

Chapter 2

BRICS challenges and opportunities: management's perceptions in South Africa's mining sector

Byelongo Elisee Isheloke ¹

¹ University of Cape Town, Department of Chemical Engineering, Minerals to Metals Initiative

Abstract

Using managerial tools such as the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis as well as the Political, Economic, Social, Technological, Ecological and Legal (PESTEL) framework, the paper presents an outlook of what transpires about the Brazil, Russia, India, China and South Africa (BRICS)'s partnership and looks into its prospects through the lenses of management's expertise. It is an attempt to make sense of the BRICS challenges and opportunities in order to eradicate poverty and other socio-economic ills. Among other things, the positive aspects of the BRICS include but are not limited to being an alternative to the World Bank and the IMF as far as capital-intensive projects financing is concerned. The negative aspect hitting the BRICS are no other than trade (tariff) war against the US, the Russia-China attempt to proximity with EU as well as inherent socio-economic problems within each of the member countries. Using mixed methods and a predominantly qualitative design, the study presents ways to avoid threat and embrace developmental opportunities in South Africa. Last but not least, senior management and directors' perceptions were taken into account in rethinking the current BRICS role in multilateralism. Through data-turned information from the South African mining sector, the study found possible ways to improve BRICS multilateral relations through synergy and continuous engagements.

Keywords: BRICS, PESTEL framework, SWOT-analysis, Mining Industry, International trade and cooperation

Introduction

With the threat posed by the COVID-19 pandemic and the financial burden that it will have to the global economic fabric, the BRICS foresees as an organisation, numerous challenges. However, the (quasi-) successful curbing of the health crisis in Wuhan, China, and the potential restructuring, rethinking and innovation of international trade and cooperation means better prospects are a possibility. Decisions to restructure and re-engineer the mining business mainly stems from production and trade difficulties that they encounter on daily basis in their operations. To do this, mining companies have a number of tools at their disposal including the Strengths, Weaknesses, Opportunities and Threat (SWOT-analysis) as well as the Political, Economic, Social, Technological, Environmental, and Legal (PESTEL) framework. This paper examines the situation in BRICS, and South Africa's case study is hereby presented. These valuable management instruments allowed to get relevant insights from experts, engineers and professionals working at top management levels. The paper is structured in five parts, namely, the introduction, literature review, research methodology, data analysis, and conclusion.

Literature Review: Theories of International Trade and Cooperation

Applicable to the BRICS are the theories of trade and cooperation which for the partnership are among the cornerstone. Ranzau [1] studied international trade theories and provided an interesting analysis of what it entails through commerce. Nafzinger [2] examined international trade theories and linked them to liberalisation of commerce. Parikh [2] states that trade liberalisation develops economic growth.

Trade is made of imports and exports amongst other things. In the second semester of 2013, South Africa had a 3.2% increase in export volumes and R3.6 billion was received for value-added exports and jobs creation activities in poor locations. South Africa also allocated R35 billion for industrial development in order to boost the economy, accelerate transformation and generate more jobs. It was reported that R844 billion were allocated for infrastructural development and maintenance over the three years in 2014 [3]. International trade is known to have both advantages and disadvantages. The positive aspects include more economic use of natural resources; diversified commodities; availability of scarce commodities; the rise of competition; speedy industrialization; a more competitive price; transport means development and interdependence between countries. The negative aspects are on the other side including speedy exhaustion of resources, negative effects on domestic industries, imports harming domestic markets (consumption), and in case of the state of emergency, it becomes problematic or difficult to intervene abroad [4]. In parallel to Muthumani [5], Pandare [4] does not focus on the effects of globalization instead this author discusses the pros and cons of international trade and co-operation. The two concepts at times overlap in theory and practice. In other words, they share the following benefits: more economic use of resources, speedy industrialisation,

development of transport and the inter-dependence between partners. Johnson, Scholes and Whittington [6] state that, the strengths, weaknesses, opportunities and threats (SWOT) analysis provides a summary of major issues from a company's environment as well as threshold capabilities impacting on the business. In order to comprehend holistically how trade and cooperation affects the BRICS, a situational analysis was conducted as per below.

