish you the best of success in your doctorate studies.

Yours sincerely,

[redacted]

Ms Nelia Barnard
Director

11/09/14
Date

mineral resources
Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

From: Directorate: Auxiliary Support Services
Tel: [012]444 3543 **Fax:** [086] 710 1031 **e-mail:** colane.benside@dmr.gov.za
Enquiries: C Benside Ref: 6/1/1/1/2/9

Byelongo Elisee Isheloke
P.o.Box: 61223
Bishopsgate
4008

Email: ebyelongo@gmail.com

Dear Mr. Isheloke

Re: Permission to conduct research for a doctoral qualification

I am writing to inform that permission to conduct research in the department of mineral resources across the provinces is hereby granted to you.

You are therefore allowed to distribute questionnaire, organize interviews and access information that the department put at the researcher's disposal.

We trust that the data collected will be used for research purposes and that the confidentiality of participants across the provinces will be preserved.

I wish you success throughout your research studies.

Yours sincerely,

[redacted]

Colane Benside
Department of Mineral Resources

APPENDIX C: QUESTIONNAIRE

Questionnaire addressed to mining companies

1. Biographical information: Answer the following questions.

1.2 **Where is the company's headquarters located?** _____

1.3 **What is your position in this company?** _____

1.4 **How many years of experience do you have in this mining field?** _____

1.5 The company is involved in the following mining activities:

	Yes	**No**
1.5.1 Diamond		
1.5.2 Platinum		
1.5.3 Gold		
1.5.4 Copper		
1.5.5 Coal		
1.5.6 Other (specify only the main activities)		

1.6 What commodities does your company import from BRIC?

1.6.1 Brazil	
1.6.2 Russia	
1.6.3 India	
1.6.4 China	

1.7 What commodities does your company export to BRIC?

1.7.1 Brazil	
1.7.2 Russia	
1.7.3 India	
1.7.4 China	

1.8 Your company addresses downstream mineral beneficiation by doing the following:

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1.8.1 Gainsharing					
1.8.2 Distributing monetary incentives					
1.8.3 Organising mining skills training					
1.8.4 Doing beneficiation by hydration					
1.8.5 In-country cutting and polishing of mineral					
1.8.6 Promoting better waste management					
1.8.7 Local grading of mineral					
1.8.8 Smelting locally					
1.8.9 Refining plant					
1.8.10 Making craft jewellery or ceramic pottery					
1.8.11 Investing in metal fabrication					
1.8.12 Protecting the physical environment					
1.8.13 Specify other value-added activities					

2. Questions related to objective 1: To explore the influence of BRICS partnership on mineral beneficiation in SA.

2.1 Identify the competitive advantages of BRICS partners:

	Brazil	Russia	India	China	South Africa
2.1.1 Democratic institutions					
2.1.2 Information Technology					
2.1.3 Natural resources					
2.1.4 Manpower					
2.1.5 Industrial development					
2.1.6 Support of the market economy					

2.2 The company is involved with BRIC in:

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
2.2.1 Mining innovations					
2.2.2 Mining exchange programmes with the BRIC states					
2.2.3 Research information-sharing					
2.2.4 Mining projects					
2.2.5 Secondary mineral recycling					

2.2.6 Are there any other activities your company gets involved in with BRIC?

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2. 3. Are the following Project management issues a problem in your firm?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
2.3.1. Project ownership					
2.3.2 Funding allocations					
2.3.3 Implementing plans					
2.3.4 Monitoring & Evaluation					
2.3.5 Sharing of responsibilities					

2.3 BRICS networking can be improved by:

2.5 What are the future business opportunities does BRICS offer to your company?

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
2.4.1 Exchange programmes					
2.4.2 Favourable fiscal policy					
2.4.3 Financial Resources' provision					
2.4.4 Human resources' provision					
2.4.5 Utilisation of company's expertise					
2.4.6 Improved management systems					
2.4.7 collaborative synergies					

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3. Questions related to objective 2: To identify implementation challenges of BRICS interventions in South Africa.

3.1 The company experiences the following challenges:

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
3.1.1 Global economic crisis effects					
3.1.2 Insufficient funds for operations					
3.1.3 Regular labour unrest					
3.1.4 Shortage of electricity					
3.1.5 Decreasing exports					
3.1.6 Secondary mineral recycling					
3.1.7 Water recycling					
3.1.8 Depletion of mineral sources					
3.1.9 Gain-sharing					

3.2 Mechanisms are in place to overcome the following mining challenges in SA:

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
3.2.1 Exhaustion of natural resources					
3.2.2 Protection of domestic markets					
3.2.3 Protection of local mining firms					
3.2.4 Reduction in domestic products consumption					
3.2.5 International disaster management protocols					

3.3 Are there any additional challenges the company is experiencing?

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4. Questions related to objective 3: To analyse synergies suitable for implementing BRICS interventions in SA.

