

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG



APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA

By: Ms. Thabiso Jacqueline Maloa Student number: 2011688

A research report submitted to the School of Construction Economics and Management in fulfilment of MSc Building (Construction Project Management)

BUQS7027

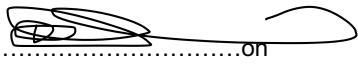
SUPERVISOR: DR Khatleli
Final Research Report

DECLARATION

I, Thabiso Jacqueline Maloa declare that the contents of this thesis are entirely my work conducted under the guidance of Dr. Nthatsi Khatleli. Published work by others has been acknowledged through references accordingly.

To the best of my knowledge and belief, it contains neither material previously published by another person nor material to which a substantial extent has been accepted for the award of any other degree of the University.

Student : Thabiso Jacqueline Maloa (2011688).....*Jac...* Signed at
Johannesburg.....this day.....²⁸.....of.....June.....2021

Supervisor : Professor Nthatsi Khatleli Signed at  on
this day²⁸t.....of.....June.....2021

ABSTRACT

South Africa battled with implementing transport and energy infrastructure post-apartheid. The current government had other priorities which included housing, water and sanitation and to a certain extent energy of the whole communities overlooked by the apartheid government. This emphasis meant that investment in transport and energy generation was neglected resulting in an infrastructure that was not coping and under capacitated.

The study explored the appetite of implementing megaprojects focusing on transport and energy as a viable option to ease the pressure from the ailing infrastructure. It appears as if the approach to implementation of megaprojects has not been very successful post-apartheid. The motivation behind South Africa's proclivity towards transport and energy megaprojects is pitted against the impact of these projects to the end users in relation to cost and benefit.

A cross-sectional case study approach focusing on multiple cases, which are: Medupi and Kusile Power Stations and Gautrain were adopted in a quest to meet the objectives of the study. The mixed method approach to data collection and analysis has been adopted to realize the research objectives and resolve the research question. Key data collection instruments included surveys directed at the end users, questionnaires and semi-structured interviews directed at professionals and students within the transport and energy sector and school of The Built Environment respectively, questionnaires directed at organisations representing workers within the transport and energy sector.

The study found that the transport and energy megaprojects are not always well planned and executed, mainly due to lack of skills and funding. The study further found amongst others that the transport and energy megaprojects have a negative financial outlook on the country's development.

The study recommends that reasonably scaled, manageable and responsive transport and energy projects be investigated and possibly adopted to ensuring better planning and execution, which will then enhance skills development and foreign Direct investment funding. The report is presented in a linear analytical format from the analysed data where emerging themes and have been coded for a comparative report. The report is concluded by the research findings and areas for future research are also highlighted.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

ACKNOWLEDGMENTS

Firstly, I would like to thank the Lord Almighty for the strength and the privilege to study. The months spent on this thesis have unleashed the spirit of resilience, ability to listen, acknowledge the areas I do not fully comprehend and have definitely build a character I can be proud of and for that I am truly grateful.

My wonderful and ever so supportive parents for always reminding me how important education is, my siblings who are my biggest cheerleaders, I hope you do and achieve better than I have, my loving and supportive husband Mr Tony Masala, I could never have done this without you burning the midnight oil with me, helping me find research material, letting me use your previous material and connecting me with the right people in the field of our study, thank you for the friendship and drive.

Dr Nthatsi Khatleli, throughout all the hardship, the time that this study has taken you continued to believe in me, had faith and never gave up even when I was giving up on myself, for that I will always be grateful and treasure you. You dedicated you time and patience in guiding and supervising my work, your professional conduct and support is appreciated and inspiring at all times.

A special gratitude to all participants at Eskom, Transnet, Gautrain, SANRAL, Wits University and the general public for warmly welcoming me into your space and always willing to assist in appreciation of the value of research, all in the hope of change.

May the good Lord Bless you all.

TABLE OF CONTENTS

ABSTRACT	i
ACKNOWLEDGMENTS	ii
LIST OF TABLES	vii
TABLE OF FIGURES	vii
ACRONYMS	ix
1. Chapter 1	1
1.1. Introduction of the study	1
1.1.1. Scope	1
1.2. Background study	2
1.2.1. Megaprojects defined	4
1.2.2. Overview of Megaprojects	Error! Bookmark not defined.
1.2.3. Why Megaprojects?	5
1.3. What is Apartheid?	Error! Bookmark not defined.
1.3.1. Background: The Apartheid Architecture	Error! Bookmark not defined.
1.3.2. Infrastructure Provisioning in South Africa post-Apartheid ...	Error! Bookmark not defined.
1.3.3. Challenges of infrastructure post-Apartheid in South Africa.	Error! Bookmark not defined.
1.3.4. Influence of mega infrastructure development post-apartheid	Error! Bookmark not defined.
1.3.5. Current Status of infrastructure implementation post-Apartheid	Error! Bookmark not defined.
1.4. Appetite Defined	7
1.4.1. Triggers and Suppressors to implement megaprojects	7
1.4.2. Factors that trigger implementation of megaprojects in south Africa.	7
1.4.3. Factors that suppress implementation of megaprojects in south Africa	8
1.5. Problem Formulation	8
1.5.1. Research problem Statement	10
1.5.2. Research question	10
1.5.3. Research Aim	11
1.5.4. Research Objectives	11
1.5.5. Research Questions	11
1.5.6. Limitations and Constraints	11
2. Chapter 2 – Literature Review	13
2.1. Literature Review : Introduction	13

2.1.1.	Infrastructure Provisioning in South Africa	13
2.1.2.	Megaprojects : Overview.....	18
2.1.3.	Current State of megaprojects in South Africa	18
2.1.3.1.	Historic Perspective of Transport Infrastructure	19
2.1.3.2.	Current status of transport infrastructure in South Africa.....	20
2.1.3.3.	Funding of South Africa’s transport infrastructure megaprojects.....	21
2.1.3.4.	Overview on Energy Infrastructure in South Africa.....	22
2.1.3.5.	Funding of Energy Infrastructure in South Africa	23
2.1.4.	Megaprojects in developed countries.....	23
2.1.5.	Megaprojects implementation in the developing country of UAE: Overview	24
2.1.5.1.	Infrastructure planning in UAE	25
2.1.5.2.	Procurement.....	25
2.1.5.3.	Key stakeholders, PPPs and investment of megaprojects development in the UAE, Abu Dhabi	26
	Figure 3 : Typical Classifications of the PPP models.....	28
2.1.5.4.	Funding of megaprojects in the UAE	29
2.1.5.5.	Challenges in the construction of megaprojects in developed countries.	29
2.1.5.6.	Corruption	29
2.1.6.	Overview : Megaprojects in Europe	30
2.1.6.1.	Planning and procurement in Europe	32
2.1.7.	Overview: Megaprojects in BRICS countries.....	33
2.1.8.	Overview : Megaprojects in Africa.....	35
2.1.8.1.	Funding of Megaprojects in Africa	35
2.1.9.	Overview of mega projects in South Africa	36
2.1.9.1.	Impact of implementation of megaprojects in south African economic growth	37
2.1.9.2.	Foreign Country specific findings on Implementation of megaprojects	38
2.1.9.3.	Challenges and Impact of megaprojects in South Africa.	41
2.1.9.4.	Eskom Medupi and Kusile Power Stations	41
2.1.9.4.1.	Delays in construction of Kusile and Medupi Power Stations.....	42
2.1.9.5.	Historic overview of the Gautrain.....	43
2.1.9.5.1.	What is the Gautrain?	43
2.1.9.5.2.	Implementation and funding of the Gautrain.....	44
2.1.9.5.3.	Construction challenges of the Gautrain	45

2.1.9.5.4. General overview and discussion on implementing megaproject in South Africa.....	46
2.1.9.6. Common challenges/problems of Megaprojects	47
2.1.9.7. Public-Private Partnerships (PPP) in South Africa : Overview	48
Chapter 3	50
3, Research Methodology.....	50
3.1. Introduction.....	50
3.2. Research philosophy and approach	50
3.2.1. What is Research?	50
3.2.2. What is Research Philosophy?	50
3.3. Research Method.....	54
3.3.1. Quantitative Method.....	54
3.3.2. Qualitative Method	55
3.3.3. Mixed Method.....	56
The method applicable to this study.	56
3.4. Research Strategy	Error! Bookmark not defined.
(a) Time horizon	Error! Bookmark not defined.
(b) Population and Sampling.....	Error! Bookmark not defined.
I. Probability Sampling.....	Error! Bookmark not defined.
II. Non – Probability sampling.....	Error! Bookmark not defined.
3.5. Data Collection.....	62
3.6. Data analysis.....	63
Analysis technique applicable to this study	64
3.7. Validity and Reliability	65
3.8. Ethical Considerations	66
3.9. Data Presentation.....	Error! Bookmark not defined.
Chapter 4	68
4. Research Data Analysis and Findings	68
4.1. Overview	68
4.2. Data analysis and presentation of results.....	68
4.3. Results Discussion and analysis.....	68
4.3.1. Research Objectives	68
4.3.1.1. Explore the appetite/need to implement megaprojects in South Africa. 68	
4.3.1.1.1. In your own understanding, how would you describe the Appetite to implement Megaprojects in South Africa?	69

4.3.1.1.2. Is there a good probability that South Africa will implement more megaprojects in the near future (apart from Eskom Medupi & Kusile)?	69
4.3.1.1.3. Assess the need and desire for partnerships and foreign investment into South Africa to implement megaprojects.	74
4.3.1.1.4. Investigate the economic benefits of implementing megaprojects successfully in South Africa.....	76
4.3.1.1.5. investigate and establish if South Africa possesses the Skills and professional capabilities to successfully implement megaprojects in South Africa	77
4.4. Summary of results.....	78
Chapter 5	79
5. DISCUSSION AND FINDINGS.....	79
5.1. Discussion.....	79
<i>Funding of megaprojects in South Africa</i>	Error! Bookmark not defined.
5.2. Summary research objectives.....	84
5.3. FINDINGS.....	85
a) Investigate Skills and professional capabilities to successfully implement megaprojects in South Africa.....	85
b) Investigate the identified economic benefits of implementing megaprojects successfully in South Africa.	86
c) Assess the benefits of partnerships and foreign investment into South Africa to implement megaprojects.....	87
d) Consolidate the general sentiments regarding the continuance of the rolling out of megaprojects In South Africa.	87
5.4. Summary of the discussion.....	87
5.5. Conclusion	88
Chapter 6	89
6. CONCLUSION AND RECOMMEDATIONS	89
6.1. CONCLUSION.....	89
6.2. Funding of megaprojects in South Africa	Error! Bookmark not defined.
6.3. Impact of implementation of megaprojects in south African economic growth	Error! Bookmark not defined.
6.4. RECOMMENDATIONS.....	90
6.5. BENEFITS/IMPORTANCE OF THE FINDINGS	91
6.5.1. Financiers	92
6.5.2. Supply	92
6.6. POSSIBILITIES FOR FURTHER RESEARCH	92
Bibliography.....	94

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

LIST OF TABLES

Table 1. Mega project characteristics	18
Table 2. PPP in Europe, value of signed contracts	31
Table 3. Sector wise Pre-tender projects in Europe	31
Table 4. PPP models used in various sectors in different countries	33
Table 5. Shares of Brazil, China, India and Korea in different infrastructural projects (%).....	40
Table 6. Typical success and failure factors of megaprojects	46
Table 7. The problems encountered in implementing Medupi.....	48
Table 8. Data Collection and Analysis Methods	64

TABLE OF FIGURES

Figure 1: Infrastructure spending by category (R billion)	22
Figure 2: Typical Classifications of the PPP models.	Error! Bookmark not defined.
Figure 3: Infrastructure Financing Commitment in Africa in 2017 by Sector (by Percent).....	37
Figure 4: Sources of Infrastructure Financing Commitment in Africa in 2017 (by Percent).....	38
Figure 5: Cross-Sectoral Delivery Performance for European Megaprojects	40
Figure 6: Typical Eskom power station (Image: Graeme Williams. Brand South Africa	42
Figure 7: Structure of a PPP Agreement adopted for Gautrain Rapid Rail Link project	45
Figure 8: Typical Flow chart of success factors	47
Figure 9: The research 'onion'	52
Figure 10: Survey questionnaire respondents	69
Figure 11 : Structured Interviews responses	70
Figure 12: Results - Historic SA megaprojects are an indication that SA still the has the desire to implement more	70
Figure 13: Results - Does SA need foreign and international specialists to plan and execute megaprojects?	71
Figure 14: Results - Gautrain, Eskom Medupi and Kusile are good examples of megaprojects implemented in SA	72
Figure 15: Results - The SA government and general public will welcome new mega projects well	73
Figure 16: Results - SA needs to show an appetite to international investors and governement to implement mega projects	74
Figure 17: Results - SA has always planned adequately for megaprojects.....	75
Figure 18: Results - SA possesses adequate specialists on project management tools in order to implement mega projects	76

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Figure 19: Results - SA needs to show an appetite to international investors and government to implement mega projects	77
Figure 20: Results - SA demonstrates enough skills and capabilities to implement megaprojects	78
Figure 21: Bold new expansion plans for the Gautrain	Error! Bookmark not defined.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

ACRONYMS

BRICs	: Brazil, Russia, India and China
EIA	: Environmental Impact Assessment
FDI	: Foreign Direct Investment
GDP	: Gross Domestic Product
GEAR	: Growth Employment and Redistribution Strategy
GFIP	: Gauteng Freeway Improvement Project
GMA	: Gautrain Management Agency
IDMS	: Infrastructure Delivery Management System
IDP	: Integrated Development Plan
IPP	: Independent Power Producers
LCDs	: Less Developed Countries
MCPs	: Mega Construction Projects
NDP	: National Development Plan
NTPF	: National Transport Policy Forum
PPP	: Public Private Partnerships
RDP	: Reconstruction and Development Programme
SADC	: Southern African Development Community
SANRAL	: South African National Roads Agency Limited
SOEs	: State-Owned Enterprise
UAE	: United Arab Emirates

1. Chapter 1

1.1. Introduction of the study

1.1.1. Scope

The study will focus on megaprojects in South Africa, particularly in the Gauteng, Limpopo and Mpumalanga provinces. The interest will be on the energy sector i.e. Medupi and Kusile and the Transport Sector focused on Gautrain and roads infrastructure as references and case studies that will give an overview of South Africa's current megaprojects. The Eskom power stations were implemented in order to support the existing infrastructure that no longer had the capacity to carry the growing population and economy. South Africa never planned for maintenance or implementation of megaprojects until 2007.

The Medupi and Kusile Power stations are the case study projects considered to be fitting for the study for the following reasons (Khatleli N. , 2016):

- Currently the biggest in size, and with Medupi to be the 4th biggest coal power generation plant in the southern hemisphere;
- Largest dry-cooled power station in the world upon completion; and
- The power station has potential to directly grow the South Africa GDP by approximately 0.35% per year.

The Gautrain as a secondary case study chosen for the following reasons (Westhuizen, 2008):

- First of its kind in the history of rail transport in Africa;
- Developed at a cost of nearly R25 billion which makes it the biggest budget ever allocated for a rail project in Africa;
- alleviate increasing congestion in Africa's premier business and industrial region;
- Deemed a successful megaproject developed through a Public-Private partnership by The Gauteng Department of Transport and Bombela; and
- It is considered on the megaprojects success story in recent years.

These 2 megaprojects, thoroughly researched should be able to assist in establishing the appetite for South Africa to implement megaprojects further and answer the research questions posed.

1.1.2. Significance of the study

The study will explore the literature on implementation of megaprojects since there is notably a very limited literature on megaproject phenomenon in South Africa. This study focuses into the world of megaprojects with a specific focus on the energy and transport megaprojects. This is prompted by the observation of the government's capital expenditure programme on energy and transport megaprojects. The sectors of the study are chosen as a viable interventions to solicit the viability and appetite to implement megaprojects.

South Africa has experienced an acute shortage of stable, supply, reliable and sustainable energy and transport infrastructure capacity challenges over the past decade or longer. In a quest to increase energy and transport capacity, South Africa, through its State owned power utility company and department of transport, have

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

embarked on a capital expenditure program on energy and transport megaprojects. According to Eskom (2008) the build program is financed through a mixture of private funding, and international funding through sovereign guaranteed loans.

Warrak (1993) regards megaprojects as projects that are susceptible to cost and time overrun. They are regarded as projects that are inherently risky. Flyvbjerg (2014) introduced the Iron law of megaproject upon analysis of considerable number of megaproject in the developed countries. Flyvbjerg Iron Law of Megaproject (2014) concluded that megaprojects are: "Over budget, over time, over and over again (Flyvbjerg, 2011). This seeks to suggest that success in the megaproject will forever remain in the horizon. Flyvbjerg (2011) asserts that megaprojects are susceptible to failure when time, cost and benefits are used as a measure of success. If as evidence indicates, approximately one out of ten megaproject is on budget, one out of ten is on schedule, and one out of ten delivers the promised benefits, then one in one thousand projects is a success (Flyvbjerg, 2011).

The energy megaprojects being implemented in South Africa resembles all the signs of conformity to the Iron law of megaproject. The costs of Medupi project is said to have spiralled to R 150 billion, double the initial estimate (Winkler, 2015). This observation necessitates the question as to why decisions are taken to pursue projects that show all the 5 signs of disastrous performance. This study attempted to answer this question with a deliberate intent to formulate a systematic understanding of the legitimacy of energy megaproject in South Africa.

The studies further sought to examine the performance of energy and transport megaprojects against the objectives of the National Development Plan (NDP) and the benefits derived out of the implementation of the energy and transport megaprojects. It sought to depict the benefits or lack thereof, of investing in the infrastructure megaprojects.

The findings of this study may to a reasonable extent prove useful in the future decision making process on energy and transport megaprojects in South Africa.

1.2. Background study

Mega Construction projects are characterised as uncertain, expensive, high risk-laden, complex, politically-sensitive and involving a large number of partners (Alfons van Marrewijk, 2008)¹. Examples of mega construction projects in South Africa include Gautrain, Gauteng Freeway Improvement project (GFIP), Eskom Medupi and Kusile power stations just to name a few. Mega construction Projects' historic data has shown that many mega projects have mostly failed and run over budget. South Africa started implementing megaprojects in the apartheid era, although the infrastructure was meant for a selected racial group of the population because the apartheid regime was always the ultimate paradigm for urban division and exclusion (Burger, 2016). When South Africa embarked on its ambitious democratic transition in 1994, there was great anticipation that under the behest of a radical-democratic majority government, ways would be found to undo the paradigm of urban division and bridge the gap created by the government (Pieterse, 2009).

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

South Africa, like most developing countries, remains entangled with socio-economic challenges which are inherently embedded in its historical realities and the prevailing economic conditions. The infrastructure backlog runs into trillions of Rands, which births plethora of service delivery protests; there is high level of unemployment and job opportunities are scarce. The unemployment rate stood at 26.7% as at the end of 2016 (Stats SA, 2016), the GDP contracted to a low 0.3% at the end of the fourth quarter 2016 (Stats SA, 2016).

There is an acute shortage of basic infrastructure to enable efficient provision of service delivery and support economic growth. These include adequate highways to ease traffic and to enable economic development, adequate water and sanitation systems to ensure an improved quality of life, sufficient educational centres of excellence to improve innovation and support development, and most importantly, the reliable and stable energy supply to support economic development and improve the quality of life for all.

Infrastructure crisis in South Africa

South Africa has experienced what has since been called the “economic boom” between the years 2004 and 2007. Stats SA GDP Publication (2007), shows that the economy expanded by an average growth rate of 4.5% for the period between 2004 and 2007. It is during this period that the country was in the midst of executing the Gautrain project and secured the bid to host the FIFA World Cup tournament. On the energy front, the country experienced the initial energy shortage and this led to the rolling out of the initial waves of power supply rationing commonly known as “load shedding”.

This created pandemonium as it affected both the individual electricity consumers and the businesses alike. These events prompted the then President, Thabo Mbeki to make the following statement:

“The national emergency represented by the current power outages poses the challenge and presents the opportunity to the entirety of our nation to give concrete expression to the call we have just made for all of us to unite in action and act in unity to keep our country on course. This must say to all of us that we are indeed in a period of challenges, but surmountable challenges. And precisely because it is a period of challenges, it is also an era of opportunity!

Sure, the problems here are serious; overcoming them will require ingenuity, especially in energy efficiency and energy saving, as well as the development of alternative power supplies. But if all of us can forge strong partnerships to tackle the situation, we will all come through – I hope relatively unscathed. This is not a time for finger pointing, but for working together in finding solutions. This having been said, it is however also necessary that we take this opportunity to convey to the country the apologies of both the Government and Eskom for the national emergency which has resulted in all of us having to contend with the consequences of load shedding. I would also like to thank all citizens for their resilience and forbearing in the face of the current difficulties.” Thabo Mbeki [2008 State of the Nation Address]

To maintain and improve economic growth, it is inevitable that South Africa had to improve the generation and supply of electricity. The government’s investment in very large energy projects since the year 2007 is to a greater extent attributable to the power generation and supply crises experienced at the height of economic growth in the years 2004 and 2007.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Eskom (2008) announced that South Africa would commission three new additional mega-plants in the form of Medupi, Ingula and Kusile as the first power stations since the dawn of democracy. The analysis of South Africa's fleet of energy plants promulgated by Eskom (2017) informs us that 92% of the total power generation in South Africa is generated through energy mega plants. Mega-plants are by definition the product of megaprojects. Eskom (2007) state that fleet of power plants that existed prior to the current build programme, were commissioned before 1994, under the apartheid government. This revelation supports the notion that energy megaproject in South Africa are almost regarded as the default projects when decisions on energy projects are taken.

Most of these very large energy projects are characterized by array of challenges, which include schedule overrun, cost overruns, labour unrest, technical complexities, contractual disputes, skills shortage challenges, community and civil society rebellion at times. Flyvberg et al. (2014), Warrak (1993); Altshuler and Luberoff (2003) are in concurrence that megaprojects are susceptible to budget, schedule overrun and benefit shortfall.

Ansar et al. (2014) strongly advises against investment in megaprojects by developing countries. Ansar et al. (2014) argues that developed countries, with a high per capita income are best suited to undertake megaproject than developing countries. Ansar et al. (2014) assert that energy megaprojects are susceptible to cost and schedule overruns. International Rivers Network (2018) is of the view that megaprojects are capable of plunging countries into a spiral of international debt, which consequently lead to impoverishment and stagnation of basic infrastructure.

1.2.1. Megaprojects defined

According to Flyvberg (2017) megaprojects are large-scale, complex ventures that typically cost a billion dollars or more, take many years to develop and build, involve multiple public and private stakeholders, are transformational, and impact millions of people. Hirschman (1995) calls such projects "privileged particles of the development process" and points out that often they are "trait making," that is, they are designed to ambitiously change the structure of society, as opposed to smaller and more conventional projects that are "trait taking," i.e., they fit into and follow pre-existing structures and do not attempt to modify these megaprojects, therefore, are not just magnified versions of smaller projects. Megaprojects are a completely different breed of project in terms of their level of aspiration, stakeholder involvement, lead times, complexity, and impact. Consequently, they are also a very different type of project to lead (Flyvbjerg, 2017).

Van Marrewijk et al.(2015) further defines megaprojects as multibillion-dollar mega-infrastructure projects, usually commissioned by governments and delivered by private enterprise; and characterised as uncertain, complex, politically-sensitive and involving a large number of partners. Increasingly, complex and extensive civil engineering and construction projects resemble megaprojects, as they too set up an integrated project organisation combining different organisations' skills, designs and constructs; and in some instances, not only build, but also operate the facility.

Megaprojects often refer to initiatives that are physical, very expensive, have public and political interest. Megaprojects involve the creation of structures, equipment, development site or a combination thereof. Megaprojects are fundamentally an expression of public authority (Alan A. Altshuler, 2003),

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

According to Flyvbjerg, (2014) megaProjects are large-scale, complex ventures that typically cost a billion dollars or more, take many years to develop and build, involve multiple public and private stakeholders, are transformational and impact million. The research problem aims to establish the appetite for South Africa to continue taking on mega projects and successfully delivering these projects, and why?

According to Brooks(2015) megaprojects can be divided analytically into four types, namely:

- infrastructure (e.g., ports, railroads, urban water and sewer systems);
- extraction (e.g. Minerals, oil, and gas); production (e.g. industrial tree plantations;
- export processing zones, and manufacturing parks); and
- consumption (e.g. massive tourist installations, malls, theme parks, and real estate developments)”

Infrastructural megaprojects can also be characterized by four subtypes:

- Technological,
- Political,
- Economic and
- Aesthetic (Flyvbjerg, 2014).

There is not a single accepted definition of megaproject in the literature and different criteria can be adopted toward this end. For instance, from the investment point of view, megaprojects have budgets above \$1 billion with a high level of innovation and complexity (Locatelli, 2015).

1.2.2. Why Megaprojects?

With the south African economy slowing, South Africa must pay closer attention to how it implement megaprojects such as nuclear power stations, new dams, rail links and roads. Drawing in the private sector will be key. The National Development Plan (NDP) points out that rising rates of investment will be achieved initially through state spending on infrastructure, largely aimed at crowding in private sector investment. The government will have to run a tight ship if it wants to create viable infrastructure projects that will help grow the country's economy and also bridge the gap created between apartheid and post-apartheid government, (Vision 2030, 2018). Megaprojects have not been immune to criticisms; there is a large body of scholarship examining the social, economic, environmental and spatial outcomes of mega projects around the globe (Harris, 2014). For example, most of the literature reviewed suggests that mega projects are characterized by:

- Minimal commitment to social just policies with the primary orientation towards profitability and competitiveness;
- Delivered by quasi-governmental organizations; and Operating within introverted business-oriented modes of governance that lack democratic accountability and exclude public participation (Harris, 2014:9).

Furthermore, a review of the literature suggests that most megaprojects around the world are characterized by similar trends: overestimation of benefits, undermining of costs and social, economic and environmental risks (Flyvbjerg et al. 2003). Based on the study of 258 transportation megaprojects, Flyvbjerg (2007)

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

estimated that 9 out of 10 projects have cost overruns, and this trend is found in all 20 countries and 5 continents covered by the study. Flyvbjerg (2007) adds that promoters and planners of most megaprojects provide inaccurate information about cost-benefit analysis and forecasting. There are policy implications for this: “lawmakers, investors, and the public cannot trust information about costs, benefits, and risks of large infrastructure projects produced by promoters and planners of such projects” (Flyvbjerg, 2007, p. 9).

This has led to some of the scholars terming megaprojects as speculative, relying on the international finance and trying to please the investors, with serious socio-spatial, economic and environmental consequences; however (Flyvbjerg et al., 2003) argues that “economic and physical scale of today’s megaprojects is such that the whole nation may be affected in both medium and long terms by the success or failure of just one project”. Gellert and Lynch (2003) argue that displacements are intractably linked to megaprojects. Goldman (2011) adds that speculative megaprojects in Bangalore resulted in displacements of rural farmers and many poor urban dwellers were also pushed out of the city. Through engagement with the literature on megaprojects and empirical findings of the study, I argue that the initial planning process of mimic the popular model of undertaking megaprojects, that is, ignoring and undermining the public participation process and underestimating the socio-economic and environmental costs.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

1.3. Appetite Defined

Appetite in this context can be defined as the willingness of investors to bear risk (Idilbi-Bayaa, 2019). Appetite defined in this context, can be further defined as the desire for the government or organisation to have an interest and willing to assume consistently with its strategy. Each business strategy implies some amount of risk, in terms of uncertainty of the results that will be achieved. Appetite is represented by the losses the government is willing and able to stand in order to reach the target results, where potential losses could also be represented by their drivers (Cremonino, 2011)" appetite is triggered or suppressed by factors that will be further deliberated.

1.3.1. Triggers and Suppressors to implement megaprojects

There is a common understanding that megaprojects are important drivers of society changes. Their impact is an important phenomenon because of the influence on both society itself and its economy. A successful megaproject can spur economic growth in less-developed countries, while a failure can set development back for years.

1.3.2. Factors that trigger implementation of megaprojects in south Africa.

Infrastructure development makes direct contribution towards the GDP; therefore investment towards infrastructure will be triggered by the following factors:

- Rapid global urbanization has triggered another round of investment boom in megaprojects (Radujković, 2015).
- To drive societal and environmental transformations (Tan, 2018)
- Population Growth – The more the population of the country expand the more there is a need for infrastructure. South Africa's current population is 58.8 million people (Statistics South Africa, July 2019) compared to 41.22 in 1994.
- Economic Cohesion – Implementation of megaprojects will create an appetite for foreign investment and create global economic cohesion and have a positive contribution towards the country's GDP.
- An increase in the size of fixed capital megaprojects has been driven by the desire to exploit economies of scale, the needs of less-developed countries (LCDs) for basic infrastructure development, and the need to exploit increasingly remote and low-grade energy and other mineral resources (Radujković, 2015)
- Aging Infrastructure – South Africa has failed to prioritize maintenance of infrastructure since 1994 and now the infrastructure is under-capacitated to carry the demand and population of the country.
- The ever-increasing demand for infrastructure, primarily in developing countries, yielded huge investments in urban and infrastructure megaprojects, such as in water and sewage, electricity, transportation, and telecommunications.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

- Infrastructure investments are hypothesized to facilitate private investments by lowering production costs and opening new markets, thereby creating new production, trade and profit opportunities (Fedderke & Bogetč, 2009).
- According to Kunzmann (2014) these drivers are:
 - Technology—Improved technology makes life easier, efficient and information accessible, more convenient, and more secure;
 - Community—beneficiary of Infrastructure services, and also decider of which problems to be tackled;
 - Policy enabler of megaprojects implementation initiatives and taking measures to minimize the negative impacts of megaprojects disruption.

1.3.3. Factors that suppress implementation of megaprojects in south Africa.

Mpungose (2016) highlights that Implementation of megaprojects in south Africa is suppressed by the following factors:

- The performance of megaprojects has long been seen as problematic in terms of overall on-time and too-budget delivery and in terms of the utility of the megaproject once in operation (i.e. the megaproject does produce the intended societal benefits) (Radujković, 2015)
- Lack of sufficient expertise and capacity necessary to prepare and manage delivery of infrastructure project
- Inadequate knowledge management and reporting.
- Poor management of projects during implementation (Malete & Khatleli, 2019)
- Political Instability challenges involve hubris, claims of corruption, and low political literacy and lack of sustainable leadership (Sovacool, 2012).
- Megaprojects are also suppressed by their extreme complexity (both in technical and human terms) and by a long record of poor delivery (Radujković, 2015).
- Economic challenges that may suppress implementation of megaprojects include cost overruns, financing difficulties, and uncertainty concerning power plant efficiencies and environmental policies (Sovacool, 2012).
- Corruption within the government portfolios, that hinders foreign investment
- Poor and inadequate execution of public-private partnership (Aigbavboa, 2019)

With all the triggers and suppressors of megaprojects, Gauteng has a R100 billion plan to build 30 new cities (Staff Writer, 2019). In the 2nd South African Investment summit over \$20bn of investment commitments were made, as leaders from business, government, and the investment community forged relationships and explored ways to reignite growth in South Africa. This may lead to show that South Africa may still have an interest in implementing megaprojects.