Mazenda [7] gives a number of recommendations for BRICS policy consideration with the aim to boosting Foreign Direct Investment (FDI) in and out flows. Government policies aim at redressing the imbalances of the past and alleviating poverty in South Africa are a prerequisite. This move as essential as an impetus for common socio-economic, security and political development [8]. Political problems often affect developmental initiatives and investors are discouraged in the long run.

The BRICS States represent 40% of the world's population and their economy is rapidly growing" ([9]. Mazenda [7] states that the newly formed (BRICS') New Development Bank must invest more on infrastructure development, but this is not news at all as it's a known factor.

Amid and post the novel Coronavirus disease these prospects will change dramatically for the worse. The NDP was established in an attempt to reverse the national non-growth economy [10]– a situation which will be exacerbated owing to the current global health and economic crisis.

Beyene [11] examines the possibility of economic integration of BRICS member states especially within their own region via trade. Resemblance includes the economic structures that allow less value addition and beneficitation in such a way that intra-BRICS transactions are diminishing with the impact of failing FDI [7]. The current COVID-19 threat only adds to the existing difficulties.

Global Economic Slowdown

Financial recession was an issue in 2010 in spite of efforts to alleviate its effects [12]; [5]. There has been a drop-in people's consumption owing to the increase of tax [13] and today COVID-related lockdowns (although necessary) equally affect the economy in the negative way. Joyce *et al.* [14] 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 accommodating as in developed countries. Joyce *et al.* [14] agree on the impact of unconventional interventions on the economy. With the threat that the COVID-19 poses, many countries including South Africa, have introduced incentives to sustain the economy – mechanisms to curb corrupt practices have also been notably put in place.

Tong and Wei [15] found that the companies which depend more on external finance were severely affected by the liquidity crisis. This finding supports the view

that FDI plays a crucial role in alleviating economic crises. Whereas the 2008-2010 global economic crisis had been caused by decrease in growth; institutional failure; exposure to numerous risks; and epidemics could happen by the human factor possibility [16] [17].

It is worth noting that FDI plays a crucial role in reducing unemployment. Local productivity is enhanced by the action of multinationals [18], although it is argued that multinationals are also a factor to under-employment of national human resources especially in Africa. Motsepe [19] stated that governments are being encouraged in Africa to conduct reforms on fiscal, legal, anti-corruption and good governance.

The BRICS bank had a charter capital of \$50 billion USA (32.5 billion pounds; 45.5 billion euros) in 2015 with prospects of reaching \$100 billion USA once increased by members' contributions [20]. The author agrees with [20] on the capital allocated to the BRICS bank as a good start. Sridharan [20] conducted research that talk to this study. It is further noted that BRICS plays an influential 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 [22].

It was recently announced that South Africa has the most sophisticated banking systems and capital market credentials than any of the BRIC countries [23].

Research Methodology

Using a predominantly qualitative methodology, the study presents ways to avoid threat and embrace developmental opportunities thrown to the BRICS. Using a SPSS Version 24, a survey questionnaire output was analysed of which the results were compared to information collected through in-depth semi-structured interviews. The study allowed to garner management's perceptions and factual information resulting in this article. This study, therefore, made use of mixed methods in making sense of the voluminous data collected during the investigation. Both quantitative and qualitative methods were used namely a survey questionnaire and an interview schedule, as collection instruments.

Findings and Discussions

Quantitative findings

On international trade, cooperation and economic impact the following were found:

Increased international trade cooperation (.642*) in correlation with better regional integration

Increased capital inflow (.544*) in correlation with technological innovation

Economic growth (-.497*) in negative correlation with exploitation of

miners.