4.1 The following advantages are foreseeable for the BRICS partnership. Rank them in terms of importance.

	Very important	Important	Neutral	Not important	Not very important
4.1.1 More sustainable operations					
4.1.2 Business expansion					
4.1.3 Expertise complementarity					
4.1.4 Increased international trade cooperation					
4.1.5 Better regional integration					
4.1.6 More profitable mineral trade					
4.1.7 Better usage of resources					
4.1.8 Greater exchange of information					
4.1.9 Better transport infrastructures					
4.1.10 Mutual developmental dependence with BRIC					
4.1.11 Increased capital inflow					
4.1.12 Technological innovation					
4.1.13 Speedy industrialisation of new zones					
4.1.14 Price decrease					
4.1.15 Job creation					
4.1.16 Better living conditions					
4.1.17 Economic growth					

4.2 Collaboration between BRICS partners could lead to the following:

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
4.2.1 Exploitation of miners					
4.2.2 Increased unemployment rate					
4.2.3 Decline in domestic mineral products demand					
4.2.4 Introduction of non-democratic systems					
4.2.5 increased environmental mining disasters					
4.2.6 Initiation of conflict or war					
4.2.7 Increased Illegal migration of miners					
4.2.8 Increased failure to cooperate internationally					

4.3 What improvement in mineral trade conditions do you foresee now that SA is a BRICS member?

4.4 How should BRICS partnership benefit African countries beyond the SADC region?

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5. Is there any other comment with regards to BRICS involvement in the mining sector in South Africa?

THANK YOU FOR YOUR TIME AND EFFORT!

APPENDIX D: INTERVIEW SCHEDULE

Interview schedule for the study: *Exploring the effects of the BRICS partnership on mineral beneficiation in South Africa*

I. **OPENING**: A. [Shake hands] My name is_____ I am currently pursuing a doctorate degree at the Durban University of Technology. I am going to interview you in order to acquire first-hand information about mineral beneficiation, mining policies in SA and the BRICS partnership.

B: (Purpose) The objective is twofold: First, I want to acquire information about the role your organisation or department plays with regard to mining policies or implementation thereof in South Africa. Secondly, I would like to tap into your knowledge in order to get further understanding on the challenges the mining industry faces in terms of BRICS partnership, mineral beneficiation and related matters.

C: (Motivation) Your input is going to make it possible to suggest courses of action that need to be taken in the mining sector for a better tomorrow. Your information is going to be valuable for this research as from today.

D: (Time allocation) This interview will only last 15 minutes' maximum.

Transition: Let me first ask you biographical and general questions.

II. BODY:

A: (Topic)

1. Biographical & general information

1. How long have you been working in this organisation and in what capacity?
2. What is the role of your organisation or department in mining policy-making?
3. How do you see the influence of BRICS partnership in the mining sector?

Transition to another question_____

B: (Topic)

2. **Exploring the influence of BRICS in Mineral beneficiation in SA**

2.1 How effective are the current mineral beneficiation policies or practices?

2.2 How can we involve the BRIC partners in promoting local mineral beneficiation in South Africa?

2.3 What need to be put in place to develop a BRICS friendly mineral beneficiation system in South Africa?

2.4 What is the role of cutting edge technology in mineral beneficiation processes?

2.5 What suggestions for improvement of cooperation do you have for a better BRICS intervention in mineral beneficiation?

Transition to another question_____

C. (Topic)

3. Identifying the challenges and exploring possible outcomes of BRICS influence on mineral beneficiation in SA

3.1 What are the major challenges the mining sector is currently facing in South Africa?

3.1.2 What can be done to stop Ebola virus from entering local mining industry?

3.1.3 What can be done to improve intra-BRICS communication in order to bridge the language gap?

4. What are the challenges in terms of mineral beneficiation?

5. What interactions do you foresee in the near future involving the BRICS partners?

6. What effects of BRIC's interventions do you foresee on mineral beneficiation in SA?

7. In terms of policies, are there issues related to mining project management?

8. What mechanisms are in place to ensure there is integration of mining companies in other BRIC countries?

9. What other comments do you have about the BRICS implication in the mining sector?

IV. CLOSING

A. (Summary) We have discussed a lot on mineral beneficiation, mining policies and BRICS interventions in South Africa. Thanks to your input I can now better understand the complexities of mineral beneficiation, BRICS partnership and mining policies. I would like to reiterate that you will remain anonymous and that confidential information will be kept as such throughout the research.