1.4. Problem Formulation

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

South Africa is an example of the mismanagement of new energy-sector megaprojects. In 2007, the South African economy was healthy when power shortages happened, halting operations at mines and smelters overnight. The then president Thabo Mbeki admitted to the prevarication by the government in not adding generation capacity on time, although there were clear prior signs that the supply was under strain. The power utility had no choice soon after that than to unleash a spending spree. The botched and hurried implementation has haunted the country ever since. Corruption and state capture are regarded as the major reasons why coal plants Medupi and Kusile are not delivering electricity as planned and why South Africa is facing crippling blackouts. Medupi and Kusile, the third- and fourth-largest coal power plants globally, were originally scheduled to be completed in 2014 and 2012, respectively, giving the country an extra 9600 MW of power, enough to avoid the now incessant blackouts (Tshidavhu, 2020)

Megaprojects are necessary to maintain and improve economic growth, it is inevitable that South Africa had to improve the transport and energy to implement megaprojects in these two sectors. The government's investment in very large transport and energy projects since the year 2007 is to a greater extent attributable to the freeways, Gautrain and energy projects implementation crisis experienced at the height of economic growth in the years 2004 and 2007.

Tshidavhu, (2020) further indicates that In South Africa, large-scale projects are required by law to address both pro-growth and pro-poor socio-economic development goals . Large-scale infrastructure projects in South Africa are promoted as having the possibility to drive economic growth, create employment opportunities, and ensure that benefits percolate to the poor and economically marginalised. However, insisting on using megaprojects as a driver of economic growth and a means of social redistribution is challenging, as literature abundantly reveals their failure in addressing social concerns.

Eskom (2007) announced that South Africa would commission two new additional mega power plants in the form of Medupi and Kusile as the first biggest coal generation power stations since the dawn of democracy. The analysis of South Africa's fleet of energy plants promulgated by Eskom (2017) indicates that 92% of the total power generation in South Africa is generated through energy mega plants. Mega-plants are by definition the product of megaprojects. Eskom (2007) state that fleet of power plants that existed prior to the current build programme, were commissioned before 1994, under the apartheid government. This revelation supports the notion that energy megaproject in South Africa are almost regarded as the default projects when decisions on energy projects are taken.

Most of these very large energy projects are characterized by array of challenges, which include schedule overrun, cost overruns, labour unrest, technical complexities, contractual disputes, skills shortage challenges, community and civil society rebellion at times. Flyvberg et al. (2014), Warrak (1993); Altshuler and Luberoff (2003) are in concurrence that megaprojects are susceptible to budget, schedule overrun and benefit shortfall, which may all be a result of poor planning.

In February 2000 South Africa and the Gauteng Premier, Mbazima Shilowa, announced the new Gautrain Rapid Rail Link between Johannesburg, Pretoria and Johannesburg International Airport (JIA) as one of the megaprojects to be developed through the Spatial Development Initiatives (SDIs). At the end of April 2000 a consortium of consulting companies was appointed to assist the Department of Transport and Public Works with

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

the execution of the project. Since then good progress has been made, although the project has had challenges. The project was initiated as a result of curbing and reducing road congestion and improving the transport sector.

In South Africa and all over the world, billions of Rands are lost in traffic congestion, through time lost, transport costs, delivery costs of goods and quality of life. In London the cost of congestion is R25 billion per year. According to van der Merwe (2001) the N1 between Pretoria and Johannesburg the congestion cost is more than R300 million per year. Unless dedicated rights of way, such as high occupancy vehicle (HOV) lanes or bus lanes are provided, buses and taxis are also subjected to the congestion on the roads. It is not always possible to provide such lanes for the full length of the bus or taxi trip.

Public transport is more environmentally friendly. Cars consume three times more energy and produce three times more carbon dioxide per passenger than public transport. Rail transport is more environmentally friendly than buses. Traffic accidents in Gauteng cost R4 billion per year. Modern rail transport have much less accidents than road traffic. Roads take up more space. For example a home-work journey by a single occupancy car consumes 90 times more space than if the same journey was taken by rail (van der Merwe, 2001)

Ansar et al. (2014) strongly advises against investment in megaprojects by developing countries. Ansar et al. (2014) argues that developed countries, with a high per capita income are best suited to undertake megaproject than developing countries. Ansar et al. (2014) assert that megaprojects are susceptible to cost and schedule overruns. International Rivers Network (2018) is of the view that megaprojects are capable of plunging countries into a spiral of international debt, which consequently lead to impoverishment and stagnation of basic infrastructure. A tremendous increase in energy demand is expected, as there are still roughly 1.2 billion people who do not have modern energy services, in regions such as Asia, Latin America, and parts of Africa (Tshidavhu, 2020)

Megaprojects are generally a problem in South Africa and the world as a whole, (Flyvbjerg, 2017) refers to “law of megaprojects” is laid out and documented: Over budget, over time, over and over again., which is what the study will explore.

1.4.1. Research problem Statement

Like everywhere else, South Africa has not had a good experience with megaprojects. The particularly dismal performance in South Africa with regards to cost overflows could have diminished the initial enthusiasm. These experiences attract further scrutiny on the prevalent appetite to further implement megaprojects.

1.4.2. Research question

The primary research question emanates from the need to address the problem of the appetite of implementation of mega projects in South Africa. The research question is as follows:

How interested is the South African government in pursuing mega construction projects after the recent initial experiences?

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

1.4.3. Research Aim

The aim of this research study is to establish the appetite for South Africa to further implement mega construction projects after initial experiences.

1.4.4. Research Objectives

- Investigate Skills and professional capabilities to successfully implement megaprojects in South Africa
- Investigate the identified economic benefits of implementing megaprojects successfully in South Africa context.
- Assess the benefits of partnerships and foreign investment into South Africa to implement megaprojects.
- Consolidate the general sentiments regarding the continuance of the rolling out of megaprojects in South Africa.

1.4.5. Research Questions

- What are the skills and capabilities needed to implement megaprojects in South Africa?
- How economically beneficial is the implementation of megaprojects in the South African context?
- How do partnerships and foreign investment benefit South Africa to implement megaprojects?
- What are the general sentiments regarding the continuance of rolling out megaprojects in South Africa?

1.4.6. Limitations and Constraints

The following limitations may be encountered in this study:

- Information from sources may not be fully disclosed, especially where the owners of mega projects are at fault or may personally and professionally implicate other people. Legal and confidential documentation may not be accessible due to investigations underway or confidentiality of the information.
- Time may be a constraint due to hectic work schedule and travels.
- Limited responses on surveys.

The study will be limited to projects implemented in South Africa; however will also use international case studies for reference purposes.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Conclusion

The importance and background of the study has today influenced the need for megaprojects in South Africa will be discussed further in detail through literature review, it is at this point to understand the concept and overview of the implementation and appetite for megaprojects.

2. Chapter 2 – Literature Review

2.1. Literature Review : Introduction

The purpose of this chapter is to holistically review literature on the phenomenon of megaprojects nationally and internationally and on the factors that impact the appetite and implementation of megaprojects in South Africa. The Chapter also highlights the knowledge deficiency that exists in literature dating back to the history of apartheid to the current status and future plans of megaprojects.

2.1.1. Infrastructure Provisioning in South Africa

In 1923 the Union Parliament passed the Natives (Urban Areas) Act in South Africa, which laid down the principles of residential segregation and reinforced the doctrine that the African population had no permanent rights in the towns (Frescura, 2000). The racial ideas underpinned the segregation ideology that was an instrument of white mining and infrastructure development and capturing interests bent on mobilizing cheap black labour. The system of segregation rationalised a policy of perpetuating pre-capitalist economies in the South African reserves and infrastructure, (Rich, 2016).

This could have been the inception of Apartheid; however the doctrine of apartheid was made law in South Africa in 1948, but the subordination of the black population in the region was established during European colonization of the area. In the mid-17th century, white settlers from the Netherlands drove the Khoi and San people out of their lands and stole their livestock, using their superior military power to crush resistance. Those who were not killed or driven out were forced into slave labour, (Boddy-Evans, 2017). This has left inequality gaps in south Africa, for the safe of this study a thorough investigation has to be done in order to investigate and understand megaprojects. The literature will show South Africa's current status, and overview of how developed countries and BRICs countries approach megaprojects and their funding systems. In developing and developed countries the study will focus on the UAE, Europe and China for BRICs countries.

2.1.2. Background: The Apartheid Architecture

Apartheid required a massive program of spatial engineering. Establishment of largely rural African "homelands" and internal passport system attempted to control urbanization so that black "influx" was tailored to the labour needs of white-controlled industries. In the cities, black populations were restricted to residential townships on the metropolitan fringe, necessitating long trips to work and other destinations on white-controlled transit systems (Orcutt, 1997).

According to Orcutt (1997) the establishment of legislated apartheid after 1948 accelerated the destruction of black settlements near urban centres and the removal of their populations to the urban periphery. The razing of Sophiatown, one of the most culturally and politically vibrant black communities in Johannesburg, and the removal of its population to an area south of Johannesburg's mining belt in 1955 was only one notable case. In other cities, industrial zones, transportation corridors or other barriers separated black townships from white commercial and residential areas.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

During the colonial and apartheid era government restricted geographical settlement choices and freedom of movement of black people in South Africa. Decades of discriminatory policies have left deep scars across south Africa's infrastructural landscape, creating one of the most unequal and polarized societies in the world, (Burger, 2016). The policies were accompanied by large regional discrepancies in government spending, entrenching the association between place and poverty, (Gordon, 2016).

Pieterse (2009) , the apartheid system came with limitation of resources including education and infrastructure available to the non-whites; it has taken 18 years to rectify the damage cause by apartheid. Basic changes needed to be made in order for economic growth to be equitable amongst South African citizens. Infrastructure and access to sustainable jobs should be the main priorities in terms of restructuring the economy for the future.

The capital expenditure peaked dramatically during the apartheid years, resulting in growth produced by the investment in infrastructure before the dawn of the current democratic dispensation. The social(Housing, Healthcare, Education etc) and economic(Transport, Energy, Agriculture, communication etc) infrastructure inherited by the democratic government was generally in a poor shape, poorly located, ill-maintained and ill-equipped to serve and modern, changing economy, national Treasury, (2013).

The sharp fall in infrastructure investment post 1976, meant that the state of infrastructure could not withstand the fast growing economy. The democratic government inherited a severe inadequate power generation, water and roads infrastructure that had been exacerbated by the racial inequality, many rural areas still have no access to running water and electricity (Rustomjee, 2013).

The infrastructure expenditure during the apartheid years made excessive investments that served mainly the white minority and maintained the apartheid state. In making these choices, consumption expenditure on education, healthcare, housing, municipal services and energy, majority of the population was sacrificed to facilitate the development of infrastructure for the privileged minority (Ngunjiri, 2017).

2.1.3. Infrastructure Provisioning in South Africa post-Apartheid

The dawn of democracy in South Africa prompted hope for better living conditions and improved provision of services for its citizens after years of desperation for survival during the apartheid rein. Even after years of coming into democracy South Africa has been bedevilled by systemic ineffectiveness that has backlogged the delivery of infrastructure (Malete & Khatleli, 2019). Megaprojects are a new understanding in South Africa, with a few already implemented post-Apartheid, it is imperative in the South African context that one understands history of the country. Ideas of race in South African history have usually been seen in the context of the rise of white nationalism and Apartheid (Rich, 2016).

The racial ideas underpinned the segregation ideology that was an instrument of white mining and infrastructure development and capturing interests bent on mobilizing cheap black labour. The system of segregation rationalised a policy of perpetuating pre-capitalist economies in the South African reserves and infrastructure, (Rich, 2016).Our reflection on past treatment of urban segregation begins with the assertion that the implicit acceptance of 'race' as a legitimate and primary category of inquiry has impoverished the understanding of residential segregation in the South African city (Mabin, 2017).

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Nation Building is a slow and multifaceted process, the passage of the natives act in In 1923 the Natives (Urban Areas) Act in South Africa, which laid down the principles of residential segregation and reinforced the doctrine that the African population had no permanent rights in the towns (Frescura, 2000). In the early 20th century, it was wide acknowledged that the establishment of a national policy on how to administer and house urban African population was a crucial dimension of the overall framework of racial segregation within South Africa (Parnell, 2012). The apartheid government largely invested in and maintained capital projects only for the benefit of the minority white community (The Presidency, 2015). This could have been the initial stages of Apartheid in south Africa.

Malete & Khatleli (2019) highlighted that, with the backlogs of delivering infrastructure, steps are being taken to improve infrastructure planning and delivery and reduce non-performance. Authorities in South Africa have come up with collaborated attempts to improve service delivery in the public sector. Organs of state have developed policies for infrastructure planning, procurement and delivery, to standardize requirements across the public sector in an attempt to address the infrastructure delivery challenges. This resulted in initiating Infrastructure Delivery Management System (IDMS) in October 2010, a model that forms the backbone of delivery of public sector infrastructure projects. National Treasury (2012) defines IDMS as an all-inclusive government management system of the infrastructure. The provision of infrastructure is through the construction industry, and comprises of a wide range of activities that result in infrastructure that will be utilized to provide services for the public. IDMS has been introduced as an intervention to the infrastructure delivery problems and the effectiveness of the system in ameliorating the infrastructure delivery challenges has not been explored (Malete & Khatleli, 2019).

Maikudi (2014) further indicates that specific institutions and intervention programmes initiated by the Mandela regime include the Reconstruction and Development Programme (RDP) and the Growth Employment and Redistribution Strategy (GEAR). The major challenge of the South African economy is the subsisting marginalization of the majority who languish in massive unemployment, poverty and poor services in spite of the efforts made by the post-Apartheid regimes of Mandela, Mbeki and Zuma. Lehloesa (2000) indicated that the objectives of GEAR differed fundamentally from those of the RDP. GEAR aimed at creating a competitive fast-growing economy.

In 1994, that's when the government launched the Reconstruction and Development Programme (RDP), which had formed the essence of the ANC's first election manifesto (ANC, 1994). The RDP stressed people-based development and an emphasis on the role of all South Africans in building the new economy and society (McGrath, 2004). It seemed to promise a kind of new deal approach to meeting national development needs, with relatively little concern with international debates about globalization, liberalization and technological change. Its most visible element, given the legacy of apartheid, was increased state spending to improve delivery of key social services to promote equity (Nicolaou, 2001).

Ogbu (2011) shows that the government has also used infrastructure projects to correct the apartheid legacy of inadequate transportation, housing and services in the townships. Since 1994, infrastructure has been developed through initiatives like the RDP, a national blueprint for improving government services and basic living conditions for the poorest citizens, who number at least 17 million. The RDP was premised on the understanding that equity and redress had to be achieved quickly. As a 'reconstructive' policy, it recognized

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

that the problems of lack of housing, water and electricity supply, shortage of jobs, inadequate education and health care for the majority needed to be urgently addressed in order for the political gains to be cemented. It proposed job creation through public works. The building of houses and provision of services would be done in a way that created employment, thus growth was intrinsically linked to a strong social element to ensure that unemployment was reduced and labour-intensive projects encouraged (McGrath, 2004).

Provision of social infrastructure by the public sector is a fundamental portion of the economy, therefore it is imperative that infrastructure delivery systems improve to meet social and economic objectives. Continuous efforts are ongoing to improve the implementation of infrastructure and speed up improvements in infrastructure delivery. Many initiatives are meant to help organs of state to better their infrastructure plans and provision by expanding capacity and expertise to ensure better service delivery (Malete & Khatleli, 2019)

2.1.4. Challenges of infrastructure post-Apartheid in South Africa.

The Government of South Africa has been in the process of planning and delivering infrastructure in all spheres of government for several years. According to Malete and Khatleli (2019) great strides have been made to increase availability of general services since 1994, however the provision of physical and social infrastructure remains slow, and is mostly the cause of ongoing service provision demonstrations across the country. The demand for infrastructure supply currently is increasing and requires a radical process to unblock the infrastructure bottlenecks. The various infrastructure delivery challenges indicate the public protests over the alleged failure of service delivery by government (Malete & Khatleli, 2019).

South Africa began the post-apartheid era facing challenges as formidable as those confronted by Europe at the end of World War II, or the Soviet Union after communism. It had to re-engineer an economy dominated by mining and expand into modern pursuits like infrastructure development and education, while overcoming a legacy of colonial exploitation, racial oppression and global isolation — the results of decades of international sanctions (Goodman, 2017).

The South African democratic government has long recognized infrastructure as being essential for economic growth, and the extension of infrastructural services to the poor has been one of its key strategies for overcoming the infrastructural gap and inequality post 1994 (Pieterse, 2009).

The political transitioning in South Africa, from 1990 to 1994, was a time to experiment in infrastructure development. For a development of a community of this magnitude, participation planning and management needs to be central to this process and a number of infrastructure provision approaches needed to be explored. The economy post-1994 and the resultant programme of fiscal conservatism impacted upon public provision of public infrastructure (McGrath, 2004).

The systematic segregation dates back to the colonial era: in the late 19th and early 20th centuries, the British colonial government resettled racial groups under the pretence of responding to disease epidemics in overcrowded neighbourhoods (Ogbu, 2011).

Apartheid is often construed as a largely political construct, but architecture and planning were critical to implementing apartheid policies. Design practices became cultural extensions of state power, and some

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

professional designers validated the power of the white minority through the design of monumental structures such as the Union Buildings and Voortrekker Monument in Pretoria, and through the planning of new townships mandated under laws such as the Group Areas Act (1950), which specified where racial groups were allowed to live in urban areas (Ogbu, 2011) .

2.1.5. Influence of mega infrastructure development post-apartheid

South Africa has – in many ways – outstripped Africa’s rate of development by leaps and bounds. Since the arrival of democracy in 1995, the country has enjoyed a veritable infrastructure renaissance that has only been picking up steam over the past decade, (DeBuys Scott, 2013).

According to Fourie (2013), post 1994 South Africa was under immense pressure to develop and upgrade infrastructure in order to deal with the backlog. The demand for electricity has often outstripped supply, resulting in costly power failures, which were then followed by impulsive decisions to build power stations with no proper planning in place. Tsheola (2012) cited that the conditions of roads have mostly worsened, with service delivery about lack of infrastructure happen on a daily basis.

Despite progress the legacy of apartheid remains highly visible in the patterns of deprivation with enduring gaps particularly between black and white and between former “homeland” provinces and others. White South Africans are unlikely to suffer much deprivation regardless of which provinces they reside in. In contrast, black South Africans experience multiple forms of deprivation that varies considerably by province, (Burger, 2016).

Although there has been progress in the post-apartheid era, the enduring impact of race and race-related characteristics remain. This work resonates with the widespread frustration with the current system, manifesting in protest action. Much remains to be done and we need to have a public conversation about how we accelerate transformation and social justice (Burger, 2016).

Twenty years into democracy, only now is South Africa talking about executing power plants and high speed trains to the citizens of South Africa—despite the fact that we have struggled to get more than one successful (Time and Cost) megaproject in the entire country (Mohale, 2015). South Africa has put together the National Development plan in order to fast track these megaprojects and bridge the gaps created by the Apartheid government (Mohale, 2015). This study on megaprojects will focus on Energy and Transport infrastructure, I.e. Eskom Power stations (Medupi and Kusile) and the Gautrain, these two case studies were chosen because they represent the two sectors that are predominant in the megaprojects space in South Africa (Khatleli, 2016).

2.1.6. Current Status of infrastructure implementation post-Apartheid

The infrastructural backlog in South Africa has actualized several megaprojects in diverse sectors to improve the country’s economic competitiveness, to bridge the gap that was created in the apartheid era (Khatleli, 2016). With the current challenges at the energy power stations at Medupi and Kusile, some are contending that South Africa does not have the ability to build megaprojects (Khatleli, 2016). The major challenge is that projects of this magnitude often go off the rails, either with regard to budget or time – or both, (Nicklas Garemo, 2015). Despite all the challenges endured by South Africa, it is imperative to establish the appetite to implement megaprojects.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

2.1.7. Megaprojects : Overview

Fiori et al. (2005, p23) define Mega projects as “a large scale project with a price tag in excess of \$1 billion dollars; or the “new Animal” that has a strikingly poor performance in terms of economy, environment and public support. Grun (2004) calls megaprojects the “Giants” among projects. According to (Flyvbjerg et al., 2003), they also lead to cost overruns and lower-than-predicted revenues that hinder economic growth instead of advancing it.

Table 1. Mega project characteristics

Element	Characteristic and Description
Size	Large scale
Cost	Exceeds one billion US dollar
Time	Exceeds 5 years Long” duration
Success	Different objectives
Singularity	Unique, no megaproject looks like another
Risks/concerns	Fail to meet costs estimations, time schedules, and anticipated project outcomes. Poor performance in terms of economy, environment, and public support. Leads to cost overruns and lower-than-predicted revenues that hinder economic growth instead of advancing it.
Implementation	Owner requiring multidisciplinary inputs from many organizations
Impacts	Impacts on the community, environment, state budgets.

Source : Public non-consultation related delays in delivery of megaprojects (Khatleli, 2017)

2.1.8. Current State of megaprojects in South Africa

South Africa has made a determined commitment to infrastructure provision post 1994; although there are still some challenges in the provisioning of infrastructure much has been achieved in terms of capital investment with a reduction in infrastructure backlog inherited from the apartheid government, (Palmer, 2013).

South Africa’s economy boomed, with the GDP growth rate hitting 4.9% in 2004, 5.1% in 2005, and 5% in 2006. This growth, together with rapid industrialization and a mass electrification programme that has brought power deep into the rural areas, meant increased demand for energy, and an overworked electricity infrastructure. It was anticipated that generation capacity will peak by 2011, however that the country still has a long way to go till infrastructure is capacitated to reach all South African adequately (Brand South Africa, 2017).

Although backlogs continue to be a concern and a political priority, a more critical issue is that of the condition of south Africa’s existing infrastructure assets, much of which are nearing or have reached the end of their span (DBSA, 2012; Boshoff, 2009). It is the quality of infrastructure that will determine the improvement of the socio-economic conditions of the citizens (Collinson & Patterson-Abrolat, 2016; Gquaji, 2016).

Most of South Africa’s infrastructure such as roads in rural areas and electricity provision is in a poor state and are deteriorating exponentially, whilst capacity in some areas becomes limited and is unable to satisfactorily accommodate demand, therefore this study will focus mostly on energy and transport infrastructure in South Africa, with the case studies on Medupi, Kusile and Gautrain.

2.1.8.1. Historic Perspective of Transport Infrastructure

The system of apartheid left a legacy of social exclusion and artificial separation of people from both their places of work and the majority of social services required to live a productive life. Furthermore, 'in time, transport became a site of popular struggles and a dramatic expression of tensions and disputes over control, management and affordability of racially divided spaces. The post-apartheid challenge was to transform these geographies of exclusion, and provide a more equitable and effective system of public transportation. Efforts to that end began in 1992 with the formation of the National Transport Policy Forum (NTPF), marking the first time that public discussion occurred amongst a broad and credible representation of actors in the country. In addition, the RDP of 1994 declared that. Transportation was viewed as a basic human right, along with other important social services such as health and education. The South African government has, however, largely failed to address this crucial aspect of public policy planning in a sustainable manner (Thomas, 2013)

Transport infrastructures are high-cost, long-term investments that serve as vital foundations for the operation of a region or nation and are essential to a country's or business's economic development and prosperity, by improving well-being and generating jobs and income. The development of appropriate financing options is of key importance in the decision making process in order to develop viable transport infrastructures. Transport infrastructure and especially freight transport projects require significant capital investment as well as ongoing funding for operations and maintenance. From a financial point of view, many freight transport projects have a "funding gap" and require other sources of funding in order to be sustainable (Dimitrou, 2018)

One of the greatest spatial challenges to overcome in the post-apartheid city is the inequality and spatial inefficiency caused by apartheid planning. Not surprisingly a World Bank report of the early 1990s considered South Africa's cities among the most inefficient in the world. Cities were (are) characterized by low-density sprawl, fragmentation and separation, all of these contributing to the dysfunctional structure where privilege was racially determined (Donaldson and Van der Merwe, 2000). Over a period of four decades, black South Africans were systematically marginalized, among others, in terms of accommodation, leisure, employment, and transport. Structural deficiencies in the former apartheid city, resulting from segregation and low-density sprawl, created long-distance work-travel patterns. The dual nature of apartheid urban spatial planning is evident in the country's poor transport system and infrastructure.

Roads are undeniably important to any country as, among others, good roads can lead to an improved standard of living for the public, create more employment, provide a social service, bring about spatial agglomeration benefits and improved accessibility and support economic growth and development (van Rensburg, 2019)

The transport sector is a key contributor to South Africa's competitiveness in global markets. The country's transport infrastructure is modern and among the most developed in Africa; however still not addressing and bridging the infrastructure gap especially in rural areas. Despite its impressive credentials, South Africa's transport infrastructure also faces some challenges and it is no longer the only gateway to Africa. Because of increasing infrastructure bottlenecks hampering growth, investment has begun to bypass South Africa. (PWC, 2017). The major challenge for South Africa's road network is that 78% is estimated to be older than its original 20-year design life. There is a massive backlog in road maintenance

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

and rehabilitation. Despite increased funding for roads, resources allocated to roads infrastructure remain inadequate for eliminating the huge backlogs in maintenance over the next five to ten years (Petterson, 2019).

South Africa is a large country with vast distances between the major cities, which makes the establishment and maintenance of the road infrastructure relatively costly. Development Bank of South Africa Report (2017) illustrates that during the year 2015/16 infrastructure expenditure was substantially below what was expected for during the beginning of the financial year. It is still questionable, why South Africa still has road infrastructure backlogs even though its road networks serve as a link to other countries. The national roads link all the country's major centres to one another as well as to neighbouring countries.

In South Africa, roads are considered the most important mode of transportation (Kunene & Allopi, 2009). Road transportation accounts for eighty per cent (80%) compared to cargo and other transport modes sharing twenty per cent (20%). This therefore implies that roads have to be in perfect condition in order to afford the users effective and efficient benefit (Mamabolo, 2015).

Substantially below what was expected for during the beginning of the financial year. It is still questionable, why South Africa still has road infrastructure backlogs even though its road networks serve as a link to other countries. The national roads link all the country's major centres to one another as well as to neighbouring countries

Access to transport infrastructure provision promotes accessibility that promotes economic growth, human development, and betters quality of life through improved productivity and sustainable economic growth, Specifically, public infrastructure provisioning may enhance trade and commerce and play an important role in alleviating poverty and inequality (Ojah, 2016). South Africa has also taken note on how a High-speed train, The Gautrain has improved the lives of commuters.

The Gautrain, Africa's only high- speed train in Africa; however the country is currently feeling the effects of almost 30 years of under- investment in its rail system. The average age of the fleet is 30 to 40 years (with a maximum life span being 46 years) and 51% of the fleet soon due to be retired.

2.1.8.2. Current status of transport infrastructure in South Africa

According to Solomons (2019) of the South African Federation Road federation, roads in South Africa that are not properly and timeously maintained are costing South Africa millions of Rands and negatively affecting the economy and society. Roads are a vital public asset and can deliver a higher economic return on investment than any other single type of infrastructure. But SA's physical road network is backlogged and likely to require billions of Rands to restore and upgrade if maintenance is not taken seriously and also to cater for the growing population and address the poor service delivery of the democratic government (Petterson, 2019).

South Africa's poor transport infrastructure is associated with the gap created by the apartheid government, by poor planning by the democratic government, a lack of technical skills and capacity, corruption and poor or insufficient maintenance, the new democratic political dispensation in South Africa since 1994 has resulted in a progressive deterioration of infrastructure. Furthermore, the extremely low allocation of available financial resources to the maintenance of infrastructure has led to a situation where the current status of the infrastructure, especially at local government level, is that it is at risk of failure. The cost of replacing this

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

infrastructure is much higher than it would have been if sufficient maintenance had been done in the first instance. Thus, in the last 20-odd years, South Africa's infrastructure development has not advanced as it should have (National Treasury , 2019).

2.1.8.3. Funding of South Africa's transport infrastructure megaprojects

Infrastructure funding for roads is largely provided by South Africa's national government. Parastatal companies have provided funding for freight rail and port infrastructure and they also undertake infrastructure development in other sectors, while other initiatives include the government's Expanded Public Works Programme, and public- private partnerships. In 1998 South Africa established a National Road Agency , SANRAL (South African National Roads Agency Limited) wholly state-owned statutory company responsible for developing, maintaining, and managing South Africa's national road network, in accordance with its governing legislation, the South African National Roads Agency Limited and National Roads Act (Goitom, 2015), this may have well been the inception and implementation of Public-Private Partnerships in South Africa which will be discussed further in the literature. The South African National Roads Agency and National Roads Act envisages various sources of funding for SANRAL, including :

- capital investments or loans made by the state
- revenue generated from fuel taxes in accordance with any applicable law;
- loans;
- interest from cash balances or investments;
- revenue generated from participation in joint ventures;
- revenue generated from the sale of assets;
- revenue generated from tolls;
- revenue generated from collecting fines;
- revenue generated from developing, leasing, or managing assets;
- revenue generated from any fees collected;
- parliamentary appropriations; and
- revenue generated from grants, donations, or inheritances.