This paper presents the econometric model developed as a result of this research. A linear formula better explains the relationship between the variables.

$$Y = f(x_1, x_2, x_3, x_4)$$

In the formula above, the Dependent Variable (DV) is mineral beneficiation and the Independent Variables (IV) include more sustainable operations, global economic crisis and so forth. A summary of the multivariate linear regression follows:

Table 1. Multivariate Linear Regression Model Summary

Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate
1	.698 ^a	.487	.351		.78875

a. Predictors: (Constant), More sustainable operations, Global economic crisis effects, Involved with BRICS, Project ownership

Table 1 indicates that there is a strong positive correlation between the predictors and the dependent variable: (Constant), More sustainable operations, global economic crisis effects, involved with BRICS, and project ownership. Nearly 49% of the variation (dependent variables) can be explained by variations in the predictors. The next section presents the Anova.

Table 2. Anova ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.868	4	2.217	3.564	.031 ^b
	Residual	9.332	15	.622		
	Total	18.200	19			

a. Dependent Variable: Upstream

b. Predictors: (Constant), More sustainable operations, Global economic crisis effects, Involved with BRICS, Project ownership

Table 2 indicates that the overall model is a good estimate of the dependent variable (since $p < 0.05$, that is $p = 0.031$).

Table 3. Coefficients Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
		B	Std. Error			
1	(Constant)	.976	.753		1.297	.214
	Involved with BRICS	.279	.187	.305	1.497	.155
	Project ownership	-.467	.183	-.555	-2.557	.022
	Global economic crisis effects	.516	.200	.521	2.581	.021

More sustainable operations	.376	.185	.384	2.037	.060
-----------------------------	------	------	------	-------	------

a. Dependent Variable: Upstream

Table 3 tests the null hypothesis that the coefficients of the variables in the equation are zero. P-values less than 0.05 imply that there is a significant difference. It implies that the (shaded) variables do have an impact on the dependent variable.

Qualitative Findings

In general, it was established that the current beneficiation policies are not very effective in South Africa. 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 thought it must be approached cautiously.

Table 4. BRICS SWOT-Analysis

Strengths	Weaknesses
- Huge human resources/popularity	- Top-down initiatives/partnership
- Emerging economies	- Relatively new/ inexperienced deployed workers
- Huge mineral/natural resources	- Insufficient emancipation of women
- Cross-continental positioning	- Not enough funding compared to FMI/WB
- E-business/IT	- Limitations to entry into the partnership
- Import-Export/trade exchanges	- Distance between partners
- Huge think tank	- Lack of a democratic common language
- Fast growing economy	- Lack of independent/external audit
- Strong/stable institutions	- Limited resources or depletion
- BRICS Bank/liquidity	
Opportunities	Threats
- Bottom-up approach going forward	Negative competition with FM/WB -
- Alternative to IMF/WB as a possibility	Disunity at UNSC over Libya...
- BRICS PLUS opportunity	- Excessive nationalism/selfishness
- Economic development	- Economic recession/aftermath
- Mineral beneficiation initiatives	- Ageing population – China

- Lobby for climate change MDG/SDV	- Insufficient democracy in China
- Research/Development	Uncertainty about the future
- Military cooperation	- Unequal financial capabilities
- Globalisation/global initiatives	- Unemployment
- Triggering world reforms - Citizens' solidarity and social diversities	- War from non-members: physical/ideological/economic
	- Neo-colonialism/dominance

Source: Consulted [40]; [41] and others.

In Table 4, the BRICS strengths appear to be that they are all emerging economies with strong and stable institutions. In addition, the BRICS members are rich in minerals and have the manpower to their credit. Overwhelmingly, one of the biggest threats for BRICS is now the COVID-19 saga in addition to the lack of beneficiation policy breakthroughs in many African countries.

This study makes use of another important management instrument: the political, economic, social, ecological, technological and legal (PESTEL) framework below.