B. Thank you so much for your time, effort and input. If there is any other information you think can help me with regard to this research, please forward it to me when possible.

C. I should have enough information for my thesis after combining your input with previously collected data. In case of there being a need for more information, would it be alright for me to send you and email of phone you in that regard? I look forward to sending you a summary of the findings upon completion of this research. Please fill free to contact me in this regard.

THANK YOU VERY MUCH!

APPENDIX E: MINING COMPANIES/ORGANISATIONS IN COLLABORATION WITH THE CHAMBER OF MINES (CM)

3 Associations	14 Base Minerals	20 Coal
3 Diamonds	7 Gold	3 Investments
7 Mining contractors	3 Mining Corporates	11 Platinum

Source: www.chamberofmines.org.za/about/members (Chamber of Mines 2018).

Note: The list above does not constitute the participants as currently the CM has more members. Participants are kept anonymous and they were 69 at the time of research from the mining sector. In addition, ten participants were targeted, making the population 79 in total.

APPENDIX F: CONFERENCES, WORKSHOPS AND SYMPOSIUMS

Date/Year	Theme	Type of event attended
2014	DUT Proposal development workshops, ML Sultan Campus, Durban	**Workshop**
17 Sep. 2015	Governance of China and Africa Symposium: President Xi's book launch (video conference) held at HSRC, Durban	**Symposium**
12-13 Nov. 2015	BRICS competition commission conference at ICC, Durban	**Conference**
19-20 Nov. 2015	One Belt One Road Conference (OBOR) at Hotel School, DUT	**Conference**
2016	Public participation at the Provincial Parliament of KwaZulu-Natal in Pietermaritzburg in 2016	**Conference**
14-15 June 2016	TIPS Annual Forum: industrialisation and the mining economy held at the University of Johannesburg	**Conference**
03-05	1st Interdisciplinary Postgraduate Conference: Human Capacity Building through Postgraduate Research for Sustainable Development in Africa at DUT, Durban	**Conference**
25-26 Aug 2016	DUT Leadership conference at ICC, Durban	**Conference**
09 March 2017	BRICS currency video conference: exploring the use of a common currency and/or payment mechanism amongst BRICS countries held at the Atrium, HSRC, Durban	**Video conference**
26 April 2017	Address by the Vice-Premier of China at Hotel School, DUT on 26 April 2017	**Conference**
01-02 June 2017	e-Thekwini Academic Research Symposium held at Durban ICC, 01-02 June 2017	**Symposium**
20 June 2017	3rd e-Learning Symposium held at Coastland Hotel Conference Centre, 20 June 2017	**Symposium**
04-06 Oct. 2017	Ethics Educators' training at Coastland Hotel Conference Centre, 04-06 October 2017	**Conference**

APPENDIX G: CORRELATIONS (EXTRACT)

			Gainsharing	Distributing monetary incentives	Organising mining skills training	Doing beneficiation by hydration	In-country cutting and polishing of mineral	Promoting better waste management
Spearman's rho	Gainsharing	Correlation Coefficient	1.000					
		Sig. (2-tailed)						
		N	19					
	Distributing monetary incentives	Correlation Coefficient	.629**	1.000				
		Sig. (2-tailed)	0.004					
		N	19	20				
	Organising mining skills training	Correlation Coefficient	0.148	0.071	1.000			
		Sig. (2-tailed)	0.544	0.766				
		N	19	20	20			
	Doing beneficiation by hydration	Correlation Coefficient	0.281	0.210	0.307	1.000		
		Sig. (2-tailed)	0.244	0.374	0.188			
		N	19	20	20	20		
	In-country cutting and polishing of mineral	Correlation Coefficient	.534*	0.344	0.218	0.070	1.000	
		Sig. (2-tailed)	0.022	0.149	0.371	0.774		
		N	18	19	19	19	19	
	Promoting better waste management	Correlation Coefficient	0.279	0.051	.533*	-0.149	-0.028	1.000
		Sig. (2-tailed)	0.247	0.830	0.016	0.531	0.908	
		N	19	20	20	20	19	20
	Local grading of mineral	Correlation Coefficient	0.234	0.138	0.361	0.300	0.340	0.314
		Sig. (2-tailed)	0.350	0.573	0.129	0.212	0.168	0.190
		N	18	19	19	19	18	19
	Smelting locally	Correlation Coefficient	-0.155	-0.259	0.181	0.174	-0.111	0.128
		Sig. (2-tailed)	0.526	0.270	0.445	0.464	0.651	0.592
		N	19	20	20	20	19	20
	Refining plant	Correlation Coefficient	0.429	.516*	-0.163	0.348	0.418	-0.352
		Sig. (2-tailed)	0.067	0.020	0.493	0.133	0.075	0.128
		N	19	20	20	20	19	20
	Making craft jewellery or ceramic pottery	Correlation Coefficient	0.150	0.202	0.216	.504*	.539*	-0.352
		Sig. (2-tailed)	0.541	0.393	0.361	0.023	0.017	0.128
		N	19	20	20	20	19	20
	Investing in metal fabrication	Correlation Coefficient	0.167	0.010	0.209	-0.244	.550*	0.340
		Sig. (2-tailed)	0.508	0.969	0.392	0.315	0.018	0.154