Currently, SANRAL operates two separate business areas (toll and non-toll operations). The reports on and budgets for each are kept strictly separate for purposes of management and cash flow obligations; "no cross-subsidization between the two are permitted (Goitom, 2015) For the 2012/2013 fiscal year and subsequent three fiscal years, the South African government has adopted an aggressive new National Infrastructure Plan. It has a budgeted expenditure of R827 billion (about US\$80 billion) over the three years, beginning in the 2013/2014 fiscal year, to boost both existing and new major infrastructure projects. (PWC, 2017)

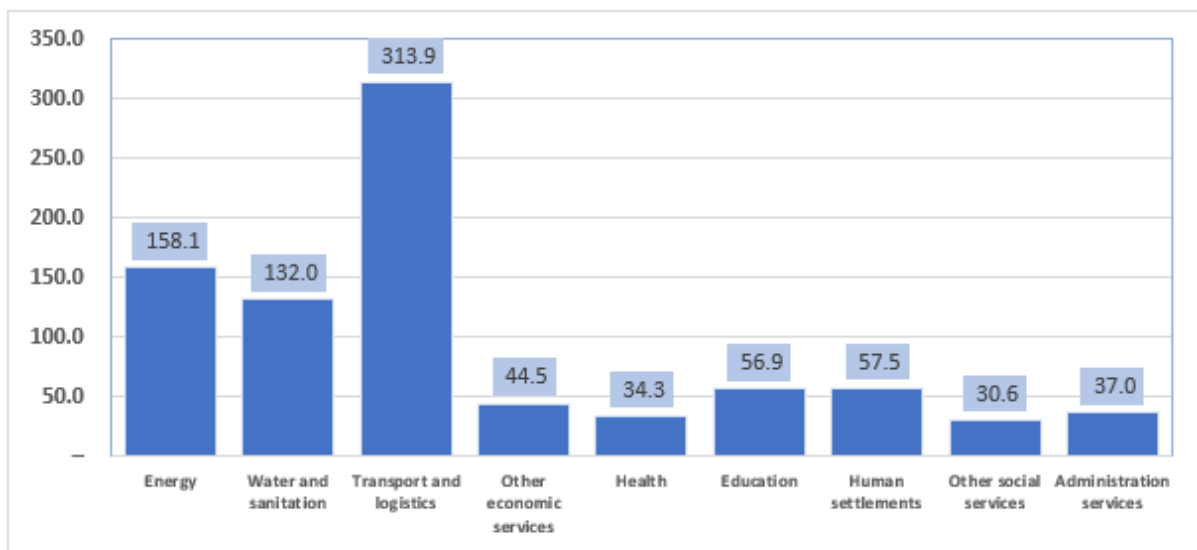
A good quality road network holds numerous benefits to any country, but is dependent on sufficient and stable modes of funding and adequate financing. The quality and extent of the road network are dependent on sufficient maintenance, timely upgrading and appropriate new construction of the infrastructure, which, in turn, is dependent on sufficient and stable modes of funding and adequate financing facilitated through a country's road funding framework. Funding of public infrastructure reflects who ultimately pays for the infrastructure to

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

be built and maintained over its lifetime. Financing refers to the capital needed to pay for the investment costs up-front. financing for roads in the South African framework is nearly always under pressure. The government cannot always ensure that sufficient funds are spent on roads given other urgent developmental requirements, or that the spending on roads is done in an economically efficient manner (van Rensburg, 2019).

According to National Treasury (2019), highlights of the 2019/2020 budget with regards to Infrastructure, the biggest allocation of infrastructure spending over the next three years is on transport and logistics (36%); energy (18%); and water and sanitation (15%). The allocations per category are reflected in Figure 1 below.

Figure 1: Infrastructure spending by category (R billion), (2019)



Source: National Treasury

2.1.8.4. Overview on Energy Infrastructure in South Africa

When it comes to addressing the country's electricity challenges, former President Jacob Zuma believed that an independent buyer of electricity could help solve the country's energy crisis in two to three years and would take the bias away from purchasing decisions, as Eskom presently acts as both the generator and retailer of electricity. The independent power producer (IPP) model currently being used by the government for Eskom to buy electricity from private producers is the way to go, he believes; but some in the government remain unhappy that the private sector had entered the energy sector out of what he calls "false ideological reasons" (Vision 2030, 2018).

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

According to Engineering News, there is a huge concentration of investment in power projects in South Africa to grow the country's power outputs. Therefore, within the SADC region, focus could be placed on developing trade corridors and investing in building transmission and distribution lines to transport the power – rather than each country looking to invest in power infrastructure development independently (Engineering News, 2018)

Post 1994 the government fast tracked energy infrastructure and build projects that are expected to add almost 11 000MW or an additional 25% of power to the constrained current electricity grid of about 43 500MW. Private sector investment will add a further 16% (including 1 500MW which is already feeding the grid). (Vision 2030, 2018).

Currently Medupi and Kusile Power Stations have come online; there is a substantive contingent of skilled people who need to be mobilized. Currently, investment into and development of mega power infrastructure projects in South Africa – whether coal, gas or nuclear base-load generation plans – is on hold. Without a continuation of projects in the country, South Africa faces a risk of losing crucial skills as professionals seek valuable employment opportunities in other markets, (Engineering News, 2018)

2.1.8.5. Funding of Energy Infrastructure in South Africa

Energy expenditure is expected to total R 158.1 billion over the next three years, accounting for 18.3% of total infrastructure spending. Eskom accounts for R 134.3 billion (85%) of total energy spend. R 69 billion has been set aside for the proposed restructuring of Eskom; this translates to R 23 billion per annum. As part of broadening access to energy, R 17.4 billion has been set aside to connect 590 500 new households to the national grid (National Treasury , 2019).

2.1.9. Megaprojects in developed countries

The development of MCPs in developing countries is a two-edged dilemma. On the one hand, MCPs require high design knowledge and technical skills, competent human resources and managerial capabilities as well as high cost investment. On the other hand, developing countries have shortage in many of these requirements, which obstructs the development of MCPs. This section of the study aims to establish an international understanding to implement, plan and overcome the challenges of MCPs development in developing countries (Othman, 2014). About 85.4% of the world's population lives in developing countries (Human Development Report, 2011). These countries are characterised with:

- (a) Low level of education and training and outflow of best brains,
- (b) Corruption and political instability, dearth of capital, outdated technology and low production levels,
- (c) Poor health care, low life expectancy and high growth rate of population
- (d) Difficulties related to social, demographic and culture (Kumar, 2012)

The distinction between countries as developed or developing is, generally based on certain criteria including (Othman, 2014):

- (a) economic development,

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

- (b) education and training provision,
- (c) political stability, technological development, infrastructure and production rate,
- (d) healthcare, life expectancy and growth rate of population, and
- (e) society, demography and culture issues.

MCPs represent a strategic option towards achieving sustainable development objectives in developed countries. On the one hand, these projects are characterised with the need for high design knowledge and technical skills; competent human resources and managerial capabilities as well as excessive cost investment.

The distinction between “developed” and “developing” countries is a continuous issue surrounded by fierce debate (Moohebat et al., 2010). Generally, the classification of a country as “developed” and “developing” is based on measures such as:

- Economic Development
- Education and training
- Technological Development
- Political stability
- Infrastructure Development
- Health and Social welfare

2.1.10. Megaprojects implementation in the developing country of UAE: Overview

The study will focus on the two major cities in the UAE, Dubai and Abu Dhabi as case studies. Early in 2013, the Abu Dhabi Government committed to fund a further AED330 billion for major developments over the five years i.e. 2014-2018, focusing on social development, particularly healthcare, education, housing and selected strategic transport projects.

For centuries, Abu Dhabi was a small village whose economy was based on fishing and pearl diving. In the early 1960s, the discovery of immense gas and oilfields gave impetus to a series of projects and transformations. After the demolition of the original settlement, in the second half of the 1960s, an infrastructural plan and a development and land-use scheme were conceived. By grouping into the United Arab Emirates (UAE), the seven sultanates became a single independent sovereign unit in 1971, with Abu Dhabi as their capital city. Until 2004, the founding father of the nation, Sheikh Zayed Bin Sultan Al Nahyan, guided the country through a simple and concrete approach, providing the region with basic structures and facilities: streets, an airport, a stadium, and the Cultural Centre. Development has systematically been combined with the planting of millions of palm trees to mitigate the climatic conditions (Ponzini, 2015).

The population doubled between 1986 and 2005 due to the in-crease in temporary workers. The current population is over 1.4million, among which less than 10% is native. It is the highest per capita income country in the world despite dramatic social dualism (Gimbel, 2007).

2.1.10.1. Infrastructure planning in UAE

The Economic Vision has been interacting with and influencing urban expansion strategies. Once the urban development programmed in the 1980s general master plan was completed, an international team developed the Urban Structure Framework Planning 2007 to drive the sustainable development of the city until 2030. The Prince declared:

“This plan provides a strong and comprehensive foundation for the development of the city of Abu Dhabi, in a strategic and coordinated way. while building a global capital with his own rich cultural heritage” (AD, 2007, 2). The plan states: ‘Abu Dhabi will manifest its role and stature as a global capital city’ (UPC, 2007, 21) and “Abu Dhabi’s urban fabricant community infrastructure will enable the values, social arrangements, culture and more of this Arabic community”

The task force designing the plan naturally recommended carrying out a socioeconomic analysis of the demand and driving factors in the real estate market. However, the most critical aspect seems to be the definition of legally binding planning powers, a more transparent and long-term planning process, and creation of an authoritative planning department capable of interacting with the actual urban development processes and actors. The current strategy of urban development is supported by a public investment of over 200 billion dollars between 2008 and 2013 (Colliers, 2007)

Currently infrastructural and environ-mental invariants, urban development simply happens by dividing the land into precincts with general use, density and typology (so-called building block) features and assigning them to a few developers. The mega-development master plans are juxtaposed according to specific interests and, in fact, contradicting the statements about new urban expansions to be gradual and continuous with existing areas (Ponzini, 2015).

2.1.10.2. Procurement

Typically, government departments and authorities have awarded long- term concession contracts on a conventional competitive tender basis.

There is no UAE-standard PPP project agreement. However, for projects in certain sectors (such as water and electricity) in Abu Dhabi, the Government of Abu Dhabi has precedent documents, developed over a series of PPP-type projects, that it prefers to use.

In terms of related documents, Abu Dhabi has adopted standard-form construction contracts based largely on FIDIC model agreements (most common procurement and contractual arrangements). Consultants are typically engaged to provide the following services:

- Architecture.
- Civil and structural engineering.
- Mechanical and electrical engineering.
- Project supervision.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

- Project management.

Giretti (2014) cites that most commonly used procurement and contractual arrangements (involving both local and international parties), the employer engages its own design, supervision and project management consultants and separately procures a contractor to construct the project according to that design. Alternatively (Al Nahyan1 et. al, 2018) and as is often seen on large-scale projects, procurement is on a design/build basis (that is, the contractor is responsible for design as well as construction) or an EPC/turnkey basis (that is, the contractor is responsible for the engineering, procurement and construction of a ready-to-use asset capable of achieving specified outputs and performance criteria). In each of these two cases the contractor may carry out the design and engineering in-house or by engaging external consultants (Kerr, 2017)

Governments are responsible for the strategic planning in order to develop projects with correct forecasts and assumptions (for example, on demographics, demand, prices, revenues, capital expenditure, or operating expenditure), and a high understanding of market dynamics. They have also to plan for volatility and adverse scenarios (Al Nahyan1, 2018) . Other challenges of the government and authorities include planning and management of future interface risks, caused by early-stage decisions regarding project structures and design. In addition, the risk of contractors, and private investors, who are essential, has to be taken into account in the phase of strategic planning (DIMITRIOU, 2018).

2.1.10.3. Key stakeholders, PPPs and investment of megaprojects development in the UAE, Abu Dhabi

Compared to typical western democratic developing and developed countries, the separation between public and private sectors in Abu Dhabi is practically been slow because the same actors have key positions in public decision making and in the management of private companies. The tactic of attracting foot-loose investments, tourism and specialized tertiary activities in skyscrapers or mega-development compounds tends to make real-estate values increase towards higher values of other, perhaps geo-graphically distant, office, hotel or leisure space. In recent years, this tactic has been combined with mega-development projects and the use of star architects (Ponzini, 2015). Although Public-private partnerships have not been very popular in the UAE, specifically in the 2 major cities of Dubai and Abu Dhabi, PPPs are slowly becoming a new way of developing infrastructure.

Tangab (2018) defined Public-private partnership (PPP) in developed countries as a business model that constructs public assets or provides public services through the cooperation of private investors and the government. Private investors depend on management skills or fund support to participate in infrastructure projects to gain economic benefits by undertaking various risks under this business model. The private investors include the complete use professional skills, resources, and experiences and effectively increase the operational efficiency of projects. For example, commercial entities or retail consumers can manage microgrids to balance interests of stakeholders. In various developing countries, they have released a bunch of policies to support the promotion of PPP model which is bene infrastructure projects. Several infrastructure projects have been planned and completed through the PPP model to alleviate the financial burden of government; this method is considered effective in various developed and developing countries. Through the investment and management of the private sector, the PPP model enables the early availability of public

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

products and services that is particularly attractive in developing countries. In addition, the reason of the private sector involved in PPP projects are considerably driven by economic benefits, thereby enabling them to implement highly efficient risk management, and the possibility of project overspending is lower than when direct government management is involved. However, there are not a specific classification of PPP model in developing countries which results in the low-effective policy implement (Tangab, 2018) .

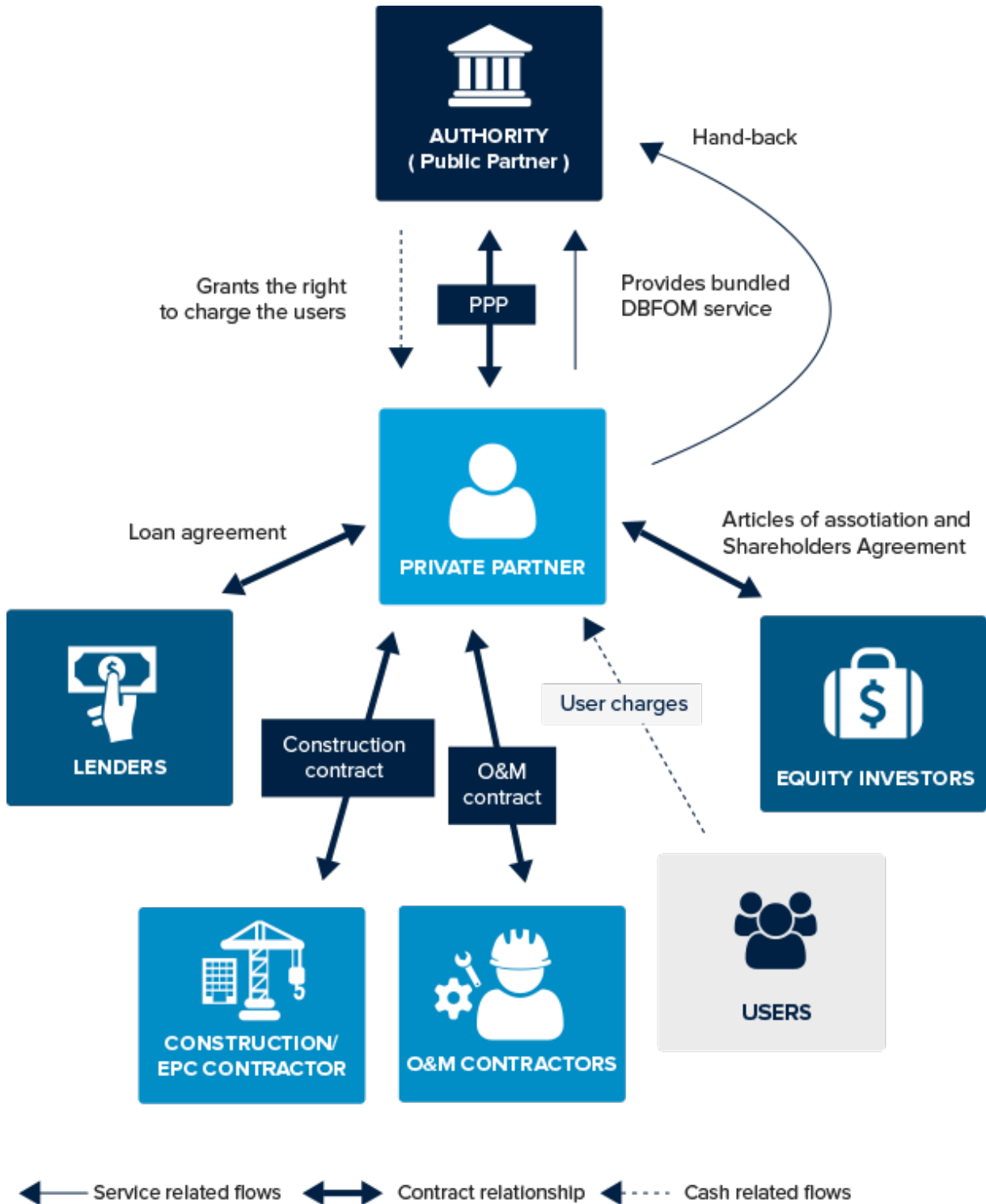
PPPs remain relatively uncommon in the UAE. However, examples of infrastructure being procured and maintained under long-term concession contracts do exist, particularly in Abu Dhabi. The Abu Dhabi Water and Electricity Authority (ADWEA) maintains a programme of procurement of power and water facilities under PPP structures and there are similar initiatives in transport and other infrastructure sectors across the UAE. A number of government authorities have expressed intentions to investigate the use of PPPs in the procurement of future projects and services, such as healthcare and education.

During the last decade, the UAE has been the biggest market for PPPs in Gulf Cooperation Council (GCC) countries. Currently, PPPs are increasingly being used in the rapid development of UAE infrastructure projects.

Learnings from UAE success factors of PPP (Abdou, 2016)

- Availability and effectiveness of proper regulatory and legal framework for PPPs;
- Proper risk assessment and allocation and sharing among project stakeholders;
- Clear project brief and client outcomes;
- Comprehensive and business viability of project feasibility study;
- Proper project value management systems during different project phases;
- The abundance of energy resources has transformed the small principality of Qatar into a centre for economic and urban development in West Asia.;
- Qatar has implemented several megaprojects to attract global firms, high-skilled workers, and tourists; and
- Education and training of local planners are crucial aspects for bridging the gap between the master planning and implementation phases in the Gulf Region (Rizzo, 2015)

Figure 3 : Typical Classifications of the PPP models.



Source : Source: Adapted from "International Public-Private Partnerships synthesis report (Parsons Brinckerhoff commissioned by FHWA, 2013)

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

2.1.10.4. Funding of megaprojects in the UAE

Investing in large transport infrastructures is a key driver in strengthening the national economy and enhancing nation's productivity, as they creates economic benefits and additional income . According to Kerr et. al (2017) For large PPP-style projects typically seen in the power and water sectors, limited recourse financing is usually obtained. This is where the security is principally over the project assets and not the assets of the sponsors or investors. Such financing arrangements are mainly based on the precedents of the Loan Market Association and will involve a syndicate of lenders, likely to include international financial institutions.

The approach does not differ significantly between local and international contracts. Employers tend to fall into one of the following categories:

- Commercial and leisure real estate developers (often wholly or partly government-owned).
- Public works authorities and public utilities (again usually government-owned, although there are examples in the UAE of power, water and infrastructure facilities being procured through public private partnerships (PPP) structures with the government party participating in the project company (see Question 29)).
- Oil and gas companies (including state-owned organisations such as Abu Dhabi National Oil Company) (Kerr, 2017).

2.1.10.5. Challenges in the construction of megaprojects in developed countries.

Energy megaprojects have become a defining feature of the modern energy transition in the UAE and across the world. Whether driven by growing demand stemming from urbanization and industrialization - or by energy security concerns over foreign dependence and price volatility - large, centralized, national and transnational energy projects are now common centre pieces of energy strategy in many developing countries. While there is widespread agreement on the need for a combined approach, most national energy or electrification strategies contain very few details on the integration of decentralized systems and little information on the potential for distributed solutions is available for public discourse. We see this story playing out across Asia, Europe, Middle-East and Africa where the mega-dam has become a resurgent solution for energy service. According to Shirley & Kammen, (2015), the UAE has also suffered corruption by stakeholders and have exercised law enforcement on it.

2.1.10.6. Corruption

Anti-bribery and corruption (ABC) provisions in the UAE are contained in the Federal and Emirate-specific penal codes and human resources management laws.

The Federal Penal Code criminalizes the act of offering, accepting or facilitating a bribe for a public official to commit or omit any of their duties (regardless of intention) or to commit or omit an act which is not part of the official's duties.

The Federal Human Resources Law prohibits public employees from accepting any gifts that are not promotional or branded in nature. Such gifts may only be distributed to employees by a specific unit within the

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

department responsible for that role. The law also prohibits public employees from accepting or facilitating bribes to commit or omit any of their duties.

ABC provisions that apply to Emirate-specific public officials include the Federal Penal Code (it applies to both) and the following local laws:

- The Dubai Penal Code criminalizes the act of offering or accepting a bribe for a public official to commit or omit any of their duties. It also prohibits offering or accepting a benefit without compensation where the official is or may be involved in procedures or work with the person offering the benefit.
- Penalties
There are various penalties for corrupt business practices and bribery, which include:
 - (a) Under the Federal Penal Code, imprisonment of up to ten years and/or fines of up to the value of the bribe or AED10,000.
 - (b) Under the Emirate-specific Penal Codes, imprisonment of up to three years and/or a fine.
 - (c) Under civil service laws, referral to the authorities for prosecution under penal laws and disciplinary action.

2.1.11. Overview : Megaprojects in Europe

Europe, stated in IFSL (2009) that in 2008 saw the intensification of the credit crunch and the severe economic downturn presented challenges in all sectors of the economy that rely on private finance. The downturn led to delays to projects and 2009 is set to be one of the most challenging ever for the PPP industry. However in Europe we can still see PPP projects coming to financial close. The PPP market in Europe was growing in size over the last two decades and in 2005-06 the PPP market increased in size by 37% (Piper, 2007). This was due to more countries in Europe launching projects and putting projects through tender. High growth is expected in rail, waste and water, healthcare and defence sectors. In 2006 the tender value of PPP projects has more than doubled since May 2004 and is around €54 billion according to the fourth annual report (Piper, 2007). Table 2 shows the top ten countries ranked in order of the capital value of the projects from 2001-08. On top is the UK followed by Spain and France (Rajput, 2010).

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Table 2. PPP in Europe, value of signed contracts

Ranking	Country	Capital value of projects € million	No. of signed deals.
1	UK	61131	536
2	Spain	4127	38
3	France	4093	34
4	Italy	3563	20
5	Republic of Ireland	3253	19
6	Greece	2398	8
7	Germany	2029	40
8	Belgium	1780	6
9	Netherlands	1733	9
10	Poland	1520	2
11	Austria	899	6
12	Finland	700	1
13	Bulgaria	654	6
14	Hungary	556	11
15	Cyprus	500	1
16	Portugal	450	7
17	Other countries	977	7

Source : IFSL, 2009

PPP projects have been launched across a wide range of sectors in Europe. Roads are by far the most dominant sector, assisted by the fact that the concession model has a long and successful history within Europe, particularly in southern European countries (City & Financial, 2008). According to Piper (2007) in recent times apart from the road, bridge and tunnel infrastructure projects there is an increasing demand for hospitals, with a real health infrastructure market in Europe with projects in Italy, Spain, Portugal, France, Germany, Czech Republic and the UK.

Table 3 – Sector wise Pre-tender projects in Europe (Piper, 2007)

Table 3. Sector wise Pre-tender projects in Europe

Sector	Percentage(%)
Bridges/Tunnels/Roads	60
Rail/Light rail	22
Defence	4
Healthcare	4
Sports /leisure/tourism	3
Airports	2
Education	2
Waste/Water	2
Prisons	1
Maritime/ports	1
Regeneration	1

Source: Piper, 2007

The literature will focus on the development and construction of railway line projects in Europe as this has transport authorities that are in a period of large infrastructure investments that require significant increase in resources and competences and has the biggest and effective mode of transport. South Africa can also use

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

the literature collected for and lessons could be learnt on how South Africa's Gautrain could have been done better Benchmarking, which helps project managers learn from others, improve particular project areas, and reduce project costs. For railway projects, benchmarking is essential for the comparison of unit costs for major cost drivers and may assist in the expansion of Gautrain or similar future projects.

According to Piper (2007) rail represents 15% by tender value of the market which consists mostly of light rail projects. The infrastructure for heavy rail has been delivered using a PPP model in only a few cases such as the Perpignan to Figueres cross border rail link. The scale and politics of such projects make them difficult to deliver. However, there are several big schemes currently in development for high speed links in Portugal, Austria and the Netherlands . The European railway systems are critical for both long-distance and commuter traffic, as well as freight transportation . Until the early 1990s, most European railway systems were organized in the form of state-owned and vertically integrated monopolies (Villalba-Romero, 2016) . The EU directives from 1991 stipulates the separation of the national railways into different organizations for owning and developing the infrastructure and for operation and transport activities. Following this trend, all or parts of the design, construction and maintenance of railway infrastructure have been deregulated and opened for competition in many countries (Rajput, 2010).

2.1.11.1. Planning and procurement in Europe

Europe mainly uses two main delivery systems; Design-bid-build (DBB) and Design-Build (DB). In DBB contracts a client is responsible for design and the contractor for the construction, entailing a detailed description of what work is to be undertaken . DBB contracts may be preferable if the client has sufficient expertise and experience to specify how to achieve this system. A disadvantage is that the absence of contractors' production knowledge during the design may impair innovation and efficiency during the production stage, especially in more complex projects.

In a DB contract, contractors are involved early and responsible for detailed design work . This can promote greater exchange of production knowledge between consultants and contractors, which can lead to product design with improved constructability. DB contracts also improve the contractor's opportunities for innovation. A potential problem regarding innovation is however rebranding of DBB contracts into DB . DB contracts without degrees of freedom for the contractors are not to be expected to deliver innovation (Eriksson, 2017).

Both DB and DBB contracts promote a focus on competition as they separate, allocate, and clarify the actors' different responsibilities, which make the contracts more transparent. However, if DBB contracts are procured early or if the client is involved in the design stage of a DB contract, both types of contracts can involve some degree of joint specification. Then the clients, consultants and contractors work together to promote a synchronized focus on innovation and efficient production. In such cases, when the contractor is procured early and the actors engage in joint planning and design based on either DB or DBB contracts, where one party has the main responsibility and the other is more consultative, cooperation is promoted (Eriksson, 2017).

Deloitte (2006) describes the most common PPP models are Design-Build (DB), Design-Build-Maintain (DBM), Design- Build-Operate (DBO) or Build-Transfer-Operate (BTO), Design-Build-Operate-Maintain (DBOM) also known as Build-Operate-Transfer (BOT), Build-Own-Operate-Transfer (BOOT), Build-Own-Operate (BOO) and

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Build-Own-Operate/Maintain (DBFO, DBFM or DBFO/M). PPPs can also be used for existing services and facilities in addition to new ones. Some of these models are Service Contracts, Management Contracts, Lease, Concession and Divestiture. Rajput (2010) cited that globally, PPPs have played a central role in answering the pressing need for new infrastructure development especially in the transportation sector i.e. roads, tunnels, bridges, airports, ships, railways, and other forms of transportation. Thus transportation is the largest sector implementing the PPP model in the world. Factors that make most transportation infrastructure ideal for PPPs are firstly, the strong emphasis on the role of cost and efficiency helps to align private and public interests and secondly, the growing public acceptance in many countries of associated user fees for assets such as roads and bridges which makes private financing easier in this sector. The ability to limit participation to paying customers, in the form of train tickets or bridge tolls, ensures a revenue stream that can offset all or some of the cost of provision in many countries, a format readily understood by the private sector. The scale and long-term nature of these projects are well served by PPPs.

Table 4: PPP models used in various sectors in different countries (Adapted Deloitte, 2006)

Table 4. PPP models used in various sectors in different countries

Sector	Country	PPP models
Transport	Australia, Canada, France, Greece, Ireland, Italy, New Zealand, Spain, UK, US, India	DBOM, BOOT, Divestiture
Water, wastewater, and waste	Australia, France, Ireland, UK, US, Canada, India	DB, DBO, BOOT, Divestiture
Education	Australia, Netherlands, UK, Ireland, India	DB, DBO, DBOM, BOOT, DBFO/M, integrator
Housing/Urban Regeneration	Netherlands, UK, Ireland	DBFM, joint venture
Hospitals	Australia, Canada, Portugal, South Africa, UK	BOO, BOOT, integrator
Defence	Australia, Germany, UK, US	DBOM, BOO, BOOT, alliance, joint venture
Prisons	Australia, France, Germany, UK, US	DB, DBO, BOO, management contract

Source: Adapted Deloitte, 2006

According to IFSL (2009), in Europe the infrastructure needs for the European Union run into trillions of dollars. The energy sector alone requires \$1.2 trillion over the next 20 years. Approximately \$90 billion is needed annually for infrastructure investment in Germany alone.

2.1.12. Overview: Megaprojects in BRICS countries

South Africa has the largest economy in Africa and is the most developed in sub-Saharan Africa. As a member of the BRICS countries, an association of five major emerging market economies, South Africa is recognised as a key emerging market along with other members of the group Brazil, Russia, India and China (PWC, 2017).

According to the Health and development of BRICS countries, BRIC is an acronym for the developing nations of Brazil, Russia, India, and China - countries believed to be the future dominant suppliers of manufactured goods, services, and raw materials by 2050. China and India will become the world's dominant suppliers of manufactured goods and services, respectively, while Brazil and Russia will become similarly dominant as

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

suppliers of raw materials. As of 2010, South Africa joined the group, which is now referred to as BRICS (Hoirisch, 2015).

According to Othman (2013), emerging and developing countries have significantly increased their weight in terms of global GDP and global economic growth. Perhaps most importantly, some emerging and developing economies have accumulated very large, long-term foreign exchange assets, which they have typically placed in sovereign wealth funds. Many of these resources are invested in developed countries with relatively low yields. China is one of the BRICS countries that has experienced rapid transport infrastructure development in recent years. The total length of limited-access highways or expressways, for example, more than tripled from 191,000 km in 2001 to 651,000 km in 2009 (MoT, 2010). The development has been especially rapid in the mega city-regions of the country. The development of transport infrastructure has direct implications for spatial accessibility at both the national and regional scales (Trueb, 2015).

Trade has always been a vital part of economy and with the concept of globalization it reaches to the international level. The role of Foreign Direct Investment (FDI) in this development is very crucial. The enormous increase in FDI flows across countries is one of the clearest signs of the globalization of the world economy over the past 20 years (UNCTAD, 2006). According to UNCTAD foreign direct investment (FDI) is defined as an investment involving a long-term relationship and reflecting a lasting interest in and control by a resident entity in one economy (foreign direct investor or parent enterprise) of an enterprise resident in a different economy (FDI enterprise or affiliate enterprise or foreign affiliate). Such investment involves both the initial transaction between the two entities and all subsequent transactions between them and among foreign affiliates. FDI has innumerable effects on the host country's economy. It influences the income, production, prices, employment, economic growth, development and general welfare of the recipient country (Agrawal, 2011).