Table 5. PESTEL Framework

Political Factors	Economic Factors	Social Factors
- Different political regimes	- Recession	- Unemployment in BRICS countries
- Conflict of interests at UNSC	- Investors' friendly regulations in SA	- Inequality in SA, poverty in BRICS
- The burden of historical heritage: Apartheid for SA, communism for Russia and China, cast system in India, issue of cultural diversity in Brazil	- BRICS bank liquidity	- Ageing societies – China
- Military joint-venture for peace-building/conflict resolution	- Mining dependent economy (SA)	- The communication/language challenge
- Democratic institutions	- Search for natural resources/raw materials (Russia, India, China)	
	- Dynamics of newly established pro-free-market system in China and Russia	
Technological Factors	Ecological Factors	Legal Factors
- Technical Factors	- Climate change issues	- Human rights violations in BRICS
- The mechanisation of mining jobs	- Effects of mining on the environment	- Lawyers in Brazil not allowed to team up with external legal agents for action in Brazil
- IT infrastructure in mining/RFID	- The danger/benefit of nuclear technology	- Legal matters
- Beneficiation infrastructure	- COVID-19 threat	
- BRICS think tank/Knowledge hub	- The impact of the green economy	

- Depletion of geo-resources
- Conspiracy theories on COVID-19

Source: [12]; [42] and others.

Any government's action that takes into account all the PESTEL factors as in Table 5 is to be commended. It is the responsibility of public officials to put in place policies, although a third party could also influence policy formation or implementation thereof. Anderson [24] stresses out the role of the government in putting in place sound policies to cater for the need of the business environment in which the mining company operates.

Table 6. 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%		

It emerged that 75% percent of interviewees were males, that is six out of eight participants (Table 6). 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.

Biographical information: The following table presents demographics:

Table 7. 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

As indicated in the table 7, senior, middle and lower management were interviewed. It was found that, 52% of the respondents were employed at senior or middle management position. Moreover, 14.3% of the respondents were either directors or senior leaders. Some senior managers were reluctant to participating in the research conducted by a non-member of their company. This corroborates with other sources [25]. A total of 33% of the participants were mining engineers or had a tertiary qualification. The number of years of professional experience is presented below.

Table 8. Number of Years of Experience

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

Table 9. BRICS Competitive Advantages

		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

Table 8 shows that the most experienced manager had worked for 30 years in the organisation and the least one year. Experienced managers passed their expertise through this investigation to potential readers. Of importance to this study is the competitive advantage of each BRICS country.

For Brazil, the competitive advantage is found to be “industrial development” and “natural resources” in line with the previous findings [26] with respectively 47.6% and 33.3% of scores (See Table 9). The instability and the allegation of corruption (about the leftist popular leader Lula da Silva) that shook this country recently [27] also saw the country’s involvement in BRICS affairs weakened; raising concern about the sustainability of the partnership. Persisting instability in Brazil and negative perception in the public opinion (if unresolved) is a danger to BRICS [28] 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.

Table 10. Downstream Mineral Beneficiation

	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%

India is identified as having IT as its biggest competitive advantage with 57.1% of scores. 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 [12] [29] with 57.1% of scores, followed by “manpower” and IT scoring 42.9% each. The highest competitive advantage for SA was found to be “democratic institutions” with 66.7%; equally so, “natural resources” scored the same. As SA seeks to prioritise infrastructure, mining and mineral beneficiation [30], IT infrastructure will be crucial going forward. More on mineral beneficiation is presented in the following section.

Table 10 above shows output that address beneficiation of minerals in South Africa.: organising mining skills training (90%); protecting the physical environment (90%); and promoting better waste management (80%) are among options needed in the mining sector. These outputs are found by combining scores. The literature shows that mining companies are compelled to comply with the laws of South Africa with regard to skills transfer, environmental protection and safe disposal of waste [31]; The Mineral and Petroleum Resources Development Act 28 of 2002) [32].

Information Technology

Emergent themes covered a variety of issues including the cutting-edge technology and 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). It is important to note that the government seeks to develop the infrastructure [30]. Pickering and Porter [29] agree with the interviewee no.4 on the need to promote ITC.