	N	18	19	19	19	18	19
Protecting the physical environment	Correlation Coefficient	-0.048	-0.182	0.234	0.027	-0.385	.467*
	Sig. (2-tailed)	0.846	0.444	0.321	0.911	0.104	0.038
	N	19	20	20	20	19	20
Mining innovations	Correlation Coefficient	0.353	0.279	-0.012	0.232	.536*	0.006
	Sig. (2-tailed)	0.150	0.262	0.963	0.354	0.026	0.982
	N	18	18	18	18	17	18
Mining exchange programmes with the BRIC states	Correlation Coefficient	-0.015	0.174	-0.035	0.165	0.027	-0.051
	Sig. (2-tailed)	0.954	0.489	0.890	0.514	0.917	0.841
	N	18	18	18	18	17	18
Research information-sharing	Correlation Coefficient	0.042	0.236	0.353	-0.272	0.213	0.356
	Sig. (2-tailed)	0.877	0.362	0.165	0.290	0.429	0.161
	N	16	17	17	17	16	17
Mining projects	Correlation Coefficient	-0.032	-0.044	0.177	-0.031	-0.147	0.345
	Sig. (2-tailed)	0.900	0.862	0.483	0.903	0.574	0.161
	N	18	18	18	18	17	18
Secondary mineral recycling	Correlation Coefficient	0.176	0.161	0.046	-0.168	0.209	0.343
	Sig. (2-tailed)	0.470	0.510	0.851	0.492	0.405	0.150
	N	19	19	19	19	18	19
Project ownership	Correlation Coefficient	0.142	0.036	-0.165	0.170	-0.199	0.049
	Sig. (2-tailed)	0.562	0.881	0.487	0.474	0.414	0.837
	N	19	20	20	20	19	20
Funding allocations	Correlation Coefficient	-0.074	0.049	-.488*	-0.393	-0.140	-.445*
	Sig. (2-tailed)	0.763	0.839	0.029	0.086	0.566	0.049
	N	19	20	20	20	19	20
Implementing plans	Correlation Coefficient	-0.045	-0.029	-.470*	0.143	-0.283	-0.359
	Sig. (2-tailed)	0.860	0.907	0.042	0.560	0.255	0.131
	N	18	19	19	19	18	19
Monitoring & Evaluation	Correlation Coefficient	-0.090	0.095	-0.179	0.134	-0.329	-0.060
	Sig. (2-tailed)	0.713	0.689	0.450	0.574	0.169	0.802
	N	19	20	20	20	19	20
Sharing of responsibilities	Correlation Coefficient	-0.243	-0.040	-0.130	-0.019	-0.346	-0.023
	Sig. (2-tailed)	0.316	0.867	0.585	0.936	0.147	0.923
	N	19	20	20	20	19	20