In last two three decades world has experienced a massive change in terms of geopolitics, economics and in organisation and distribution of production. For several reasons, emerging economies of Brazil, Russia, India and China (BRIC) have acquired important role in the world economy as producers of goods and services. All the four countries of BRIC have common characteristic of large population, potential consumer market, fast economic growth, big land size etc, on the basis of which they are attracting large amount of investors around the world. The BRICS, with 40 percent of the world's population spread out over three continents, already account for 25 percent of global GDP (Fund, 2009).

In 2014 the Shanghai-based bank had at least US\$50 billion in initial capital, making it a significant new entrant into the sphere of global development finance. The countries have made massive investments in infrastructure over the last decade, with special emphasis on energy and electricity infrastructures, a binding constraint for growth in all of them but Russia, which has invested in infrastructure for exporting its abundant energy resources.

According to Infrastructure and Sustainable Development goals in the BRICS led new development bank (2014), the international development finance already provided by the individual BRICS to developing countries has filled some of the finance gap, including for infrastructure projects:

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

The BNDES financed 27 infrastructure projects in South America from 1997 to 2013, including eight water and sanitation projects and six gas pipelines. BNDES' total support for exports of Brazilian goods and services to the region totalled US\$3.67 billion from 2001 to 2010, with smaller sums going to Lusophone Africa (Portuguese-speaking African countries) (Hochstetler 2014). South Africa's Industrial Development Corporation added US\$2 billion for 41 projects in 17 African countries between 2001 and 2010. The Development Bank of Southern Africa spent hundreds of millions of dollars more for cross-border infrastructure projects that will rebuild regional trade, sometimes recreating infrastructure destroyed by the apartheid government (Qobo and Motsamai 2014).

China's policy banks dwarf all the others, committing US\$132 billion to African and Latin American governments from 2003 to 2011. About half of the loans are commodity backed, with in-kind reimbursement, since neither side has convertible currency (Bräutigam and Gallagher 2014). Many of these are for resource extraction, but they include many infrastructure loans as well. In Latin America, China largely complements the lending of the World Bank and Inter-American Development Bank (IADB), making infrastructure loans when they do not and financing countries with risky borrowing profiles (Gallagher, Irwin and Koleski 2012).

Brazil, China and India all distribute much of their foreign development finance as export-import support or otherwise tie it to their national firms. Finally, the BRICS' national development banks increasingly provide large sums to directly cover internal development finance needs at home. Much of both their domestic and foreign funding goes to infrastructure and other long-term growth requirements. In short, an infrastructure focus for the NDB is a natural extension of the financing already being done by the BRICS' national development institutions, (Hochstetler, 2014).

2.1.13. Overview : Megaprojects in Africa

According to Deloitte (2013), the infrastructure boom in Africa had seen investment in 322 megaprojects reach \$222, 7 billion. The report showed that some of the money-pot was being spent in energy (36% - 97 projects) and transport (25% - 82 projects). Overall, 59% of the megaprojects were owned by governments, 2% by private-public partnerships and 29% by private investors. With Europeans and US investor owning 17% of the projects in Africa.

2.1.13.1. Funding of Megaprojects in Africa

Research has shown that funding for megaprojects is a huge challenge. Majority of funding of the African megaprojects came from china (Engineering News, 2013), at \$43,6 billion. South Africa and Nigeria (Ngunjiri, 2017), have a more developed funding framework, and are the leading countries in Sub Saharan Africa along with Mauritius, Rwanda, Tanzania, Ghana, Botswana and Ethiopia.

Funding challenges in Africa range from poor planning, insufficient political will, and limited public sector capabilities to develop strategic foresight. In most African countries, infrastructure development investment is usually hindered by political interference, governance policies and financial markets challenges (Engineering News, 2013).

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Africa also fails to attract international investors in infrastructure projects due to lack of skills and capabilities to plan, execute and manage mega projects. Currently, only South African banks and to a lesser extent Nigeria banks, offer sound financial support to fund megaprojects. Private-public partnerships have somewhat played a role in funding mega projects; however they're not a solution because they remain complex in execution and during negotiations

Tshidavhu, (2020) shows that energy investment decisions are generally guided by government policy rather than by market signals . Government interventions in the implementation of megaprojects represent a highly effective tool of any government's policy and may contribute, as it does on many occasions, to a significant level of public expenditure. As noted in South Africa Power Plant Megaprojects (PPMs) are often implemented too late, are very costly, and usually fail the general populace by not providing the expected benefits.

Tanzania together with the Chinese government were developing what would be the world's biggest port, Bagamoyo port in 2015. This port will have the capability to carry 20 million containers a year with an estimated cost of \$11 billion and to be completed in 2045 (Ernest & Young, 2016). The project was however suspended indefinitely in 2017 due to funding problem only to be resuscitated in 2019 after an injection US\$10 Billion by the Chinese government (Zheng, 2019). A similar scale megaproject in Technology infrastructure was initiated in Kenya in 2012. Kenya's development of Konza Technology City to the value of \$14, 5 billion software hub just outside Nairobi. Furthermore, China and Nigeria got into a partnership to build Lagos-Calabar Coastal Railway worth \$11 billion (Ernest & Young, 2016).

2.1.14. Overview of mega projects in South Africa

Megaprojects in South Africa particularly, are being executed by State Owned Enterprises (SOEs) and the private sector. Currently, the largest megaprojects underway are the Eskom Medupi and Kusile power stations. South Africa has also had the opportunity in the past thirteen years to develop some of the world's major infrastructure such as The Gauteng Freeway Improvement Project (GFIP), Gautrain and the collective of the 2010 FIFA World cup infrastructure (Haferburg and Huchzermeyer, 2015).Megaprojects are described by (Federal Highway Administration, 2000) as "projects of significant cost that attract a high level of public attention or political interest because of substantial direct and indirect impact in the community, environment and government budgets". Currently, in South Africa the two largest mega projects are Eskom's Medupi and Kusile power stations which are under construction (Venter, 2014).

According to Flyvbjerg et al. (2006), political leaders are always opposed to infrastructural development. According to Pillay et al. (2009), megaprojects fail during the initial stages of planning and organization. Poor organization and planning cost result in inaccurate cost estimates and scheduling (Blas et. Al., 2011). Moreover, it may result in failure to implement subcontractors' agreements and the commencement of the construction. An incisive overview of project challenges is required, especially on the appetite to implement more mega projects.

According to Pillay et al. (2009), the construction of the FIFA 2010 stadia was hampered by delays, budget overruns and shortage of skills. Apparently the project also failed to adhere to best practices of the scope of the project changed with time (Haferburg and Huchzermeyer, 2015).

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

2.1.14.1. Impact of implementation of megaprojects in south African economic growth

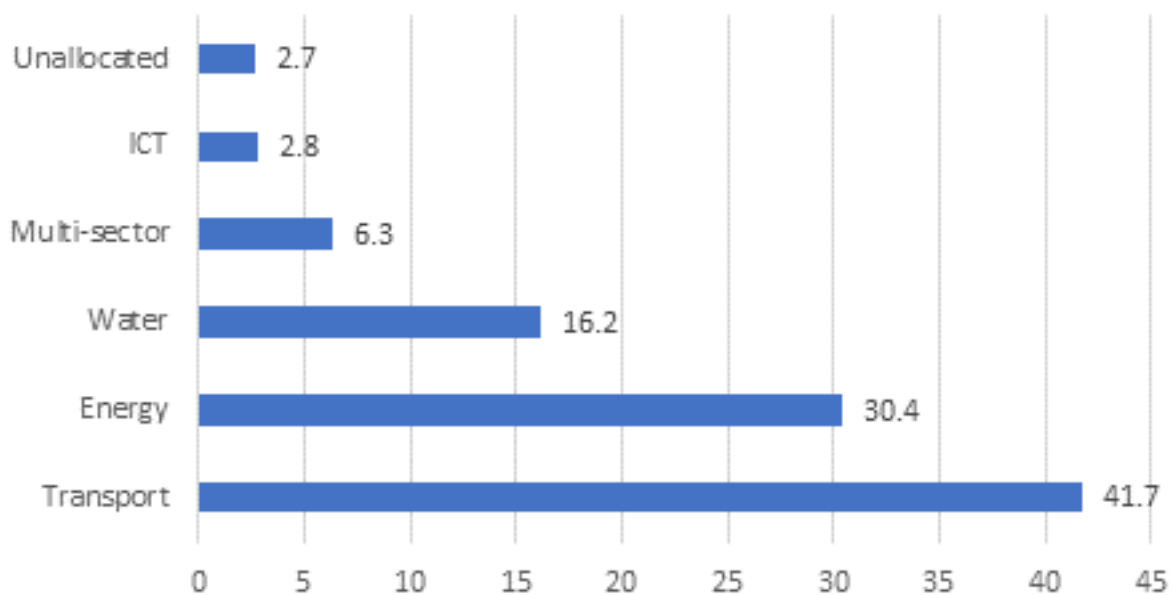
South Africa is on a multibillion-rand development drive to remedy the skewed implementation of infrastructure during the apartheid years, and to meet the demands of a growing economy and population. According to the National Treasury, between the 2009/10 and 2013/14 financial years the public sector spent just over R1-trillion on infrastructure and will spend a further R813-billion over the next three years.

Landman, (2018), South Africa's gross domestic product (GDP), public sector spending on economic infrastructure such as roads, bridges, dams, electricity and pipelines is now at its highest level in 25 years, reveals this year's Budget Review. Over the four years from 2014/15 to 2017/18 this will amount to 6.2% of GDP, slightly down from 6.7% of GDP over the five years from 2009/10 to 2013/14.

The relationship between infrastructure and economic growth has, in recent years, become one of the most important economic topics in both academic and policy circles. The National Treasury has allocated R416 billion to spending on infrastructure development and maintenance, in the current three-year budget cycle (National Treasury, 2007). This after a period from 1976 to 2002 when annual infrastructure investment fell from 8.1% to 2.6% of GDP, with per capita expenditure falling from R1 268 to R356, (Garlick2, 2008)

The graph below indicates the impact that funding towards megaprojects has towards the GDP.

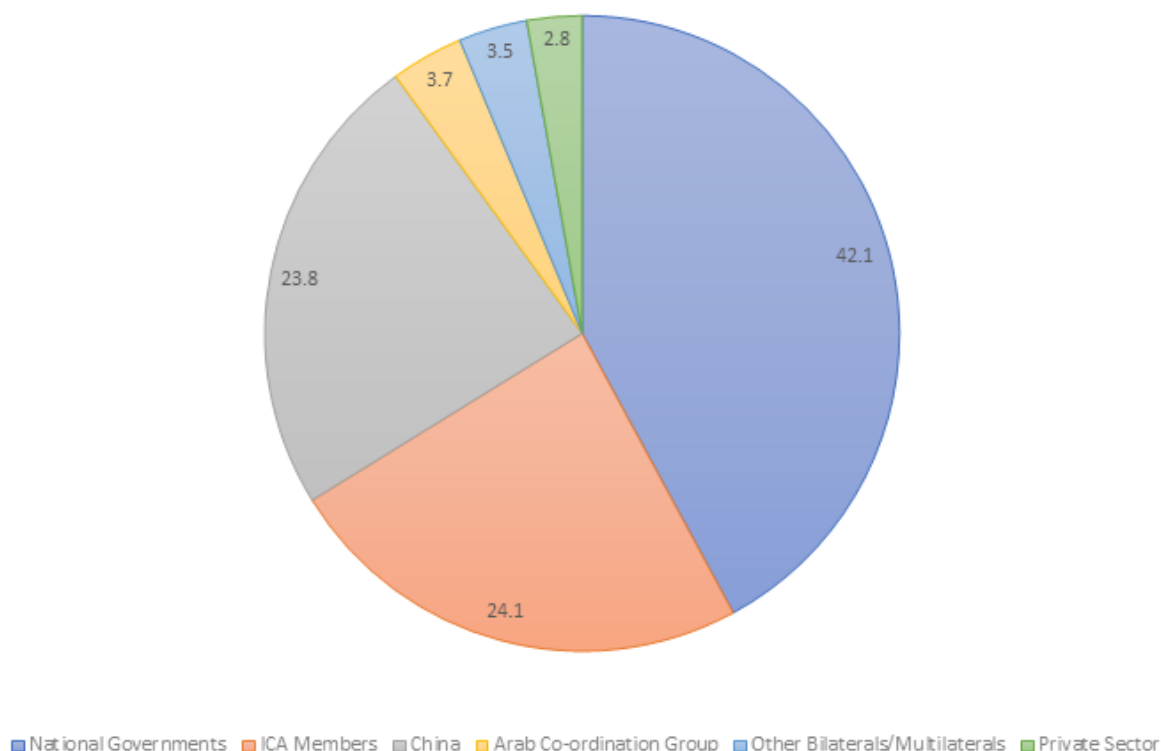
Figure 2: Infrastructure Financing Commitment in Africa in 2017 by Sector (by Percent)



Source: Extracted from the Infrastructure Consortium for Africa's 2017 infrastructure financing trends in Africa report

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Figure 3: Sources of Infrastructure Financing Commitment in Africa in 2017 (by Percent)



Sources: Sources of Infrastructure Financing Commitment in Africa in 2017 (by Percent)

Data has shown that China's commitment of \$14.7-billion in investments and said that South Africa's biggest trading partner was ready to invest and work with South Africa in sectors such as oceans and green economy, science and technology, Construction & manufacturing, agriculture, environment and finance. Other investments include a \$10-billion investment from Chinese automaker Beijing Automotive Industry Company (BAIC) which will go towards expanding its plant based in Coega, Port Elizabeth as well as the expansion of television maker Hisense's plant.

2.1.14.2. Foreign Country specific findings on Implementation of megaprojects

Research has shown that the average spending on infrastructure for developing countries varies between 2 and 4%. In China, it amounts to 8.5% of GDP. Literature compared this to Brazil, where public investment in infrastructure came in at US\$44-billion or 2.4% of GDP last year before its present economic crisis hit, according to consulting firm Inter.B. Brazil's plan to concession US\$65-billion in new infrastructure projects over the next two years, announced in June, will notch this up to just 3.5% of GDP, (Landman, 2018).

The graph below indicates a European cross-sectoral comparison of megaproject's ability to be delivered on target in terms of both schedule and budget, which could be a learning point for. Firstly, it demonstrated that megaprojects findings echo those of other researchers in the area. European megaprojects across all sectors are uniformly delivered late and over-budget. It does: however, demonstrate significant variations across the sectors in that performance. According to the (NEPAD, 2009), the following Asian countries have an operational and funding system on implementing megaprojects.

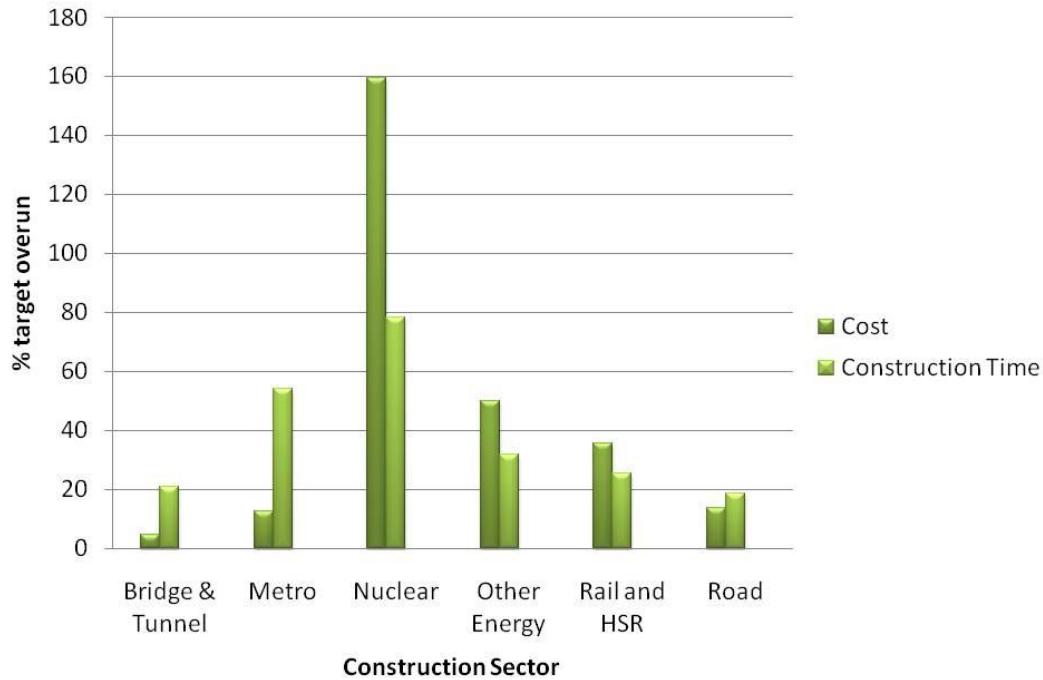
THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Literature compared the system to implement megaprojects with the countries below and as a result, research established that:

- **Korea** is the third most important economy participating in Africa's infrastructural sectors. Of all its operations most clearly mirror those of Africa's traditional economic partners of its 21 infrastructure projects in Africa, 19 are aid-funded and two result from FDI (Foreign Direct Investment). Given India's project policy orientation, a high share of Korean projects are in social infrastructure. Next to China, Korea is one the largest of the construction equipment exporters to Africa,
- **India** follows behind Korea in relation to the number of infrastructure projects in which it is involved. Fifteen cases of involvement in Africa's infrastructure since 2000 are identified. These have been concentrated in economic infrastructure, particularly in power and railways. India's aid to Africa is minimal, but there are signs that it is adopting a more proactive and strategic approach towards its presence in Africa. This is evidenced in its involvement in a large railway project in Nigeria which involves some degree of bundling of aid, trade and private sector involvement. Exports of construction equipment to Africa have been minimal.
- **Turkey** has a strong global presence in the construction sector, and it is not surprising therefore that it has been involved in a number of infrastructure projects (14 in total since 2000), particularly in the airport and oil- infrastructure sectors. Although Turkey has a growing aid programme, its participation in Africa's infrastructure sectors has been driven by its private sector winning open tenders. Although most of these projects have been in North Africa, Turkey is now making major push for deeper involvement in SSA. Exports of construction equipment to Africa have been minimal.
- **Malaysia** and **Russia** have a very limited presence in Africa's infrastructure sectors, each having been involved in 5 infrastructural projects since 2000. Neither country has an aid programme of significance, and relations with Africa are driven by strictly commercial imperatives. Malaysian firms are concentrated in the oil sector (having divested from the ICT sector), and Russian investments are concentrated in power and oil-infrastructure. Neither economy is an exporter of any significance of construction equipment to Africa.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Figure 4: Cross-Sectoral Delivery Performance for European Megaprojects



Source: (Brookes, 2015)

Table 5. Shares of Brazil, China, India and Korea in different infrastructural projects (%)

Sector	Brazil	China	India	Korea
Roads	18.6	72.9	0.0	5.7
Rails	13.6	59.1	22.7	4.6
Power	14.0	54.4	10.5	12.3
Sea Port	40.0	60.0	0.0	0.0
ICT	4.6	77.3	9.1	9.1
Oil refinery & pipelines	0.0	28.6	14.3	0.0
Airports	35.7	28.6	0.0	0.0
Stadium	0.0	85.7	0.0	14.3
Irrigation	0.0	0.0	0.0	100.0
Water and Sanitation	14.3	57.1	0.0	19.1
Housing	60.0	0.0	0.0	0.0
Total	16.1	59.8	6.4	8.9

Source : (NEPAD, 2009)

Tshidavhu, (2020), indicated that research conducted in Hong Kong identified that causes of delay in construction projects include poor site administration and management; unanticipated ground conditions; slow decision-making by all project teams; employer-initiated variations; essential variation of works; the non-existence of effective communication, and possible preconceptions.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

In Malaysia, the main causes of cost overruns and delays in building construction projects are poor scheduling and control of time; delays in the preparation of design documents; ineffective communication between stakeholders; changes in laws and regulations; low labour productivity; lack of knowledge in executing methods; contractor's financial problems that result in the shortage of construction materials on-site; owner's financial problems and slowness in decision-making; consultant's poor supervision and delays in issuing instructions, and external factors such as materials shortage and poor site condition (Tshidavhu, 2020).

2.1.14.3. Challenges and Impact of megaprojects in South Africa.

Development of Infrastructure megaprojects is crucial to the society, economy, government and individual livelihoods. They have an impact to improve and better people's lives if implemented and planned well; however the major challenge with megaprojects is that they often go off the rails, either with time or budget, most likely both. Megaprojects have a huge impact in transforming the economy (Engineering News, 2017).

Megaproject need to work on two levels – in the short term for recovering financial outlays and the longer term for creating social impact (Garemo, Matzinger, Palter, 2015). Building and maintaining of megaprojects can be a lifesaving impact.

Most megaprojects fail due to the inadequate organisational design capabilities. Most of them fail because there was no adequate design, and that makes them expensive to maintain and the situation is often exacerbated by a lack of a legitimate business case for their initiation (Khatleli, 2016).

Poor planning and execution, megaprojects are known to be expensive and may take anything over 4 years to execute, so if projects are of low budget, the temptation is to cut corners to maintain profit margins. According to Garemo, Matzinger and Palter, (2015), project execution from design and planning through construction, is riddled with problems such as incomplete design, lack of clear scope, ill-advised shortcuts, and even mathematical errors in scheduling and risk assessment.

2.1.14.4. Eskom Medupi and Kusile Power Stations

The construction of Medupi PowerStation commenced in 2007 with the intention to support the under capacitated power grid, Eskom to meet the demand of power consumers. The 4764 MW Medupi coal-fired power station, situated near Lephalale in Limpopo Province (Yelland, 2016). Currently Medupi is the biggest coal power plant in the world with the output energy supply of 4764MW to consumers.

- The 4800 MW Kusile coal-fired power station close to Kendal power station in the Nkangala district of Mpumalanga province, has been under construction since 2008 (Yelland, 2016). According to Eskom's Head of capital Mr. Abram Masango, advised
- The latest estimated CTC (Cost to Completion) for Medupi, excluding flue gas desulphurization plant (FGD), and excluding interest during construction (IDC), had increased from R105 billion to R135 billion.
- The latest estimated CTC, including FGD, but excluding IDC, had increased from R119.5 billion to R160 billion.
- CTC approved for Kusile is currently R160 billion, including FGD and excluding IDC.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Just like many other megaprojects in the world, these two megaprojects have been delayed due to a number of reasons such as labour unrest, procurement delays etc. and budget overruns of over 100%.

It is quite evident that inadequate planning played a big role, as well as procurement of suitable skills. Although, the project is neither on schedule nor cost, Medupi has since achieved some milestones successfully, (Eskom - COP17 Fact Sheet, 2017).

Figure 5: Typical Eskom power station (Image: Graeme Williams. Brand South Africa)



Source: . Medupi and Kusile Power stations (2017)

Medupi is a 4764MW greenfield coal-fired power station located West of Lephalale, Limpopo Province, South Africa, (Eskom - COP17 Fact Sheet, 2017). Construction of Medupi power station commenced in 2007 to meet Eskom's declining capacity, which had started showing signs of weakness in meeting demand (Khatleli, 2016).Kusile Power Station Project is a 4 800MW (6 x 800MW units) project that encompasses the construction, commissioning and operation of a new coal-fired power station and its associated infrastructure next to the existing Kendal Power Station in the Witbank area of the Mpumalanga Province. The project is managed by a team of highly skilled professionals with a World Class safety management team producing top performance, (Eskom - COP17 Fact Sheet, 2017).

2.1.14.4.1. Delays and Overruns in construction of Kusile and Medupi Power Stations

The power station was first commissioned back in 2007 and initially Eskom expected the total duration of the project to be no longer than four years. But the project has been hit by delays and cost overruns, and nine years later, three additional boiler units still have to be finished before the new deadline of 2018, (Eskom,

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

2018). According to Denton's report on Eskom's projects status, limited skills, poor upfront planning, inadequate quality control and labour strikes were key reasons for delays at Eskom's new build projects Medupi and Kusile, the Dentons report commissioned by Eskom in 2015 revealed. Eskom received a loan of almost R20bn in one month from the China Development Bank to help finance the continued construction of Medupi (Dentons, 2015).

According to Tshidavhu, (2020) to understand the influence of cost and schedule overruns in megaproject construction, it is important to identify and assess the challenges militating against megaprojects success in South Africa. The bias will be towards energy projects, as they are the biggest in value and have received the largest publicity and media scrutiny because of their importance to the functioning of the economy. Some of the common overruns identified by Tshidavhu, (2020) at Medupi and Kusile are attributed to project challenges such as severe wind, precipitation, floods, or hail, can delay the project, due to reduced visibility to move equipment, delays in the delivery of materials, reduced access to the site for workers, damaged infrastructure, and the loss of electrical power and political instability.

2.1.14.5. Historic overview of the Gautrain

2.1.14.5.1. What is the Gautrain?

The provincial government of Gauteng, South Africa recently launched the continent's largest transportation megaproject ever. The Gautrain is Africa's first rapid rail network, and is intended to ultimately connect Tshwane/Pretoria, Johannesburg, and the OR Tambo International airport. An ambitious and expensive project in the 'new' South Africa, the Gautrain has generated considerable controversy and debate both within South Africa and beyond. The case of the Gautrain is important for policy makers, and development practitioners who seek to understand the political and social implications of constructing such projects within the South African context. Moreover, the success or failure of this project will be important in assessing whether or not similar projects should be approved in other African contexts (Thomas, 2013).

In February 2000 former Premier of Gauteng Mbhazima Shilowa announced that the provincial government would build the first high-speed metropolitan transport network on the continent. This announcement came after his predecessor, Tokyo Sexwale, visited Munich, Germany in 1997 with current Gautrain Management Agency CEO Jack van der Merwe to 'investigate the possibility of a rapid rail system in Gauteng' (Oberholster 2010). A German pre-feasibility study was then completed in 1999, which led to the ultimate decision by Shilowa to proceed with planning the project. A feasibility study was subsequently completed by July 2001, an Environmental Impact Assessment (EIA) commenced in January 2002, and a request for prequalified bidders was released in early 2002. The Gauteng provincial government decided to engage in a PPP in order to design, construct and operate the rail system. Bombela's obligations in the partnership 'include the design, construction, part-financing, operation and maintenance of the system', and the agreement lasts over a 54 month construction and development period followed by a 15.5 year operating and maintenance period (Lombard, 2017).

Khatleli et al. (2014) shared that Gautrain project is procured as PPP project between the Gauteng Provincial Government and Bombela Concession Company (Pty) Ltd, which comprises of three companies – Bombela

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Civils Joint Venture, Bombela Electro-Mechanical and Bombela Operator. Bombela is made up of four sponsor entities, namely; Bombardier, Murray & Roberts, Bouygues and Strategic Partners Group. The project is a design, build, operate and transfer (BOT) project of 20 years, where the construction phase took 5 years and operating and maintenance will take 15 years. The parties in the project are the client, Gauteng Provincial Government, the main contractor, Bombela Concessionaire, the certifiers, Independent Certifiers (ARUP), and Independent Socio-Economic Monitor (ISEM). The Turnkey Contractor (TKC) is the project management consultant for the Gautrain project, whose role is to bring together all the components to make the project a success. Bombela branches into two contracts being civil contract and electric and mechanical contract, done by Bombela Civils Joint Venture and Bombela Electro-Mechanical respectively (Khatleli, et al., 2014) .

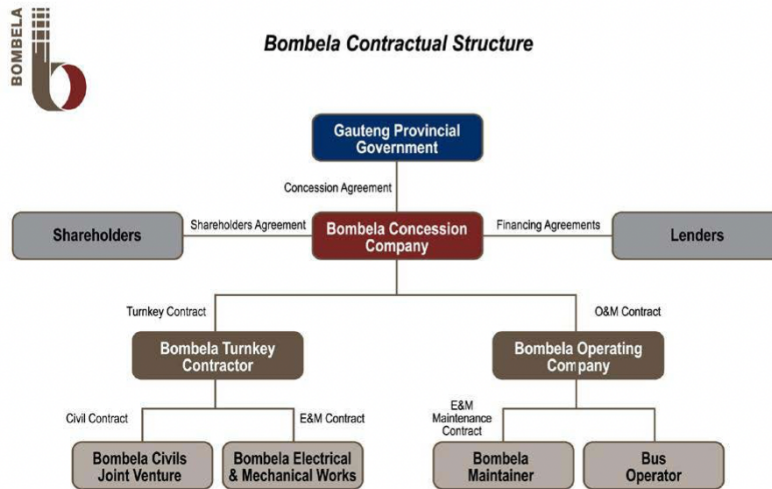
2.1.14.5.2. Implementation and funding of the Gautrain

The Gautrain Rapid Rail Link is a railway system that uses modern, state-of-the-art and tested technology. The Business Case is important as this is the first system of its kind in South Africa, and is one of the first being implemented locally that uses the build-operate-transfer (BOT) and public-private partnership (PPP) approaches. This may provide valuable information on the future management regime and the issues surrounding the concessioning of local commuter rail services, (JH Venter, 2001).

Gautrain is a mass rapid transit railway system connecting the main economic hubs of Gauteng, namely, Johannesburg, Tshwane and O.R.Tambo International Airport. It was built to reduce the traffic congestion experienced between these areas. It is aimed at providing another mode of public transport to car users which will attract private car-users to the train (Gautrain Management Agency, N.D.).The Gautrain TOD is characterized by both buses and trains that work together to transport people between the various stations and around their surrounding areas, (Surti, 2017). The contract structure from Khatleli and Malete (2019) is detailed below.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Figure 6: Structure of a PPP Agreement adopted for Gautrain Rapid Rail Link project



source: Bombela Civil Joint Venture's Quality Management Plan, 2007

Construction on the R25-billion Gautrain rapid-rail link project, which began in September 2006, continued on schedule during the month of August. The project was planned to be completed in two phases – with the first phase to be completed in 45 months (in time for the 2010 FIFA soccer World Cup), and the second phase to be completed in 54 months. The first phase involved the construction of a network between the OR Tambo International Airport and Sandton, north of Johannesburg and the second phase included the remainder of the rail network between Sandton and Johannesburg, including the route from Midrand to Hatfield (Engineering News, 2007).

According to, Venter (2001), feasibility was one of the important goals for the planning of the project. This is important for the following reasons:

- To ensure the interest of the private sector, business entrepreneurs, funding institutions, financiers and bankers.
- To ensure that competitive tenders, and hence financial implications acceptable to government are achieved with the role players being well informed about the potential benefits, cost and risk involved.
- To ensure that the project does not fail after construction has commenced and especially after operations have commenced, the implications may be difficult to handle.