Socio-Economic Impact of BRICS and Mineral Beneficiation

It was felt by a few that the influence of China is too much. Xi [34] elaborates on how influential China has become. Furthermore, the burning issue in South Africa is that of economic transformation. All the participants agree on transformation (Interviewee no. 1 to Interviewee no. 8). There was a feeling that the country needs to do more beneficiation gradually and responsibly (Interviewee no. 4 and Interviewee no.5).

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). The advent of Coronavirus disease in 2019 (COVID-19) is novel and requires the attention of all stakeholders.

Politicians are not immune to corruption [36]; [37]. Therefore, an integrated approach should be the way forward. 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.

Mining Policy

A total of 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. Participants stated:

- 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).

BRICS, Globalisation and Beneficiation

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. Minerals in the BRICS countries were extensively

reviewed [26]; [51]; [38].

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). The Brics strategy [39] presents another story. Other commentators would disagree with this finding favouring instead globalised deals, and states that there is nothing wrong with globalisation.

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).

Bilateral versus multilateral agreements

The outputs below depict what had happened in the past:

- A MoU Russia-South Africa on PGM & Palladium was signed;
- In 1977 India-South Africa signed a MoU;
- The EU has gotten in place on emission Euro-standards whereby cars are to be adapted to those standards; and China & South Africa diamonds works happen to be a reality now (Interviewee no.5).

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 [12].

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).

Policy and Competition

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).

Multilateralism is being advocated for by China [41]. Corradi and Verzelloni [21]; [34]; [43], [7] are a testimony to the need to synergise for policy coordination.

Challenges in South Africa Include

Rich-poor disparity; BBBEE; Beneficiation; Marikana massacre effects; Mining safety; The mining industry legacy (Apartheid). Threat of disease; Helping 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 [37]; [36]; 44; [12]; [45]; [46]; [47].

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 [4]; [5]). One then is led to ask: do mining companies try to escape their social responsibilities?

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 [48].

A different approach to work is needed, as a participant summarised it:

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 [49]; [50]. Hereafter, the matching findings are grouped in categories

before discussion.

Biographically Common Issues and Policy Formulation

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.

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. The policy of the government of SA is gender equality or 50-50% gender parity. Similar situation as it unfolds in the Russians industrialisation is also studied [51]. Of the BRICS countries, SA outruns the rest in terms of women's emancipation although SA ranks 15th globally and fourth in Africa [52]. 25-30 years of employment at maximum could be reached.

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 [7] currently.

Common Findings on Challenges and Proposed Solutions to The Challenges

These include the following: global economic effects; labour unrests; shortage of electricity; and lack of sufficient gainsharing. Disparities between quantitative and qualitative data findings were also challenging albeit slightly. The similarities outweighed the differences in the given responses.

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; capacity-building; mining skills training; and gainsharing.

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. The highest levels of disagreement were found on secondary mineral recycling; mining projects; and mining exchange programme. 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.

Conclusion

This study explored the effects of BRICS partnership on mineral

beneficiation in South Africa. It looked into the issue of mineral beneficiation in the context of BRICS and addressed relevant theories to the study including international trade and co-operation theories. Using mixed methods, the investigation into the perceptions of mining companies' management and government officials who deal with BRICS and/or mineral beneficiation yielded the results herein presented. It was established that mineral beneficiation becomes successful when both downstream and upstream beneficiations are the focus of public-private engagement, and when the beneficiation infrastructures are in place and user friendly. Data mining shows that a mathematical model was possible and is herein presented. The main finding was that gradual mineral beneficiation should be the way to go for the BRICS engagement in South Africa.

Acknowledgement

The NRF and the DUT schemes for the findings; the Durban University of Technology for financial support (DUT); the Chamber of Mines; the Department of International Relations and Co-operation, - BRICS Directorate (DIRCO); the Department of Mineral Resources; and Mining companies as well as related organisations; the participants for their inputs and shared knowledge; and the University of Cape Town for supporting the researcher currently through a postdoctoral research fellowship position.