Exchange programmes	Correlation Coefficient	0.301	0.121	0.296	.492*	0.189	0.235
	Sig. (2-tailed)	0.211	0.611	0.205	0.028	0.439	0.318
	N	19	20	20	20	19	20
Favourable fiscal policy	Correlation Coefficient	.569*	.508*	0.294	0.122	0.314	0.390
	Sig. (2-tailed)	0.011	0.026	0.222	0.618	0.204	0.098
	N	19	19	19	19	18	19
Financial Resources' provision	Correlation Coefficient	0.115	0.199	0.243	0.094	0.293	0.286
	Sig. (2-tailed)	0.639	0.401	0.302	0.694	0.224	0.222
	N	19	20	20	20	19	20
Human resources' provision	Correlation Coefficient	0.044	0.046	0.204	0.124	0.200	0.114
	Sig. (2-tailed)	0.859	0.846	0.388	0.602	0.411	0.631
	N	19	20	20	20	19	20
Utilisation of company's expertise	Correlation Coefficient	0.180	0.118	0.434	0.267	0.286	0.333
	Sig. (2-tailed)	0.460	0.629	0.063	0.270	0.250	0.163
	N	19	19	19	19	18	19
Improved management systems	Correlation Coefficient	0.011	-0.005	0.218	0.040	0.213	0.237
	Sig. (2-tailed)	0.966	0.986	0.384	0.874	0.412	0.343
	N	18	18	18	18	17	18
Collaborative synergies	Correlation Coefficient	0.218	0.379	0.141	0.363	0.249	-0.149
	Sig. (2-tailed)	0.400	0.120	0.578	0.139	0.334	0.555
	N	17	18	18	18	17	18
Global economic crisis effects	Correlation Coefficient	0.124	0.037	0.201	.642**	-0.171	-0.026
	Sig. (2-tailed)	0.613	0.877	0.394	0.002	0.483	0.913
	N	19	20	20	20	19	20
Insufficient funds for operations	Correlation Coefficient	-0.119	-0.041	-0.247	-0.173	0.182	-0.415
	Sig. (2-tailed)	0.628	0.864	0.294	0.465	0.457	0.069
	N	19	20	20	20	19	20
Regular labour unrest	Correlation Coefficient	0.164	0.008	0.250	0.073	0.179	-0.038
	Sig. (2-tailed)	0.502	0.974	0.288	0.760	0.463	0.874
	N	19	20	20	20	19	20
Shortage of electricity	Correlation Coefficient	-0.201	-0.073	-0.177	-0.150	0.043	-0.232
	Sig. (2-tailed)	0.410	0.760	0.456	0.527	0.860	0.325
	N	19	20	20	20	19	20

	Decreasing exports	Correlation Coefficient	-0.405	-0.225	-0.047	-0.088	-0.343	-0.190
		Sig. (2-tailed)	0.085	0.340	0.844	0.713	0.150	0.421
		N	19	20	20	20	19	20
	Secondary mineral recycling	Correlation Coefficient	-0.120	-0.283	-0.042	0.205	-0.160	-0.224
		Sig. (2-tailed)	0.623	0.227	0.861	0.385	0.512	0.342
		N	19	20	20	20	19	20
	Water recycling	Correlation Coefficient	-0.082	-0.191	-0.051	-0.006	-0.191	-0.011
		Sig. (2-tailed)	0.738	0.419	0.830	0.980	0.432	0.963
		N	19	20	20	20	19	20
	Depletion of mineral sources	Correlation Coefficient	-0.137	-0.156	-0.192	0.147	-0.382	-0.202
		Sig. (2-tailed)	0.575	0.512	0.417	0.536	0.106	0.394
		N	19	20	20	20	19	20
	Gain-sharing	Correlation Coefficient	-.586**	-0.213	-0.221	-0.312	-.540*	-0.060
		Sig. (2-tailed)	0.008	0.367	0.350	0.180	0.017	0.800
		N	19	20	20	20	19	20
	Exhaustion of natural resources	Correlation Coefficient	-0.165	-0.003	-0.204	0.017	0.283	-.514*
		Sig. (2-tailed)	0.499	0.991	0.389	0.944	0.240	0.020
		N	19	20	20	20	19	20
	Protection of domestic markets	Correlation Coefficient	0.292	0.246	0.351	-0.114	.465*	0.213
		Sig. (2-tailed)	0.226	0.296	0.129	0.632	0.045	0.368
		N	19	20	20	20	19	20
	Protection of local mining firms	Correlation Coefficient	.463*	0.229	0.359	-0.117	.562*	0.356
		Sig. (2-tailed)	0.046	0.331	0.121	0.624	0.012	0.124
		N	19	20	20	20	19	20
	Reduction in domestic products consumption	Correlation Coefficient	0.318	0.239	0.004	-0.120	0.162	0.179
		Sig. (2-tailed)	0.184	0.311	0.988	0.615	0.507	0.449
		N	19	20	20	20	19	20
	International disaster management protocols	Correlation Coefficient	0.070	0.265	0.333	-0.038	0.236	0.278
		Sig. (2-tailed)	0.777	0.258	0.152	0.872	0.331	0.235
		N	19	20	20	20	19	20
	More sustainable operations	Correlation Coefficient	.464*	0.115	0.404	.578**	0.352	0.011
		Sig. (2-tailed)	0.045	0.629	0.077	0.008	0.139	0.965
		N	19	20	20	20	19	20