2.1.14.5.3. Construction challenges of the Gautrain

Although the Gautrain is currently one of the few megaprojects that is successful in terms of delivery schedule, it still had its own construction challenges. The construction challenges comprised of all advanced engineering processes such as the tunnelling and construction of the viaducts, (Goosen, 2011).

- Discovery of water in the underground tunnel linking Rosebank station to Park station; and

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

- Contract Management disputes

2.1.14.5.4. General overview and discussion on implementing megaproject in South Africa

A review of literature suggests that most megaprojects around the world are characterised by similar trends : overestimation of benefits, undermining of cost and social, economic and environmental risks (Flyvberg et al., 2003; 2008). Based on the study of 258 transportation megaprojects, Flyvberg (2007), estimated that 9 out of 10 projects have cost overruns. Flyvberg (2007), adds that promoters and planners of most megaprojects provide inaccurate information about cost-benefit analysis and forecasting. There are policy implications for this; investors and the public cannot trust information about cost, benefits and risks of large infrastructure projects produced by project stakeholders and planners of such projects (Flyvbjerg, 2007: 6).

Through literature reviewed, South Africa has shown much interest in implementing megaprojects, although the country does not have capacity or skills to successfully implement. According to Khatleli (2016), Medupi was implemented hastily and not enough preparation was done to prepare for the organizational capacity and improve the technical know-how of the organization.

South Africa provides very good prospects for megaprojects implementation because of the infrastructure backlog. The unique historical and current political challenges have to be taken into consideration during the planning and implementation of megaprojects, (Khatleli, 2016).

South Africa can learn from other projects in and around the world on how megaprojects can be implemented differently in order to deliver them successfully. Megaprojects, even when highly successful, are difficult projects. Recent EU Cost megaprojects research concluded that these are the characteristics of megaprojects: colossal, captivating, costly, controversial and complex (Radujković, 2015).

The following success and failure factors have been identified in South Eastern Europe in the planning and execution of Mega Projects:

Table 6. Typical success and failure factors of megaprojects

Failure Factors of Megaprojects	Success Factors of Megaprojects
Lack of knowledge in the pre-planning stage	Political Support
Poor support from stakeholders and government	Availability of information
Legal and contractual aspects	Improved Communication
Poor understanding of the project scope and objectives	Clear leadership
Lack of knowledge in the pre-planning stage	Calculated risk allocations and mitigation plans
Poor support from stakeholders and government	Clearly defined programme and schedule management

South Africa can learn from European countries which have showcased successful megaprojects. Brookes, (2015) the following for further research of success and failure factors:

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Figure 7: Typical Flow chart of success factors



South Africa must ensure sustainability of project management, it is critical to identify success and failure causes on historic and current megaprojects. The results of scientific investigation show that all research done so far has made a great contribution to the megaprojects rating, moving from one main problem to potential solutions.

2.1.14.6. Common challenges/problems of Megaprojects

According to GIBB (2017), it was noted that due to the intricacy of megaprojects, the scope can and does change over time. These projects are also susceptible to misinformation about costs, benefits and risks during project development and decision-making, including in the business case. These factors often lead to cost overruns and benefit shortfalls during implementation. With some of the common problems of megaprojects highlighted as :

- Poor intensive planning that needs to form part of an integrated pre-feasibility study ahead of the project.
- Lack of understanding of the unique South African culture and communication barriers are the main factors diluting the effectiveness of the engineering skills transfer programme from expatriates to local engineers during the implementation of MCPs (Lephoto & Khatleli, 2019).
- Poor application of the appropriate program and project management processes.
- Poor public consultation, which ensures that every stage of the project has the contribution of the public who are the custodians and targets of the projects (Mahayi, 2017).
- Political Pressures - on implementing mega projects where the visuals associated with the implementation of the projects purely for political mileage (Khatleli, 2017).
- Lack of accurate data collection on cost, controls and schedule.
- No provision of robust risk-analysis or risk management protocols
- Untimely reporting and progress relative to budgets and timelines.
- lack of popular embrace but mass disgruntlement, which is indicative of a soft implementational underbelly (Khatleli, 2016).
- Lack of project exclusive implementation strategies.

It has been noted by Garemo (2015) that lack of skilled resources and capacity, without a well-resourced qualified network of project managers, advisers and controllers, projects will not deliver the best possible return on investment. The rush to implement power stations projects meant that labour unions were not properly consulted and this has led to all sorts of protestations ranging from complaints about poor working conditions to resisting hiring skilled foreign workers (Khatleli, 2016).

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

The table below details problems encountered at Eskom's Medupi Power station

Table 7. The problems encountered in implementing Medupi

Ambitious Implementation Timelines	Timelines which overlooked capacity issues and labour market volatility in South Africa.
Improper EIA	Failure to conduct a proper Environmental Impact Assessment resulted in the stalling of progress due to the mishandling of culturally sensitive issues, like relocation of old graves.
Spiraling Costs and Delays	Spiraling costs and delays have led to political pressure leading to a high executive staff turnover, thus losing momentum on some of the initiatives where gains had been made.
Contractual Expenses	Contractual expenses where coal contracts had to be honored as the suppliers were ready whereas the plant was behind schedule.
Workplace Tensions	Workplace tensions occasioned by the importation of semi-skilled labourers amidst local sentiments that locals could have been quickly capacitated.
Costly Technical Mistakes	Costly local mistakes caused by the inexperience of local experts were magnified by the sheer size of the project.

Source : Impediments to Megaproject implementation (Khatleli N. , 2016)

2.1.14.7. Public-Private Partnerships (PPP) in South Africa : Overview

PPPs can be defined as “a long term contract between a private party and government entity for providing a public asset or service, in which the private party bears significant risk and management responsibility and remuneration is linked to performance. Although PPPs have been legalized in some countries, the term itself has no legal meaning. It broadly refers to the different possible relationships between entities in the public and private sector (Wannalak2, 2016).

Khatleli (2020), further emphasises the definition of PPPs in the Southern African context as a legal and/or contractual relationship between a government and a private business venture that is aimed at delivering basic amenities and public services. According to the PPP Unit in South Africa, a PPP is defined as a contract between a public sector institution and a private party, where the private party performs a function that is usually provided by the public sector and/or uses state property in terms of the PPP agreement. Most of the project risk (technical, financial and operational) is transferred to the private party. The public sector pays for a full set of services, including new infrastructure, maintenance and facilities management, through monthly or annual payments (Khatleli, 2020). Due to the complexity of PPPs, inadequate contracts and lack of legal framework, South Africa has experienced mixed results (failures and few achievements) in education, health and telecommunication sectors. More so, from the South African perspective the following are considered the main benefits of PPPs, (Kavishe, 2019).

Public-Private Partnerships (PPP) Benefits

- It promotes creativity and innovative methods,
- Improves government's capacity to addresses public needs,
- Reduces implementation costs,

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

- Gain access to private sectors' technical and managerial expertise, financial resources and technology,
- Enabling large capital projects while decreasing public debt and aid dependency,
- Consumer satisfaction of supplied needs,
- Boost economic growth by the initiated new investment,
- Increase in public goods and service provision,
- Risk sharing,
- Mutual benefit.

PPP stakeholders will need to learn and find new ways through the validated PPP conceptual models that have been researched and implemented successfully to address the challenges to enhance the success of PPP in megaprojects in South Africa. Furthermore, policy makers will also be able to identify the weaknesses of the existing PPP policy and regulatory framework in order to make improvements or to formulate a better PPP policy and regulatory framework and strategies (Kavishe, 2019).

Governments in developing countries and South Africa implement megaprojects as a strategic means for achieving sustainable development objectives such as infrastructure, healthcare facilities, educational institutions, human and economic development projects. On the one hand, megaprojects require high design knowledge and technical skills; competent human resources and managerial capabilities as well as high cost investment. Othman (2013), further indicates that, developing countries are characterised with the following :

- Low standard of education, training and out flow of best brains,
- Corruption and political instability, dearth of capital, outdated technology and low levels of production, poor health care, low life expectancy and high growth rate of population,
- difficulties related to social, demographic and culture.

All of these challenges hindered the development of these essential megaprojects (Othman, 2013). Investors and owners need to take an active role in putting together the project team. It is not enough for them to have a vague theoretical overview of how the project should work. They need to create a detailed, practical approach to deal with such likely eventualities as managing quality risks, escalating contractor's costs, or replacing a high- tech supplier. An experienced project manager is not enough; players must assemble a team that has all the requisite skills, including legal and technical expertise, contract management, project reporting, regulatory approval, stakeholder management, and government and community relations. The world needs megaprojects to deliver the economic and social goods that billions of people lack and to create the economic growth that will pay for them. But a bad project has consequences that go well beyond a specific bridge, tunnel, or sewage system. Getting it right, or at least better, is good for everyone (Palter, 2015).

2.1.15. Conclusion

The literature introduced the characteristics of megaprojects in all spheres, covering risks, challenges, shortfalls and opportunities associated with megaprojects. It highlighted the performances of megaprojects in both developed and developing countries with a deliberate focus to South Africa and the African continent. Literature review chapter further delved into the performance of megaprojects in South Africa including energy and transport sectors.

Chapter 3

3, Research Methodology

3.1. Introduction

This chapter comprises four sections. The first section introduces and locates the study into a philosophical stance. Secondly, the research methods are introduced. Thirdly, the research strategy and identified cases are introduced and described. The final section describes the data collection instruments and analysis framework. Furthermore, the validity, reliability and generalizability of the research results are described.

The study is inherently exploratory by virtue of its endeavour to improve knowledge in the less chartered field of the megaprojects in the South African context; however not enough has been researched to explore the Appetite appropriately. Exploratory research tends to tackle new problems on which little or no previous research has been done (Brown, 2006; Cited in Moloi, 2018). This study seeks to deepen and broaden the understanding in the phenomenon of implementation of megaprojects within the energy and transport sector in South Africa. The study seeks to gain an understanding of an appetite to implement megaprojects in South Africa given recent experiences with the pioneering projects. The study further seeks to achieve these through a systematic research strategy and methods discussed in this chapter.

3.2. Research philosophies

3.2.1. What is Research?

Leedy and Ormrod (2010), defined Research as a systematic process of collecting, analyzing, and interpreting information (data) in order to increase our understanding of a phenomenon about which we are interested or concerned. Research is an organised and systematic method of finding answers to questions, carefully and detailed study into a specific problem, concern, or issue using the scientific method. It's the adult form of the science fair projects back in elementary school, where you try and learn something by performing an experiment. This is best accomplished by turning the issue into a question, with the intent of the research to answer the question, (Kowalczyk, 2018).

According to Saunders et al (2016), the selection of a better research philosophy and approach will depend on the research question(s) of the study. Research can be briefly defined on the dimension of testing and exploring information data, where theory and research is well developed in order to make a conclusive analysis and way forward on the problem statement, Horn (2012).

3.2.2. What is Research Philosophy?

According to Saunders et al (2016) ,the term research philosophy refers to a system of beliefs and assumptions about the development of knowledge. Although this sounds rather profound, it is precisely what you are doing when embarking on research: developing knowledge in a particular field. The knowledge development you are embarking

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

upon may not be as dramatic as a new theory of human motivation, but even answering a specific problem in a particular organisation you are, nonetheless, developing new knowledge,

Galliers (1991) further defines research philosophy as a belief about the way in which data about a phenomenon, should be gathered, analysed and used. The term ontology (what is known to be true) as opposed to doxology (what is believed to be true) encompasses the various philosophies of research approach. The purpose of science, then, is the process of transforming things believed into things known: doxa to episteme. Two major research philosophies have been identified in the Western tradition of science, namely positivist (sometimes called scientific) and interpretivist (also known as ant positivist).

How interested is the SA government in pursuing mega construction projects after the recent experiences? In order to identify and answer the question, the research aim to study and interpret those experienced realities by government officials and politicians. Which this means the study will be more subjective. Given this circumstances, the study will undertake the interpretivist philosophy.

Saunders et al (2016) suggested that the selection of a better research philosophy will depend on the research question(s) of the study. Due to the descriptive nature of the research, the approach to be adopted to gather the required information will be guided primarily by inductive perspective. This approach will help derive a theory from the gathered information. The information/data collected under this approach will be labelled as research findings. From literature will able to tell if South Africa still has an appetite to implement Megaprojects.

There are two approaches that can be used i.e. Inductive and Deductive approach and this study will adopt the inductive approach, Horn (2102) highlights that Inductive reasoning is defined as individual instances, that is observing instances of something, observing a pattern in the instance, Building a tentative theory; and Testing a that general theory to provide generalization about behaviour.

The approach applicable to this study is based on the following reasons:

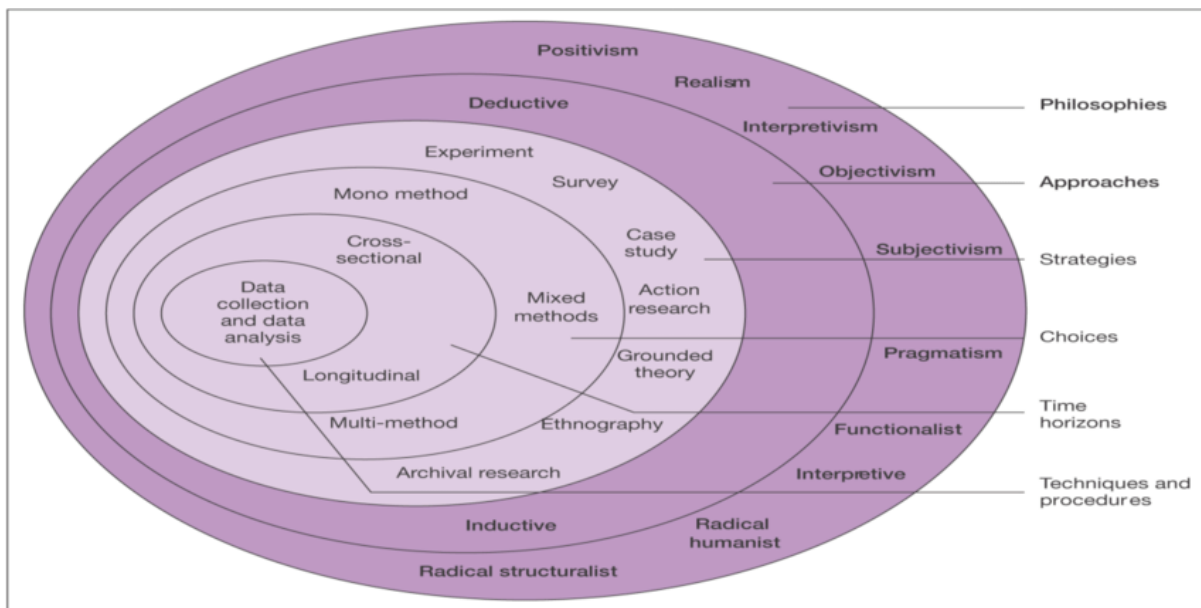
- Data has been collected from interviews and survey and then explored to see which themes or issues to follow up and concentrate on.
- Qualitative method, which ultimately had elements that may be concluded as a mixed method of collecting and analysing data is the method applicable to this study; therefore, this process has the capability of leading to the development of well-grounded explanations. In this way, analytic induction encourages the collection of data that are thorough and rich and based on the explored actions and meanings of those who participate in this process, whether through in-depth interviews or observation, or some combination of these methods (Saunders, 2009).
- Saunders, Lewis and Thornhill indicate that inductive approach often allows a good fit to develop between the social reality of the research participants and the theory that emerges – it will be 'grounded' in that reality.
- The data collected was used to suggest subsequent, appropriate action to be taken because it is specifically derived from the events and circumstances of the setting in which the research was conducted.
- This approach has given an intensive examination of a strategically selected number of cases in order to establish the causes of a specific phenomenon (Saunders, 2009).

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

A collective conclusion was made based on a collective pattern from the interviews and Survey data collected from the population sampled. By collecting data to explore the appetite to implement megaprojects in South Africa. The selection of this approach was substantiated by the requirement to identify the problem and to understand the nature and the magnitude of the problem better through a general stance of the responses on data collected.

In a nutshell, a research design according to Saunders et al (2016) is a general guideline that shows steps of how the research question will be answered. The research 'onion' by Saunders et al (2016) (fig. 1) will be adopted as a guide in developing a research design suitable for this study.

Figure 8: The research 'onion'



Source: © Mark Saunders, Philip Lewis and Adrian Thornhill 2008

The research Onion research onion is a way of depicting the issues underlying your choice of data collection method or methods and peeled away the outer two layers – research philosophies and research approaches. In this case we uncover the next three layers: research strategies, research choices and time horizons. These three layers can be thought of as focusing on the process of research design, that is, turning your research question into a research project (Robson 2002).

Types of Philosophies according to (Saunders, Lewis and Thornhill, 2016):

- **Positivism** relates to the philosophical stance of the natural scientist and entails working with an observable social reality to produce law-like generalisations. It promises
- **Interpretivism**, like critical realism, developed as a critique of positivism but from a subjectivist perspective. Interpretivism emphasises that humans are different from physical phenomena because they create meanings.
- **Postmodernism** emphasises the role of language and of power relations, seeking to question accepted ways of thinking and give voice to alternative marginalised views

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

- **Pragmatism** asserts that concepts are only relevant where they support action (Kelemen and Rumens 2008).
- **Objectivism** incorporates the assumptions of the natural sciences, arguing that the social reality that we research is external to us and others (referred to as social actors).

Philosophy applicable to the study.

Positivism is the philosophy applicable to this study due to its stance that allows observations based on social realities and truths observed. According to Horn (2012). The philosophy also recognizes only that which can be scientifically verified or which is capable of logical or mathematical proof, and therefore rejecting metaphysics and theism (Horn, 2012).

3.3. Research Strategy

Research strategy is a plan of how a researcher will go about answering the research question (Saunders, 2009). Denzil and Lincoln (2011) regard the research strategy as a link between the philosophy and subsequent choice of methods to collect and analyse data.

The research strategy considered the existing theoretical knowledge, applied and practical from the literature review along with the objectives set as the framework of the research. A focus on exactly what is required helped on developing and planning the methodology approach although may have elements of a mixed method. This study collection of data is largely inclined to qualitative method; it is cross-sectional in nature as outlined in the succeeding section of this report.

As a result, in order to understand the dynamics of this problem area, the use of a literature review is a common method that is used by many research articles in trying to obtain an understanding of the challenges that are commonly found in project management and what tools there are in order to respond to these challenges.

The nature of the research topic will determine the type/structure of methodology that must be followed in getting valuable information. The research requires full data analysis and since there is no theory to work with, deduction approach cannot be used in this study. Due to fertile conditions for deep insight understanding of the research this allows to take the direction of qualitative research methodology with structured interview questions and survey questions for information collection, (Horn, 2012) .

The literature review is also critical in the journey to determining any loopholes that may exist in the research area while also bringing to one's attention what is already in existence and what has been found. Once this has been done, the next step would be to select a sample that is relevant to the research area and start engaging with the sample by developing a questionnaire to get a better understanding of how other people perceive the problem so that the research can take on an objective view of the subject.

This was the quantitative part of the research which has enabled the author to analyse these findings and get to a conclusion. These methods are the most commonly used in the research area and will adopt these methodologies in the study as they have proven to be very effective hence the continued use. Not only that, but these methods

are easy to administer and they are the most effective way of getting an understanding of what is happening within the area of research and this is important in order for us to depict what is happening so that I can plan the way forward and come to a conclusion (Saunders, Lewis and Thornhill, 2016).

(a) Time horizon

This study is motivated by the nature of current/recent events occurring in executing mega projects in South Africa. When it comes to time horizon Saunders et al (2016) state that research studies are either a 'cross-sectional study' or 'longitudinal study'. A 'cross-sectional study' takes a snapshot time horizon and 'longitudinal study' takes a series of snapshots over a given period. Due to the nature of this study, cross-sectional time horizon will be adopted which will allow data collection about the known current situation of mega projects in South Africa. In this case the study of the phenomenon will focus at the implementation of megaprojects pre democracy and post democracy. Cross-sectional studies often employ the survey strategy Easterby-Smith et al. (2008), which is what has been adopted in the phenomenon together with structured interviews. Cross-sectional studies usually describe the incidence of a phenomenon (Robson, 2002).

The time horizon considered for this particular study is one of the conspicuous constraints to this study is the availability of time. The study comprises comparison of two energy megaprojects and one transport megaproject implemented in South Africa between the years 2007 and 2020. This study is said to be inherently cross-sectional. It studied a phenomenon of energy megaprojects at a particular time, that is, between the years 2007 and 2020. The study is inherently exploratory; it seeks to gain an insight into the energy and Transport megaprojects phenomenon with a view of establishing appetite to implement megaprojects at a particular time, in this case in the democratic government.

3.3. Research Method Designs

The research methodology directs the whole endeavour: it controls the study, dictates how the data are required, arranges them into logical relationships, set up an approach for refining and synthesizing them, suggests a manner in which the meanings that lie below the surface of the data become manifest and finally yield one or more conclusions that lead to an expansion of knowledge (Leedy and Ormrod, 2010; cited in Moloï 2018). The research method has collected data through structured interviews and questionnaires. Leedy (1989) introduces the three broad research methodologies in the field of academic research as the: qualitative research; the quantitative research; and the Mixed - Method.

3.3.1. Quantitative Method

Quantitative research refers to a group of methods in which the main focus is on quantities. Thus the main task is counting the number of times things occur or the amounts of items such as money (Horn, 2012). Quantitative research is based on observations that are converted into discrete units that can be compared to other unit's statistical analysis (Maykut and Morehouse, 1994). This is supported by Saunders, Lewis and Thornhill (2009), who state that quantitative research, examines relationships between variables, which are measured numerically and analysed using a range of statistical and geographical technique.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

According to Winter (2000) a quantitative researcher attempts to fragment and delimit phenomena into measurable or common categories that can be applied to all of the subject or wider and similar situation. Leedy and Ormrod (2010) on the other hand state that quantitative researchers seek explanations and predictions that will generalize to other persons and places. The intent is to establish, confirm, or validate relationships and to develop generalizations that contribute to existing theories (Ormrod, 2010)

Leedy and Ormrod (2010) state that quantitative researchers often choose method that allows for objective analysis of the data. Leedy and Ormrod (2010) further state that quantitative researchers are often detached from the research participants so that they can draw unbiased conclusions.

3.3.2. Qualitative Method

Leedy and Ormrod (2010) state that qualitative research focus on phenomenon that occurs in natural settings. It involves studying the phenomena in all their complexity (Leedy and Ormrod, 2010). The researcher builds a complex, holistic picture, analyses words, reports detailed views of informants, and conducts the study in a natural setting (Creswell, cited in Moloji 2018). Qualitative research starts from the stance that people understand and relate to things cognitively – from within the mind. Qualitative research relates to people in ways that allow them to express their beliefs, assumptions, desires and understanding (Horn, 2012).

Horn (2012) further indicates that a qualitative method seeks to provide contexts, like one-to-one interviewing , that allow a participant to express such things. Analysis of qualitative data seeks to place these beliefs, assumptions and undertakings in a wider social context. The main data will be words, but in modern studies can also be video or audio material. Leedy and Ormrod (2010) assert that qualitative researchers are mainly concerned with the complexity of the problem in its entirety. They recognize that the issue they are studying has many dimensions and layers, and so they try to portray the issue in its multi-faceted form.

Leedy and Ormrod (2010) state the following as the advantages of the qualitative research:

- They can reveal the nature of certain situations, settings, processes, relationships, systems, or people.
- They enable researchers to gain new insight about a particular phenomenon.
- They develop new concepts or theoretical perspectives about the phenomenon,
- They discover the problems that exist within the phenomenon
- They allow a researcher to test validity of certain assumptions, claims, theories, or generalizations within real-world contexts
- They provide a means through which a researcher can judge the effectiveness of particular policies, practices, innovation.

Leedy and Ormrod (2010) state that qualitative researchers often seek better understanding of complex situation and use their interpretative skills to create means from data; this meaning is then translated to form theory from the ground up.

3.3.3. Mixed Method

The mixed methods research is the branch of multiple methods research that combines the use of quantitative and qualitative data collection techniques and analytical procedure (Saunders et al., 2016). Tashakkori and Teddlie (1998) define mixed method studies as those that combine the qualitative and quantitative approaches into the research methodology of a single study or multiphased study. These definitions are supported by Morgan (2014) in defining the mixed method research as a research wherein both qualitative and quantitative methods are adopted. In relation to philosophical inclination, Saunders et al (2016) assert that both the qualitative and quantitative researches are valued and preferred by pragmatist researchers.

Literature informs us that the mixed method approach empowers the researcher to take multi- dimensional view in investigating the research problem. Saunders et al. (2016) argues that the usage of mixed methods designs in conducting research provides richer data than mono method design and that they are shorter in timescale and practical to undertake. Mixed Methods research may use quantitative research and qualitative research equally or unequally (Creswell and Plano, 2011). Creswell (1995) introduced the following four mixed method designs, namely: Sequential studies; Parallel/Simultaneous studies; Equivalent status design; and dominant – less dominant studies.

The mixed method designs introduced by Creswell (1995) are differentiated below:

- Equivalent Status designs

The researcher conducts the study using both the quantitative and the qualitative approaches about equally to understand the phenomenon under study (Creswell, 1995).

- Sequential Studies

The researcher first conducts a qualitative phase of the study and then a quantitative phase, or vice versa (Creswell, 1995).

- Parallel/ Simultaneous Studies

The researcher conducts the qualitative and quantitative phase at the same time (Creswell, 1995).

- Dominant-less dominant studies

The researcher conducts the study within a single dominant paradigm with a small component of the overall study drawn from an alternative design (Creswell, 1995).

Creswell (1995) highlights the fact that the research methods that are mixed do not, on their own, suggest that they are being adopted and blended equally. The quest to realize the research objectives is pivotal to adapting a specific research design and methods.

The method applicable to this study.

Creswell (1998) is of the view that pragmatists emphasize the importance of conducting research that best addresses the research problem. In light of the qualitative, quantitative and mixed method strategies discussed above, the best fit method for meeting the research objectives of this study and addressing the research problem is the utilization of both qualitative and quantitative strategies.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Fellows and Liu (1997) is of the view that research methods are not mutually exclusive and that the application of both qualitative and quantitative methods for collection and analysis of data provides the researcher with multifaceted view of the phenomena and thus enhancing the researcher's ability to make reliable and relatively valid conclusions. This is further supported by Creswell (2008) in stating that the utilization of both qualitative and quantitative methods provides better understanding of the research problem and improves the prospects of reliability and validity of the research findings.

In light of the multidimensional data required, and a need for holistic view to problem solving, the mixed method – Dominant less dominant design is adopted as the best fit method. This enabled collection and analysis of data through both qualitative and quantitative means. Furthermore, both the subjective and objective factors to data collection and analysis were factored greatly in moulding the findings of the study.

Although the study has predominantly leaned more towards the qualitative method Saunders, Lewis and Thornhill (2009) indicate that is used predominantly as a synonym for any data collection technique (such as an interview) or data analysis procedure (such as categorising data) that generates or use non-numerical data. Qualitative therefore can refer to data other than words, such as pictures and video clips, which is the case and applicable to this study. Horn (2010) further highlights that the qualitative approach is often used when the area being researched is not well defined or is not well understood by current theory or research; however in this case the megaprojects has been widely research but not much in the appetite thereof. In this well researched subject of megaprojects, new insights and solutions may be discovered with regards to the appetite to implement megaprojects when a more exploratory approach is undertaken.

Horn (2012) further indicates that qualitative research seeks data and understanding from natural organisational settings. This approach is suitable for this study because the interest is in exploring meanings, perceptions and understanding, interview are a very effective instrument for gathering this type of data. Interviews were observed to conducted in a way that respondents have an understanding of the subject and can give valuable insights.

3.4. Case Study

Hussey et al. (1997) defines a case study as an extensive examination of a single instance of a phenomenon of interest. Yin (1994) defines a case study as an in-depth inquiry into a topic or phenomenon within its real – life setting. These definitions are supported by Leedy and Ormrod (2010) in stating that in a case study, program or event is studied in-depth for a defined period of time. Leedy and Ormrod (2010) further emphasize that a case study is suitable for learning more about a little known or poorly understood situation. A case study strategy has a capacity to generate insights from intensive and in-depth research into the study of phenomenon in its real-life context, leading to rich, empirical descriptions and the development of theory (Dubois and Gaddle 2002; Eisenhardt and Graebner, 2007; Ridder et al, 2014; and Yin, 2014 cited in Saunders et al, 2016). Case study research draws on quantitative or qualitative research and frequently uses a mixed methods approach to understand fully the dynamics of the case (Saunders et al, 2016).

Leedy and Ormrod (2010) are of the view that case study may be conducted based on a single, multiple or collective cases. This is supported by Hussey et al. (1997) in stating that more than one case may be adopted so as to analyze the phenomenon in its entirety. Sometimes researchers focus on a single case, perhaps because its unique or exceptional qualities can promote understanding or inform practice for similar situation (Leedy and Ormrod, 2010). Leedy and Ormrod (2010) recognizes that in other instances, researchers study two or more

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

cases – often cases that are different in certain key ways – to make comparisons, build theory, or propose generalizations. Leedy and Ormrod (2010) refers to these types of case studies as the multiple or collective case studies. This recognition is supported by Saunders et al. (2016) who affirms that case study can incorporate multiple cases. Leedy and Ormrod (2010) state that the major weaknesses of the case study research based on the single case is that the findings may not be generalizable to other situations..

Yin (1994) introduces three types of case studies, namely, the exploratory case study, descriptive case study and explanatory case studies. Yin (1984) argues that exploratory case studies are fundamentally adopted to explore any phenomenon in the data which serves as a point of interest to the researcher. Yin (1984) state that in most instances, exploratory case studies endeavors to address the questions of “what” or “who”. Descriptive case studies are set to describe the natural phenomena which occur within data in question (Zainal, 2007).According to Yin (1984), the descriptive case study answers the questions of “how” or “why”. The last type of case studies is the explanatory case study. Explanatory case studies examine the data closely both at a surface and deep in order to explain the phenomena in the data (Zainal, 2007).

Creswell (1995) argues that case study approach provides the researcher with multidimensional view of the phenomenon, thus ensuring the credibility and reliability of the research findings. Yin (1994) is of the view that multiple case design serve to confirm evidence which enhance the reliability and validity and generalization of the research findings. Yin (1994) argues that generalization on case study, be it single or multiple, stems from the theory rather than on populations. Campbell (1975 cited in Yin, 1994) state that replication of the case through pattern-matching helps to formulate a theory which can be relied on to ensure validity of the multiple case studies.

Creswell (1995) acknowledges that the research work deploying the case study may have single or multiple cases. Creswell (1995) further state that a multiple case study strategy enables collection of both quantitative and qualitative in relation to the research phenomenon, thus ensuring the provision of rich and multidimensional views to resolving the research problem.