Disclaimer

There is no conflict of interests whatsoever.

References

- [1] Ranzau, S. 2009. *Five theories of international trade*. Available: <http://voices.yahoo.com/five-theories-international-trade-2942515.html> (Accessed 24 September 2013).
- [2] Nafzinger, E. W. 2012. *Economic development*. 5th ed. Cambridge: Cambridge University Press.
- [3] Naidoo, B. 2014a. Budget in brief. *SA Mining*, March: 8.
- [4] Pandare, N. 2012. *Advantages and disadvantages of international trade*. Available: <http://www.scribd.com/doc/99601487/Advantages-and-Disadvantages-of-International-Trade> (Accessed 01 February 2020).
- [5] Muthumani, S. 2010. *International trade*. Sathyabama: Sathyabama University.
- [6] Johnson, G., Schole, K. and Whittington, R. 2006. *Exploring corporate*

strategy: text and cases. 7th ed. London: FT Prentice.

- [7] Mazenda, A. 2016. *BRICS FDI relations: a preliminary review*. *Development Finance Agenda*. Available: http://journals.co.za/docserver/fulltext/default_v2_n2_ab.pdf?expires=1478786671&id (Accessed 10 November 2016).
- [8] PTI. 2017. China invites five nations for summit under BRICS plus, denies reports of expanding group. *First Post*. Available: www.firstpost.com/world/china-invites-five-nations-for-summit-denies-attempts-at-expanding-group-3989949.html (Accessed 03 September 2017).
- [9] *Esperanto in BRICS countries*. 2016. *Esperanto: a language of communication and growth in our BRICS states* (Pamphlet). Available: http://uea.org/vikio/Landaro_briksa. (Accessed 01 October 2016).
- [10] Zhenbo, H. 2013. *The BRICS summit in Durban: too soon to write it off*. Shaping policy for development: <https://www.odi.org/comment/7359-aid-development-finance-brics-brazil-russia-india-china-southafrica> (Accessed 10 March 2017).
- [11] Beyene, H. G. 2015. BRICS and Sub-Saharan Africa trade interdependence and peace: evidence based on revealed comparative advantages. *Journal of Law, Society and Development Multi-, Inter- and Transdisciplinary*, 2 (1): 4-28.
- [12] Jones, S. 2012. *BRICS and beyond: executives lessons on emerging markets*. West Sussex: John Wiley & Sons.
- [13] Shaban, A. and Vermeylen, F. 2015. Trade in the creative sector: comparing India with China, Brazil, and UK. *Economic & Political weekly*, L (20): 68.
- [14] Joyce, M., Miles, D., Scott, A. and Vayanos, D. 2012. Quantitative easing and unconventional monetary policy – an introduction. *The Economic Journal*, 122 (November).
- [15] Tong, H. and Wei, S. 2011. The composition matters: capital inflows and liquidity crunch during a global economic. *The Review of financial studies*, 24 (6): 2023-2052.
- [16] United Nations. 2014. Ebola threatens world peace. *Arab News*, 20 September.
- [17] Chan, M. 2014. Ebola outbreak threatens peace, security, WHO chief says. *Sfgate*, 13 October.
- [18] Brander, J. A. and Spencer, B. J. 1985. Foreign direct investment with unemployment and endogenous taxes and tariffs. *Journal of International Economics*, 22 (1987): 257-279.