Business expansion	Correlation Coefficient	-0.192	-0.261	0.139	0.264	0.099	-.503*
	Sig. (2-tailed)	0.431	0.266	0.559	0.261	0.688	0.024
	N	19	20	20	20	19	20
Expertise complementarity	Correlation Coefficient	0.173	-0.148	.529*	0.338	0.300	0.079
	Sig. (2-tailed)	0.479	0.534	0.017	0.144	0.212	0.740
	N	19	20	20	20	19	20
Increased international trade cooperation	Correlation Coefficient	-0.098	-0.302	0.206	0.008	-0.018	0.039
	Sig. (2-tailed)	0.691	0.196	0.383	0.974	0.942	0.871
	N	19	20	20	20	19	20
Better regional integration	Correlation Coefficient	0.327	0.100	0.154	-0.004	0.448	0.251
	Sig. (2-tailed)	0.172	0.676	0.518	0.988	0.055	0.286
	N	19	20	20	20	19	20
More profitable mineral trade	Correlation Coefficient	0.217	-0.057	0.259	-0.183	0.192	0.319
	Sig. (2-tailed)	0.373	0.810	0.271	0.441	0.431	0.170
	N	19	20	20	20	19	20
Better usage of resources	Correlation Coefficient	0.323	-0.070	0.152	0.200	0.367	0.150
	Sig. (2-tailed)	0.178	0.770	0.524	0.398	0.122	0.527
	N	19	20	20	20	19	20
Greater exchange of information	Correlation Coefficient	-0.046	-0.083	.598**	0.370	-0.058	.518*
	Sig. (2-tailed)	0.851	0.728	0.005	0.108	0.813	0.019
	N	19	20	20	20	19	20
Better transport infrastructures	Correlation Coefficient	-0.141	-0.132	.722**	0.004	0.056	.518*
	Sig. (2-tailed)	0.566	0.579	0.000	0.988	0.819	0.019
	N	19	20	20	20	19	20
Mutual developmental dependence with BRIC	Correlation Coefficient	-0.288	-0.181	0.285	-0.315	-0.078	0.133
	Sig. (2-tailed)	0.232	0.444	0.223	0.176	0.749	0.576
	N	19	20	20	20	19	20
Increased capital inflow	Correlation Coefficient	-0.373	-0.068	0.337	-0.159	-0.015	-0.039
	Sig. (2-tailed)	0.116	0.775	0.147	0.503	0.952	0.871
	N	19	20	20	20	19	20
Technological innovation	Correlation Coefficient	0.162	0.050	0.428	-0.089	0.245	0.319
	Sig. (2-tailed)	0.507	0.833	0.060	0.708	0.312	0.171
	N	19	20	20	20	19	20