To answer the research questions, meet the objectives of the study and resolve the research problem, the multiple exploratory case study strategy has been adopted as the best fit strategy. This is primarily because of the exploratory nature of the study and limited literature in the phenomenon under the microscope, especially in the developing countries in general and South Africa in particular. Herriot & Firestone (1983 cited in Yin, 2009) argues that the evidence from multiple cases is often considered more compelling, and the overall study is therefore regarded as being more robust. Yin (1994) is of the opinion that researchers conducting case studies do not necessarily need to visit the site under study; but rather could collect their data by consulting secondary sources.

This strategy would ensure collection of rich data which would prove useful to use in conducting comparative analysis between various chosen cases. Data collection is conducted through questionnaires, survey and structured interviews.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Research Approach

Philosophical approaches that may be used in the study are:

- Inductive – this reasoning and approach generalises information from individual instances, it involves instances of something, looking for a pattern in the instances, building a tentative theory and testing the general theory to provide generalisation about behaviour (Horn, 2012).
- Deductive – The deduction approach owes much to what would be a scientific research. It involves the development of a theory that is subjected to a rigorous test. As such, it is the dominant research approach in the natural sciences, where laws present the basis of explanation, allow the anticipation of phenomena, predict their occurrence and therefore permit them to be controlled (Collis and Hussey 2003).

This study used an inductive approach by first collecting data for two purposes: to explore first the phenomena of implementing megaprojects in south Africa. The selection of this approach is justified by the requirement to start by having a feel for the problems so as to understand the nature and the magnitude of the problem better. The chosen approach would assist to get a feel of what was going on, so as to understand better the nature of the problem and make sense of the interview data collected by analysing those data. The result of this analysis would be the formulation of a theory (Saunders, 2009). Induction also criticises a tendency to construct a less rigid methodology that permits alternative explanations of what is going on in that sense Saunders (2008). According to Easterby-Smith et al. (2008) research using an inductive approach is likely to be particularly concerned with the context in which such events were taking place. Therefore, the study of a small sample of subjects might be more appropriate than a large number as with the deductive approach.

Easterby-Smith et al. (2008) indicates that the main reasons for choosing this approach are mainly as follows :

- It enables you to take a more informed decision about your research design, which is more than just the techniques by which data are collected and procedures by which they are analysed. It is the overall configuration of a piece of research involving questions about what kind of evidence is gathered and from where, and how such evidence is interpreted in order to provide good answers to your initial research question.
- It will help you to think about those research strategies and choices that will work for you and, crucially, those that will not. For example, if you are particularly interested in understanding why something is happening, rather than being able to describe what is happening, it may be more appropriate to undertake your research inductively rather than deductively.
- That knowledge of the different research traditions enables you to adapt your research design to cater for constraints. These may be practical, involving, say, limited access to data, or they may arise from a lack of prior knowledge of the subject. You simply may not be in a position to frame a hypothesis because you have insufficient understanding of the topic to do this.

The Approach applicable to this study.

The study generally used quantitative and a bit of qualitative (Mixed Method) approach to analyse knowledge from respondents. Positivism relates to the philosophical stance of the natural scientist and entails working with an observable social reality, it provides unambiguous and accurate knowledge (Saunders, Lewis and Thornhill,

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

2016). Structured face toface interviews, questionnaire on email and surveys were used in order to allow participants to voice out their experiences, frustrations, and possible solutions. Questions used in all these methods were the same throughout. The objective of the study is to establish if South Africa still has the appetite or desire to continue and take on more megaprojects, despite all the challenges and failures of megaprojects.

Population and Sampling

Population

Horn (2012) defines population as the set of individuals, items or data from which a sample is taken. Defining the research population for business research frequently centres on being a member of a particular group, such as:

- Staff in an organisation
- User of a product
- Members of a group

It is important to set criteria that make it clear who or what is included in a population (Horn, 2012).

Sampling

According to Horn (2012), sampling is choosing the participants to be involved in a study. All dissertations must have a section that's relates to how the participants were chosen. Notwithstanding this indicate quantity of elements, the study targeted at least 30 participants from the questionnaire, 10 from interviews and 20 from the survey; however lesser responses were received. These samples were further categorized in terms of their location, proximity and association with various energy and transport megaprojects. Medupi Power Station is located in the Limpopo province, Kusile Power Station is in the Mpumalanga province and Gautrain in Gauteng. The envisaged breakdown of the participants was as follow:

- Email Questionnaire – 30
- Structured Interviews – 10
- Survey – 20

The results of the surveys and Data Analysis questionnaires are presented in Chapter 4 of the study.

The collected data was qualitatively and quantitatively analyzed and the guideline outlined below used to form the basis of analysis. The opinions and perceptions of the participants were analyzed based on the set of questionnaire and the results were presented graphically to derive a generalized meaning. Quantitative data analysis data has been collated and represented through the usage of graphs and table to aid in interpreting the data.

I. Probability Sampling

Probability sampling, Horn (2012) uses some form of random selection of cases from the sampling frame. It is commonly used method when indicative reasoning drives the methodology. This method is easy to understand and provides a reasonable presentation of a population. This sampling technique is commonly used for survey based research strategies where inferences are made from the sample about a population to answer research questions or to meet research objectives (Saunders, Lewis and Thornhill, 2016).

II. Non – Probability sampling

This technique, Horn (2012) does not involve the random selection of cases from sampling frame. This technique where each case selected from the total population is not known and it is impossible to answer research questions or to address objectives that require statistical inferences about the characteristics of the population (Saunders, Lewis and Thornhill, 2016).

Ideally, for conducting of this research, the use of SOEs platforms from various projects and professionals especially within Eskom and Transnet. Participants were chosen based on their profession, location of work, involvement in projects and socio-economic understanding, mainly within from Eskom and Transnet, as well fellow students and the general public where possible.

The sampling method applicable to this study is the non-probabilistic sampling, this method is selected because it is related to case of the study. The sample for this research is mainly composed of project leaders/managers/planners/Quantity surveyors/Built environment students and other stakeholders based in and around Gauteng, Mpumalanga and Limpopo, these professionals have been involved or have an understanding of the megaprojects concept in South Africa and around the world.

The Selection of sites

As the title explicitly state, the fundamental purpose of this study is to explore. The characteristics of the study identified thus far are that: it is guided by pragmatic philosophy; it relies on dominant – less dominant method to data collection and analysis; wherein the collection of data is largely inclined to qualitative method; it cross-sectional in nature as outlined in the succeeding section of this report. The study is strategically executed through a multiple - case study in the main. The cases were strategically chosen based on their potential to yield data that would enable comparative analysis.

The three provinces were chosen as areas of interest for data collection because of project locations that being Medupi located in Limpopo, Kusile located in Mpumalanga and Gautrain located in Gauteng. The participants in this study were interviewed based on the experiences and lessons learnt from South Africa's megaprojects pre and post-apartheid . The response rate from the interviews was 100% although some questions were not fully answered where participants had no opinion, and 86% response rate was acquired on digital questionnaire and survey received. Digital platforms such as emails were used where participants could not be reached personally, especially in the Limpopo and Mpumalanga provinces.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

The objective of sampling on case studies of the historic and current megaprojects in South Africa, and has been used to select a representative and non-biased sample. Cases will be selected from Eskom (Medupi & Kusile) and GMA (Gautrain) as these are the most recent megaprojects in South Africa. The non- probability sampling technique will be deployed in this study since it is not a random selection. In this case the population and target participants are known and have been established (Saunders, Lewis and Thornhill, 2016).

3.5. Data Collection

The study was conducted through structured face to face interviews, questionnaire on email and survey was a pathway to establish if South Africa still has an appetite to implement mega projects. Research interview is a purposeful conversation between two or more people, requiring the interviewer to establish rapport and ask concise and unambiguous questions, to which the interviewee is willing to respond, and to listen attentively (Saunders, Lewis and Thornhill, 2016).

Leedy and Ormrod (2010) state that interviews in qualitative studies are either open ended or semi-structured, in the latter case revolving around a few central questions. Saunders et al. (2016) defines semi-structured interviews as wide-ranging category of interview in which the interviewer commences with a set of interview themes but is prepared to vary the other in which questions are asked and to ask new questions in the context of the research situation. Leedy and Ormrod (2010) argue that unstructured interviews are flexible and likely to distort the ability of the researcher to make comparisons among the interviewees.

Due to the limitation of research in this field and its inherent outlook to explore, the semi- structured interviews were adopted. Participants were given space to engage and provide additional information on the subject of energy projects in general. These inputs ranged from comments on the decision making processes, the cost of energy, and the state of electricity generation and stability of supply in South Africa. This was carried out so as to maximize reliability of the collected data and to improve the quality and validity of the outcome.

The structured interviews were pivotal to ensuring fulfilment of the following research objectives:

- Explore the appetite/need to implement megaprojects in South Africa
- investigate and establish if South Africa possesses the Skills and professional capabilities to successfully implement megaprojects in South Africa
- Investigate the economic benefits of implementing megaprojects successfully in South Africa.
- Assess the need and desire for partnerships and foreign investment into South Africa to implement megaprojects.

These interviews were conducted to gain an in-depth understanding of the transport and energy megaprojects phenomenon in South Africa and to examine the perceptions of professionals and experts towards these types of projects. The interviews specifically delved into the perceptions and opinions of energy experts and professionals in relation to the following:

- The perception on Medupi, Kusile and Gautrain projects,

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

- The importance of partnership and foreign investment to implement megaprojects,
- The impact of apartheid on implementation of megaprojects in the democratic government,
- Availability of skills to implement these projects,
- The importance of planning to implement megaprojects,
- Sustainability of these projects,
- The cost implications of these projects,
- Local Capacity to manage the implementation of these projects.

The analysis of data collected through these series of interviews was analysed qualitatively. To generate contributory meanings from the information obtained through the series of interviews, the content analysis technique was adopted.

Given the exploratory and descriptive nature of this study, it sought to discover insight and understanding on how the previous experience of megaprojects has affected the interest for the government. And such, according to (Saunders et al, 2016), is usually associated with open questions which will help in gaining insight about the topic, and due to the exploratory nature, the interview questions will be structured. Key points will be noted during the interviews to be transcribed and formally written later, and if possible, also recorded with the permission of the participants.

Data was scrutinised from some of the interviews, questionnaires and surveys and from conducting interviews on the chosen topic. Data collected from interviews and survey was collected based on the literature review and online articles relevant to the topic. Data was collected from reading articles related to the topic then compiled the information gathered individually from interviews and survey to form solid findings and conclusion. This assisted in understanding the chosen topic and the global presence of the problem.

From the set research objectives, interviews, questionnaires and survey questions were derived to get answers from the identified gaps from the literature and posed in the research questions. These questions were derived for usage in interviews in order to collect field data from the chosen/selected sample of interviewed individuals.

For the interview questionnaires for relevance and quality to the research structured questions will be formulated. The interview question were furthermore distributed via email in a form of a questionnaire and survey for participants who are unavailable to meet and for those who were available were met individually, mostly in the workplaces and conducted the interviews. The data collected was recorded with the permission of the participants and backed-up electronically where possible.

3.6. Data analysis

According to Marshall and Rossman (1999, p150) "data analysis is defined as the process of bringing order, structure and meaning to the mass of collected data". Data analysis is the explanation of the data and what the data represents. Data analysis does two important things, namely:

- It separates out the data into gender groups; and
- Groups things together, as and when we add responses to the question e.g. age categories.

To bring order and meaning to the collected data there will be a need to apply the logical skills and be able to analyse the collected information. It is important to first describe and compare the recorded responses received from each interviewed individual. Secondly, identify the relationship between the collected data from different

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

participants and check for any similarities and differences. Lastly after these steps of data analysis, then data will be consolidated in order to come to a conclusion or derive outcome based on the findings.

Analysis technique applicable to this study

According to Sandelowski and Barroso (2003), research findings can be placed on a continuum indicating the degree of transformation of data during the data analysis process from description to interpretation. The use of qualitative descriptive approaches such as descriptive, content analysis, and thematic analysis is suitable for this qualitative study which will employ a relatively low level of interpretation, in contrast to grounded theory. This study will apply both content and thematic analysis in surveys and structured interviews

This research will use both content and thematic analysis, content analysis which Horn (2012) defines as a more formal and systematic method for analysing open questions or qualitative data. Thematic method will also be used. The technique will qualify and analyse the presence, meaning and relationship of words and concept. This technique has been chosen due to its versatility, that it can be used in circumstances where media, texts and interviews require analysis, which is the case in this study.

Table will be formulated with numbers representing the following (5 - strongly agree, 4 – agree, 3 – neither, 2 - disagree, 1 – strongly disagree. Sample data analysis will be done through Microsoft Excel. The research will follow the Climate Assessment toolkit to ensure completion.

The research methods adopted research methods are summarised as follows.

Table 8. Data Collection and Analysis Methods

Research Objectives	Research Question	Method Adopted	Data Collection Instrument	Data Analyses Technique
The stimulus behind undertaking the energy megaprojects in SA	What are the triggers of undertaking megaprojects in South Africa?	Qualitative Method	Structured Interviews, primary data source documents	Content analysis. Analysis of Documents
The Skills and capabilities to successfully implement megaprojects in South Africa	Does South Africa possess required skills and professional capabilities when implementing mega construction projects in South Africa?	Quantitative Method/Qualitative	Structured interview questions and Survey to professional, consumers and students	Content analysis based on a sample of the Built Environment/SOEs professionals and students
Investigate the economic benefits of implementing megaprojects successfully in South Africa.	What are the economic benefits associated with implementation of megaprojects?	Quantitative/Qualitative	Survey, structured Interviews	Statistical and Content Analysis
Assess the need and desire for partnerships and foreign investment into South Africa to implement megaprojects.	Would Partnerships and foreign investments work better in implementing mega construction projects in SA?	Quantitative Method	Survey to professional, consumers and students	Thematic Data Analysis based on a sample

3.6. Data Presentation

Horn (2012) indicates that data can be written firstly as separate responses from different professionals and then conclusion will be drawn on what the participants said in a form of a case study. In some cases, to back up a point made and will use quotations from responses from the different professionals with similar responses. The case study will show the different or similar perspective in which the professionals experience the Appetite of implementing megaprojects in South Africa.

3.7. Validity and Reliability

Validity of a research can be defined as an extent to which requirements of scientific research have been followed during the process of generating research findings. Oliver, (2010) considers validity to be compulsory for all types of research. There are different types of validity, Cohen et al. (2007) identifies content validity, criterion-related validity, construct validity, internal validity, external validity, concurrent validity and face validity.

Reliability can be referred to as an extent to which a test, measurement procedure or a questionnaire generates a common outcome on repeated trials. Hooley et al. (2008) has described reliability as the degree to which the measures yield stable results and are free from error i.e. the measurement procedure stableness. If a procedure or measurement device stably assigns similar scores to objects or individuals with common values, the components is assumed reliable.

Horn (2012) also referred to validity of qualitative data as a much more subjective notion and is closely coupled to the sampling system that was used. The idea of construct validity is to evaluate how well the research process has generated data that is closely coupled to the research questions. Saunders (2016) indicates that participant observation is very high on ecological validity because it involves studying social phenomena in their natural contexts. As Delbridge and Kirkpatrick (1994) note, 'because we are part of the social world we are studying we cannot detach ourselves from it, or for that matter avoid relying on our common sense knowledge and life experiences when we try to interpret it'.

The propensity that we all have for our own perceptions to colour our interpretation of what we believe to be 'true' is well known. What we advocate here is that we cannot avoid observer bias. All we can do is to be aware of the threat to reliability it poses and seek to control it. Saunders (2000) refers to reliability as application and consistency. When the researcher uses previous research studies to build on and achieve same results, then that research when is reviewed by other researchers will be seen as reliable. Whereas validity means that correct procedures have been applied to find answers to the question.

The reliability technique will be adopted to ensure that no question is answered twice by one participant and all questions have been answered truthfully where information is available. The Climate Assessment Process and Toolkit user guide and the safety climate assessment toolkit will be adopted because this method ensures maximum reliability on data collected, (Loughborough University, 2011)

The following points will be considered to validate data:

- The appropriate time scale for the study will be selected.
- Selection of suitable method for the study i.e. interviews
- Ensure that participants are not pressured in any way to select specific choice on answer sheets.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

- The qualitative method for most of my data collection, it is the most common suitable taking into account the characteristics of the study.

3.8. Ethical Considerations

The maintenance of your objectivity are vital during the analysis stage to make sure no misrepresentation on the data collected. This included not being selective about which data to report or, where appropriate, misrepresenting its statistical accuracy (Zikmund,2000). A great deal of trust is placed in each researcher's integrity, and it is clearly a major ethical issue were this to be open to question. This duty to represent data honestly extends to the analysis and reporting stage of your research. Lack of objectivity at this stage will clearly distort your conclusions and any associated recommendations.

The ethical issues of confidentiality and anonymity also come to the fore during the reporting stage of your research. Wells (1994) recognises that it may be difficult to maintain the assurances that have been given. However, allowing a participating organisation to be identified by those who can 'piece together' the characteristics that you reveal may result in embarrassment and also in access being refused to those who seek this after you. Great care therefore needs to be exercised to avoid this situation. You also have the option of requesting permission from the organisation to use their name. To gain this permission you will almost certainly need to let them read your work to understand the context within which they will be named.

With the poor track record of megaprojects in South Africa it is evident that there is inadequate planning, control and skills in implementation megaprojects, it is a sensitive matter and may have affected the South African appetite, so will ensure to get ethical clearance from the school of construction Economics and Management ethics committee.

- Over and above getting ethics approval, will ensure that while interviewing the participants do not pose questions that undermine the rights, needs, values, cultural background of the respondents,
- Over and above will ensure to observe the following ethical considerations concerning research participants as outlined (Thomas, 2010),
- Sensitive not identified stakeholders,
- Informed consent,
- Informed anonymous,
- Reporting anonymous and at aggregated levels,
- The study will keep all information safe and not disclose individual people without their consent,
- No personal information will be requested,
- Participant will be voluntary.

3.9. Conclusion

Leedy and Ormrod (2010) defined research as a systematic process of collecting, analysing, and interpreting data in order to increase our understanding of a phenomenon about which we are interested or concerned. The research method adopted to undertake this study is the mixed method approach. This has largely been influenced by the quest to realize the research objectives. Tashakkori and Teddlie (1998) defined mixed method study as that which combines the qualitative and quantitative approaches into research methodology of single or

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

mutiphased study. This study is more inclined to Dominant – less dominant mixed method design. Creswell (1995) defined the Dominant-less dominant mixed method as the study within a single dominant paradigm with a small component of the overall study drawn from an alternative design. The study has been largely qualitative, with quantitative elements.

The case study strategy has been adopted focusing of three cases in the form of Medupi, Kusile and the Gautrain projects. Medupi and Kusile Stations are inherently energy megaprojects by virtue of their project values and characteristics and the Gautrain being a transport project. Leedy and Ormrod (2010) explained that case study is suitable for learning more about a little known or poorly understood situation. The study is exploratory in its outlook; hence the case study was adopted. The adoption of three cases, ensures comparative analysis of the results, thus ensures generalizability, reliability and validity of the results.

Chapter 4

4. Research Data Analysis and Findings

4.1. Introduction and Overview

The purpose of this chapter is to analyse and present the results of the collected data. These include data collected through structured interviews and questionnaires. As stated in the previous chapters, the participants include professionals within the energy sector specifically Eskom and Transnet, professionals in the manufacturing and banking industry, students in the Built Environment and finally consumers of electricity. 80% of the general public were interviewed through structured interview questions and the responses were integrated in the summary of the questionnaires since questions were the same.

It is worth noting that the results for both the questionnaires and structured interviews have been integrated and presented in comparative fashion so as to assess and highlight the distinct characters between the three chosen cases which are: Medupi Power Station, Kusile Power Station and the Gautrain, these projects are inherently megaprojects by virtue of their project values and scale (they are all above \$1 bn). Horn (2012) emphasises the two important functions of data as:

4.2. Data analysis and presentation of results

The questionnaire was sent out to professionals within the public and private sector. The questionnaire was sent to over 30 email addresses and 8 interviews conducted; however only 15 responses from the questionnaire were received. The results for the questionnaire and interviews were combined and a general view is given, survey results were automatically analysed on the survey monkey for all the responses received. Same set of questions was used for the questionnaire, interviews and survey, the questionnaire and the responses to the questions are attached as Appendices. Interview responses were recorded manually, summarised and a collective and general analysis was given under the survey graph analysis.

4.3. Results Discussion and analysis

Below is the discussion and analysis of the results as received from the respondents. Results and discussions will be grouped under the objectives set, to establish if objectives are met and detail findings.

4.3.1. Research Objectives

- Explore the appetite/need to implement megaprojects in South Africa,
- investigate and establish if South Africa possesses the Skills and professional capabilities to successfully implement megaprojects in South Africa,
- Investigate the economic benefits of implementing megaprojects successfully in South Africa,
- Assess the need and desire for partnerships and foreign investment into South Africa to implement megaprojects.

4.3.1.1. Explore the appetite/need to implement megaprojects in South Africa

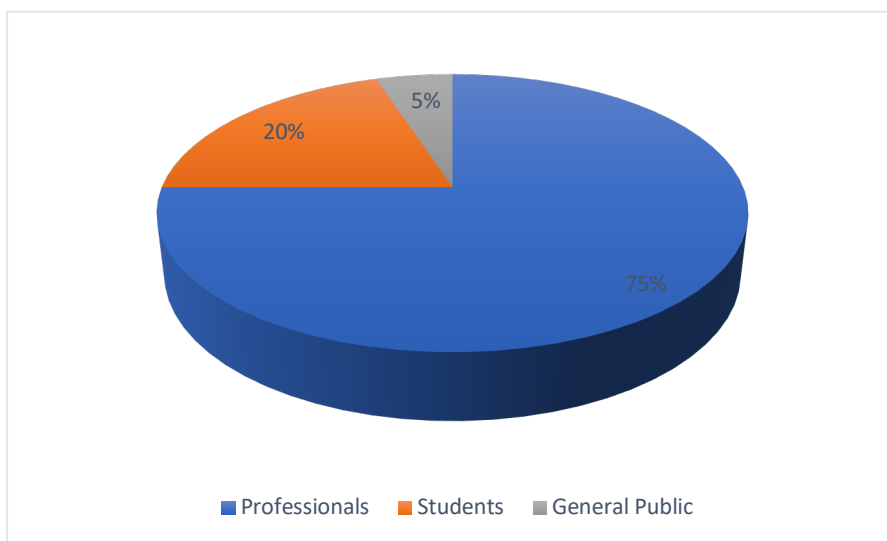
THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

4.3.1.1.1. In your own understanding, how would you describe the Appetite to implement Megaprojects in South Africa?

Most participants indicated that there is a huge appetite to implement mega projects in South Africa; however, there has been very poor implementation or maintenance of the current existing infrastructure since 1994. Regarding the general understanding of megaprojects many have described the appetite to implement megaprojects as the desire and interest that South Africa may show to the government and other investors to implement megaprojects; however they further indicated that the desire can be futile if there is no government initiatives and support as well as international investments. Survey and interviews responses highlighted that although there is appetite to implement megaprojects, funding and planning as two of the biggest hindrances to implementation of megaprojects.

Structured interview response have also shown that South Africa cannot afford implementation of megaprojects without the government and foreign investment. Skills shortage have also been highlighted as a hindrance to implementing megaprojects. The chart below indicates the proportions of participants ranging from professionals and students in the Built Environment in South Africa, as well as general public.

Figure 9: Survey questionnaire respondents



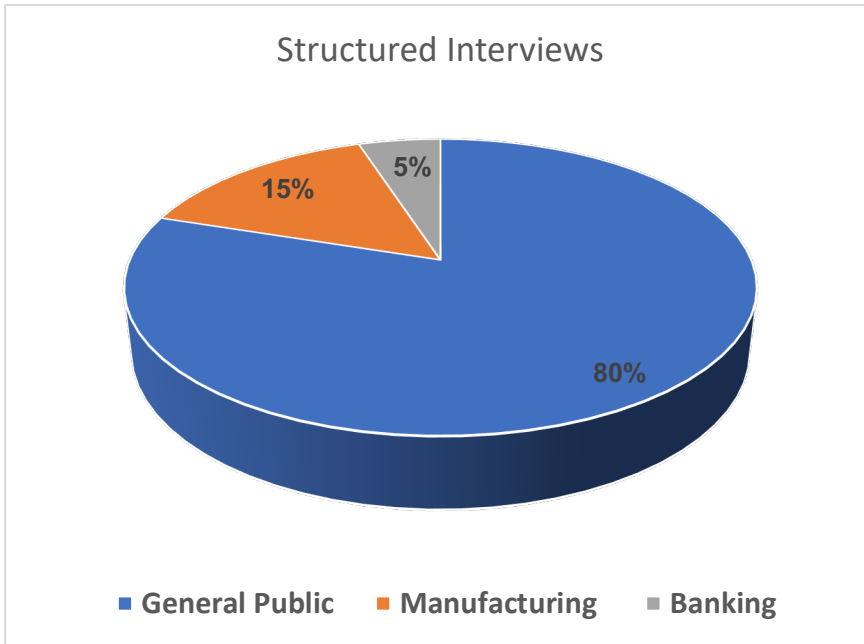
4.3.1.1.2. Is there a good probability that South Africa will implement more megaprojects in the near future (apart from Eskom Medupi & Kusile)?

a) Are historic South African megaprojects an indication that South Africa still has the desire to implement more?

The intention of this question was to establish if there is a link or impact on the implementation of megaprojects based on the country's political and infrastructure development history.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Figure 10 : Structured Interviews responses

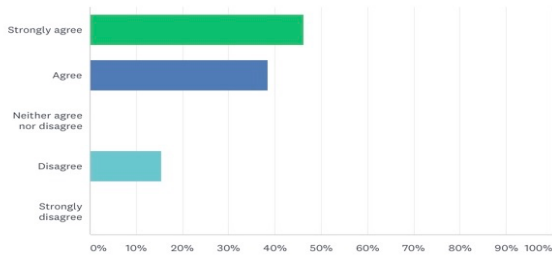


Most of the respondents indicated that they strongly agree that the historic and current megaprojects are an indication that South Africa still has the desire to implement megaprojects in the future. With adequate funding and skills support, South Africa still has the need to implement megaprojects in order to deliver services to the citizens, also bridge the gap created from 1994 to date. 46% of the respondents strongly agree, 38% agree and only 15% disagrees; therefore it is evident that the majority of the population reckons that based on the projects that South Africa has embarked on, there is still desire to continue implementing megaprojects.

Figure 11: Results - Historic SA megaprojects are an indication that SA still the has the desire to implement more

Historic South African megaprojects are an indication that South Africa still has the desire to implement more.

Answered: 13 Skipped: 0



ANSWER CHOICES	RESPONSES	
Strongly agree	46.15%	6
Agree	38.46%	5
Neither agree nor disagree	0.00%	0
Disagree	15.38%	2
Strongly disagree	0.00%	0
TOTAL		13

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

b) Does South Africa need foreign and international specialists to plan and execute megaprojects?

The question was asked in order to establish if funding also made it on the list of problems that South Africa may have towards implementation of megaprojects. The majority of the participants have indicated that South Africa does indeed need foreign investment in order to implement megaprojects, the South African government cannot afford them.

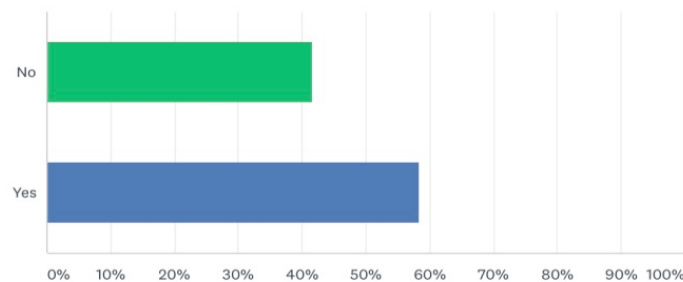
According to Stats SA, 2019 South Africa's GDP grew by 3.1% in Q2 of 2019; however, this positive news, however, does not suggest that the value of South Africa's GDP has grown since the turn of the year. It only means that, we have stabilized conditions from the drop that was experienced in the first quarter (Q1) of the year. This is a clear indication that South Africa cannot afford megaprojects at this GDP and youth unemployment rate of 29%.

With foreign investment injected into South Africa to implement megaprojects, this will create the opportunity for the previously disadvantaged community to earn employment and upskill themselves.

Figure 12: Results - Does SA need foreign and international specialists to plan and execute megaprojects?

Does South Africa need foreign and international specialists to plan and execute megaprojects?

Answered: 12 Skipped: 1



ANSWER CHOICES	RESPONSES
No	41.67% 5
Yes	58.33% 7
TOTAL	12

- 41.87% of the population does not think that South Africa needs foreign investment; however, the rate of unsuccessful megaproject is attributed to poor planning and corruption by the government.
- 58.33% indicated that South Africa does need foreign investment together with foreign specialist to monitor and manage the project expenditure and financials. Some participants also made reference to Gautrain, which is somewhat a success megaproject in south Africa where there was intense management and monitoring by the Bombela and not so much of the South African government.
- 75% of the structured interview responses also cited that South Africa alone cannot afford to fund megaprojects; therefore, foreign investment is required. It also emerged that to avoid failure on projects, international specialist needs to be part of the planning and execution team in order to track progress, quality and project financials.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

- 25% of the respondents generally highlighted that, if South Africa dealt with corruption, reduced parliamentary expenses and worked closely with private sector, megaprojects are doable without international investments.

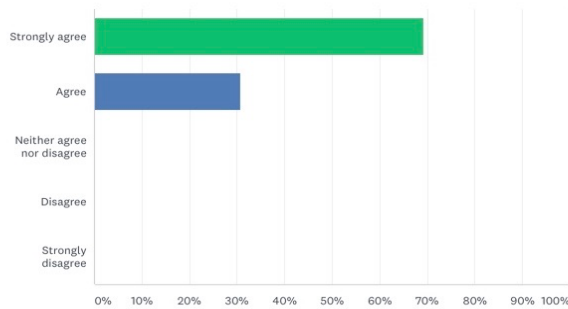
c) In your opinion, Gautrain, Eskom Medupi and Kusile are good examples of megaprojects implemented in South Africa?

Despite the challenges in the planning, execution and operations of the Eskom PowerStation and Gautrain, these are amongst the most recent megaprojects in South Africa, and participants strongly agree that they are the good types of megaprojects that South Africa needs. Although most participants indicated that the projects are great; however better planning is required.