- [19] Motsepe, P. 2013. Motsepe gives half to the poor. *SA Mining*, February: 6.
- [20] Sridharan, V. 2015. *Russia offers debt-ridden Greece funds from BRICS bank*. Available: www.ibtimes.co.uk/russia-offers-debt-ridden-greece-funds-brics-bank-1509825 (Accessed 13 July 2015).
- [21] Corradi, G., Gherardi, S. and Verzelloni, L. 2010. Through the practice lens: where is the bandwagon of practice-based studies heading? *Management Learning*, 41 (3): 265-283.
- [22] Huanhuan, L. 2017. "BRICS Plus" can become new integration model for world economy: EDB chief economist. *New China*, 17 April 2017.
- [23] Dimmer, K. 2014. Banking on the BRICS: economy. *Professional Accountant*, 9-12.
- [24] s. Anderson (2015) ?Anderson, J. E. 2016. *Public policymaking*. 8th ed. Texas: Cengage Learning.
- [25] Information Resources Management Association. 2013. *Digital rights management: concepts, methodologies, tools, and applications*. Hersley: IGI Global. Available: <https://books.google.co.za/books?id=pNiFYa0LicIC&pg=PA1291&lpg=PA1291&dq=senior+managers+refuse+to+participate+in+research+from+outside&s> (Accessed 19 October 2017).
- [26] *BRICS joint statistical publication*. 2013. Durban: Statistics SA.
- [27] Bloomberg. 2017. Lula, judge face off in watershed graft trial. *The Mercury*, 12 May: 8.
- [28] Pandey, A. 2016. Political situation in Brazil. *India Council of World Affairs*. Available: www.icwa.in (Accessed on 10 March 2017).
- [29] Pickering, R. and Porter, J. 2014. Unlocking the future of mining. *SA Mining*, February: 52-53.
- [30] Fabricius, P. 2013a. Brics members get down to business. *The Mercury*. 23 August.
- [31] *The beneficiation strategy*. 2015. Pretoria: The DME.
- [32] The Mineral and Petroleum Resources Development Act 28 of 2002)
- [33] Fabricius, P. 2013b. Zuma agrees to billions for BRICS. *The Mercury*. 6 September: 2.
- [34] Xi, J. 2014. *The governance of China*. Beijing: Foreign Languages Press.
- [35] Jayasuriya, D. S. 2012. Investment and advisory: case studies for private sector development in Papua New Guinea and China. *Enterprise Development & Microfinance*, 23 (3): 229-239.

- [36] Bond, P. 2014a. Marikana's meaning for crisis management: an instance of South Africa's resource curse. *Crisis Management*, 192-219.
- [37] Bond, P. 2014b. South Africa's multiple resource curses, the metalworker's break and community uprisings, *Review of the month*, April: 1-21.
- [38] Van der Merwe, A., Hoff, D., Soomaroo, S., Manuel, C., Makube, T., Bantwini, M., Van der Wal, S., Zweni, T., Fourie, G., Soldaat, B., Peinke, L. and Majaja, N. 2013. *South Africa's top 10 investment projects*. Pretoria: The DTI.
- [39] *The beneficiation strategy*. 2015. Pretoria: The DME.
- [40] Matjie, N. and Zamo, G. 2012. *Export 101: a practical guide to exporting*. Durban: EDTEA.
- [41] Tan, Y., Shi, Y., Buarque, F., Gelbukh, A., Das, S. and Engelbrecht, A. eds. 2015. *Advances in swarm and computational intelligence*. Beijing: Spring.
- [42] Notshulwana, M. 2012. *Policy brief no.4. South Africa's national interest and BRICS: towards bandwagoning or balancing?* Johannesburg: DBSA.
- [43] Bond, P. 2013. Frustrated global governance reform, subimperial geopolitical economy, and BRICS banking. *Paper submitted to the Human Sciences Research Council for publication in State of the Nation: South Africa 2013-2014*, 24 November 2013.
- [44] Chan, M. 2014. Ebola outbreak threatens peace, security, WHO chief says. *Sfgate*, 13 October.
- [45] Bawa, A., Bohler-Moller, N. Fikeni, S., Zondi, S., Naidu, S. eds. 2014. *BRICS and Africa: partnership for development, integration and industrialization: papers of the fifth BRICS Academic forum*. Pretoria: DIRCO.