	Speedy industrialisation of new zones	Correlation Coefficient	-.478*	-.481*	0.271	0.089	-0.127	-0.123
		Sig. (2-tailed)	0.038	0.032	0.248	0.710	0.604	0.605
		N	19	20	20	20	19	20
	Price decrease	Correlation Coefficient	-0.377	-0.264	-0.011	-0.185	0.050	-0.245
		Sig. (2-tailed)	0.112	0.260	0.962	0.435	0.838	0.298
		N	19	20	20	20	19	20
	Job creation	Correlation Coefficient	-0.073	-0.181	0.410	0.381	0.091	0.164
		Sig. (2-tailed)	0.766	0.445	0.073	0.097	0.711	0.490
		N	19	20	20	20	19	20
	Better living conditions	Correlation Coefficient	0.046	-0.043	0.211	0.111	0.168	-0.003
		Sig. (2-tailed)	0.852	0.857	0.372	0.642	0.492	0.990
		N	19	20	20	20	19	20
	Economic growth	Correlation Coefficient	-0.200	-0.286	.464*	0.412	-0.073	0.249
		Sig. (2-tailed)	0.411	0.222	0.039	0.071	0.765	0.290
		N	19	20	20	20	19	20
	Exploitation of miners	Correlation Coefficient	0.162	0.227	-.456*	0.062	0.441	-.656**
		Sig. (2-tailed)	0.520	0.350	0.050	0.800	0.067	0.002
		N	18	19	19	19	18	19
	Increased unemployment rate	Correlation Coefficient	-0.007	0.199	-0.096	-0.065	0.024	0.008
		Sig. (2-tailed)	0.978	0.399	0.688	0.785	0.921	0.973
		N	19	20	20	20	19	20
	Decline in domestic mineral products demand	Correlation Coefficient	0.034	-0.189	-0.069	0.026	-0.285	0.214
		Sig. (2-tailed)	0.891	0.424	0.773	0.913	0.236	0.365
		N	19	20	20	20	19	20
	Introduction of non-democratic systems	Correlation Coefficient	-0.255	-0.059	-0.215	0.010	-0.192	0.036
		Sig. (2-tailed)	0.293	0.805	0.362	0.967	0.430	0.882
		N	19	20	20	20	19	20
	increased environmental mining disasters	Correlation Coefficient	-0.183	-0.017	-0.069	-0.079	-0.087	0.215
		Sig. (2-tailed)	0.452	0.942	0.773	0.741	0.724	0.362
		N	19	20	20	20	19	20
	Initiation of conflict or war	Correlation Coefficient	0.263	-0.019	0.137	0.031	0.065	0.373
		Sig. (2-tailed)	0.277	0.938	0.565	0.897	0.792	0.105
		N	19	20	20	20	19	20

	Increased Illegal migration of miners	Correlation Coefficient	-0.111	-0.346	-0.195	0.002	0.037	0.050
		Sig. (2-tailed)	0.651	0.136	0.411	0.992	0.880	0.833
		N	19	20	20	20	19	20
	Increased failure to cooperate internationally	Correlation Coefficient	0.079	-0.036	-0.254	-0.106	0.149	0.036
		Sig. (2-tailed)	0.749	0.882	0.280	0.656	0.543	0.881
		N	19	20	20	20	19	20

Note: extracts of data output are presented selectively as the survey generated a lot of information. Some of the most important insights are appended while the rest will be subjected to data mining for publications.

APPENDIX G: CORRELATIONS (EXTRACT) CONTINUED

	Mining innovation	Global economic crisis	Better usage of natural resources	Organizing mining skills	Promoting better waste management	Research information sharing	Technological innovation
Economic growth				0.464*			0.468*
Exhaustion of mineral resources					0.514*		
Mining exchange programme with BRIC	0.482*						
Secondary mineral recycling	0.556*						
Refining plant	0.576*						
Depletion of mineral resources		0.524*					
Exhaustion of natural resources	0.591*						
Better living conditions			0.511*				
Monitoring and evaluation	0.578*						
International disaster management Protocols	0.583*						
International disaster management protocols							0.458*

APPENDIX G: CORRELATIONS (EXTRACT) CONTINUED

	Promoting better waste management	Organizing mining skills	Better usage of natural resources	Protecting the physical environment	Better regional integration	Initiation of conflict or war	Better living conditions
Organizing mining skills	0.533*						
Funding allocations			0.488*				
Local grading of minerals				0.464*			
Protecting the physical environment					0.517*		
Regular labour unrest						0.449*	
Decreasing exports							0.634*

APPENDIX G: CORRELATIONS (EXTRACT) CONTINUED

	Greater exchange of information	Greater exchange of information	Greater exchange of information	International trade and cooperation
Technological innovation	0.515*			
Job creation		0.557*		
Economic growth			0.704*	
Better regional integration				0.642*
More profitable mineral trade				0.662*
Better usage of resources				0.515*
Technological innovation				0.505*
Speedy industrialization of new zones				0.609*

APPENDIX G: CORRELATIONS (EXTRACT) CONTINUED

	Price decrease	Job creation	Increased unemployment rate	Decline in domestic mineral products demand	Introduction of non-democratic systems
Better living conditions	0.465*				
Better living conditions		0.474*			
Increased illegal migration of miners			0.542*		
Increased failure to cooperate internationally				0.493*	
Increased environmental disasters					0.672*
Initiation of conflict or war					0.509*
Increased failure to cooperate internationally					0.479*
Increased illegal migration of miners					0.502*

APPENDIX G: CORRELATIONS (EXTRACT) CONTINUED

	Increased environmental mining disasters	Initiation of conflict or war
Initiation of conflict or war	0.646*	
increased failure to cooperate internationally		0.666*