Figure 13: Results - Gautrain, Eskom Medupi and Kusile are good examples of megaprojects implemented in SA

Gautrain, Eskom Medupi and Kusile are good examples of megaprojects implemented in South Africa?

Answered: 13 Skipped: 0



ANSWER CHOICES	RESPONSES
Strongly agree	69.23% 9
Agree	30.77% 4
Neither agree nor disagree	0.00% 0
Disagree	0.00% 0
Strongly disagree	0.00% 0
TOTAL	13

d) In your opinion, is there a good probability that South Africa will implement more megaprojects in the near future (apart from Eskom Medupi & Kusile).

The world still has the desire to invest in South Africa and hope that infrastructure development, economy and employment would improve. according to, (Mhlanga, 2018) China has committed \$14.7-billion in investments and said that South Africa’s biggest trading partner was ready to invest and work with South Africa in sectors such as oceans and green economy, science and technology, agriculture, environment and finance.

The South African government and development institutions of South Africa and China signed memorandums of understanding (MOU) to deepen relations in departments such as international relations, trade and industry, home affairs and agriculture. The responses further indicate the appetite and desire to carry on implementing megaprojects although the optimism is quite low from respondents.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

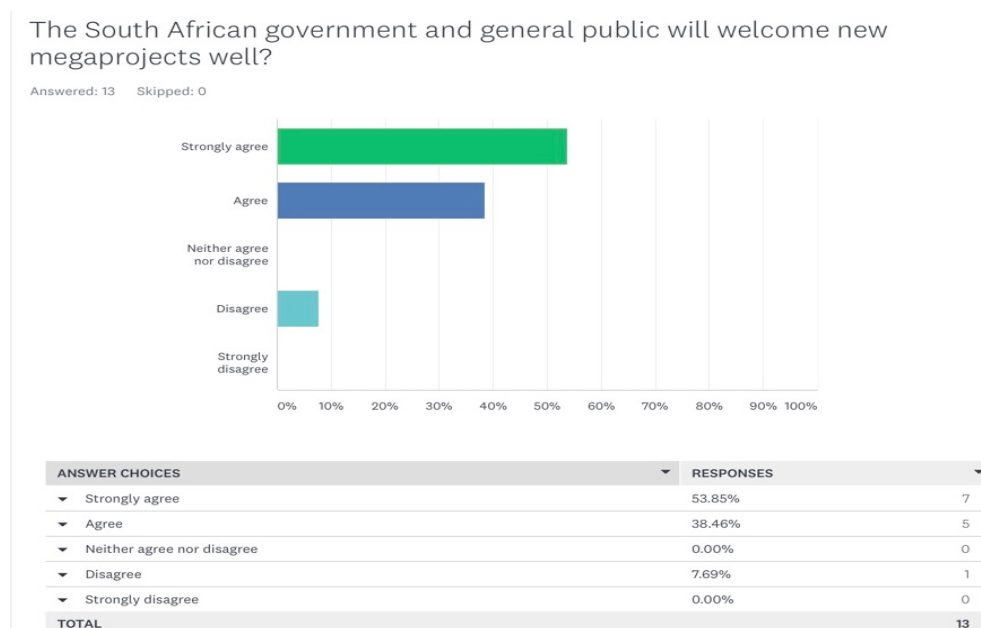
80% of the interviewees indicated that ~South Africa has quite a huge appetite towards implementation of megaprojects, although there is inadequate skills and funding. There is a need for infrastructure development and upgrade post apartheid. It was further highlighted that South Africa still needs more megaprojects apart from Kusile and Medupi, Gautrain extensions in all metropolitan cities, better working and managed system of the metrorail, improved water systems and housing, these were some of the examples that surfaced in the interviews.

e) Will the South African government and general public welcome new megaprojects well?

The 53.85 % of the participants strongly agree that South Africa will welcome the new megaprojects well. These will improve the state of the economy, quality of life and create employment. According to , (Ballard & Rubin, 2018) the idea that all housing and other infrastructure would be delivered exclusively through the construction of megaprojects across the country. New infrastructure projects are expected to be on a huge scale, so size and global reach will matter, according to KPMG's Global Construction Survey 2012.

Some advocates of the megaprojects approach, notably the Gauteng provincial government, were particularly attracted to the idea of creating whole new “post-apartheid cities” which could meet the “live, work and play” needs internally. Starting afresh with new settlements would be a way of designing urban spaces to avoid the inequalities and inefficiencies that beset existing cities. They would also bring major projects to poor areas that had little else to drive any significant economic growth, (Ballard & Rubin, 2018).

Figure 14: Results - The SA government and general public will welcome new mega projects well



The question triggered hope and optimism, participants again highlighted the opportunities that megaprojects will present economic growth, inflation, openness of the economy, political stability, international reserves, and natural resource availability and trade.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

4.3.1.1.3. Assess the need and desire for partnerships and foreign investment into South Africa to implement megaprojects.

a) Does South Africa need to show an appetite to international investors and government to implement mega projects?

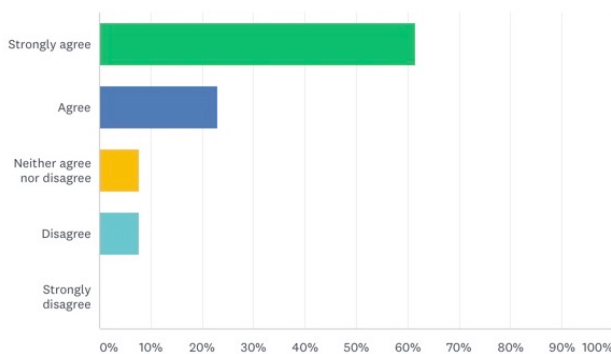
The objective of this question was to establish if South Africa has an interest to demonstrate to international investors if there is a will and interest to implement megaprojects. Majority of the participants strongly agree that South Africa does indeed need an international investor in order to implement megaprojects. South Africa cannot solely afford these kinds of projects in the current economic climate. It has also never funded any megaproject on its own.

According to, (Steve Onyeiwu, 2004) despite economic and institutional reform in Africa during the past decade, the flow of Foreign Direct Investment (FDI) to the region continues to be disappointing and uneven.

Figure 15: Results - SA needs to show an appetite to international investors and government to implement mega projects

South Africa needs to show an appetite to international investors and government to implement mega projects.

Answered: 13 Skipped: 0



ANSWER CHOICES	RESPONSES	
Strongly agree	61.54%	8
Agree	23.08%	3
Neither agree nor disagree	7.69%	1
Disagree	7.69%	1
Strongly disagree	0.00%	0
TOTAL		13

The response to this question indicated that 61% of the population strongly agrees that South Africa does indeed show the appetite to the international market to implement more megaprojects. With the following factors highlighted by participants as significant for foreign investment into Africa: economic growth, inflation, openness of the economy, political stability, international reserves, and natural resource availability; however conventional wisdom, political rights and infrastructures are also important for foreign investments into South Africa and Africa as a whole.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

b) Has South Africa always planned adequately for megaprojects?

Both the survey and interviews respondents are of the general view that sufficient time is not allowed for upfront planning. With 43.08 % and 87.5% of the population from the survey and interviews respectively, not in agreement that South Africa plans adequately for megaprojects. The delays in completion and associated cost overrun are to a greater extent attributed to lack of prior planning. Some of the key points raised by respondents include:

- The assertion that Eskom's Medupi and Kusile projects in particular were executed as a fast-tracked project;
- SA had no sufficient skills and capabilities to undertake the project;
- SA resorted to appointment of multinational consultants to lead the projects without prior consultation; and
- It was never clear from the onset what type of projects were required to meet the demand in terms of scale.

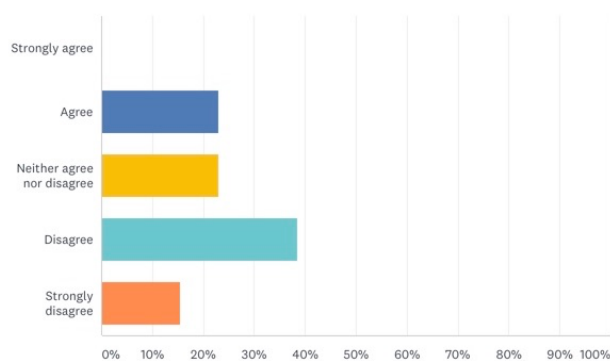
Acquiring new contracts is increasingly about having the right expertise so the battle for skilled resources is likely to intensify even further. South Africa has implemented quite a number of megaprojects both in the apartheid and democratic era, with each era experiencing different challenges. The respondents of the questionnaire have mostly disagreed with the question that there is adequate planning prior to implementation.

History has demonstrated that there is not enough planning that goes into the planning of these projects. Developing and retaining key technical skills is essential if this country is to meet the challenge of building massive new infrastructure, while at the same time upgrading existing services.

Figure 16: Results - SA has always planned adequately for megaprojects

South Africa has always planned adequately for megaprojects?

Answered: 13 Skipped: 0



ANSWER CHOICES	RESPONSES
Strongly agree	0.00% 0
Agree	23.08% 3
Neither agree nor disagree	23.08% 3
Disagree	38.46% 5
Strongly disagree	15.38% 2
TOTAL	13

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

c) South Africa possesses adequate specialists on project management tools in order to implement mega projects

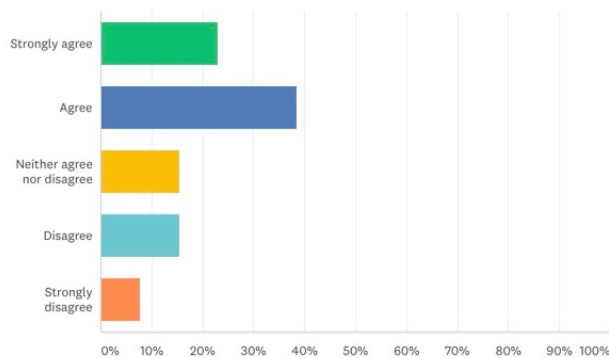
The objective of this quest was to establish if South African Project Management professionals make use of the tools available in the industry in order to implement megaprojects successfully. There are standard tools (E.g. PMBOK, PLCM etc) available for project managers in South Africa, that if used and implemented well then chances of successfully planning and executing megaprojects will be high.

This question will also give an indication of the 2 questions prior, if there are enough skills and planning in south Africa. The responses from this question indicate that there is a strong disagreement that south Africa makes use of the tools available in the industry and market.

Figure 17: Results - SA possesses adequate specialists on project management tools in order to implement mega projects

South Africa possesses adequate specialists on project management tools in order to implement mega projects

Answered: 13 Skipped: 0



ANSWER CHOICES	RESPONSES
Strongly agree	23.08% 3
Agree	38.46% 5
Neither agree nor disagree	15.38% 2
Disagree	15.38% 2
Strongly disagree	7.69% 1
TOTAL	13

4.3.1.1.4. Investigate the economic benefits of implementing megaprojects successfully in South Africa.

a) What is the Impact of implementation of megaprojects in south African economic growth

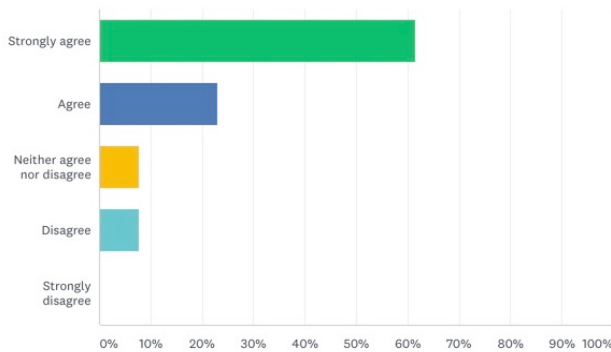
100% of the interviewed participants indicated that FDI and implementation of megaprojects in South Africa will have the following benefits Job Creation, Improved infrastructure Improved standard of living. This generally improves the economy in the country and attracts trade with other states

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Figure 18: Results - SA needs to show an appetite to international investors and government to implement mega projects

South Africa needs to show an appetite to international investors and government to implement mega projects.

Answered: 13 Skipped: 0



ANSWER CHOICES	RESPONSES
Strongly agree	61.54% 8
Agree	23.08% 3
Neither agree nor disagree	7.69% 1
Disagree	7.69% 1
Strongly disagree	0.00% 0
TOTAL	13

The response to this question indicated that 61% of the population strongly agrees that South Africa does indeed show the appetite to the international market to implement more megaprojects. With the following factors highlighted by participants as significant for foreign investment into Africa: economic growth, inflation, openness of the economy, political stability, international reserves, and natural resource availability; however conventional wisdom, political rights and infrastructures are also important for foreign investments into South Africa and Africa as a whole.

4.3.1.1.5. investigate and establish if South Africa possesses the Skills and professional capabilities to successfully implement megaprojects in South Africa

a) Does South Africa demonstrate enough skills and capabilities to implement megaprojects?

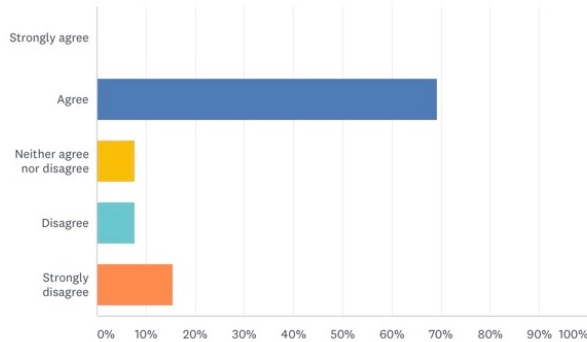
Regardless of all the historic challenges and failures encountered in the implementation of megaprojects in South Africa, most participants to the questionnaire agree that south Africa possesses skilled resources to successfully implement megaprojects; however, I am of the opinion that South Africa may possess some skills but not adequate to implement megaprojects and requires support and training. Although 69% respondents allude that South Africans have skills and capabilities, better planning is required to successfully execute these projects on time and budget. The Survey also indicated the importance of Training and upskilling of the unemployed people is one of the paramount priorities of the government through the Workplace Training, Community upliftment through government projects and Department of Higher learning (DHL).

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Figure 19: Results - SA demonstrates enough skills and capabilities to implement megaprojects

South Africa demonstrates enough skills and capabilities to implement megaprojects?

Answered: 13 Skipped: 0



ANSWER CHOICES	RESPONSES	
Strongly agree	0.00%	0
Agree	69.23%	9
Neither agree nor disagree	7.69%	1
Disagree	7.69%	1
Strongly disagree	15.38%	2
TOTAL		13

4.4. Summary of results

The objective of the questionnaire is to establish and answer the following :

- Investigate Skills and professional capabilities to successfully implement megaprojects in South Africa
- Investigate the identified economic benefits of implementing megaprojects successfully in South Africa context.
- Assess the benefits of partnerships and foreign investment into South Africa to implement megaprojects.
- Consolidate the general sentiments regarding the continuance of the rolling out of megaprojects in South Africa.

The questionnaire targeted to streamline and narrow the responses towards these objectives of the study. The objectives give an indication to answer the research questions. The majority of the respondents have indicated that despite all the challenges associated with implementation of megaprojects South Africa still has the appetite and desire to implement megaprojects. The questionnaire has also established that there is poor planning and lack of qualified resources, therefore south Africa needs foreign partnership and investment to implement megaprojects successfully; however foreign investment will also yield great results and benefits for the country such as job creation, upliftment of infrastructure, service delivery and improved standard of living for South Africans.

Chapter 5

5. DISCUSSION AND FINDINGS

5.1. Discussion

The research focused on exploring the appetite to implement new megaprojects, the level of megaproject skills in south Africa, planning for megaprojects, the economic benefits of megaprojects as well as benefits of partnerships, funding and foreign investment. These answered through survey and interviews, gave an indication that South Africa has the potential to further implement megaprojects. The case of the Gautrain and Eskom Power plants is important for policy makers, development practitioners and scholars who seek to understand the political and social implications of constructing such projects within the South African context. Moreover, the success or failure of these projects have been important in assessing whether or not similar projects should be approved and implemented in other South Africa and other African contexts.

Survey shows that South Africa represents a tremendous market potential for both domestic and foreign economic investment, most of the megaprojects are implemented through joint ventures between various state agencies and funded via soft loans from international agencies such as China, International monetary fund, world Bank etc. through reading of international cases, it has been noted that the involvement of international funders influences the instruments used, operational systems used as well as the management and maintenance plans or systems use; therefore this leaves the country invested in, in this case it shows clearly that developed and foreign countries are willing to invest in South Africa for megaprojects. This was established and confirmed in literature and physical data collected

Reading through the responses of the structured interview questions, it has been discovered with the question **“There is a good probability that South Africa will implement more megaprojects in the near future (apart from Eskom Medupi & Kusile).”** that there is a tremendous interest and desire to implement new megaprojects in South Africa. People are open to new infrastructure developments post the apartheid era. Infrastructure expenditure during the apartheid years was relatively high as a percentage of GDP. Countries such as China have also committed and invested funds in South Africa; therefore literature is in agreement with what is observed by South Africans that there is interest to further implement megaprojects.

Data collected shows that due to the growing population and an exponentially increasing need for transport and energy in south Africa and neighbouring countries, there is a need for megaprojects in South Africa. This is in agreement with the literature where Ogbu (2011) shows that the democratic government has realised the gap in infrastructure projects, inadequate transportation, housing and services in the townships due to population growth.

According to Radujković (2015) a recent EU Cost Megaprojects research concluded that these are most megaprojects that have been implemented, were planned in detail with all stakeholders prior to implementation; however 87% of the survey and interview disagrees with the narrative that megaprojects are planned well prior to execution in South Africa or anywhere in the world as evidence shows that megaprojects are delayed with cost overruns. Just like in South Africa, Implementation of megaprojects in the EU or in the world is influenced by factors such as the need of infrastructure influenced by population growth, economic and investment needs to supplement the country's GDP. Radujković (2015) further indicated that the planning for megaprojects commence prior to any decisions are made by stakeholders, Therefore it is imperative that

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

South Africa learns lessons from some of the major megaprojects planned and executed successfully around the world.

According to Tangab (2018) it has been proven and indicated in literature that Europe and other countries such as the UAE that Private Public Partnerships are the gateway to implementing megaprojects successfully, in South Africa the Gautrain is a great case. These sentiments are also shared through physical data collected through survey and interviews that South Africa needs to focus more into PPPs in order to successfully implement megaprojects in the future, to minimize and avoid delays and cost overruns.

According to Ngunjiri (2017) indicates that even though South Africa and Nigeria are the biggest economies in Africa, they cannot implement megaprojects without FDI. Ngunjiri (2017) further indicated that South Africa relies on BRICs and IMF in order to implement megaprojects. Survey and interviews agrees with literature found that the south African government is currently not in a position to implement and execute megaprojects without any financial assistance or grants. It is evident that south Africa cannot implement megaprojects without foreign investments and partnerships. South Africa is currently securing loans and grants from the international banks and investors in order to service the current infrastructure such as Eskom.

According to the results the Gautrain project, JH Venter (2001) indicates that it was through foreign partnerships and international loans or investments that although there were challenges, Gautrain became a success story of megaprojects in South Africa. In the Gautrain investors in the development of these projects have an ownership stake in the project or product that way they ensure that the interests of the parties are taken care of as well as the return on investment is realised. Structured interviews results also agree that it is indeed evident that partnerships could be a success based on the Gautrain project.

“South Africa demonstrates enough skills and capabilities to implement megaprojects?”

The questionnaire was targeted at professionals in the built environment although it was also distributed to entrepreneurs, fellow students and general professionals in the private sector who show an interest in the socio-economic issues in south Africa. The responses were not filtered on people who are presumed to have a more thorough knowledge or insight of the skills but took all responses and analysed them equally. It has been evident that even people who are not in the built environment may have an interest on the implementation of future megaproject and some research has been conducted. This gave an interesting insight on the objective of the question posed.

The study shows that professionals in the built environment are well aware that South Africa does not possess adequate skills and knowledge to implement megaprojects; unfortunately, these sentiments are also shared by the respondents who are not in the field but just ordinary South Africans. Development Report (2011), indicated that megaprojects require high design knowledge and technical skills, competent human resources and managerial capabilities, the implementation of our historic megaprojects is evidence enough to the citizens that south Africa does not have the skills, examples of the projects not gone perfectly well are the Eskom Medupi and Kusile power stations which commenced in 2007, the third and fourth largest coal powerplants in the world, were originally due to come online in 2014 and 2012 respectively, which would have given the country an extra 9 600MW of power, enough to avoid blackouts, in 2019 they are still under intense construction.

Nicklas Garemo (2015), highlighted in literature that it does indeed seem that lack of skilled resources and capacity, without a well-resourced qualified network of project managers, advisers and controllers, projects will not deliver the best possible return on investment due to delays and cost overruns caused by unskilled resources.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Dentons (2015) further indicated in literature that the estimated budgets for the Eskom Kusile and Medupi power stations were estimated to be R80 billion and R70 Billion respectively; however the cost to date estimate to be at R208 billion for Medupi and R239 billion for Kusile, this is attributed to political interference, market instability, labour unrest, cost overruns due to corruption, lack of capacity at Eskom to manage megaprojects, but most of it attributed inadequate skills for implementation and execution of projects of this magnitude. This is a clear indication that South Africa does not possess the right skills and knowledge to successfully execute megaprojects. According to (Engineering News, 2019) while some of the units have come online and are generating electricity, they have been plagued by problems. Eskom calls these "design faults" and says it will cost R8-billion to rectify. This has to be a lesson learnt for South Africa before implementing megaprojects in the future, Medupi and Kusile are perfect cases that South Africa can learn from now going forward. These are the biggest energy plants post the apartheid.

The interview and survey results show that most of the delays are attributed to lack of oversight and control over the projects from an early stage, which paved the way for corruption. A further major reason for the delays and cost overruns was because Eskom had decided it would be the designer and project manager, a massive task. According to literature, Yelland (2019) indicated in the case of Eskom that it had neither the resources nor the skills to handle the two mega projects It had been over 20 years since Eskom had built a power station when it decided to build the two big projects, and by then much of the skilled staff had left. This is aligned and in agreement with what the study found where participants indicated that the reasons megaprojects are failing is because the people have no idea what they're doing and lack skills.

6.2. Funding of megaprojects in South Africa

It is evident that Infrastructure funding in South Africa is largely provided by the national government. The government has courted foreign direct investment to lure investors into areas that need infrastructure, and foreign companies often build, own and operate facilities. The government has introduced a policy of broad-based black economic empowerment (BBBEE), which requires foreign companies to go into partnership with local businesses, shifting company ownership patterns. The study also shows that even in other countries, the government is often the major stakeholder in implementing megaproject; however private sector is also involved financially and operationally.

South Africa is Africa's most sophisticated economy and already it is thought to be home to between 350,000-500,000 Chinese migrants, many of whom flocked to the country to help cater to the consumer tastes of its rising middle classes in the decades following the end of apartheid, (Pheiffer, 2017). Whether infrastructure investment is funded by the public or private sector, the source of funds for this investment is of crucial importance, as funding decisions may have significant and sometimes detrimental macroeconomic aspects. Borrowing from international foreign sources requires significant interest and capital repayments in foreign currency, which may push down the value of the rand. Domestic borrowing, on the other hand, may make it more expensive to borrow capital for other investment projects and other investments by the private sector, (Garlick2, 2008)

(Engineering News, 2017), Governments remain the single largest developers of infrastructure projects – and own between 57% and 90% of tracked projects. Governments that invest in enabling infrastructure are seen as more proactive and tend to attract more investors, ultimately making them more likely to achieve economic and export diversification objectives,

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

With the South African economy been sluggish for the past few year and with little to no growth of the country's GDP; however South Africa has In recent years seen commitments from foreign investors and still open to taking up more megaprojects. Though insecurity and a plummeting state of the economy have given individual entrepreneurs pause; however Mhlanga (2018) has indicated in literature that countries like China is still very keen on the country's development and implementation of megaprojects particularly in the construction industry. In 2019 China signed memorandums of understanding (MOU) with South Africa to deepen relations in departments such as international relations, trade and industry, manufacturing, home affairs and agriculture, (Mhlanga, 2018).

6.3. Impact of implementation of megaprojects in south African economic growth

South Africa is on a multibillion-rand development drive to remedy the skewed implementation of infrastructure during the apartheid years, and to meet the demands of a growing economy and population. According to the National Treasury, between the 2009/10 and 2013/14 financial years the public sector spent just over R1-trillion on infrastructure and will spend a further R813-billion over the next three years.

(Landman, 2018), South Africa's gross domestic product (GDP), public sector spending on economic infrastructure such as roads, bridges, dams, electricity and pipelines is now at its highest level in 25 years, reveals this year's Budget Review. Over the four years from 2014/15 to 2017/18 this will amount to 6.2% of GDP, slightly down from 6.7% of GDP over the five years from 2009/10 to 2013/14.

According to the data collected, it is evident that the economy will grow through foreign direct investments, implementation of megaprojects that will also amplify job creation in South Africa, with Gautrain as the most recent project operating and keeps creating and sustaining employment.

Lessons learnt from the Gautrain project should be carefully researched and monitored over the coming years in order to provide a more comprehensive assessment of the long- term costs and benefits of the Gautrain. In particular, it will be instructive to measure the costs of the project against slightly more long-term benefits (or costs) that may flow from its operation. Several layers of data collected over the coming years will be useful, including: ridership levels; the demographic composition of users; the final costs of the project; other economic benefits to the poor that may accrue from the new transportation system (e.g. jobs in tourism); economic growth attributed to economic activity around stations/hubs and to increased airport accessibility; and future integration of the Gautrain into existing transportation networks.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

goods. However, like employment creation, these contracts and benefits are limited to the actual construction of these megaprojects, although skills and knowledge cannot be taken away.

The study further revealed the exponential rise in the need for energy infrastructure upgrade and development, South Africa has been experiencing Load Shedding in recent years due to inefficiency of the current infrastructure. It was expected that when investment into new power plants is made, they would be efficient for the population, however, the persistent delays in completion of the energy megaprojects exacerbate the inadequate power supply, thus impacting the economy and citizens negatively.

On the basis of these findings and the multiplicity of risks associated with the energy megaprojects, it is clear that energy megaprojects:

- Benefit the local businesses as over 58% of the project budget is expended locally;
- Benefit considerable number of job seekers for a limited duration and assist in providing training; and
- Benefit the economy and attracts investors into the country.

5.2. Summary research objectives

As outlined in above, the objectives of the study were to:

- Investigate Skills and professional capabilities to successfully implement megaprojects in South Africa
- Investigate the identified economic benefits of implementing megaprojects successfully in South Africa context.
- Assess the benefits of partnerships and foreign investment into South Africa to implement megaprojects.
- Consolidate the general sentiments regarding the continuance of the rolling out of megaprojects in South Africa.

The above stated objectives were used fundamentally in the collection of data. This included conducting interviews and survey questionnaires. These objectives have been fulfilled. The above stated objectives were used fundamentally in the collection of data. This included conducting interviews and survey questionnaires. These objectives have been fulfilled.

5.3. FINDINGS

a) Investigate Skills and professional capabilities to successfully implement megaprojects in South Africa

According to the responses, South Africa does possess the skills required although the researcher believes that intense training in project management and partnerships is required in order to implement megaprojects successfully. The complexity and scale of megaprojects mean that learning across projects must transcend individual experience. Training and upskilling of the unemployed people is one of the apex priorities of the government through the Department of Higher learning (DHL). An investment in training of people in rare and specialised skill, improves the prospects of securing job opportunities to all beneficiaries beyond the completion dates of the respective megaproject.

The study shows that:

- According to The Department of Public Enterprises (2015), reported on the impact of the build programme in terms of supporting local businesses, skills development, job creation and beneficiation. The report focused on programmes within Eskom and Transnet. The Transnet programme dealt mainly with what was anticipated to be achieved in the future, while Eskom talked about what the programme had actually achieved.
- Transnet had rolled out a R300 billion investment programme over a seven-year period. It was hoped that the investment would expand rail, port and pipeline infrastructure and increase capacity to meet market demand. By expanding rail, traffic would be moved from roads to rail, hence helping to minimize road accidents and reduce damage to road infrastructure. The capital investment was aimed at creating jobs, promoting skills development and localisation, empowerment and transformation opportunities.
- Using a macro-economic impact model, it was expected that the build programme would help to create 540 000 direct and indirect jobs over the seven-year period. The programme aimed to leverage the procurement expenditure and to increase localization, which would help to maximize local job creation. An additional 480 000 job opportunities were expected to be created through Transnet's spending. Some of the build programme projects had been delayed due to problems with the planning phase, such as changes in decision-making, as well as the overall challenge of the infrastructure investment backlog.
- The Eskom report described how the build programme had unfolded, highlighting the achievements insofar as supplier development and localisation had been concerned. The development role of major contractors had been to increase the capacity and capability of local suppliers across Eskom's value chain, and to source supply competitively and get fair pricing.
- Linkages to priority or high impact spend areas had been made by Eskom to ensure access to local suppliers and understanding of supplier types. Contracts to the value of R150 billion had been awarded, and R102 billion was total local content committed by suppliers. This represented 66% of the total contract value, showing a positive development in local suppliers. However, Eskom was also faced with a backlog in infrastructure investment.
- Public-private partnerships or collaboration was being encouraged in an attempt to overcome the infrastructure investment backlog which was currently affecting service delivery, particularly at Eskom, which had started load shedding in recent months.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Members were concerned with how Eskom continued to use suppliers who had proved to be problematic in the past, as well as using middle men when procuring inputs, rather than going direct to source, which was more cost effective. In addition, there were concerns over the delays in pipelines becoming fully operational. The overall analysis of the results points to the satisfactory performance of the energy megaprojects in relation to training and development. As high as 58% of the respondents are of the view that considerable effort has been made through the development of the energy megaproject to train and upskill the unemployed. This sentiment is also shared by the respondents within the organised labour fraternity (Department of Enterprise, 2015).

b) Investigate the identified economic benefits of implementing megaprojects successfully in South Africa.