		Chi-Square	df
	When was this company founded?	2.5	14
Q1.1			
Q1.4	How many years of experience do you have in this mining field?	5	13
Q1.5.1	Diamond	3.769	1
Q1.5.2	Platinum	2.571	1
Q1.5.3	Gold	1.923	1
Q1.5.4	Copper	3	1
Q1.5.5	Coal	0.333	1
Q1.8.1	Gainsharing	12.316	4
Q1.8.2	Distributing monetary incentives	6.5	4
Q1.8.3	Organising mining skills training	13.2	3
Q1.8.4	Doing beneficiation by hydration	4.5	4
Q1.8.5	In-country cutting and polishing of mineral	3.895	4
Q1.8.6	Promoting better waste management	4.3	2
Q1.8.7	Local grading of mineral	3.895	4
Q1.8.8	Smelting locally	5.5	4
Q1.8.9	Refining plant	2.5	4
Q1.8.10	Making craft jewellery or ceramic pottery	6	4
Q1.8.11	Investing in metal fabrication	4.421	4
Q1.8.12	Protecting the physical environment	7.6	2
Q2.2.1	Mining innovations	2	4
Q2.2.2	Mining exchange programmes with the BRIC states	3.111	4
Q2.2.3	Research information-sharing	4.471	4
Q2.2.4	Mining projects	1.111	3
Q2.2.5	Secondary mineral recycling	5.474	4
Q2.3.1	Project ownership	7.81	4
Q2.3.2	Funding allocations	3.524	4
Q2.3.3	Implementing plans	12	4
Q2.3.4	Monitoring & Evaluation	7.81	4
Q2.3.5	Sharing of responsibilities	4.952	4
Q2.4.1	Exchange programmes	7	3
Q2.4.2	Favourable fiscal policy	4.3	2

Q2.4.3	Financial Resources' provision	7.714	2
Q2.4.4	Human resources' provision	1.667	3
Q2.4.5	Utilisation of company's expertise	10.5	4
Q2.4.6	Improved management systems	5.474	4
Q2.4.7	Collaborative synergies	3.895	2
Q3.1.1	Global economic crisis effects	20.19	4
Q3.1.2	Insufficient funds for operations	4.952	4
Q3.1.3	Regular labour unrest	8.286	4
Q3.1.4	Shortage of electricity	6.857	4
Q3.1.5	Decreasing exports	5.905	4
Q3.1.6	Secondary mineral recycling	4.476	4
Q3.1.7	Water recycling	2.571	4
Q3.1.8	Depletion of mineral sources	2.571	4
Q3.1.9	Gain-sharing	16.381	4
Q3.2.1	Exhaustion of natural resources	2	4
Q3.2.2	Protection of domestic markets	3.5	4
Q3.2.3	Protection of local mining firms	4	4
Q3.2.4	Reduction in domestic products consumption	7.6	3
Q3.2.5	International disaster management protocols	16	4
Q4.1.1	More sustainable operations	4.333	3
Q4.1.2	Business expansion	2.571	2
Q4.1.3	Expertise complementarity	4.714	3
Q4.1.4	Increased international trade cooperation	13.857	3
Q4.1.5	Better regional integration	8.762	4
Q4.1.6	More profitable mineral trade	8.524	3
Q4.1.7	Better usage of resources	3.571	3
Q4.1.8	Greater exchange of information	8.143	3
Q4.1.9	Better transport infrastructures	1.667	3
Q4.1.10	Mutual developmental dependence with BRIC	7.333	4
Q4.1.11	Increased capital inflow	5.095	3
Q4.1.12	Technological innovation	11.19	3
Q4.1.13	Speedy industrialisation of new zones	5.476	3
Q4.1.14	Price decrease	11.619	4
Q4.1.15	Job creation	18	2

Q4.1.16	Better living conditions	8.857	2
Q4.1.17	Economic growth	14.857	2
Q4.2.1	Exploitation of miners	4	4
Q4.2.2	Increased unemployment rate	3.524	4
Q4.2.3	Decline in domestic mineral products demand	6.238	3
Q4.2.4	Introduction of non-democratic systems	6.238	3
Q4.2.5	increased environmental mining disasters	9.238	4
Q4.2.6	Initiation of conflict or war	5.857	3
Q4.2.7	Increased Illegal migration of miners	10.667	4
Q4.2.8	Increased failure to cooperate internationally	7	3