Megaprojects in South Africa are most commonly situated in low-income, in the vicinity of raw materials for energy infrastructure and where there is a high volume of people and needs such as Gauteng for transport infrastructure. There is no doubt that these projects alter the economy, livelihoods, accessibility of services and neighbourhoods. Government supports these large-scale projects because they eliminate blight, create vibrant new communities, increase tax revenue, and create jobs; however it is undeniable that these projects can have negative impacts as well if not executed accordingly. Project approvals are granted based on the premise that there is a positive return on public funds invested, and that the majority of negative impacts can be mitigated. Yet, very little energy is exerted on projecting the long- term impacts on the citizens who live in the wider community surrounding megaprojects. The following have been identified as the major benefits that are yielded by megaprojects:

- The current impact of energy and transport megaprojects to South Africans is largely negative, this is largely as a result of political interference, corruption and poorly managed megaprojects in South Africa. However, the current megaprojects have benefitted south Africa with the following :
- Job creation through local construction companies and the emergence of small and medium companies. The multitude of jobs created through the development of energy megaprojects are temporary jobs limited largely to the sectional construction phase of the project
- Training and skills development is continuously created through the social development programmes initiated by the government through SOEs
- Local small to medium firms benefits through firms' provision ancillary non-technical items, including consumables and spares.
- Attraction of foreign direct investments to south Africa, when megaprojects are implemented successfully.

The study has shown that according to Fouilloux and Otto (2015) Eskom has set up a fully-fledged regional execution centre in South Africa capable of engineering, procurement, construction etc and support functions such as human resources and finance. Around 80% of all turbines in operation in South Africa are Eskom currently employs over 35000 people directly and indirectly, to meet new power project commitments, and aiming to recruit hundreds more . Eskom has a contractual obligation to develop local and emerging suppliers through Supplier, Development and Localisation programme BEE (Black Economic Empowerment) , which includes black ownership, and the employment and development of black staff, particularly women, youth and disabled. Priority

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

will thus be given to previously disadvantaged groups in all jobs created. Local skills will be developed through training people as managers and technicians. A wide range of mechanical and electrical skills have been transferred to local industry through a period of three to four years of training in such fields as design, building, maintenance and electrical technology. Local industry will also benefit from the new power projects, which are required to have 50% local content, with a number of major components to be manufactured in South Africa) (Otto, 2017).

c) Assess the benefits of partnerships and foreign investment into South Africa to implement megaprojects.

The research study clearly reveals that funding management thereof is one of the major obstacles when it comes to implementation of megaprojects in south Africa. South African government cannot afford projects of this magnitude. Partnerships and Foreign Direct Investment is essential to implement megaprojects. It is thus important to note that infrastructure development and megaprojects implementation is subject to thorough cost-benefit analysis and carefully takes into account the areas in which infrastructure is in greatest need of upgrading. Infrastructure plans must also take into careful consideration the forecasted investment levels required to sustain particular growth targets. Finally, the relationship between infrastructure maintenance and economic growth remains imperative to for South Africa to achieve desired goals, this issue requires considerable attention and planning in order to develop a comprehensive understanding of the implementation of megaprojects in South Africa. Flyvberg (2014) indicates that megaprojects are not just bigger versions of small projects, but are a "completely different breed of project in terms of complexity". Illustrates this by saying if the manager of a conventional project needs the equivalent of a driver's licence to do what he had to do, then the manager of a megaproject would need the equivalent of a pilot's jumbo jet licence. "And just like you would not want someone with only a driver's licence to fly a jumbo, you don't want a conventional project manager to manage a megaproject,"

d) Consolidate the general sentiments regarding the continuance of the rolling out of megaprojects In South Africa.

The study has indicated that there is appetite to implement megaprojects in South Africa. although foreign direct investment is slacking due to poor planning and execution of megaprojects in South Africa which may well be influenced by political interference and corruption within the public sector, there is appetite in South Africa. Based on the responses it is safe to conclude that South Africa indeed has the appetite to implement megaprojects. These are essential for the country's economic improvement, bridging the gap from the Apartheid era and the improved cost of living.

5.4. Summary of the discussion

This study sought to investigate appetite to implement megaprojects in South Africa. In essence, the study utilises mixed method involving the use of structured interviews and survey questionnaires (Objectives 1 to 4) and content analysis of documents reviewed for the Eskom Power stations' projects i.e. Medupi and Kusile and The Gautrain. Literature and survey data has established that the implementation of megaprojects in South Africa is currently experiencing great resistance interest from the public despite historic challenges and other government inefficiency

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

such as political interference, skills shortage, funding cost overruns, corruption, unemployment and labour unrests are some of the major constituents of megaproject failures; however South Africa can implement megaprojects better through partnerships, training and lessons learnt from other countries across the world.

The results of the questionnaire were collected and arranged through survey monkey web. The analysis was done for each question that found it to be relevant to the research. The research questionnaires were analysed according to the categories within which it was collected and was compared to the literature reviewed in the study, being the questionnaire and survey to establish the appetite to implement megaprojects in South Africa. The analysed data was then compared to the literature review to see if the responses collected correlate with what was found within the literature review. The results were utilized to provide an indication if south Africa has an appetite to implement megaprojects as well as a way forward on how and what other researches should be based on. From the study conducted, it appears that South Africa does indeed have an appetite to implement megaprojects; however there are focus areas identified in the study that South Africa and its government need to strategically align to the megaprojects plans, maintain political stability, adequate resource planning, plan and manage project funding accordingly to avoid and minimise cost overruns and corruption, stakeholder management to avoid unrests that lead to project delays.

5.5. Conclusion

In this chapter the discussion of results was informed by the preceding chapter 4 in line with the objectives of the study. This allowed the researcher to critically analyse the face to face interviews findings and the online survey data to make inferences based on results and draw conclusions.

Chapter 6

6. CONCLUSION AND RECOMMENDATIONS

6.1. Introduction

The chapter will summarise and consolidate the responses from the questions distributed to the participants. A conclusion is therefore drawn and consolidated based on the data collected, to give an overview on the current and future state implementing megaprojects in South Africa.

6.2. CONCLUSION

The study concludes that the appetite to implement megaprojects is significant despite all the challenges in South Africa. The findings of the study have proven that the energy and transport megaprojects yield undesired negative impact to South Africans, due to the current poor planning and execution of megaprojects. The study shows that in the context of South Africa, the decision making processes on energy transport megaprojects are somewhat not aligned to the needs of the country and its citizens, such as the development of energy power plants was only established in 2007 when the country was already battling with electricity. The Gauteng Freeways were already congested and congestion increasing exponentially; therefore the backlog will always be there. It became evident through the analysis of data that participation of the members of the public, who are financiers and the general public, is not prioritised when decisions on energy and transport megaprojects are taken. The priority for megaprojects implementation is often limited to major cities and largely dominated by lobby groups and civil society organisations that may not necessarily have the interest of the end users as a priority.

The study looked into the probability of implementing public transport megaprojects such as the Gautrain and the Gauteng Freeway Improvement project. The Gautrain was highlighted as one of the most recent and successful megaproject in the transport sector. The success of the Gautrain is attributed to the private public partnership between Gauteng Transport and Bombela Concession Company. Bombela deployed technical expertise from Germany and a monitoring team to supervise and manage the planning, construction and operation phases of the project. The operation of Gautrain has reduced traffic congestion and job creation, must be weighed against the social and political implications of the project. The benefits include job creation, alleviation of road traffic congestion, skills transfer programmes, and the potential to contribute to overall economic growth in the province, although not to the entire country. These critiques of the project originate from scholars, transportation experts, and civil society actors within South Africa, and provide significant reason for concern regarding the appropriateness of building a high-speed rail network in this region.

Interview participants further highlighted that Gautrain is not a solution for all South Africans since it further deepens mobility-related exclusion in the province; it prioritizes wealthy, as opposed to poor, citizens in the allocation of public funds; costs for the project have escalated considerably from initial estimates; and other options for a more effective and integrated transportation plan were not sufficiently considered. Participants further criticized the project for consuming an unprecedented amount of public funding, while the project is aimed primarily at an elite class of people within the region. This is occurring despite the dire and urgent need for more comprehensive and efficient public transit targeting the majority of the population.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

Although the Gautrain presents several legitimate benefits to the people of Gauteng, this project suffers from several debilitating limitations. These problems include the following: escalating and potentially unsustainable costs, both up-front and operational; the possibility of deepening mobility-related exclusion and reproducing the urban geography of apartheid; public spending priorities that target the wealthy elite while transportation infrastructure and basic needs for the poor require more urgent attention; and lack of debate and discussion regarding more integrated and appropriate alternatives to the Gautrain.

Regardless of all the challenges and concerns regarding the Gautrain project, the study has shown that there is interest to further expand the Gautrain projects to other parts of the province. The GMA together with The Gauteng Department of transport have embarked on the expansion plans of the Gautrain. The expansion has is a clear indication that South Africa has the appetite to still undertake and implement megaprojects despite all the challenges. According to Gautrain Management Agency (2019) since 2010, the Gautrain Project has supported the creation of thousands of jobs, committed R37.5m to community organisations and contributed some R78 to Gauteng's economy per trip. Gautrain has also shown that it also had a significant and immediate impact because it linked the major hubs or nodes of economic activity in the province with a fast and reliable rail service, generating significant social and economic benefits.

6.3. RECOMMENDATIONS

- In-depth planning for megaprojects should be conducted, with lessons learnt from developed and developing countries
- South Africa should consider embarking more on public-private partnership to minimise political interference and corruption.
- Megaprojects should be aligned to realistic economic development plans and projection e.g 500 000 job creation, National development plan etc.
- Government should engage the public more in the planning phase of megaprojects, to understand the needs of the citizens, organised unions and avoid protests and delays that become costly.
- The operation and maintenance of existing megaprojects should be optimised and maintained in accordance to the technical requirements and also to avoid an extreme deterioration of the infrastructure.
- In a country with limited financial resources, scarcity of skills and competing demands for the scarce monetary resources, megaprojects should be well planned and executed by qualified teams.
- Small to Medium business and skill development through mentorship should be of utmost importance in order to improve and reduce the importing of expensive skills into the country.
- There is a need to develop and introduce the megaprojects research, planning and advisory body within the government and private sector. This body or committee should be empowered to participate on all forms of megaprojects from the conception to close-out phase.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

- South Africa should take the hard lessons garnered so far and accept that capacitation is needed to implement these huge critical projects. The national energy needs projections should be revised periodically, and interventions by way of new projects should never be rushed. The study has shown that, although the challenges bedeviling megaprojects are the same globally, as they are in South Africa, the South African causes of budget overflow and programme slippage are particularly preventable, as they appear to be underpinned by poor planning and management.
- The improvement of implementation performance is critical, as there are likely to be more critical megaprojects yet to be implemented. Since there are no specific solutions to mitigate the factors in existing literature, it is thus recommended that specific solutions that could mitigate the causes of cost and schedule overruns be included in future studies. The following recommendations are proposed for further studies:
 - The study should investigate the effectiveness of megaprojects procurement systems in South Africa.
 - The study should also investigate the level of expertise of South African construction professionals in handling complex projects with intricate interfaces.
 - The study of the specific nuances of critical energy projects should be prioritised.

6.4. BENEFITS/IMPORTANCE OF THE FINDINGS

The research findings would benefit all responsible stake holders within the South Africa and Southern Africa; these include the companies responsible for energy and transport megaprojects; financiers; the government; policy makers; energy project managers in general and most importantly the end users. The paradigm shift in concept, planning and development of megaprojects would benefit each of the stakeholders as follow:

- The elected projects would be more cost effective, thus requiring minimum cost of capital with a reasonably reduced payback period;
- Project would be completed on time and within the budget, thus ensuring agility in and reliability repayment of borrowed funds;
- A realistic budget for multiple long term projects for various plants would be drawn;
- Plants would be evidently self-funding;
- The risk associated with currency fluctuation would be minimised as a result of the short-term project delivery;
- Lessons learnt would be noticeable and implementable in other projects to ensure continuous improvement Policymakers;
- Project would be planned and executed in shorter period thus affording policymakers the opportunity to witness and consider the impact of their policy decisions;
- Localisation would be enhanced due to the sustained demand of the projects; and
- Job creation would improve as there would be certainty of energy generation.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

6.4.1. Financiers

- The elected projects would be more cost effective, thus requiring minimum cost of capital with a reasonably reduced payback period;
- Project would be completed on time and within the budget, thus ensuring agility in and reliability repayment of borrowed funds:
- A realistic budget for multiple long-term projects for various plants would be drawn;
- Plants would be evidently self-funding;
- The risk associated with currency fluctuation would be minimized as a result of the short-term project delivery;
- Lessons learnt would be noticeable and implementable in other projects to ensure continuous improvement Policymakers;
- Project would be planned and executed in shorter period thus affording policymakers the opportunity to witness and consider the impact of their policy decisions;
- Localisation would be enhanced due to the sustained demand of the projects; and
- Job creation would improve as there would be certainty of energy generation.

6.4.2. Supply

- Traffic congestions and generation and supply of electricity would be significantly improved, thus supporting the government's programme on service delivery.
- Long term job creation would be improved noting that megaprojects usually take long.
- The spill over benefits to the economy would be maximized, investors in general would be induced to invest due to availability of transport and energy infrastructure.
- Localisation would improve, thus growing the transport and energy sectors of the economy.
- Transport and energy tariffs would be affordable due to availability and sufficiency, thus incentivizing the consumers to improve service delivery.
- Improved and reliable infrastructure will attract foreign Direct Investment (FDI).

6.5. POSSIBILITIES FOR FURTHER RESEARCH

The phenomenon of energy megaprojects is notably an uncharted territory in the context of the South African transport and energy sector. As established in literature, megaproject are characterised by disruption, in both economic and social spheres, they bring with unspoken promise of hope, prosperity and unprecedented economic growth. Literature further informed us that the key risk in relation to these types of projects is that they may be causes of mega indebtedness, infrastructure stagnation and poverty in developing countries.

It is recommended that further research be conducted on clear defined model of economic funding model and the efficient planning and implementation of the megaprojects in South Africa. These should deliberately include the analysis of alternatives to transport and energy megaprojects.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

The success of such a research studies would contribute to the reduction on the capital cost overruns, sovereign debt, Efficient planning and implementation of megaprojects withing stipulated timelines.

Bibliography

- Frescura, F., 2000. Deconstructing Apartheid City. *Urban Issues*.
- SAHO, 2011. Johannesburg the Segregated City. *SAHO*.
- Boddy-Evans, A., 2017. The Origins of Apartheid. *ThoughtCo.*
- Brand South Africa, 2017. Infrastructure Development in South Africa. *Brand South Africa*.
- Orcutt, J., 1997. Transportation Struggles in the Post-Apartheid City. *Planners Network*.
- Vision 2030, 2018. The role of infrastructure in building the South African economy. *Vision 2030*.
- Engineering News, 2018. Rethinking the value of infrastructure in South Africa. *Engineering News*.
- October, A., 2018. Eskom wants to use “lessons” from Medupi and Kusile to drive nuclear. *Engineering News*.
- Eskom - COP17 Fact Sheet, 2017. Kusile and Medupi coal-fired powerStations under construction. *COP17 Fact Sheet*.
- Eskom, 2018. *Nersa Public Hearing*, s.l.: s.n.
- Dentons, 2015. *investigation into the status of business and challenges experienced by Eskom*, Cape Town: Dentons.
- JH Venter, S. B. K. M., 2001. *GAUTRAIN RAPID RAIL LINK: Intergrated technical planning, feasibility and business case*. Johannesburg, South African Transport Conference.
- Surti, N., 2017. *The Impact of the Gautrain station in Midrand*, s.l.: s.n.
- Engineering News, 2007. Gautrain construction steams ahead. *Engineering News*.
- Goosen, S., 2011. Gautrain operations, construction faring well. *Engineering News*.
- Engineering News, 2017. Governments largest developers of Africa’s infrastructure projects. *Engineering News*.
- New Learning, 1990. *Apartheid Education*, s.l.: s.n.
- BlackPast.org, 2017. *Apartheid (1948-1994)*, New York: Harper & Row.
- Soweto.co.za, 1991. *Apartheid*. *Soweto.co.za*.
- Ogbu, L. F. & L., 2011. South Africa: From Township to Town. *places*.
- DeBuys Scott, 2013. *South Africa’s infrastructure triumph*, s.l.: KPMG.
- Burger, R., 2016. South Africa has made progress, but deprivation still bears apartheid scars. *The Conversation*.
- Mohale, B., 2015. The Pitfalls of Post 1994 South Africa. *Ujuh*.
- Statistics South Africa, July 2019. SA population reaches 58.8 million. *SA population reaches 58.8 million*.
- Staff Writer, 2019. Gauteng’s R100 billion plan to build 30 new cities. *Businesstech*.
- South African Government, 2019. South Africa Investment Conference 2019. *investment confernce 2019*.
- Rich, P., 2016. Race, Science, and the Legitimization of White Supremacy in South Africa, 1902-1940. *The International Journal of African Historical Studies*, Volume 49.
- Mabin, S. P. & A., 2017. Rethinking Urban South Africa. *Journal of Southern African Studies*, Volume 24.
- Parnell, S., 2012. Negotiating Segregation : Pre-parliamentary debate over Natives (Urban Areas) Act of 1923. *Journal Studies*, Volume 59.
- Jeffrey Butler, R. I. R. J. A., 2012. The university of Carlifonia Press. *The black homelands of South Africa* .:

- Lissoni, S. A. a. A., 2012. 'Let's Talk About Bantustans'. *South African Historical Journal*, Volume 64.
- Lipton, M., 1989. *Capitalism and Apartheid South Africa*. Cape Town: s.n.
- Idilbi-Bayaa, M. Q. a. Y., 2019. Risk appetite and oil prices. *Energy Economics*.
- Cremonino, A., 2011. *Risk Appetite as a Core Element of ERM: Definition and Process*, s.l.: Society of Actuaries.
- Mpungose, A., 2016. *The Politics of Megaprojects: Assessing the Socio-Spatial and Environmental Impacts of the Proposed Dig-Out Port in South Durban*, Durban: University of Kwazulu Natal.
- Alan A. Altshuler, D. E. L., 2003. *Mega-Projects: The Changing Politics of Urban Public Investment*. Washington D.C: The Brookings Institution.
- Locatelli, N. J. B. a. G., 2015. Power plants as megaprojects: Using empirics to shape policy, planning, and construction management. *Elsevier*, pp. 57-66.
- PWC, 2017. *Africa gearing up*, s.l.: s.n.
- Lowenberg, R. B. & A. D., 2016. *Impact of Apartheid on Economic Growth: Implications and Empirical Evidence from South Africa*, s.l.: s.n.
- Radujković, S. M. a. M., 2015. Critical drivers of megaprojects success and failure. *Elsevier*, Volume 122, pp. 71-80.
- B.K. Sovacool, L. B., 2012. Energy security and hydropower development in Malaysia: The drivers and challenges facing the Sarawak Corridor of Renewable Energy (SCORE). *Elsevier*.
- Flyvbjerg, B., 2017. *"Introduction: The Iron Law of Megaproject Management"*, Oxford: Oxford University Press.
- al., T. Y. e., 2018. Contents lists available at ScienceDirect Cities journal homepage: www.elsevier.com/locate/cities Understanding 'smart cities': Intertwining development drivers with desired outcomes in a multidimensional framework. *Elsevier*.
- Tan, Y., 2018. Understanding 'smart cities': Intertwining development drivers with desired outcomes in a multidimensional framework. *Elsevier*.
- Fedderke, J. & Bogetč, Z., 2009. Infrastructure and Growth in South Africa: Direct and Indirect Productivity Impacts of 19 Infrastructure Measures. *Elsevier*, 37(09), pp. 1522-1539.
- Shirley, R. & Kammen, D., 2015. Energy planning and development in Malaysian Borneo: Assessing the benefits of distributed technologies versus large scale energy mega-projects. *Elsevier*, pp. 15-29.
- Othman, A., 2014. *A conceptual model for overcoming the challenges of mega construction projects in developing countries*, s.l.: s.n.
- Ponzini, D., 2015. Large scale development projects and star architecture in the absence of democratic politics: The case of Abu Dhabi, UAE. *Elsevier*, Volume 30.
- Colliers, R., 2007. *Abu Dhabi real estate overview*, mimeo: s.n.
- Michael Kerr, D. R. B. M. a. Z. O. D., 2017. Construction and projects in United Arab Emirates: overview. *Thomson Reuters*.
- DIMITRIOU, D. J., 2018. *ECONOMIC IMPACT AND PROJECT FINANCING EQUILIBRIUM TO ASSESS LARGE TRANSPORT INFRASTRUCTURE PROJECTS*, s.l.: Democritus University of Thrace.
- Abdou, R. A.-S. & A., 2016. *Factors critical for the success of public-private partnerships in UAE infrastructure projects: experts' perception*, s.l.: International Journal of Construction Management .

- Rizzo, A., 2015. *Rapid urban development and national master planning in Arab Gulf countries. Qatar as a case study*, s.l.: Elsevier.
- Per Erik Eriksson, S. L. L. B. a. J. N., 2017. Procurement of Railway Infrastructure Projects – A European Benchmarking Study. *Civil Engineering Journal*, 3(4).
- Hoirisch, P. M. B. J. R. F. a. C., 2015. *Health and development in BRICS countries*, Spain: Dossiê Saúde Global.
- Agrawal, V. R. a. D. G., 2011. *FDI Inflow Determinants in BRIC countries: A Panel Data Analysis*, s.l.: s.n.
- Pieterse, E., 2009. *POST-APARTHEID GEOGRAPHIES IN SOUTH AFRICA: WHY ARE URBAN DIVIDES SO PERSISTENT?*, s.l.: s.n.
- Ojah, O. K. a. L., 2016. Available online at www.sciencedirect.com ScienceDirect HOSTED BY Review of Development Finance 6 (2016) 105–125 Does infrastructure really explain economic growth in Sub-Saharan Africa?, s.l.: s.n.
- Johann A. van Rensburg, S. C. K., 2019. *Funding for roads: Understanding the South African road funding framework*, s.l.: s.n.
- Goitom, H., 2015. National Funding of Road Infrastructure: South Africa. *The law library of congress*.
- Petterson, D., 2019. Lack of road maintenance will cost SA billions. *Infrastructure Journal*.
- National Treasury , 2019. *Focus on Infrastructure spend in the 2019 SA Budget*, Pretoria: National Treasury.
- Wannalak2, V., 2016. *Public-Private Partnership under the South-South Cooperation: The Case of Solar Energy Development in Thailand1*, s.l.: s.n.
- Westhuizen, J. V. D., 2008. Gritz, Glamour and the Gautrain: Mega-Projects as Political Symbols.
- Aigbavboa, N. X. M. a. C., 2019. *The role of public private partnership in improving service delivery in South Africa*. s.l., s.n.
- Zheng, S., 2019. China, Tanzania in talks to get US\$10 billion Bagamoyo Port project back on track.
- Ngunjiri, J., 2017. *Mega project financing in Africa still a major challenge*, s.l.: s.n.
- Dimitrou, D. J., 2018. *ECONOMIC IMPACT AND PROJECT FINANCING EQUILIBRIUM TO ASSESS LARGE TRANSPORT INFRASTRUCTURE PROJECTS*, s.l.: Democritus University of Thrace.
- Mamabolo, M. A., 2015. *IMPLEMENTATION OF ROAD INFRASTRUCTURE DEVELOPMENT PROJECTS IN RURAL AREAS OF SOUTH AFRICA: A CASE OF POLOKWANE MUNICIPALITY IN CAPRICORN DISTRICT*, s.l.: s.n.
- Fund, I. M., 2009. *BRICs Drive Global Economic Recovery*, s.l.: s.n.
- Mahayi, M. L., 2017. *INVESTIGATING PUBLIC CONSULTATION IN THE IMPLEMENTATION OF MEGA PROJECTS IN SOUTH AFRICA*, s.l.: s.n.
- Turok, i., 2011. *Deconstructing Densities : Strategic Dilemmas Confronting the Post-Apartheid City*, s.l.: s.n.
- Maikudi, S. A. S., 2014. *AN OVERVIEW OF NATION BUILDING CHALLENGES IN POST APARTHEID SOUTH AFRICA*, s.l.: s.n.
- Thomas, D. P., 2013. *The Gautrain project in South Africa: a cautionary tale*, s.l.: Journal of Contemporary African Studies.
- Lombard, S. H., 2017. *VALUE CREATION AROUND TRANSPORT INFRASTRUCTURE IN SOUTH AFRICA: THE CASE OF GAUTRAIN* , s.l.: s.n.

- Tangab, B., 2018. *Classification of Public Private Partnership Projects in Developing Countries*, Wuhan, China: s.n.
- Kavishe, N., 2019. *IMPROVING THE DELIVERY OF PPP HOUSING PROJECTS IN DEVELOPING COUNTRIES*, s.l.: University of Birmingham.
- Othman, A. A. E., 2013. *Challenges of mega construction projects in developing countries*, s.l.: The British University in Egypt.
- Alfons van Marrewijk, S. R. C. T. S. P. M. V., 2008. Managing public–private megaprojects: Paradoxes, complexity, and project design. *Elsevier*, Volume 26, pp. 591-600.
- Lehloesa, T. L., 2000. *South Africa's Growth, Employment and Redistribution Strategy in the Context of Structural Adjustment Programmes in the South.*, Grahamstown: Rhodes University.
- Rajput, L. G. a. R., 2010. *Comparison of Indian PPP Construction Industry and European PPP Construction Industry: Process, Thresholds and Implementation*. Dublin, Technological University Dublin.
- Villalba-Romero, F. a. L. C. L., 2016. *EVALUATING SUCCESS IN PPP ROAD PROJECTS IN EUROPE: A COMPARISON OF PERFORMANCE MEASUREMENT APPROACHES*, s.l.: Elsevier.
- Trueb, H. D. a. O., 2015. Transportation Megaprojects, Globalization, and Place-Making in Hong Kong and South China. *Transportation Research Board*, 1926(1).
- Daniela Giretti, V. F. a. S. L. E.-G., 2014. *Engineering, Procurement, and Construction Challenges of Oil and Gas Artificial Islands in the Arabian Gulf, Part 2: Settlement Prediction of Shallow Foundations*, Abu Dhabi: Society of Petroleum Engineers.
- Moza T. Al Nahyan¹, Y. E. H. M. S. M. a. B. B., 2018. *A Decision-Support System for Identifying the Best Contractual Delivery Methods of Mega Infrastructure Developments*, Abu Dhabi: Department of Management, Abu Dhabi University, Abu Dhabi, U.A.E..
- Palter, N. G. S. M. R., 2015. *Megaprojects: The good, the bad, and the better*, s.l.: .
- Malete, R. & Khatleli, N., 2019. *Efficacy in Infrastructure Delivery Post-Apartheid: An Analysis of Infrastructure Delivery Management System in the Public Sector in South Africa*. Johannesburg, SACQSP.
- Khatleli, N., 2017. *PUBLIC NON-CONSULTATION RELATED DELAYS IN DELIVERY OF MEGA PROJECTS*. Valencia, Spain, ISEC.
- Khatleli, N., Masenya, B., Motshwari, T. & Tsiu, K., 2014. *The Impact of Black-Owned Small, Medium and Micro Enterprise in Public Private Partnership Projects: The Case of Gautrain Rapid Rail Link*. Pretoria, South Africa, SACQSP.
- Lephoto, T. & Khatleli, N., 2019. *Engineering Skills Development through Mega Construction Projects (MCPs) 1*. Johannesburg, South Africa, SACQSP.
- Khatleli, N., 2020. *GUIDELINES FOR IMPLEMENTING PPPs IN SADC*, Johannesburg: South African Institute of international affairs.
- Khatleli, N., 2016. *The Impediments to efficient megaproject implementation in South Africa*. Manchester, UK, Association of Researchers in Construction Management, pp. 803-812.
- Khatleli, N., 2016. *The Impediments to Efficient Megaproject Implementation in South Africa*. Manchester, UK, Association of Researchers in Construction Management, pp. 803-812.
- Kowalczyk, D., 2018. What is Research? - Definition, Purpose & Typical Researchers. *Study.com*.
- Mark Saunders, P. L. A. T., 2009. *Research methods for business students*. fifth ed. Edinburgh: Pearson.

THE APPETITE TO IMPLEMENT MEGAPROJECTS IN SOUTH AFRICA.

- Horn, R., 2012. *Researching and writing dissertations*. Broadway, London: The chartered institute of Personnel and Development.
- Horn, R., 2012. *Researching and writing dissertations: A complete guide for business and management students*. second edition ed. s.l.:CIPD.
- Ormrod, P. D. L. a. J. E., 2010. *Practical Research PLANNING AND DESIGN*. 9 ed. s.l.:Merrill.
- Mhlanga, ., 2018. China commits to more investments in South Africa. *Infrastructure News*.
- Ballard, R. & Rubin, M., 2018. Why megaprojects to deliver houses in South Africa might not work. *The Conversation*.
- Steve Onyeiwu, H. S., 2004. Determinants of Foreign Direct Investment in Africa. *Sage Journals*, 20(Issue 1-2).
- Loraine Kennedy, G. R. B. B. G. T. A. V. J. A., 2016. Megaprojects and Urban Development in Cities of the South. *Research Gate*.
- Engineering News, 2019. ← Back Eskom and the multi-billion rand mega projects that could have saved SA. *Engineering News*.
- Yelland, C., 2019. *Engineering News*.
- Pheiffer, E., 2017. TOP 10: AFRICA INFRASTRUCTURE PROJECTS IN 2018. *The Business Year*.
- Landman, J., 2018. *The role of infrastructure in building the South African economy*, Johannesburg: Vision2030.
- Garlick2, J. F. a. R., 2008. *Infrastructure Development and Economic Growth in South Africa: A review of the accumulated evidence*, Cape Town: University Of Cape Town.
- NEPAD, 2009. *Infrastructure Development WITHIN THE CONTEXT OF AFRICA'S COOPERATION WITH NEW AND EMERGING DEVELOPMENT PARTNERS*, s.l.: United Nations.
- Department of Enterprise, 2015. *Build Programme impact on local businesses, skills development, job creation and beneficiation: briefing by Department of Public Enterprises*, Pretoria: Parliamentary Monitoring Group.
- Otto, J.-P. F. a. M., 2017. *Medupi and Kusile*, s.l.: Energise.
- Brookes, N., 2015. *Delivering European Megaprojects*. Leeds: Megaproject : A Guide for Policy Makers and Practitioners.
- E. van der Merwe, G. N. O. v. Z., 2001. 'Meeting the Transport Challenges in Southern Africa'. Pretoria, Conference Planners.
- Tshidavhu, F. & K. N., 2020. *AN Assessment of THE causes of schedule AND cost overruns in south African megaprojects: A case of THE critical energy sector projects of medupi AND Kusile*, Johannesburg: UFS.
- Patrick Bond, G. D. a. G. R., 2011. *TRANSFORMATION IN INFRASTRUCTURE POLICY FROM APARTHEID TO DEMOCRACY*, s.l.: s.n.
- Hochstetler, K., 2014. *INFRASTRUCTURE AND SUSTAINABLE DEVELOPMENT GOALS IN THE BRICS-LED NEW DEVELOPMENT BANK*, s.l.: s.n.